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Oil Market Welcomes
Iran-Saudi
Rapprochement
$3.6bn
Oil/Gas
Projects
Inaugurated

Positive Note in No-Flaring

Ali Forouzandeh
Director General of Public Relations

One of the main challenges to Iran's petroleum industry pertains to determining the fate of flare gas burnt during oil extraction. One advantage of associated petroleum gas (APG) capturing at flares is value chain completion, preventing energy loss and reducing environmental pollution. Gas flaring has been incurring heavy costs on Iran.

Ever since taking office, Minister of Petroleum Javad Owji proposed solutions like setting up NGL units in order to resolve the issue of gas flaring. Positive developments have since been seen in this sector.

A major related event was the recent inauguration of Phase 1 of the Persian Gulf Hoveyzeh Gas Refinery (NGL 3200) in the Jofair region in Khuzestan Province. That would accelerate Iran's plan to capture APG.

Meantime, NGL 3100 in western Iran, NGL 3200 in southern Iran and NGL Kharg in Kharg Island are only some of gas gathering projects approved by National Iranian Oil Company (NIOC). The NGL 3100 plant is expected to come online by next March.

In a report, the World Bank highlighted Iran's relative progress in preventing gas waste in 2022 despite sanctions.

According to this report, Iran cut its gas waste in 2022. In 2021, Iran was wasting away 17.4 bcm of gas in its oil and gas fields, which was reduced to 17.35 bcm in 2022 in spite of Iran's restricted access to cutting-edge technology due to US sanctions.

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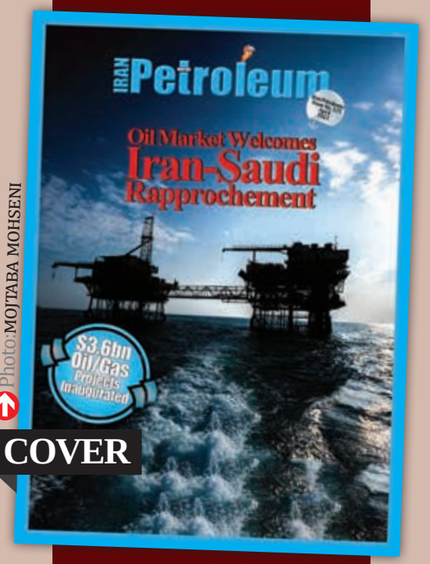

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$3.6bn Oil/Gas Projects Inaugurated

President Ebrahim Raeesi and Minister of Petroleum Javad Owji on 28 April oversaw inauguration of a handful of oil and gas projects worth $3.6 billion. With the commissioning of these projects, Iran would see its crude oil and gas production capacity increase 45 tb/d and 850 mcf/d, respectively. Furthermore, work started on the expansion of the Sohrab oil field under an IPC contractual framework steered by Dana Energy. That would bring the field's accumulated production to 160 million barrels.

Flare Gas Capture

Gas flaring has been a major challenge to Iran's petroleum industry over recent years because the associated petroleum gas recovered from joint fields was transmitted to flares. Flare gas gathering will help prevent associate petroleum gas (APG) emissions and restore all this gas to production cycle. However, due to sanctions imposed on Iran's petroleum industry, Iran's Petroleum Ministry has faced serious challenges. That is why the Persian Gulf Hoveyzeh gas refinery was established to capture APG from joint oil fields. Addressing the ceremony, Minister Owji said: "Currently, nearly 400 tb/d of oil is being recovered from Azadegan, Yadavaran, Yaran and other fields [in West Karoun] with the rich APG being flared. But with the inauguration of the Persian Gulf Hoveyzeh gas refinery, sour and poisonous APG which affected Khuzestan's environment is processed and sweetened prior to being injected into national trunkline, which would remedy the gas imbalance."

In phase 1, the Persian Gulf Hoveyzeh gas refinery will be gathering 250 mcf/d of flare gas from Azadegan, Yadavaran and Yaran. The second phase of the refinery is expected to come online by next March to bring the facility's capacity to 500 mcf/d with an investment of $1.4 billion. Persian Gulf Petrochemical Industries Company (PGPIC) is steering the project. The refinery's heavy products are fed into the Bandar Imam Petrochemical Plant via a 186-km-long 16-inch-diameter pipeline. Other projects that came online that day were the precompression unit of NGL 900 and NGL 1000, which would add 600 mcf/d to national rich gas production capacity. According to Owji, the three projects would add 25 mcm/d to the country's rich gas production capacity.

Owji has said that flare gas released from all fields in Iran will be decided upon before the end of the term in office of the current administration. Seven packages of investment have been envisaged for gathering 30-40 mcm/d of flare gas which is being burnt. The Persian Gulf Hoveyzeh refinery and NGL 3100 in Ilam would gather flare gas in West Karoun. The Persian Gulf Bid-Boland refinery would gather flare gas in East Karoun. Other flare gas gathering projects in Iran are NGL Kharg and South Pars gas gathering. Owji said nearly $15 billion worth of oil and gas projects would come online in the current calendar year (started on 21 March 2023).

Azadegan to Lift Output

A project to increase output from the Azadegan field by 45 kb/d came online. The project which worth $400 million involves drilling, completing and operating 40 new wells.

Azadegan is to undergo development in two phases. Phase 1 involves drilling and completing 206 wells, setting up 10 manifolds, two separators as well as a central treatment export plant (CTEP) with a capacity of 320 tb/d.

The first step in the development of the South Azadegan field accelerated as Raeesi administration took office. For this purpose, a plan started in October 2021 with a view to accelerating the completion of the first step in the development of the field by relying on local contractors and manufacturers and drilling 40 wells. The client of the project is Petroleum and Engineering Development Company (PEDEC) on behalf of National Iranian Oil Company (NIOC). The project is financed by Saba Arvand Oil and Gas Development Company's Special Purpose Vehicle (SPV).

Throughout this project, 2,800 job opportunities were created. Furthermore, Iranian companies saw their share increase to 100% while "Hoveyzeh Marshes" were protected. South Azadegan oil field covers 765 square kilometers of land in Khuzestan Province. Jointly owned by Iran and Iraq, it is estimated to hold 27 billion barrels of oil in place.

Sohrab Development

Minister Owji referred to the start of operations in the Sohrab field, saying: "Nobody had focused on this joint field which is to be developed with $800 million investment for 30 tb/d of oil."

NIOC has assigned financing, development and operation of the Sohrab field to Dana Energy under an IPC deal. With oil price at $50 per barrel, the accumulated oil recovery from this field over a 20-year period would yield $8 billion, not considering associated gas.

Development of the Sohrab field involves natural depletion and drilling of 20 new wells, workover of 2 wells, installing downhole equipment at 14 wells, installing a compressor station, laying a crude oil pipeline, building a separator and measuring station. A 57-km pipeline for carrying crude oil and a 60-km pipeline are other activities pertaining to this project. The project's direct costs (DCC) and indirect costs (IDC) are estimated at $97 million and $96 million, respectively plus $293 million in income tax costs. This project can create 1,000 direct and 2,000 indirect jobs with a 51% share for domestically manufactured equipment. Environmental and security restrictions and complexities pose challenge to development of the Sohrab oil field. The field is being developed by considering environmental issues with regard to Hoveyzeh Marshes.

Gas Flaring Ends in West Karoun

The inauguration of the first phase of Persian Gulf Hoveyzeh Gas Refining Company (NGL 3200) in Jofair in Khuzestan Province is aimed at putting an end to associated gas flaring in the West Karoun cluster of oil fields – North Azadegan, North Yaran and Yadavaran. The commissioning of this refinery is among Iran's petroleum industry plans to capture flare gas rather than being burnt.

Completing the value chain, preventing energy wastage and reducing environmental pollution are among the benefits of gathering associated petroleum gas at flares. Based on this attitude, National Iranian Oil Company (NIOC) is setting up NGL units in order to capture flare gas at operational zones.

The operation of NGL 3100 in western Iran, NGL 3200 in southern Iran and NGL Kharg in Kharg Island is just a simple example of projects approved by NIOC to put an end to gas flaring at these areas. NGL 3100 is expected to come online before the end of the current calendar year in March 2024. The first phase of NGL 3200 has come online in the form of the Persian Gulf Hoveyzeh refinery. NGL Kharg has had more than 65% progress now. Houshang Falahatian, deputy minister of petroleum for planning, has said that 8.2 mcm/d of flare gas is being connected early this calendar year, which would increase by 18.2 mcm/d by the end of the year. For the two following years, the figure is expected to reach 17 mcm/d and 7 mcm/d. Among other projects envisioned by NIOC are auctioning off flare gas produced in East Karoun and optimization of flare gas installations at the Persian Gulf Bidboland refinery.

Once all these projects have been implemented, gas flaring would be halved in two years before coming to an end by 2025. It has also to be recalled that National Iranian South Oil Company (NISOC), running 14 gas and liquefied petroleum gas plants, gathers about 185 mcm/d of APG to feed petrochemical plants or inject to some wells. NISOC has captured 80% of its associated gas and plans to capture the rest. The gas precompression units of NGL 900 and NGL 1000 – with an investment of IRR 2,200 billion – are ready for operation. That would convert low-pressure gas to high-pressure gas and add 600 mcf/d to the processing capacity of NISOC.

50% Gas Gathering

Mohsen Khojasteh-Mehr, CEO of NIOC, highlighted the significance of the operation of the first phase of NGL 3200, saying: "According to plans, 50% of flare gas would be gathered this [calendar] year. NGL 3200 is one of the most important projects considered in this timetable."

He said that 26.4 mcm/d of gas on average would be captured at flares by the end of the year, which would mean 50% gas gathering.

He also referred to the construction of NGL 3200, saying the two-phase project would finally gather 500 mcf of gas at West Karoun fields (Azadegan, Yadavaran, Darquain, North Yaran, South Yaran, Sohrab, Sepehr, Jofair, Susangerd and Band Karkheh). This project is under way by the Directorate of Business Management of NIOC. The €1,400 million investment in this project has been provided by Persian Gulf Petrochemical Industries Company (PGPIC). The approach sought in this project is to boost productivity and safeguard the environment. The NIOC chief said another advantage of this project would be supply of 70 mcf/d of light sweet gas and 1,200 tonnes a day of gas condensate. "Currently, more than 20 mcf/d of flare gas is transferred from North Azadegan to NGL 3200, which would gradually reach 30 mcf/d. Once flaring ends in all West Karoun fields, we would see a green petroleum industry take shape in West Karoun with no environmental pollution caused by flares," he said.

$500mn Revenue

Each phase of the Persian Gulf Hoveyzeh refinery has a capacity equaling 250 mcf/d. In the second phase, it would receive all associated gas produced at South Azadegan. In case oil production increases from West Karoun fields, the refinery may be developed into a third phase. Afshin Kiani, CEO of Persian Gulf Hoveyzeh Gas Refining Company, said the second phase of the facility has been 80% completed, which is expected to be ready to come online in a year.

The refinery's output includes 360 mcf/d of natural gas to be fed into national gas trunkline, 97 tb/d of NGL to feed Bandar Imam Petrochemical Plant, and 41 tonnes a day of granulated sulfur for industrial and agricultural purposes. Kiani said construction of this project started in 2013, adding: "Up to 2016, this project was in the hands of Petroleum Engineering and Development Company (PEDEC). It was 21% complete when it was assigned to PGPIC. A consortium of PGPIC (70%) and Khatam al-Anbia Construction HQ (30%) was set up to build NGL 3200. The investment for this project has been $1,338 million plus IRR 2,210 billion."

Kiani said: "We're currently receiving 100-150 mcf/d of sour gas from West Karoun fields as feedstock, which would gradually rise to 250 mcf/d in Phase 1."

He said that implementation of both phases and receipt of 500 mcf/d of sour gas from West Karoun fields would cut carbon dioxide emissions by 14,000 tonnes a year. After that, the associated gas produced at West Karoun fields would be entirely gathered. He said this project would yield $500 million in annual income, adding that necessary equipment had been entirely installed. Touching on the 84% share of domestic manufacturing in this project, Kiani said: "Except for compressors, local companies in the province can supply all necessary equipment. Furthermore, part of this equipment was purchased from abroad. The license of this equipment is fully Iranian and we have no problem with the launch of units."

Oil-rich West Karoun is located along the border with Iraq. The Yadavaran oil field is estimated to hold 30 billion barrels of oil in place. At its current output, it produces 100 mcf/d of flare gas.

Abuzar Sharifi, the CEO of PEDEC, said Yadavaran oil field was sending 90 mcf/d of flare gas to the Persian Gulf Hoveyzeh refinery for processing. About 10% of flare gas from Yadavaran is destined for domestic purposes and lifting installations. The rest is flared as no gas refinery is available. "Given the maintenance and overhaul of compressors and monitoring of the 18-inch gas pipeline at the Yadavaran field, PEDEC was a leading company in sending gas to the Persian Gulf Hoveyzeh refinery. Since precommissioning in February 2023, 50% of Yadavaran's flare gas was being transmitted to this unit. Now with the completion of the refinery, Yadavaran sends its entire flare gas to the facility," he said. Abdollah Ozari Ahvazi, CEO of Arvandan Oil and Gas Production Company, said: "In the future, with the operation of the second phase of the Persian Gulf Hoveyzeh refinery, all flares at West Karoun would be turned off and the flare gas would be converted to products of higher value-added."

NISOC Plans

Iran sits atop the world's largest oil and gas reserves combined. Currently, in addition to gas fields, flare gas from oil fields supply national gas needs. Therefore, the flare gas has first to be gathered prior to being compressed and pumped to refineries. At gas refineries, in addition to sweetening rich gas, heavy and light products are separated so that light gas would be sent for households and businesses while heavier products would feed petrochemical plants. Within the area administered by NISOC, Iran's largest oil producer, no-flaring would be of high significance. Ali-Reza Daneshi, CEO of NISOC, said an agreement had been signed with PGPIC to gather 593 mcf/d of gas from Khuzestan. Gas gathering facilities have been set up in Gachsaran, Aghajari and part of Maroun to capture flare gas in East Karoun. An agreement has also been signed with the Maroun Petrochemical Plant for gathering 173 mcf/d of flare gas from Karoun Oil and Gas Production Company.

NISOC recently put on auction flare gas with a view to generating wealth, preventing environmental pollution, saving national resources, creating opportunities for investment and creating jobs.

Petchem Value Chain Completion Document Unveiled at IPF

During the 14th International Petrochemical Forum (IPF) convened in Tehran May 1-2, opportunities for investment in the petrochemical sector were highlighted while Iran's Petrochemical Industry Value Chain Development and Completion Document was presented. Iranian petrochemical officials said the document laid emphasis on the development and completion of value chain, reducing crude sales and hard currency generation in the petrochemical industry. To this effect, all petrochemical developers, companies and holdings should adapt their development plans to this document which would ensure prospective investors in Iran's petrochemical sector. Nearly 107 petrochemical projects are under way in Iran, ranging from basic industries to value chain completion. That necessities generative investment in this industry more than ever. Minister of Petroleum Javad Owji said $80 billion had been invested in the petrochemical industry, adding that $80 billion more would be needed for implementing new projects. Iran's petrochemical production capacity has reached 93 million tonnes, which is expected to double in 10 years as new value chain and upstream projects would come online.

$160bn Investment in Fields

Minister Owji told the IPF gathering that under the 13th administration, the Petroleum Ministry was determined to enhance oil and gas output, build refinery-integrated petrochemical plants, prevent crude sales, neutralize sanctions and create value-added.

"The country's oil production has exceeded 3 mb/d and natural gas production crossed 1 bcm/d under the 13th administration," he said.

Noting that Iran's petroleum industry is driving national economy, the minister said Iran sits atop 33 tcm of natural gas and 154 billion barrels of recoverable crude oil.

"Currently there is no oil and gas field to have remained undecided. Meantime, $160 billion is planned to be invested in developing independent and joint gas fields over 5 to 7 years."

The minister pointed to the partnership of holdings and banks in developing joint fields, saying: "Ever since we took office under the 13th administration, we have not eyed any crude sales and we have constantly sought to expand the value chain in this industry. In coincidence with developing the upstream sector, Iran's Petroleum Ministry has sought to establish energy security, and guarantee sustainable supply of gas and liquid feedstock by building refinery-integrated petrochemical plants."

Apart from existing refinery-integrated petrochemical plants, Iran's Petroleum Ministry has embarked on the Shahid Soleimani petrorefinery project. "In the current calendar year, about $500 million is envisaged in the national budget for completing the Mehr Khalij Fars petrorefinery complex."

He added that Iran's Petroleum Ministry would continue to supply feedstock to industries. "By developing petrorefineries and increasing oil and gas production we will try to supply sustainable feedstock to major industries. We are ready to eliminate imbalance in the oil and gas products."

Owji said the Petroleum Ministry would provide feedstock to major industries for any project including underground gas storage, liquefied petroleum gas (LPG) and liquefied natural gas (LNG). He added that the Petroleum Ministry would support potential investors in terms of feedstock, marketing, technical knowhow and infrastructure.

10 Petchem Megaprojects

Ruhollah Dehqani Firoozabadi, vice-president for science, technology and knowledge-based economy, said the government targeted doubling petrochemical exports by the end of the 8th National Economic Development Plan.

"In early 2022, 10 megaprojects were envisioned in the petrochemical sector," he said. Dehqani said Iran's knowledge-based economy was dependent on the petroleum industry, highlighting Iran's huge oil reserves. He said that more than 8,000 technology development companies were active in Iran, adding that 250 top petrochemical technologies had been developed in the country. Dehqani said Iran was investing heavily in knowledge-based economy.

He also said that the petroleum industry had so far paid $200 million for first-time manufacturers in Iran. "In lieu of every single dollar investment in technology development, $8 would be saved," he said.

550 Petchem Grades

Morteza Shahmirzaei, CEO of National Petrochemical Company (NPC), said Iran's petrochemical industry had grown 60 times since the 1979 Islamic Revolution, adding that nearly 107 petrochemical plants were under construction in the country. He said more than 550 petrochemical and polymer grades were being manufactured in Iran, adding that all petrochemical catalysts would have been manufactured domestically by the end of the tenure of the 13th administration. He said 80% of equipment needed by the petrochemical industry was being manufactured domestically. "In some sectors, up to 90% of required equipment is supplied domestically." Laying emphasis on the need for completing the value chain in the petrochemical industry, Shahmirzaei said: "To manufacture 21 new petrochemical products to bring us closer to completing the value chain, the equivalent of $4.5 billion in investment would be needed, for which required planning is under way."

Petchem Output to Rise 10mt

Hassan Abbaszadeh, director of planning and development of NPC, told a panel discussion titled "Roadmap for Iran Petrochemical Industry Value Chain Development" that Iran's petrochemical output would increase 10 million tonnes in the current year to 80 million tonnes. "Currently, 70 petrochemical complexes are operational in Iran, three of which are utility plants," he said.

Abbaszadeh said Iran's installed petrochemical capacity stood at 93 million tonnes, which required 1mb/d of crude oil as feedstock.

He said 70% of feedstock for the petrochemical industry was gas, adding that 70 million tonnes of petrochemicals was produced last calendar year. Referring to Iran's petrochemical sales last calendar year, Abbaszadeh said: "40 million tonnes of products was sold for $27 billion – 28 million tonnes worth $16 billion for exports and 12 million tonnes worth $10 billion on local markets."

He said: "The installed capacity of Iran's petrochemical industry stands at 58 million tonnes for basic products, 13 million tonnes for middle products and 20 million tonnes for final products." Touching on petrochemical projects under way, he said: "The projects that have already started are about 35% complete, for which $13 billion has been spent. More investment is needed for their completion."

He said that basic petrochemical projects had been on an upward trend, adding: "Of 93 million tonnes of installed capacity, methanol, ethylene and propylene projects are increasing." He stressed the need for revision of the 8th National Development Plan's petrochemical projects, saying: "As Iran has a brilliant performance in the ammonia, ethylene and methanol sector, these sectors provide a good opportunity for developing the methanol sector." Stressing the need for developing the methanol value chain, he said: "Iran comes after Saudi Arabia in basic products, followed by Qatar, the United Arab Emirates, Oman, Kuwait and Turkey."

$10bn Investment in Value Chain

Abdol-Hossein Bayat, head of Oil Industry Pension Fund (OIPF), said OIPF would invest more than $10 billion in the value chain completion. He said some of these projects were the Dehloran and Kangan refinery-integrated petrochemical plants, Mahestan refinery and NGL 3100. He said that 75% of OIPF's investment was made in the oil, gas, refining and petrochemical sector. He welcomed cooperation with international companies for engagement in internal and external projects, saying: "Over the past two years, we have executed many plans to make up for the missing links of the value chain in such projects as the Kharg Petrochemical Plant and the Jey and Sepahan oil refineries." "Currently, 26 projects are under way by OIPF. Once sanctions are lifted, OIPF would become the best known and largest fund in Iran for investors."

PGPIC $15bn Projects

Abdol-Ali Ali-Asgari, CEO of Persian Gulf Petrochemical Industries Company (PGPIC), said the holding had 28 projects, worth $15 billion, under way. "Quitting crude sales means completing the value chain. Therefore, we are adding to downstream projects and eye constructing downstream parks," he said. He said constructing downstream parks had already begun mainly along the Persian Gulf coasts, adding: "Makran, Jask, Chabahar, Parsian, Nayband and Genaveh are among locations considered for these parks. Nine parks will be definitely built and we are receiving necessary permits." Ali-Asgari said PGPIC welcomed investment in these projects, noting that petrochemical actors can engage in these projects with a view to ending raw material sales. He said PGPIC's net margins reached IRR 950 trillion last calendar year, which is projected to reach IRR 1,350 trillion in the current calendar year.

Petchem Exports to Brazil

Hossein Qaribi, Iran's ambassador to Brazil, told a panel discussion titled "International Petrochemical Cooperation" that petrochemicals were an important element in Iran's exports to Brazil. "Last year, Iran achieved the highest ranking in urea fertilizer exports to Brazil," he said, adding that Iran-Brazil trade totaled $6.5 billion. Noting that Brazil was not advanced in the petrochemical industry and that it depended on petrochemical imports, he said: "Brazil produces 2.9 mb/d of crude oil, which is planned to reach 3.5 mb/d. However, Brazil faces many problems in refining. It imported $6 billion worth of gas last year." Qaribi said Iran became a urea supplier to Brazil in 2019, adding: "Brazil depends on chemical fertilizer imports up to 80%. It consumes 8-10 million tonnes a year of urea fertilizer." He said Iran also had a good position in Brazil's polymer market, adding that Brazil imported plastic polymers or $6-11 billion in 2022. "Iranian businesspeople are required to enter this market and have a proper understanding of the market and consider long-term planning as we should not look at Iran-Brazil ties in the short term," said the diplomat. On the exchange of goods between Iran and Brazil, Qaribi said: "Over recent years, Iran-Brazil cooperation has been a good model for barter trade, but Iranian producers are required to step into trade too, which means that we would become both producer and trader of chemical fertilizers." He said Iran's embassy in Brazil was ready to provide any kind of information to petrochemical actors for entering Brazil's market. He said that Brazil was building a railway network in its northern ports, which would serve Iranian products.

Ammonia-Methanol, PE Exports to India

Iraj Elahi, Iran's ambassador to India, said ammonia-methanol and polyethylene constituted the main Iranian petrochemical products exported to India. He said Iran's exports to India totaled $2.146 last calendar year, adding that $756 million was for Iran's petrochemical exports to India. He said Indian government's regulations blocked Iranian urea imports, adding: "India's low-cost Russian products imports has posed a big obstacle to Iran's products in the Indian market."

Russia Keen to Use Iran Technology

Kazem Jalali, Iran's ambassador to Russia, said Tehran-Moscow ties were growing on a daily basis. "Energy is one of the major issues in Iran-Russia ties and a major element of cooperation between the two countries is petrochemicals," he said. Jalali said Russia was willing to use Iranian petrochemical technology and products.

He said good steps had been taken for overcoming obstacles in the way of Iran-Russia ties. "Good and effective steps have been taken in the transit sector and we will soon witness operation of the Iran-Russia north-south transit project," he said. Jalali said Russia's Deputy Prime Minister Alexander Novak would visit Iran soon along with the governor of Russia's central bank to resolve monetary and banking problems.

ICOFC Invests $4bn in Field Development

Iran's enhanced gas production has prompted National Iranian Oil Company (NIOC) to consider crash plans for recovery from independent gas fields. To that end, a comprehensive plan has been formulated for early gas recovery from the gas fields run and operated by Iranian Central Oil Fields Company (ICOFC), which is the second largest gas producer in Iran.

Mehdi Heydari, CEO of ICOFC, tells "Iran Petroleum" the company is expected to add 10 mcm/d to its output by March 2024. The following is the full text of the interview Heydari gave to "Iran Petroleum":

Mahnaz Mohammad-Qli

Tous in northeast, Baba Qir and Bistoun in west, Dey, Aghar, Sepid Zakhour, Sepid Baghoun, Halegan, Eram, Pazanan, Khartang and Gordan under SEOGPC

How many fields is ICOFC currently developing?

Production, development and storage constitute the three special missions assigned to ICOFC. Being active in more than 14 provinces, ICOFC is the second largest gas producer in the country, thereby playing an instrumental role in energy supply security and winter gas supply. The three companies of West Oil and Gas Production Company (WOGPC), East Oil and Gas Production Company (EOGPC) and South Zagros Oil and Gas Production Company (SZOGPC) along with the strategic Sarajeh zone cover ICOFC operations. The outstanding feature of ICOFC is gas production. WOGPC, EOGPC and SZOGPC run totally 85 oil and gas fields, whose development is under way particularly for gas production. ICOFC has also formulated special projects to make up for gas imbalance in the country. For this purpose, ICOFC has embarked on developing gas fields including in northeastern Iran by EOGPC.

How much is the current gas production capacity at ICOFC-run fields?

Under normal conditions, according to NIOC plan, 242 mcm/d of gas is produced by ICOFC-run fields. But by the end of the current calendar year, 10 mcm/d has to be added to ICOFC's output, which would be instrumental in ending the winter gas imbalance in the country. ICOFC is committed to adding 10 mcm/d to its output this year and we will try to fulfil this obligation.

Some fields run by EOGPC and SEOGPC are not yet producing any gas. Are you planning to extract gas from these fields or is the NIOC Directorate of Exploration planning to assign new fields to you?

We plan development in two phases. First, untapped fields need to be developed. These fields are under authority of SZOGPC, EOGPC and WOGPC. But the Directorate of Exploration has been asked to carry out exploration in some strategic areas which may need gas. For instance, the Directorate of Exploration should discover small fields in northeastern Iran to help gas supply to that area which needs gas support in winter due to pressure fall-off.

Which fields, owned by SZOGPC, EOGPC and WOGPC, are currently active?

At EOGPC, Khangiran, Gonbadli, Mozdouran and Shourijeh are already producing gas. The Tous field is also expected to join them in the current calendar year. The major field in this area is Khangiran with 44 mcm/d output in winter peak. With gas storage during eight months of year, nearly 66 mcm/d of gas is supplied by EOGPC during winter. Tous is expected to bring the figure to 70 mcm/d. At SZOGPC, which is the most important subsidiary of ICOFC, four strategic zones – Parsian, Nar & Kangan, Aghar & Dalan and Sarkhoun $ South Gashou – are producing gas. Each zone, particularly Parsian, Aghar & Dalan, and Nar & Kangan, are supplying gas to northeastern Iran. The largest field is Parsian with a 66 mcm/d output.

How much gas is produced by these four fields?

During winter peak, they produced 162 mcm/d.

What about WOGPC and the Tang-e Bijar field?

WOGPC's gas production is done at Tang-e Bijar whose second phase development, assigned by gas compressors, would bring gas production capacity in western Iran to 11 mcm/d. We're in the process of signing agreement for the second phase development of this field. It will take 24 months to launch this gas compressor station, but we will reach conclusion as soon as an agreement has been signed. Of course, the Ilam gas refinery would also receive more gas.

How many fields are under development by ICOFC in total?

In light of development of key fields by ICOFC, the company's policy has changed from production-based approach to production-development-based approach. These fields are expected to be developed within the framework of 15 packages. Operation of two gas compressor stations (Shanol and Sarkhoun), the second phase of the Farashband refinery and 12 fields form this package. Development operations will be carried out during five years under EPCF deals to bring gas output 130 mcm/d by 2026. It means that a volume the equivalent of four South Pars phases would be added to ICOFC's gas output.

What are these fields?

Tous in northeast, Baba Qir and Bistoun in west, Dey, Aghar, Sepid Zakhour, Sepid Baghoun, Halegan, Eram, Pazanan, Khartang and Gordan under SEOGPC. These fields are expected to undergo development under EPCF deals with $4 billion investment. The package will be assigned entirely to contractor who would determine the financier. Based on the model presented for this project, investment will return in four to five months.

Has any contractor been chosen?

We are in talks with the contractor and our talks are nearing conclusion.

Are they Iranian?

Yes, they are. Of course, we will engage Russian and Chinese companies, with which we have signed MOUs and we are in talks on the price of agreement.

Haven't you yet reached agreement with Russian and Chinese companies?

Iranian companies have joined Chinese and Russian companies and we are in talks to reach agreement with them. For instance, development of the Farashband refinery and the Eram and Pazanan fields is close to agreement. Foreign partners will be hired. For Khartang, Gordan and Pazanan, MOUs have been signed, which will soon become agreement.

Which fields are expected to start early production?

NIOC planned early gas production from the Aghar, Dey and Tous fields in a bid to make up for gas imbalance. Production from these three fields is projected to add 10 mcm/d to ICOFC's output this calendar year. Moreover, early production from the Khartang field – after drilling seven new wells and working over one well – would add another 10 mcm/d next calendar year. Therefore, ICOFC would see its output rise 20 mcm/d by next calendar year. The drilling contractor for Khartang, Aghar, Dey and Tous fields is National Iranian Drilling Company (NIDC). Early

Under normal conditions, according to NIOC plan, 242 mcm/d of gas is produced by ICOFC-run fields. But by the end of the current calendar year, 10 mcm/d has to be added to ICOFC's output, which would be instrumental in ending the winter gas imbalance in the country

Development of Naftshahr, Sarvestan and Saadatabad fields has been awarded under EPC and EPD contracts.

production is also planned in the Madar field, which lies in the Gulf of Nayband, which would add nearly 20 mcm/d of gas to national output.

Given the age of ICOFC gas fields, particularly SEOGPC fields, would you please explain about the launch of gas compressor stations there?

At SEOGPC, Varavi and Homa are ageing fields that need compressor stations. We have signed an agreement with a local company and proper measures have been undertaken. In coming winter, the Varavi and Homa gas compressor station will become online, which would help sustain production from these two fields. In addition to two compressor stations, a separation center will be also established to upgrade the quality of feedstock fed into the Parsian gas refinery. This center is also planned to come online by the end of the current calendar year.

How about Nar and Kangan?

Both are ageing fields currently in the last third of their lifecycle. Launching gas compressor stations for these two fields has been assigned to Oil Madar's reservoirs are similar to that of South Pars. It can also produce more than 45 kb/d of condensate. An MOU has been signed for this field, which is close to agreement.

How many compressor stations will be launched by WOGPC?

With the operation of Dehloran, Cheshmeh-Khosh and West Paydar gas compressor stations, 250 mcf/d of gas would be fed into NGL 3100 in western Iran. NGL 3100 is expected to become operational by the end of the current calendar year for the purpose of flare gas gathering at Azar, Cheshmeh-Khosh, Dehloran, West Paydar and Danan fields.

ICOFC has for the first time set up mini-NGL facilities in the country. Would you please explain about that?

Yes, the Cheshmeh-Khosh mini-LNG facility was launched last calendar year to prevent gas flaring. Its capacity is up to 20 mcf/d, which would help the environment and production stability because ICOFC is sensitive to its environment alongside sustainable production. All flare gas packages at ICOFC, except for Serkan and Maleh Kuh fields, have been finalized and awarded to contractor.

How much associated gas is being gathered totally?

Flaring comes from five fields owned by ICFOC. At the Cheshmeh-Khosh field, a mini-LNG is gathering 17 mcf/d of flare gas. Flare gas gathering at Khesht, Sarvestan and Saadatabad has been awarded to contractor and is currently under way. For Serkan and Maleh Kuh fields, auction is under way.

What has been done for underground gas storage?

Underground gas storage is a strategic activity pertaining to gas supply. It is steered by ICFOC in the upstream sector. Currently, Sarajeh and Shourijeh fields store gas during eight months of year to be consumed during the last four months of year. Maximum production from these two fields in winter is about 26 mcm/d. The second phase of gas storage at Shourijeh is under way by National Iranian Gas Company (NIGC).

How much will be added to ICOFC's total oil output by 20 March 2024?

Development of Naftshahr, Sarvestan and Saadatabad fields has been awarded under EPC and EPD contracts. Development of Naftshahr and Saadatabad has been concluded while development of the Danan field is in the final stage. Once these fields reach maximum production they would be producing along with Khesht more than 80 tb/d. The Azar field has been also assigned to ICOFC. It is jointly owned by Iran and Iraq. It has been developed by Petroleum Engineering and Development Company (PEDEC), which is being assigned to ICOFC for production steering. In its initial Master Development Plan (MPD), it is estimated to produce 65 tb/d of oil.

Where does the second development phase of the Dehloran field stand now?

It is in the process of licensing round. It would add 10 tb/d to ICOFC's output.

How much investment is ICOFC earmarking for development of fields?

In light of ICOFC's development policy, nearly $4 billion has been invested in development of Tous, Aghar, Dey, Eram, Pazanan, Khartang, Gordan, Madar, Shanol, Sarkhoun, Baba Qir, and Bistoun gas fields as well as the second phase of the Farashband refinery. Since development of these fields is EPCF-based, ICOFC is fully ready to attract domestic and foreign investment and good measures have been undertaken in this regard. An event is planned to be held to offer ICOFC opportunities for investment to explain all projects to would-be domestic and foreign investors. Therefore, we invite all local and foreign companies to invest in these projects because NIOC guarantees the return of investment, which would be recouped in the form of revenue from the fields or oil and condensate from other fields.

What has been done with regard to supporting knowledge-based companies?

As far as first-time manufacturing and supporting knowledge-based companies is concerned, good measures are under way at ICOFC. 10-inch smart pigging has been done for the first time in the country, which has yielded good results. Furthermore, an agreement has been signed with another knowledge-based company to produce temporary plugs to prevent cement pouring inside reservoirs and stop water production. These plugs would dispense with the need for cement pouring and contaminating oil and gas reservoirs. With regard to commodity manufacturing, significant measures have been undertaken at ICOFC's three subsidiaries, mainly commodities for wellhead and downhole pumps by Iranian companies. We are using these commodities. It has to be recalled that for the first time in the history of Iran's petroleum industry, a 10-inch smart pig was developed while a handful of nations had monopolized its manufacturing technology. Smart pig is among 10 strategic items of Iran's Petroleum Ministry. Sponsored by ICOFC, this pig was built by a local knowledge-based company before undergoing field test for satisfactory results. That would help monitor corrosion of pipelines in all oil and gas fields, particularly gas fields for sustainable gas supply in winter. Given the existence of thousands of kilometers of main and pipelines for oil and gas across the country, this magnetic smart pig would periodically detect defects in oil and gas pipes to be repaired for safe production.

At SEOGPC, Varavi and Homa are ageing fields that need compressor stations. We have signed an agreement with a local company and proper measures have been undertaken. In coming winter, the Varavi and Homa gas compressor station will become online

SPGC Main Feed Supplier to Petchem Plans

CEO of South Pars Gas Complex (SPGC) Ahmad Bahoush said SPGC is the main supplier of feedstock to petrochemical plants, adding that it was sending 10,000 tonnes a day of ethane. "Currently, 10,000 tonnes a day of SPGC's ethane is supplied to Jam, Arya Sasol, Morvarid, Kavian and Petro Iranian petrochemical plants," he said.

"Last [calendar] year, following regular and precise overhaul and use of high-quality Iranian items and equipment, nearly 2.2 million tonnes of ethane was produced by SPGC refineries," he added.

Bahoush referred to propane and butane as two SPGC products, saying 3.283 million tonnes of propane and 2.286 million tonnes of butane were produced.

The giant south Pars gas development consists of 13 refineries which are totally supplying more than 570 mcm/d of gas. Hossein Shamshiri, deputy CEO of SPGC, said winter gas supply last calendar year was among strengths of the 13th administration. "SPGC's natural gas production stood at 17.2 bcm last winter, up 6% year-on-year," he said. "SPGC has supplied 70-80% of Iran's gas demand over this time and SPGC's gas production reliability has reached 100%," he added. Bahoush said SPGC materialized 99.9% of its target in gas production last calendar year, up 2.7% from the year before.

Gas Production Up 7 bcm y-o-y

Ahmad Zamani, director of coordination and supervision on production for National Iranian Gas Company (NIGC), said Iran's gas production would increase 7 bcm this year compared with the year before. He said the increase in production was due to the fewer days spent on the overhaul of South Pars Gas Complex (SPGC) refineries. "That is a big achievement and a very important step for containing inflation and boosting production," he said. Zamani said: "We expect to reach good results in the supply of amines and molecular sieves in coming years."

Gholam Abbas Hosseini, CEO of Iranian Gas Transmission Company (IGTC), said last calendar year gas transmission rate was 2% higher than the preceding year. "Last calendar year, 273.92 bcm of gas was transmitted, up from 268.3 bcm the year before."

GOGPC Exceeds Output Target

Mehrdad Kahkesh, CEO of Gachsaran Oil and Gas Production Company (GOGPC), has said that the company realized its production target by 102%.

He added that GOGPC would not be required to cut its output in the current calendar year, noting that it would keep producing more. Kahkesh said that the production target was achieved following pigging and securing defective points, operation of main oil export pipelines, and operation of gas compressor stations and gas gathering units. He said that installation and operation of a new separator helped gas injection into the Gachsaran reservoir and the LPG feedstock for Bandar Imam Petrochemical Plant. Referring to GOGPC's prioritized plans for the current calendar year, he touched on workover on some wells with enhanced oil recovery, continued securing of wells and installations around Chamshir Dam, continuation of overhaul, pigging, procurement of spare parts for gas production and injection stations, repair and operation of associated gas gathering facilities in order to reduce gas flaring and environmental pollution. On GOGPC's plans for flare gas gathering, he said: "We have two plans for this purpose.

Top Russian Delegation Due in Tehran

Iran's deputy minister of petroleum for international affairs and trading said a high-ranking delegation from Russia will visit Tehran to sign cooperation documents. Ahmad Assadzadeh added the two sides are scheduled to ink the documents on the sidelines of business-to-business (B2B) meetings coinciding with the 27th Iran International Oil, Gas, Refining and Petrochemical Exhibition.

He said heads of Iran-Russia Joint Economic Commission – Iran's Petroleum Minister Javad Owji and Russian Deputy Prime Minister Alexander Novak – held phone talks. The Russian delegation will attend the opening ceremony of the exhibition, also known as Iran Oil Show 2023, said Assadzadeh, continuing the Russian officials, including Russian Central Bank Elvira Nabiullina, will discuss Moscow-Tehran cooperation in banking, transit, oil, gas, and petrochemical sectors. Iran Oil Show 2023, which will be held at Tehran International Permanent Fairground from May 17-20, is to host more than 1,500 Iranian and foreign oil, gas and petrochemical companies, knowledge-based firms, start-ups, and universities.

Iran Gas Flaring Down despite Sanctions

The latest Global Gas Flaring Tracker Report, a leading global and independent indicator of gas flaring, indicates that global gas flaring decreased by three percent to 139 bcm in 2022 from 144 bcm in 2021.

Oil production increased by 5 percent to 80 mb/d from 77 mb/d in 2021. As a result, the global average flaring intensity—the amount of gas flared per barrel of oil produced—dropped to 4.7 m3/bbl in 2022 from 5.1 m3/bbl in 2021. Three countries: Nigeria, Mexico, and the United States, accounted for most of the decline in global gas flaring in 2022. Two other countries—Kazakhstan and Colombia— stand out for consistently reducing flaring volumes in the last seven years. The top nine flaring countries continue to be responsible for the vast majority of flaring: Russia, Iraq, Iran, Algeria, Venezuela, the United States, Mexico, Libya, and Nigeria account for nearly three-quarters of flare volumes and just under half of global oil production.

Iran Gas Swap Up 358% y-o-y

CEO of National Iranian Gas Company (NIGC) Majid Chegeni said the amount of gas Iran swapped in 1401(ended on March 20, 2023), saw a 358% hike year-on-year.

Chegeni stated that Iran's gas export volume also showed a 10% rise in the previous year.

The deputy petroleum minister pointed to the performance of his company in the field of natural gas trade and added that the export of natural gas registered a 10 and 79% growth in 2022 in terms of volume and value, respectively as compared to a year earlier. The amount of swapped gas has registered a 358 and 530% hike in 2022 in terms of volume and value, respectively as compared to the same period of last year, Chegeni highlighted. The NIGC imported natural gas from Turkmenistan under a swap deal inked with SOCAR Company of the Republic of Azerbaijan in 2022, he said, adding, "While increasing natural gas trade with Turkmenistan, the NIGC succeeded in restoring gas import from Turkmenistan into the country. This huge volume of natural is swapped from Turkmenistan to the Republic of Azerbaijan and Nakhichevan, he noted. Elsewhere in his remarks, the deputy petroleum minister referred to the export of byproducts of natural gas and noted that Iran's export of liquefied petroleum gas (LPG) registered a 32 and 57% hike in terms of volume and value, respectively as compared to 2021.

It is expected that the volume of gas imported from Turkmenistan under the gas swap deal inked with SOCAR would increase more than 70% in 2023 as compared to a year earlier, the NIGC chief said.

SP16 Platform Gas Production Up

CEO of Pars Oil and Gas Company (POGC) Mohammad Hossein Motejalli has announced ramped up gas production from the platform of Phase 16 of the giant South Pars gas field in the current calendar year.

He said the production increase would follow the completion and operation of a 110-km subsea pipeline. Referring to the supply of 706 mcm/d of rich gas last calendar year, he said: "Currently, 95 km of the new subsea pipeline of SP16 is over. Once the subsea pipeline project implementation is complete, gas production from the South Pars field would increase 8 mcm/d." Motejalli said drilling of 4 production wells in SP11 was a key step towards operation of the project.

He said international companies pulled out of SP11 due to sanctions in recent years, adding: "Fortunately, thanks to the good capacity of local companies we managed to drill four wells in Platform B and besides facilitating early production from this project in coming months, we plan to drill two more wells in this platform by the end of the current [calendar] year."

Asia-Pacific Needs $71tn for Decarburization

Asia-Pacific, a region highly exposed to costly climate change-related events, needs to invest US$71 trillion to achieve net zero emissions by mid-century if it aims to heed the United Nations' recent call for faster decarburization, according to a study. This level of climate commitment would boost the region's economic output by up to 6.3 per cent above predicted levels by the 2030s, New York-based international relations think tank Asia Society Policy Institute said in a study.

The clean-energy projects necessary to deliver carbon neutrality by 2050 could also create up to 36.5 million jobs by the 2030s, while reducing household energy bills by US$270 billion and improving the region's trade balance by US$827 billion by reducing fossil-fuel imports.

However, the average household would feel poorer as a result of higher consumer prices due to carbon-emission levies and higher taxes to fund decarburization, the report's authors said. The research was spearheaded last year by the High-level Policy Commission on Getting Asia to Net Zero. "Asia-Pacific households are on average worse off as a result of the transition, faced with higher [product and service] prices and higher taxes to help finance additional investments," they wrote.

Tehran Ready to Share Oil Experience with Damascus

President Ebrahim Raeesi, heading a high-ranking delegation to Syria, said Iran is ready to share its petroleum industry experience with Syria. "Iran is ready to share its experience and achievements in the electricity, energy, oil and gas, petrochemical, agriculture, industrial, scientific and technology sectors with Syrian economic and business actors," he said. Raeesi said: "During a meeting with Syria's president, we discussed how to develop economic and trade ties, and decided on overcoming obstacles." He added that his talks with Bashar Assad was focused upon removing obstacles for businesspeople and economic actors of the two countries. He said 15 documents of cooperation were signed for economic, scientific and technological cooperation. "Syria is a rich country and enjoys good potential in agriculture, trade and industry. It has unfortunately been wronged by enemy, and its oil and gas resources are being plundered; however, future is bright and promising," he said. Raeesi, upon returning from his two-day official visit to Syria, said: "The issue of cooperation in the field of energy production and distribution, facilitating economic and commercial cooperation by establishing a joint bank and insurance company and reducing trade tariffs between the two countries to zero, strengthening and expanding transit between Iran, Iraq and Syria, the efforts of the Syrian side and Iran's assistance to restore its post-war capacities in agriculture, industry and energy and facilitation of pilgrimage between the two countries were among the points

€9bn Refinery-Integrated Petrochemical Plant

CEO of National Iranian Oil Refining and Distribution Company (NIORDC) Jalil Salari said construction of a new petrorefinery complex is to start with €9 investment this year. The new facility is named after Gen. Qasem Soleimani. Salari said the new facility would be fed with heavy and ultra-heavy crude oil, adding that the products would include xylene, polymer, butadiene and propylene, refined products (70%) with no fuel oil. A consortium comprising petrochemical and refining holdings, banks, and funds was formed and signed a partnership deed to invest in the project based in Bandar Abbas, southern Iran, stated Salari, continuing the main reason behind selecting the port is the existence of two main refineries of the country there. "The reason for choosing this location was the availability of necessary infrastructure in Bandar Abbas due to the existence of two key refineries. Furthermore, no extra costs would be needed. In parallel, environmental studies, civil defense, forecasts and feasibility studies have been done," he said. The project is owned 15% by Tadbir Energy, 15% by Persian Gulf Petrochemical Industries Company (PGPIC), 15% by Ahdaf Investment Company, 10% by NIODRC, 15% by Bank Melli, 15% by Bank Refah Kargaran, 7.5% by Bank Mellat and 7.5% by Bank Tejarat.

Petroleum Ministry to Ease Awarding Contracts

A deputy minister of petroleum has said that Iran's Petroleum Ministry would ease terms of contracts for oil and gas field development.

"From now onwards, license for operation would be issued for qualified E&P companies, in addition to National Iranian Oil Company (NIOC). The whole process will be done in less than a year," Sajjad Khalili, deputy petroleum minister for supervision on hydrocarbon resources, said.

He said the Petroleum Ministry would continue to exercise right of ownership over oil resources, adding that the Office of Deputy Minister for Supervision on Hydrocarbon Resources would be tasked with issuing license of operation for qualified companies.

"Iran's Petroleum Ministry in the 13th administration is seeking to issue license for upstream and downstream operations for qualified legal persons," he said.

He added that under the new terms of oil contracts, 14 steps are required that last 3 to 5 years; while in Norway, the process takes 9 to 11 months.

Khalili said negotiations, signing contracts and making decision about development of oil and gas fields and recovery from them all lie with NIOC, adding: "Due to the complications of the process awarding of oil and gas contracts, the Petroleum Ministry is legally authorized to outsource activities outside of contractual framework and within the framework of issuance of licenses about exploration, development and production from hydrocarbon resources." "An advantage with the issuance of license is facilitation of the process and minimizing talks, which would accelerate oil and gas field development," said Khalili.

Iran, Iraq Set to Broaden Energy Ties

In the aftermath of the downfall of Saddam Hossein, Iraq and Iran moved to expand their economic and trade ties. The two countries have been since referring to one another as friendly and brotherly nations. Over recent years, their political as well as economic ties have picked up speed. Iran and Iraq share oil fields in West Karoun and are fellow OPEC member states. However, Iran has an advantage over Iraq in the energy sector: gas and techno-engineering services. Iran started pumping gas to Iraq in 2016. Iranian and Iraqi officials maintain that Tehran and Baghdad enjoy great potential for broadening cooperation in the energy sector. To that effect, joint economic meetings have been held between Iranian and Iraqi officials to explore ways for developing energy cooperation.

Gas Exports to Iraq

Iran and Iraq have signed two gas contracts. The first one was struck in 2013 in Baghdad and the next one in Basra in 2015. Under a six-year agreement, Iran agreed to pump up to 35 mcm/d of gas to Basra. In cold months, Iran would export 20 mcm/d of gas to the Iraqi city. The agreement for exporting gas to feed Baghdad's power plant is also effective. Rumors have spread from time to time of Iran halting gas delivery to Iraq. Mohammad Reza Jolaei, dispatching director of National Iranian Gas Company (NIGC), recently said an Iraqi delegation had visited Iran to discuss increased gas imports.

Iraq's Electricity Ministry spokesman said last October that his country had settled its debt vis-à-vis Iran. He said Iraq would need to import more gas from Iran. To that end, high-level talks have been under way between Iranian and Iraqi officials. The gas agreement for Baghdad expires in the current calendar year. The agreement is expected to be renewed and relevant negotiations have already started. As both sides are in favor of renewal, the agreement is highly likely to be extended. The agreement for gas delivery to Basra is also expiring within two years, which would then be subject to renewal.

Last calendar year, Iran exported about 17 bcm of gas to Iraq, up 43% from what had been agreed. Iran is currently exporting about 35 mcm/d of gas to Iraq.

Big Investment Potential

Iran and Iraq are continuing their energy cooperation despite US sanctions. They have five major energy projects under way or in the process of negotiations. The Iranian Oil, Gas and Petrochemical Products Exporters Union (OPEX) spokesman recently said oil swap with Iraq's Kirkuk had begun within the framework of cooperation between the two nations. Under this deal, 80 oil tankers come to Iran every day. Talks have also begun for Iran to export gas to Iraqi industries. Another area of interest for Iraq is to benefit from Iran's experience in liquefied petroleum gas (LPG) for cars and residential complexes. Iran is estimated to hold about 32 tcm of natural gas reserves, down 5 tcm from world's number one Russia. In terms of production, Iran comes third with an output of 256 bcm (6%), just behind the US with 934 bcm (23%) and Russia with 701 bcm (17%).

Iran is determined to broaden its cooperation with neighboring countries. Iran holds huge gas reserves in the Persian Gulf, which would enable it to have constructive and progressive cooperation based on a win-win approach.

Techno-Engineering Services

Iran has now agreements with 18 neighboring countries for exporting technical and engineering services. Iraq has the highest share among them due to deep-seated religious, social and political links with Iran. The secretary general of Iran-Iraq Joint Chamber of Commerce has said Iran can export $5 billion of technical and engineering services to Iraq. Last calendar year, Iran and Iraq agreed on $4 billion of techno-engineering services. Iran's petroleum industry has a long record in exporting technical and engineering services to neighboring states. The head of Iran-Iraq Parliamentary Friendship League has said that Iran can export technical and engineering services worth $50 billion a year for developing oil fields.

The CEO of National Iranian Oil Company (NIOC) recently said Iran was ready to export technical and engineering services to Iraq in both upstream and downstream sectors. He said: "Iran is willing to benefit from Iraq's partnership in the oil and gas industry development.

Millions of Iranians and Iraqis visit Iran and Iraq. Tehran-Bagdad trade totals billions of dollars. Every day, hundreds of Iranian trucks unload cargoes along the border to be loaded by Iraqi trucks.

Intertwined Iran-Iraq ties have led the US to grant sanctions waiver to Iraq for gas and food in recent years. Iraqi central bank officials said last year that Iraq's economic bonds with Iran are so tight that the Iraqi government had to demand that the US grant sanctions waiver. Iran and Iraq have announced they would be able to bring their annual trade figure to $20 billion through cooperation particularly in the oil and gas sector.

The Iraqi president has said his country emphasizes upgrading ties with regional nations, including Iran. He said Iraq and Iran share 1,400 km of borders, noting the significance of common values and cultural affinities.

Iraq represents the second largest market for Iranian non-oil commodities. Nonoil exports to Iraq total several billion dollars a year. Cooperation in the oil and gas sector is a key issue between Iran and Iraq. Gas and electricity export to Baghdad and Basra is a case in point. Meanwhile, establishment of five commercial centers in various cities of Iraq, Iran's 30 pavilions in Iraq's international exhibitions, organizing about 10 seminars to introduce various sectors of Iraq's market, and visits by about 30 Iraqi trade delegations to Iran to attend international exhibitions are among measures undertaken in recent years by Iran and Iraq in their efforts made to improve ties.

Oil Market Welcomes Iran-Saudi Rapprochement

Iran and Saudi Arabia have seen a thaw in their frosty ties after five rounds of talks hosted by Iraq and Oman and finally during a China-brokered trilateral meeting. During intensive talks between Iran's top security official Ali Shamkhani and Saudi Arabia's Musaad bin Mohammed Al Aiban in Beijing in March, Tehran and Riyadh agreed to resume diplomatic ties after seven years. Iran and Saudi Arabia – fellow OPEC members – never ceased to cooperate within the framework of the oil producing group; however, their cooperation experienced ups and downs over the past seven years. Iran's Minister of Petroleum Javad Owji had said before the resumption of diplomatic ties between the two countries that Tehran and Riyadh had made good decisions together within OPEC. The oil market has also given positive signals to the reestablishment of ties between the two oil-rich states. Are Iran and Saudi Arabia close to starting a new phase of cooperation within OPEC?

Key Deal

The March 12 China-brokered agreement between Tehran and Riyadh is the most important geopolitical event transpiring the Middle East in recent years and the most influential one for the oil market in 2023. Although the political aspect of Tehran-Riyadh agreement is important for the region, resumption of energy ties between them would be much more significant. Iran and Saudi Arabia share the Arash and Foroozan oil fields whose development has long been envisaged by the Petroleum Ministry. In the aftermath of this political overture, the issue of oil fields is largely expected to be focused upon in the near future.

Every time there has been talk of economic cooperation between Iran and Saudi Arabia, the final station has been OPEC. Some analysts have focused their attention on prospective cooperation between Iran and Saudi Arabia in the oil market. Iran's rapprochement with Saudi Arabia, as the leader of the Arab world, may create the impression that we can reach similar agreements with Saudi-aligned nations like Kuwait and the United Arab Emirates. Arab nations, particularly Saudi Arabia and the UAE, largely need gas in the summer. That may provide ground for Iran to export gas if domestic consumption is managed.

Mohammad Sadeq Jokar, head of Institute for International Energy Studies (IIES), analyzes Iran-Saudi ties from another angle. "As far as Iran's gas export to Pakistan is concerned, one major obstacle was Saudi interference. Now this challenge can be overcome."

"The Iran-Saudi agreement would sketch a favorable perspective for the peaceful settlement of energy challenges in the Middle East region, particularly the agreement with the UAE's Crescent Petroleum," he said. Therefore, Tehran-Riyadh détente may help create regionally convergent networks in the Middle East to facilitate access to markets in the Arab states of the Persian Gulf. Another advantage would be Arab countries' investment in Iran's upstream and downstream oil sectors. Once political tensions subside, Iran would be able to share even its nuclear capabilities with the Arab countries of the Persian Gulf.

Market Response

When it comes to OPEC and the oil and gas market, it is wells that wield the power in the world markets. Therefore, without oil barrels being ready for export, no country could influence the oil market by just relying on its potential. World markets were quick to react to Iran-Saudi rapprochement. The thaw in Tehran-Riyadh ties would benefit both exporters and importers of crude oil. Stability in the Middle East would help stabilize the world oil market. Iran and Saudi Arabia are key energy players in this region and China has always prioritized stability of this energy-rich area. Tense ties between Iran and Saudi Arabia would benefit only the US which has over recent decades sold its military hardware.

Redefining Ties

China's role in the Middle East politics is also important as it is a major investor in the energy sector in the region. The US had tied its interests to war and instability. Now regional nations have realized that following US policies would get them nowhere. Regional nations no longer want to put all their eggs in the US basket. That is why Middle East nations are redefining their ties with the US and China. Opportunity passes like a clock. Iran should not hesitate to benefit from this opportunity to improve its ties mainly in the oil and gas sector. Saudi Arabia is a prominent state among Arabs. Experts hope that the agreement with Riyadh would clear the way for further cooperation with neighboring Arab countries.

Impact on Oil Market

The significance of Iran-Saudi rapprochement and its impact on the oil market becomes further clear when we recall the fact that despite differences, Iranian and Saudi oil ministers showed off their friendship before media as they were assured it would affect the oil price. Therefore, one key sector of cooperation between Tehran and Riyadh would be the oil market and specifically within OPEC. The main chapter in Iran-Saudi cooperation would pertain to the oil market, which would take shape within OPEC. The oil market has always been tumultuous and OPEC can play the most prominent role for stabilizing it.

Oil market has long been prone to chaos. The 1973 oil shock, Iran's 1979 Islamic Revolution, economic crises in the world and lately the COVID-19 pandemic are just cases in point. In each of these crises, OPEC has moved to control oil prices, thereby showing its instrumental role.

Amid ongoing tight competition, a key factor would the market share, particularly for Iran that has lost many markets due to US sanctions. If sanctions are lifted Iran should regain its market share, which would not be easy in this competitive market. Therefore, reestablishing logical relationship with Saudi Arabia may be instrumental for Iran to get back its OPEC quota. Iran has been exempt from OPEC cuts within the framework of DoC; however, the green light in the OPEC can help Iran regain its OPEC position.

In its latest estimate, OPEC has put Iran's total crude oil reserves at 209.6 billion barrels and Saudi's at 267.192 billion barrels. Saudi Arabia exceeds Iran in crude oil reserves, but Iran's 33 tcm of gas in place push it to the top spot in aggregated hydrocarbon reserves.

Saudi Economy

The Saudi economy will be a big market for Iran. If the two countries cooperate together, tens of billions of dollars will be earned by the two countries annually. Since Iran is facing restrictions due to sanctions while Saudi Arabia does not have such restrictions and can move on different economic, political, security and cultural levels, Iran can play a role and be present in these activities. Of course, the sanctions will continue to have a negative impact on the full and comprehensive cooperation between Tehran and Riyadh, and efforts should be made to remove these sanctions. Saudi Arabia can help Iran in economic matters to a limited extent, but it can play a greater role in political and security matters and help establish stability and security in the region. Therefore, one can hope that Iran-Saudi thaw would help establish peace in war-torn Yemen. Iran has been always of the opinion that common interests require management of ties. Therefore, by adopting the policy of détente and confidence-building, it has shifted its ties with Riyadh from the status of Cold War to the status of Cold Peace. Meantime, stable ties with neighbors, i.e. peaceful coexistence, would enable Iran to stabilize its regional strength.

SAED Chief: We Don't Fear Challenges

Sarvak Azar Engineering and Development Company (SAED) has, since 2016, been managing the Azar oil field's operation and production. As an E&P company, SAED is now looking to develop challenging fields in Iran. Despite tough sanctions, SAED developed highly complicated Azar, whose second development phase is envisaged now.

CEO of SAED Hamid Tavassoli tells "Iran Petroleum" that challenges would not frighten SAED. He said Azar's production totaled 67 million barrels in April, valued at $4 billion. The following is the full text of the interview Tavassoli gave to "Iran Petroleum".

Negar Sadeghi

In addition to developing the second phase of Azar, we have begun studying development of two oil and gas fields. In case NIOC accepts our technical proposal, we will expand these two fields

How many fields is ICOFC currently developing?

Last December, SAED was qualified as an E&P company and authorized to handle projects worth up to $6 billion. What do you think is the most important factor bringing this outstanding feature to your company?

We have developed the jointly-owned Azar oil field, which is one of the most complicated oil fields in Iran. We have been managing production from Azar since 2016, having produced more than 67 million barrels up to April, which earned the country about $4 billion. Currently, all 19 wells in the Azar field are producing oil. SAED staff are among specialists who managed to expand one of the most geologically complicated oil fields in Iran.

You were an offshoot of Oil Industries, Engineering and Construction (OIEC). Now as an E&P company, how will you cooperate with OIEC?

Let me first make something clear. In early 2010s, due to sanctions, National Iranian Oil Company (NIOC) decided to assign development of the Azar oil field to a local consortium. Subsequently, a domestic consortium comprising Ahdaf Investment Company, a subsidiary of Oil Industry Pension Fund (OIPF), and OIEC, was formed. Then in 2012, SAED was established as an entirely Iranian company to handle this national project. It was awarded a buyback contract by NIOC to develop Azar. OIPF is currently holding shares in three Iranian E&P firms, i.e. Iranian Offshore Engineering and Construction Company (IOEC), OIEC and SAED. Since OIEC is an E&P company and a shareholder of SAED, we have rebranded ourselves to operate with an independent identity in the projects. Of course, we do not intend to rival OIEC in oil and gas projects. We are all under OIPF and we seek maximum margins for our shareholders.

What if international companies are allowed back into Iran? Would you worry?

Our motto is that we are open to any challenges and we eagerly accept any challenges and we fear no challenges. I remember well when foreign companies left us alone due to sanctions, they were assured that we would not be able to develop Azar due to its complexity. But Iranians managed to develop Phase 1 of the Azar field. Therefore, I think that we fare technically better than many foreign companies.

Would you like to partner foreign companies?

Sure. We have had foreign partners in various stages of development of Azar, but they pulled out due to sanctions. But if conditions become conducive to international cooperation we would like to cooperate with several qualified foreign companies.

What's your priority in the current calendar year?

In addition to developing the second phase of Azar, we have begun studying development of two oil and gas fields. In case NIOC accepts our technical proposal, we will expand these two fields.

How will Azar's second phase development be?

We started engineering studies for the second phase of Azar, one and a half years ago and presented our technical proposal to NIOC whose advice we are waiting for. Based on our studies, second phase development will be implemented in phases A and B. In Phase A, 11 wells will be drilled while in Phase B, 7 wells are envisioned. For enhanced output, we will use the 65 tb/d processing facility of the Azar field. According to our forecast we need 4 to 5 rigs. In Phase 1, drilling lasted 400 to 500 days. Now we intend to reduce this time in the second phase. Therefore, we have proposed to drill wells within 320 days and put them into production.

Can you finance the project?

We don't intend to use any foreign finance in the second phase. SAED's financial resources and National Development Fund of Iran (NDFI) are enough for the second phase development. The second phase will most probably be an IPC-based one.

Let's return to Phase 1 which you said was one of the most complicated oil fields in Iran. Would you explain further?

In the Azar field drilling, we had to drill seven layers to reach the Sarvak layer. It is more than the number of layers often drilled in other oil and gas fields in Iran. Moreover, the intermittence of low-pressure and high-pressure geological layers had made drilling operations very complicated and time-consuming in this field. Another point was that we had to use 3,000-horsepower drilling rigs, different from the normally 2,000-horsepower rigs we use for drilling. Of course, we did our job with the same 2,000-horsepower rig. That posed a big challenge to us, which we managed to overcome. I should also note that our average drilling depth in this field was 4,700 meters. We had to use special drilling operations to strike oil. In each well in the Azar field, nearly 15 km of pipes has been used, which is due to casings in this field, which they are much fewer in other fields.

What was the objective of Azar's first development phase?

The objective was to reach 65 tb/d output, which required 19 wells and a drilling waste disposal well, and a central processing unit with a rated capacity of 71.5 tb/d.

How long was the average time for drilling in Azar?

The complexity of formations in this field had caused drilling to last 400 to 450 days in the Azar field. North Hydro, which was developing the field prior to sanctions, had announced that it would drill each well during 250 days, but it did not finish before 500 days.

One of the outstanding features of development of Azar is the use of acid fracturing for the first time in Iran. Why did you decide to apply this operation to the Azar field? How many wells did you engage?

In the initial design for development of the Azar oil field, we had to use acid fracturing because of the specific conditions of this reservoir. Finally in 2015, the first acid fracturing operation was carried out on three wells. But in order to use it in the remaining wells, we had to redesign our wells. Based on our studies at that time we concluded that we can reach our production target by high-pressure acid. The key point is that we have mastered acid fracturing technical knowhow and our specialists can handle it.

Would you use acid fracturing in the second phase development of Azar, too?

Based on our experience in the first phase development of the Azar field, we plan to use it in the second phase. We need powerful pump trucks, as well as very precise engineering. Fortunately, SAED has an experienced engineering team that can handle this operation.

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Iran among Top 7 Sponge Coke Producers

The growing trend of development of Iran's refining industry and the operation of new refineries aimed at further diversity in the mix of refined products and creation of higher value-added at refineries has led to new development projects to upgrade the quality of refined products. For this purpose, upgrading the quality of heavy refined products supplied by Bandar Abbas oil refinery was envisaged. A unique feature of this project is that it would facilitate Iran's production of sponge coke with local technical knowhow. Sponge coke is widely used in aluminum manufacturing. That would make Iran a rival to American companies in the region, not to mention joining the top seven producers of sponge coke.

Upgrading the quality of refined petroleum products at Bandar Abbas oil refinery is a strategic project which is expected to reduce fuel oil production and enhance volume of more environmentally-friendly products of higher value-added with the focus being on sponge coke for the aluminum industry.

This project is being operated by technical knowhow developed by the Research Institute of Petroleum Industry (RIPI). Due to technical complications and the need for relatively high investment, it has been divided into three subprojects. Utility units and coke production are two of them. Iran's first sponge coke production unit is being constructed with an investment of €2.2 billion. That would convert low-value fuel oil to high-value products.

Hashem Namvar, CEO of Bandar Abbas oil refinery, touched on the necessity of upgrading the quality of heavy refined products, saying: "Increasing value-added through completing the value chain of the oil and gas industry and preventing crude sales has always been a governing obligation in the supply of refined products. In line with national macro-economic policies, Bandar Abbas refinery envisaged this project in order to cut volume of fuel oil production within the framework of energy efficiency strategy and upgrade the quantity and quality of refined products."

He referred to International Maritime Organization (IMO) obligations for reduction in the sulfur content of fuel oil, saying: "According to IMO obligations, from 1 January 2020 the global upper limit on the sulfur content of ships' fuel oil will be reduced to 0.50% (from 3.50%)."

Outstanding Features

The Bandar Abbas oil refinery is the most modern and the only refinery in the Middle East to treat heavy and ultraheavy crude oil. It receives the third largest crude oil feedstock in Iran after Abadan and Isfahan refineries. It comes second in terms of gasoline production, just behind the Arak refinery.It is also the second largest fuel oil producer after the Abadan refinery. By upgrading this facility, fuel oil would be transformed into lighter products that would be also more environmentally friendly.

According to Namvar, the quality of all refined products at this facility would be upgraded to the latest global standards, Iran would stop importing sponge coke and the refinery would be integrated with a petrochemical plant to supply 14,000 tonnes a year of propylene and 290,000 tonnes a year of naphtha.

Euro-5 Fuel

Namvar went on to talk about development and diversity of the supply chain of heavy refined products at this refinery, saying: "Another achievement of implementing this project is to increase the quantitative production capacity of Euro-5 gasoline and gasoil by 500 kl/d and 2.7 ml/d respectively. Meantime, the refinery would increase its middle-distillate production by 8 ml/d."

Work on this project started last October at Bandar Abbas oil refinery, which includes 14 new processing units and oil production sections. Within 42 months, the processing units would be complete.

Other products expected to be supplied after upgrading Bandar Abbas refinery include 80,000 tonnes a year of liquefied petroleum gas (LPG), 500,000 tonnes a year of solvents, 500,000 tonnes a year of base oil, 1 million tonnes a year of bitumen, and 100,000 tonnes a year of solid sulfur.

400,000 Tonnes Sponge Coke

Namvar also touched on sponge coke production at Bandar Abbas refinery, saying: "Six countries in the world possess technology to produce sponge coke. But due to sanctions, they did not agree to transfer this technology to us. Therefore, RIPI provided us with necessary technical knowhow to produce sponge coke. So far, three stages of coke have been produced at the pilot level at RIPI. One sample was sent to a European company for test, which endorsed its quality. We were then assured that Iranian knowhow would be helpful in sponge coke production. Currently, we need 300,000 tonnes of sponge coke. Bandar Abbas oil refinery is expected to produce 400,000 tonnes, which would lead toour self-sufficiency."

In 2018, the US companies exported 16 million tonnes of coke, Japan exported 13 million tonnes, South Korea 9 million tonnes, China 6 million tonnes, India 19 million tonnes and Turkey 6.5 million tonnes. Iran's Bandar Abbas oil refinery, due to its proximity to the Persian Gulf, would be able to export coke to regional markets.

Irish Sea Bains Field Set for Gas Storage Role

The UK's North Sea Transition Authority (NSTA) has offered 10-year license to dCarbonX to store gas in the depleted Bains Field in the East Irish Sea, east of the producing Morecambe fields. Redeveloping Bains for gas storage through drilling new wells could deliver a storage capacity equivalent to three to four days' supply for the UK, the NSTA said, with injection potentially starting in 2028. However, further regulatory approvals are needed before storage operations can begin. London/Dublin-based dCarbonX describes itself as a geo-energy company focused on developing subsurface facilities that help usher in the energy transition.

PetrobrasDeveloping Presalt Center in Brazil

, Shell and SENAI CIMATEC have formed a cooperation to construct a large complex in Brazil for presalt R&D.The Production Development Laboratory (LDP), due to start operating at the SENAI CIMATEC Park in the Petrochemical Camaçari Cluster (BA), will provide conditions similar to the Brazilian presalt for testing integrated systems and new equipment prior to their adoption in the field.A 300-m deep well will be drilled in the complex, connected to a flow loop comprising pipes, compressors and pumps to simulate the flow of oil and gas production.

VIEW

Aker Energy Takeover Revives Pecan Project

Aker Capital and The Resource Group TRG have agreed to sell their shares in Aker Energy to AFC Equity Investment, owned by Africa Finance Corp. Following the transaction, AFC would become the sole shareholder of Aker Energy, with a 50% stake in the Deepwater Tano Cape Three Points (DWT/CTP) Block offshore Ghana. This contains the ultradeepwater Pecan oil field and other discoveries with estimated reserves in the range 450 MMboe to 550 MMboe.

VIEW

World Largest FSRU in Hong Kong

An offshore LNG terminal is being jointly developed by CLP Power Hong Kong Ltd. and The Hongkong Electric Co. Ltd (HK Electric) to support Hong Kong's energy transition. An FSRU vessel, which will be used to receive, store and regasify LNG arrived in Hong Kong April 13 and is staying at the South Cheung Chau Anchorage. When checks and port clearance procedures are completed, the FSRU vessel will sail to the offshore LNG terminal east of the Soko Islands next week for the final commissioning of the project.

VIEW

Advanced Navigation Invests in Australia

Advanced Navigation is developing a subsea robotics R&D and manufacturing complex in Balcatta, Western Australia, for technologies including the Hydrus autonomous underwater robot.

The company expects the facility to help it meet growing demand for underwater data, bringing its existing and new solutions to market more quickly, with further plans to triple the size of its subsea team. The subsea center is located on a 5.5-acre site designed for high-volume production, research and expansion of subsea navigation and robotics technologies, including the company's underwater AI division.

Irish

Brazil

Ghana

Hong Kong

Australia

Japan and Gas; Investment for Future

Shuaib Bahman

Gas is known as a clean and relatively low-cost source of energy in the world. That explains the growing inclination for using gas in most parts of the world, particularly industrialized nations. Japan is also considered one of the countries that has shown inclination for further use of gas in recent years. Surveys show that Japan pays special attention to gas alongside renewables.

Japan is one of the biggest investors in the energy sector. The country's investments in energy have been made in various energy sectors; including oil, gas, coal, nuclear and renewable energies. As far as nuclear energy is concerned, Japan currently has more than 50 nuclear power plants which it uses as the main source of electricity. Moreover, Japan has made big investments in the renewable energy sector. In 2020, more than 18% of Japan's electricity generation came from renewables. In this context, Japan has made significant investments in the wind, solar and water sectors.

Since the 2011 earthquake and tsunami that rocked Japan, its need for gas to produce electricity and heating has increased. Because the deadly mishap that caused the sudden shutdown of the Fukushima nuclear power plant made Japan seek to replace nuclear energy sources with other energy sources to meet its needs. After the disaster, Tokyo attempted to invest in renewable energy sources, as well as working for greater efficiency in the energy sector. Meantime, Tokyo has shifted further towards gas as a cost-effective energy source. Some developments transpiring Japan's energy policy have impacted on future investment in this sector. As a leading country in the gas industry and technology, Japan has largely invested in this sector. Major companies like Japan Gas and Japan Petroleum have invested all across the globe, as Japan heavily depends on gas imports. These companies are trying their best to use sophisticated technologies to improve gas consumption. In addition to operating inside Japan, they have been investing in developing and operating gas projects overseas. For instance, Tokyo Gas has been involved alongside Italian Eni and Fiat and France's TotalEnergies in West African and Southeast Asian gas projects. Japan is also involved in the development of new technologies in the gas sector. For example, Tokyo Gas is developing along with other companies new technologies to enhance efficiency and output in gas recovery and production of liquefied natural gas (LNG). Japan's Ministry of Economy, Trade and Industry reported in 2021 that 46% of energy consumption in that country is provided by gas. Japan is home to the largest LNG market in the world. It depends on LNG imports for supplying 35% of its gas needs. Japan imports natural gas from Russia, Australia and Qatar. In 2020, Japan imported 87 million tonnes of natural gas and 75 million tonnes of LNG.

Investment in Gas

The gas industry in Japan is very dynamic, absorbing significant investment every year. A variety of reasons may be presented to justify Japan's investment in the gas sector. Some of them are as follows:

Energy Efficiency and Reduced Gas Imports: As a leading gas consumer in the world, Japan heavily depends on gas imports. Therefore, investment in the gas sector empowers Japan to optimize its gas demand and reduce its dependence on imports.

Reduced Dependence on Oil: Investment in the gas sector can help reduce Japan's dependence on oil. Oil is a major source of energy in the world. It has always been subject to price fluctuations. That is while gas prices are less affected by various factors. Therefore, Japan is investing in gas in a bid to reduce its dependence on oil and boost its energy security. Japan announced in 2019 that it would invest $10 billion in the LNG industry in a bid to reduce its reliance on Middle Eastern oil.

Diversity in Energy Sources: Investment in the gas sector can help diversify Japan's energy sources. Diversity in energy means using various sources to supply energy needs. By diversifying its energy sources, Japan can resist fluctuations more effectively. Internal and External Benefits: Japan's investment in the gas sector is not only effective internally, but also can help improve external markets.

Therefore, Japanese companies are operating gas projects in other countries. That would earn them good revenue, not to mention help grow external markets. Japan moved to invest $14.4 billion in LNG production Mozambique with a view to producing 12 million tonnes a year of LNG as of 2024. Mozambique's reserves are estimated to be more than 10 times Japan's annual LNG imports. Therefore, one can expect that in addition to ensuring sustainable supply to Japan, other countries would also benefit.

In general, global investment in the LNG industry has experienced a big jump in the light of the consequences of Russia's invasion of Ukraine, Western governments' sanctions against Russia and Europe's intention to find an alternative to Russian gas. Japan enjoys significant potential in this regard and can play a significant role in global investment and technological progress in the gas industry. Japan has also good motivations for such action.

Norway and Europe Energy Supply

Shuaib Bahman

A treacherous winter in Europe, exacerbated by the intensification of Russia's war on Ukraine, nearly became a nightmare for European nations in energy supply. That period is over, but the issue of oil and gas supply continues to be challenging. Imposing sanctions on Russian gas imports forced European politicians to find reliable alternatives for supplying their energy needs. Among the European nations, Norway with 1% of world's gas reserves comes 17th on the global scale. That explains why it has always been a major energy supplier to Europe.

However, there are doubts about whether Norway would be able to fully meet Europe's energy demand. Norway, whose natural energy sources like oil, natural gas, hydropower and wind are abundant, is able to be a major supplier of energy to Europe. For example, Norway is the largest producer of liquefied natural gas (LNG) in Europe and has the ability to supply part of Europe's energy needs. In this regard, Equinor has announced that it will maintain the maximum production rate of natural gas in order to help the European Union in energy supply. The company has emphasized that it will maintain the maximum natural gas production rate during the spring and summer so that European countries can fill their gas storage facilities to face less problems during the peak demand period in winter. Because last year, most European were not ensured of sufficient gas supply in winter. The reliable point for European countries in accessing Norwegian gas is that they will not face a serious challenge with Oslo politically.

Because Norway has always been a reliable partner for Europe, and unlike Russia, which has many political challenges with European countries, Oslo does not have these problems at all. In addition, Norway is known as one of the leading countries in the field of oil and gas technology in the industrial field.

Norwegian oil companies are trying to exploit new technologies in the field of oil and gas production and at the same time pay attention to protection of the environment. Therefore, in addition to providing energy, Norway is also known as one of the leading countries in the field of environmental protection and sustainable development, which is in line with Europe's macro policies in the field of environment. Norway has long-term plans to reduce greenhouse gas emissions, and in 2016, it became the first country in the world to announce its overall goal of reducing greenhouse gas emissions to zero by 2030. Also, Norway is known as one of the leading countries in the field of research and development of sustainable and renewable technologies. On the other hand, the intensification of Europe's need and dependence on Norwegian gas is a significant advantage for this country. The collapse of oil prices in 2014 and then the spread of the COVID-19 pandemic caused serious damage to the Norwegian oil and gas sector in such a way that many jobs were lost and the amount of investment decreased. However, the new conditions have led to new investments in the Norwegian oil and gas sector and the creation of many jobs. In addition, the increase in gas sales to European countries has resulted in significant income for Norway, which can increase in the future. According to research by Nordea Markets, Norway's gas export revenue of NOK 830 billion in 2021 reached NOK 1.5 billion in 2022 and is expected to reach NOK 1.9 billion by the end of 2023.

Challenges Ahead

Despite political and economic incentives for gas deals between Norway and the EU, there remain some challenges to overcome. Some of them are as follows:

The first challenge is Europe's excessive dependence on gas imports from Russia. The EU imported 46.8% of its natural gas from Russia in the first half of last year. Norway in turn accounted for 20.5% of natural gas imports during that period, which is less than half of the gas that Russia sent to the EU.

The second challenge is the existence of a powerful competitor, i.e. the US. As many believe, the US even instigated the war between Russia and Ukraine in order to break into the European market, so that European countries can reduce their dependence on Russian gas and the United States can more easily penetrate the European market. The third challenge is Norway's capacity to produce and export gas to European countries. Although Norway has tried to maximize gas pumping, it cannot meet all the European countries demand. At the same time, any possible damage to the country's gas facilities can create serious challenges for Europe.

In general, although Norway is a reliable source to meet European countries' need, at the same time, European countries have to think about the variety of sources and import routes to supply the gas they need. For this reason, while trying to increase Norway's capacity, the Europeans are also looking at importing gas from the Republic of Azerbaijan, Qatar and Australia. However, it is noteworthy that importing gas from other countries also requires investment and sufficient time to establish facilities. Until then, Norway can definitely play an important role in supplying part of the European countries' gas.

Investment Paradigms and Capacity Expansion in Oil and Energy

FereydounBarkeshli
Energy Market Analyst

Oil and gas capital expenditures (CAPEX) for upstream expansion and keep up increased by some 39 percent in the year 2022 to $498 billion. This rise in investments is considered the highest since 2014. However, it is noteworthy that the higher dollar value of investment is largely due to higher costs for investments and inflationary pressures rather than net value added to oil capacity expansion and maintenance. The rig counts figures as an important index of upstream activities and health of the industry rose by 22 percent in 2022 compared to 2021 but still 10 percent below 2019 level when Pandemic had not emerged as a stagnating factor in the energy sector.

These figures are from official sources such as IEA and quoted in international energy journals.

Given the average growth rate of global oil demand of 1.1 percent during the last five years, international oil exploration and development requires to increase from $498 Billion in 2022 to $640 Billion by 2030 to ensure sufficient supply at affordable prices. This is still a conservative estimate and for the world economy to live a life free from energy insecurity, it is safe to upgrade the required level of investment by another $275 Billion during the next seven years and through the end of the decade. This estimate is supported by studies made independently by World Energy Council. Europe's relative safe passage through winter in 2023 has portrayed an impression that energy security is no more relevant in today's world and that consumption will be curbed without a significant backlash to the economy.

Within OPEC Secretariat there's consensus that supply is tightening and capacity will not keep up with consumption in coming years. Issue of supply crunch has been raised and addressed by oil and energy ministers of major OPEC members namely; Iran and Saudi Arabia over recent years. Saudi Arabia's energy minister mentioned prior to the Joint Ministerial Monitoring Committee's (JMMC) session on March 3, 2023 that consuming nations must not take oil availability for granted.

This warning was particularly echoed when Iran's Petroleum minister had earlier warned that sanctions by the United States and followed by the European countries will eventually lead to a total collapse of existing energy flow system. This is echoed widespread when Russian oil and gas flow was evaporated from the market overnight by gas pipelines destruction that transmitted Russian gas to Germany in 2022.

To be more precise, European countries have not built any refineries for 34 years now. The US inaugurated its last refinery back in 1984. Countries across the US and Europe have neglected oil and gas sectors for a long time. They took abundance of oil and gas resources and availability for granted and failed to invest and create new capacities. This could have been based on a logistic calculation that the Western countries have already arrived at their peak demand and there's no further acceleration in consumption. As such EU didn't find itself compelled to invest in oil and gas in big ways.

When the war in Ukraine started and particularly after explosions in gas pipelines that transmitted gas from Russia, Europe realized the blunder of negligence to design a comprehensive energy security policy. United States of America had earlier developed shale oil and gas and turned into a net exporter of oil and gas after half a century. US invested on its conventional energy sector, while lecturing others to keep distance from oil and gas. To say the least, energy security is now a structural challenge for Europe. The continent is poor in energy resources. North Sea, the Netherlands and UK have some gas and that's all about it. As for renewables that we're going to discuss a bit later, sun doesn't shine much though wind is in abundance. Other than that, energies from hydrocarbon and the like is dominated by the United States or China. Europe faces a gloomy energy future and added dependence on the US for energy. Most European industries are energy-intensive and it's even more critical for the industry and services than the household.

Middle East at the Crossroad

As for upstream expansion, I have mainly Middle East in mind. In fact the problem is related to the western hypocrisy. West wants the Middle East to add to capacity and produce more and at the same time, tells them that they are going to throw away oil and gas in few years' time. What a strange paradox. How will the banks and financial system trust to provide loans and financial supports to National Oil Companies in the Middle East to invest and expand capacity while the consumers on the other side of the market are openly denouncing the consumption of something that you want to expand over a relatively long span of time.

Oil investment is costly. It is only rewarding over a period of 8 to 10 years. At a business point of view and as national security angle for the consumers and producers, investors need to have a long term confidence in the future demand. Holding capacity in order to safeguard consumer's energy security has its own costs. As such irresponsible governance by the major consuming countries harms and demolishes the incentives to invest and build capacity.

Major oil companies are now in the Middle East. So called IOCs, are now moving away from the Middle East and NOCs have taken the stage in a major way. National Oil Companies have funds, technology and reservoirs to supply oil to principal demand centers. Demand centers are in Asia and not Europe. NOCs are turning East for the sake of secure markets. The West's overemphasized attention towards carbon emissions and green ideas has jeopardized oil companies to invest on capacity built up. It is evident when the United States, markets its SPR for commercial purposes rather than emergency uses for which it is basically designed.

United States is rapidly expanding its own oil and gas production and most significantly shale oil and gas. Middle

East has realized that it faces a rival in energy markets rather than a partner. America has no appetite for Asian markets. US is eyeing Europe's energy market. Europe is buying the US LNG at almost four times the price of what it paid for Russian gas. The United States has overwhelmed weaponization of energy in such a way that Europe feels safer with expensive energy from the US than buying commercial-based oil and gas from nearby sources such as Russia or the Middle East. Under the new global energy map, Middle East moves away from Europe and the West towards East and South.

Re-emergence of Energy Security Dilemma

Bad governance has prevailed the oil industry since the US turned a net exporter again back in 2014. Sanctions remain the core of the US energy policy towards major oil producing countries. United States has implemented a global energy dictatorial regime that has severely undermined energy security.

Ronald Reagan proclaimed a policy that was known as Rule-based international order. Rules were, of course, written and dictated by the United States. Monetary dictatorship is the principle tool of implementing the US global hegemony. Since oil is traded in US dollar, Washington uses its leverage to sanction countries at will. As such sanctions prevail and oil supply management is remotely controlled by the US.

Consuming nations are therefore at the mercy of US sanctions-driven policies. There are currently some one billion barrels of oil reserves that are under US sanctions and have been kept away from the investment potentials. World energy security is, therefore; at risk and of course nations under sanctions suffer substantially, too. As mentioned earlier, the emergence of shale oil and gas provided an added stimulus to the US sanctions policy.

US rules-based international order is implemented through international organizations and mechanisms such as World Bank, International Monetary Fund and Swift mechanism. When World Bank and IMF were first founded in early 1950's, the US held some fifty per cent of global GDP. By then it was ruled and decided that the head of the IMF to be appointed by the US and World Bank president to be a European. Back then, there was some sort of justification for such a technocracy. In 2022, the US share of World GDP stood at 21.6 percent and Chinese international standing was 18.2 percent. BRICS's total GDP is almost greater than that of G-7.

Having said that future energy security and investments prospects for capacity expansion relies on getting rid of the US hegemonic policies in moderating global monetary and investment flows towards energy sectors of countries under sanctions.

Nevertheless, it is true that the imperative of oil is less than what it was in 1970's. Improved efficiency that we can produce more and better with less oil consumption. Meaning that energy per unit of production of GDP has diminished. This translates to less impact of oil in the economy. In the meantime, a $100 per barrel of oil price compared to $50 per barrel oil price has limited impact on oil demand in the foreseeable future. Undoubtedly, when oil prices are low, there is less incentive to invest. Investment patterns follow price trends and future speculation on price movements. This, however; is an implication that oil market demands of better and wise governance and free from political imperative related to Washington's convenience. Incentive to invest diminish during crisis and volatility. As reported by the OPEC Secretariat on March 2023, Global South oil demand is going to be massive. Countries of ASEAN are going to have the largest share of this demand. As such, without corresponding and adequate investments and capacity built up, emerging economies are not going to achieve a substantial rate of growth in their economies. Countries of the Northern Atlantic axis will not be affected directly by insufficient oil supply. It has to be re-emphasized that the US is decoupling from the international arena but Europe has to watch out for decades to come.

NOCs as Principal Players

National Oil Companies here referred to as NOC are gaining greater importance. Back in late 1950's and early 1960's, the so called Seven Sisters emerged as the main actors in the international oil markets and decided on the direction of the investment flows into the upstream. The Seven Sisters were omnipotent and omnipresent in the oil industry from upstream to midstream and downstream.

This has changed and more and deeper changes are in store for the oil market during the decade. NOCs will form the future Seven Sisters of the international oil market. Reserves, infrastructures, funds, consumption markets belong to the National Oil Companies. NOCs have collectively realized that demand is not going to shrink and capacity is essential to be built to respond to the demand.

Middle Eastern countries have realized that the US-EU alliance is of no major support to them once they don't want their oil anymore. This is a backlash from the environmentalists. Western countries cannot keep saying that they hate Middle East and its oil and don't want to consume. At the same time, Asia and the global south welcomes more oil. For Global South, environmental issues are a luxury. For the Western countries it is disgusting. NOCs are showing the right direction.

The center of oil market gravity is changing towards Asia. However, for that to materialize, there must be oil production and sustainable capacity. This is where major NOCs such as Aramco, NIOC, Adnoc have to join hands and raise sufficient capital for investment. National Oil Companies need to break free from the domination of the American financial system. Under the present system and Swift mechanism, it is impractical to advance a new financial apparatus to bypass inflationary pressures caused by excessive circulation of US dollar in the world oil markets.

National Oil Companies have already entered the production of renewable energy. Most NOCs have been doing well in solar energy. Although Middle East is rich in sunshine, sand is a barrier and hinders solar power. Moreover, solar energy systems require plenty of water, too. Hydrogen is another option but technology is advanced and few countries and companies own knowhow and knowledge of generating energy from hydrogen. Oil has driven the world economy for a century. No major task has been employed to clean oil production and consumption.

What the Middle Eastern oil producers are watching carefully is the following:

On oil and gas supply side, emphasis of the Western countries is on shale oil and gas from the United States. All attempts are underway to undermine Middle East oil supply. OPEC plus in general and the Middle East in particular are considered temporary and transitionary supplies. This is the principal policy mix of the United States, although European countries and companies still find the Middle East oil lucrative and essential.

Shale oil and gas are also available in other parts of the world including countries such as Germany and Poland. Shale is also in abundance in China. However, the economics of shale is not responding to the market. The reason is mainly the non-existence of infrastructures. For the US, infrastructure is readily available but for a non-conventional energy producer it is too costly to invest on new infrastructure.

In other front, the Western consuming countries eye on renewables. Europe has limited options. Solar energy has limited capacity due to less sunny weather for most of the year. Wind has a much better prospect. Nevertheless, technology is always a game changer. Advanced batteries may help to restore solar and wind energy longer. Nuclear is another option. However, I believe that renewables will remain a luxury for the next 2-3 decades. On the demand side, energy efficient technology can help curtail consumption. However, there is a limit to it. It must be noted that Europe will possibly be a major producer of most energy efficient appliances that will be used. Nevertheless, most energy-saving applications, save energy but use more of the raw materials that is predominantly produced in global south.

As Daniel Yergin indicated once, in the United States two-thirds of all vehicles on the road will be electric and free from gasoline. However, those cars will need two and a half times more copper to be manufactured. As such dependence on raw materials and mineral resources will possibly shift from one source of minerals to the other. Oil or any other minerals require capital investments. Without timely and adequate investments, future of energy security is at risk.

Green Hydrogen

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Certain concentration on environmental issues and global warming containment has over recent decades led governments towards developing clean energy carriers. Non-renewable energies being exhaustible and their environmentally harmful impacts and high pollution on the one hand, and the accessibility of renewable energies on the other, have prioritized energy carriers produced from clean sources, including solar, wind and nuclear energy. Therefore, development of green hydrogen, as a zero-pollution source of energy, has been emphasized by environmental observers, investors and consumers in a variety of countries, leading dozens of governments to present roadmaps in this regard. Owing to its vast desert lands with sun radiation above global standards, as well as giant water reserves in the north and south, Iran enjoys great potential to produce green hydrogen. Demographic growth and technological advancement, along with concomitant higher consumption of energy carriers, resulted in harmful environmental impacts like air pollution, GHG emissions and global warming. GHG include carbon dioxide, water steam, nitrogen oxides, methane, ozone and chlorofluorocarbons. The first three are produced as a result of burning fossil fuels. Carbon dioxide is the most important greenhouse gas, the reduction of whose emission will make a significant contribution to the reduction of air pollution in our planet's atmosphere.

GHG Emissions

As the bulk of energy consumption is supplied by polluting non-renewables like crude oil and coal, which are almost ending all across the globe, mankind has been pushed to brace for renewables like solar, wind, nuclear, biomass and geothermal energy.

Renewables exist in abundance; however, they are not constantly accessible and therefore they need to be converted to permanent, storable and portable sources. Now in light of inevitably growing consumption, three methods can reduce GHG emissions: using alternative fuel; upgrading the quality of energy consumer systems; and using renewable. Production and use of hydrogen covers all these three methods. 'Hydrogen' is derived from the Greek 'hydro' and 'genes' meaning water-forming. It is the lightest element and the most abundant chemical element, estimated to contribute 75% of the mass of the universe.

As a main component of energy generation, it can be a clean alternative to fossil fuels. Hydrogen is generated from solar, wind and nuclear energy; as well as water electrolysis. It is currently used in various industries in different ways. Hydrogen is storable and portable and unlike other renewables, it is accessible at any time and any place.

Varieties of Hydrogen

- Hydrogen is produced through different methods for various purposes. Its varieties are as follows:
- Brown Hydrogen is produced from the gasification of coal.
- Grey Hydrogen is produced from natural gas, or methane, using steam methane reformation but without capturing the GHG made in the process. It is the most common and most economical method of hydrogen production in the world.
- Blue Hydrogen refers to hydrogen produced from natural gas and supported by carbon capture and storage.
- Green Hydrogen refers to hydrogen produced by splitting water into hydrogen and oxygen using renewable electricity. The electrical current needed for this process is supplied by renewables like solar or wind energy, thereby rendering the byproduct environmentally-friendly. Currently, less than 0.1% of hydrogen consumed in the energy sector is obtained by this method.

Methods of Hydrogen Production

Fossil Fuel Reforming: In this method, hydrocarbons are used as feedstock for catalyst-assisted hydrogen production. Over recent decades, due to its abundance, accessibility and cost-effectiveness compared with other fossil fuels, natural gas has largely been used as feedstock in this process. Coal Gasification: Hydrogen, as well as a large amount of carbon dioxide is achieved by partial oxidation and water-steam gasification of coal at high pressure and temperature. Biomass Gasification: This process uses some sort of controlled process involving heat, steam, and oxygen to convert biomass to hydrogen and other products. The point with this method is the significant decline in carbon monoxide production. Water Electrolysis: It is the process whereby water is split into hydrogen and oxygen through the application of electrical energy. An electrolysis cell comprises a recipient, two electrodes, an electrolyte solution and a splitter. The required electricity may be supplied from a renewable source including solar, wind or nuclear energy or all combined.

Such motives result in the following advantages:

- With zero pollution, it will largely contribute to lower air pollution.
- It can largely contribute to absorbing renewables; only by absorbing solar energy during sunny days and converting it to electricity and applying water electrolysis, hydrogen could be produced and stored to be used at any time or place.
- Compared with other fuels, hydrogen has the biggest mass. For instance, each kilogram of hydrogen produces three times as much energy as one kilogram of gasoline. In other words, hydrogen has three times as much energy as fossil fuels and is 57 times lighter than gasoline. It is necessary to be cooled up to -253 degrees to be liquefied and then compressed to be transportable.

In each of the foregoing methods, production cost would vary depending on the yield of the process. The following data has been calculated for various methods:

Green Hydrogen: Advantages and Disadvantages

There are numerous motives to produce green hydrogen as a clean energy carrier. Some of them are:

- Materialization of carbon-free energy plans
- Proper opportunity for renewable energies' storage
- Lucrative opportunity for countries with no fossil energy source
- Social impacts of clean energy

In each of the foregoing methods, production cost would vary depending on the yield of the process. The following data has been calculated for various methods:

Hydrogen Production Costs and Yield

Production Method	Production Cost/ Kg (US Dollar)	Yield (%)
Fossil Fuel Reforming	1.5	36
Coal Gasification	1.8	33
Biomass Gasification	1.2	65
Water Electrolysis (Photovoltaic)	1.6	4
Water Electrolysis (Wind Energy)	7.3	31
Water Electrolysis (Nuclear Energy)	3.5	33

As the table indicates, the highest cost comes from solar and wind energy electrolysis. These calculations are for small units and the cost will be significantly cut when the output capacity increases. However, hydrogen production can face some technical barriers which need to overcome. Hydrogen leaks very easily and is highly flammable. Hydrogen has a high energy content per weight (more than three times as much as gasoline), but the energy density per volume is rather low. Hydrogen storage requires its compression which would be costly. Furthermore, each cubic meter of hydrogen contains one-fourth of as much gasoline's energy.

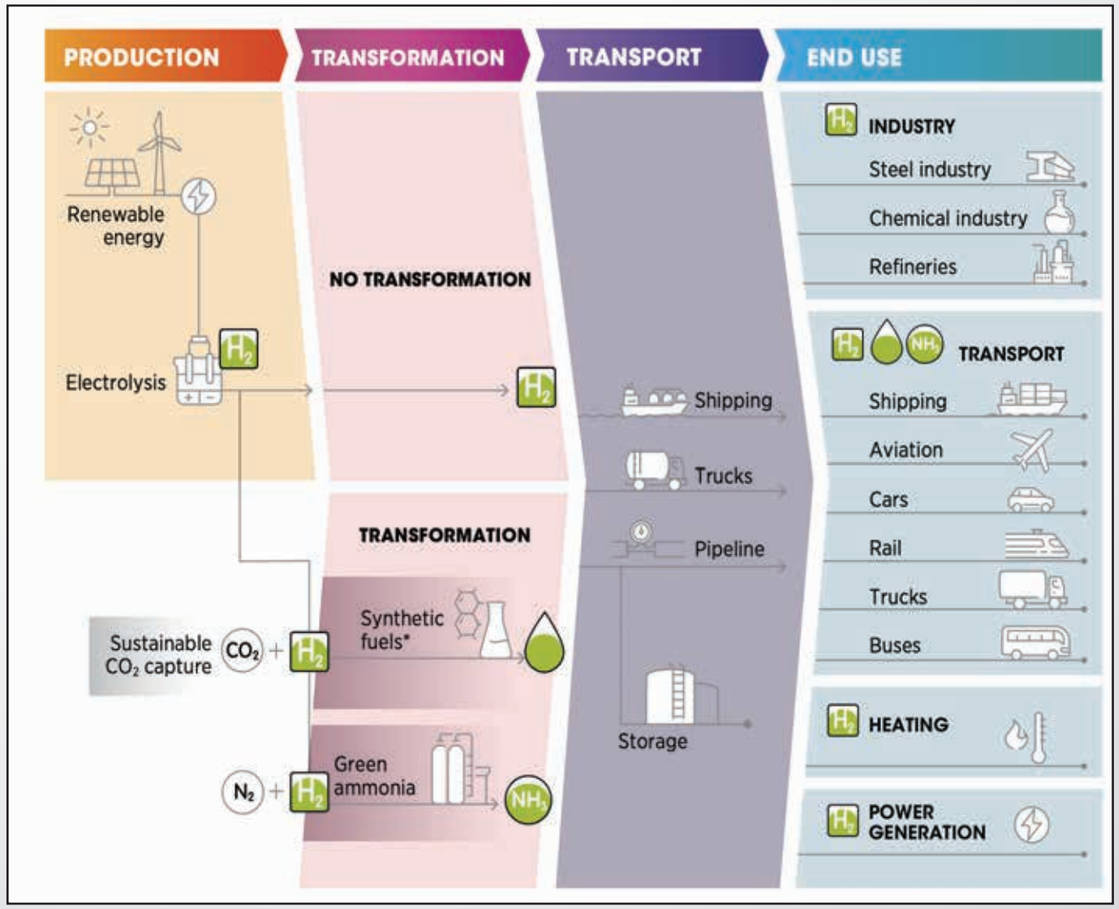
Green Hydrogen in the World

The United Nations Framework Convention on Climate Change (UNFCCC) required member states to prepare national reports to clarify their GHG emissions, after which extensive measures were taken on cutting the emissions. Since power plants and the transportation sector had a big share in CO2 emissions, one basic solution for reducing GHG emissions was to use renewables and alternative fuels. In this regard, green hydrogen enjoys a certain status, which resulted in the establishment of the World Hydrogen Council (WHC) in 2017 with 110 members now. More than $7 trillion has been invested in this sector and demand for green hydrogen keeps rising, which has subsequently been increasingly lucrative. Currently, hundreds of projects, some of which on Giga-scale, are operational throughout the hydrogen value chain all cross the globe. More than 95% of global hydrogen consumption in the energy sector is from grey hydrogen, which produces 830 million tonnes of carbon monoxide and dioxide a year. This is while less than 0.1% of green hydrogen comes from renewables. Seven leading hydrogen producers have agreed to bring its mass production costs to $2 per kg. Shell has launched Europe's green hydrogen electrolyzer. The European Union (EU) has adopted a clean hydrogen strategy, noting that green hydrogen would have a significant share in energy consumption by 2050 with its annual sales estimated to reach €630 billion. The US is currently one of the largest producers and consumers of hydrogen due to its giant refining and petrochemical industries. The US embarked on research on hydrogen and fuel cells in 2000. In 2016, the US Department of Energy presented its plan for clean hydrogen production. China has said it would be supplying about 1 million vehicles powered by fuel cells up to 2030. Japan was the first country in the world to adopt a national hydrogen strategy in 2017, planning to cut 75% from the water electrolysis system costs to 50,000 yen per kilowatt. Middle East nations, particularly Gulf Cooperation Council (GCC) member states, are planning for a hydrogen-based economy. Saudi Arabia, the world's second largest oil producer, has built big capacity for solar energy production, which would clear the way for hydrogen production. Oman, the United Arab Emirates (UAE), Qatar, Bahrain and Kuwait have also formulated their own plans for producing or importing this clean fuel.

Hydrogen in Iran

Iran holds the 4th largest oil and 2nd largest gas reserves in the world. It accounts for nearly 6.5% of the world's total gas production, standing 3rd in the world. Iran, which has been always instrumental in global supply of hydrocarbon energy, can also play a key role in the transfer of renewable energies, specifically hydrogen. In this regard, green hydrogen is considered as the most important factor in the application of renewables. Primary sources for green hydrogen production abound in Iran. One major source is vast Iranian desert lands. Kavir Desert and Lut Desert constitute Iran's main deserts, covering 86.5 million ha of land in 15 provinces. More than half of Iran is covered with desert lands endowed with direct solar energy. The average solar energy in Iran is very high. To estimate the amount of solar energy production, it is necessary to obtain the amount of solar radiation absorbed in a certain place during the day, whose unit is kilowatt hours per square meter. This figure is 3.5 kilowatt hours per square meter in the world and 4.5 in Iran and 8 in some areas. In other words, the average radiation in Iran is much higher than the world standard. The second source necessary for green hydrogen production is saline water in northern, central and southern Iran. Research conducted over recent years show the possibility of green hydrogen production from saline water. Research projects and works published by Iranian researchers prove Iran's potential to become a center of hydrogen production and transfer of technical knowhow in case necessary financial support and policymaking is provided. Iran's Petroleum Ministry, through its research wings like the Institute for International Energy Studies (IIES) and the Research Institute of Petroleum Industry (RIPI), has conducted necessary studies for benefiting from Iran's potential in this regard, which would effectively pay off, if good management is applied.

High demand by Iran's transport sector and an extensive local market on the one hand and the existence of giant renewable sources of energy like solar and win on the other, give a special status to Iran, not to mention abundant water in northern and southern Iran as well as the possibility of launching a solar farm. Therefore, it is necessary to take measures for moving in the direction of hydrogen-based economy.



Conclusion

Governments' obligation to honor their environmental obligations and reduce carbon emission, exhaustibility of fossil resources and availability of renewables have pushed governments to focus on green hydrogen production and consumption. Investment in this sector has increased significantly in most parts of the world. That is while, production costs are falling sharply. These objectives can materialize if governments adopt transparent strategies, devise regulatory frameworks, and provide financial and legal support.

Ilam, Beauty of Zagros

In the previous issue we introduced some of tourist attractions in Ilam Province. In the current issue, we continue to review more places.

Bahram Choubin Ravine

The Bahram Choubin ravine is a natural beauty in Ilam Province. It houses monuments which are unique. The ravine is wide and located in a strategic place in Kabir Kouh. Along with remnants of military towers attributed to Bahram Choubin (a Sassanid-era warlord), it is a recreational area for tourists. Some stories say Bahram was holed up there during revolt against Khosrow Parviz.

Siah Gav Twin Lakes

Siah Gav twin lakes are known as Ilam's natural aquarium. Surrounded by deserts and tall mountains, it is among the rarest natural phenomena in Iran. The lakes offer attractive and fascinating perspectives in spring and autumn.
A major feature of this aquarium is its transparent water, which may be seen up to the depth of 30 meters.
One of the lakes is upstream and the other one downstream, each with dept of 20 meters. They are connected together via a 10-meter river canal.

Iran Petroleum

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Kafarin Ravine

This ravine is located in Badreh city in Ilam Province. Widespread acorn trees and such animals as Iranian squirrels are among tourist attractions there. The River Zamzam is one kilometer into the ravine. Jaber pilgrimage site is another place for visitors.