Slide 1 Vietnam's natural gas supply crunch hinges on geopolitical interference



Interference:

Though Vietnam has ample offshore natural gas reserves, China has forced state-run PetroVietnam and its partner Madrid-based Repsol to abandon nearly completed offshore gas exploration/production projects in Vietnam's UN-mandated 200-nautical mile exclusive economic zone (EEZ) on two separate occasions since 2018.

The most recent pullout reportedly cost Repsol around US\$200 million in lost investment, a sum that the company said it wanted Vietnam to reimburse.

China's first overt intervention in Vietnam's offshore exploration plans came in July 2017 when it forced partners in oil exploration block 136-03 to cease operations. Project partners included PetroVietnam, a Repsol subsidiary and Mubadala Development Co., a United Arab Emirates (UAE)-based company.

Gas supply crunch:

Vietnam's inability to develop its own offshore hydrocarbon resources has led to a looming gas supply shortage, forecasted to begin as early as 2020, with possible electricity brown and black outs in the country, particularly in the more populous southern region. The impending shortage has temporarily slowed due to the Covid-19 pandemic.

An additional quandary is half of Vietnam's reserves are located in the northern deep-water areas of the Song Hong basin and have high carbon dioxide contents, making the production investment costly.

LNG export opportunities:

This geopolitical stand-off and harder to reach gas reserves have created opportunities for LNG exporters, particularly US LNG exporters, to help keep shipping channels to Vietnam and through the South China Sea open.

LNG imports will also help offset Vietnam's over-reliance on coal used for power generation, thus helping it reduce its greenhouse gas (GHG) emissions. However, the country still has plans to build more coal-fired power plants.

Slide 2 Potential structures for LNG-to-power in Vietnam 2021-2030, with vision to 2045



Two models:

Public Private Partnership (PPP) or the Law on Investment -Independent Power Producer (IPP)

If the PPP model is used, the project is built under Build Own Transfer (BOT)

Under the PPP, state-run EVN (the largest electric

utility in the country) will eventually own the facility. Under an IPP, EVN is simply buying power from the project without power purchase agreement (PPA) guarantees during project financing and construction.

Both PPP and IPP projects must set up a project company within Vietnam.

Integrated LNG-to-Power ventures will also require sea or coastal permitting per Decree 51 which is also not clear while adding expenses for the developer.

Vietnam's Power Development Plan VIII

Vietnam's new PDP, which was supposed to be released in January is now scheduled to be released by mid-year. It includes as many as 22 new LNG/gas-to-power projects of various sizes, representing companies from a number of countries: the US, Japan, South Korea, Singapore and others.

PDP VIII draft addresses future power capacity structure for gas, solar and wind.

Gas-to-power for 2021-2030: Power sources utilizing gas will be substantially developed from about 7 GW in 2020 to 13.5 GW in 2025 and 28-33 GW in 2030. The ratio of gas-to-power sources will be increased from 15% in 2020 to 21-23% in 2030.

The Draft sets forth demand for coal imports for power generation, increasing from 47-52 million tons in 2030 to 75-96 million tons in 2045, subject to the baseload or high-load scenarios.



Vietnam's power generation energy mix 2019

Slide 3

Legal and regulatory challenges for Vietnam's LNG and LNGto-power sector build-out



Resolution 55:

To help attract much-needed FDI in its gas sector, on Feb. 2020, Vietnam's politburo issued Resolution 55:

It sets out clear targets and objectives, including building a transparent market with <u>diverse forms of ownership and business models</u>, <u>prioritizing</u> <u>the development of gas-to-power projects</u>, particularly over other energy sources, building a roadmap for reasonable reduction of the share of coal-fired power projects, <u>and actively importing fuels for power projects</u>. It also includes objectives and policies for renewables, namely solar and wind.

In addition, it calls for development of energy infrastructure and sufficient capacity to import 8 billion cubic meters of LNG in 2030 and 15 billion cu.m in 2045.

Resolution 55 also mentions the need to: Amend and improve specialized laws on oil and gas, electricity and energy efficiency (economic and efficient use of energy).

Resolution 87:

The government has also issued Resolution 87 to regulate business activities (trading, import, transport) related to LNG.

However, both Resolution 55 and 87 are too general. For example, they don't even mention or refer to FSRU development or investment, an opportunity for the country to more cheapy and quickly build smaller LNG-to-power projects, particularly in the country's southern region, where gas and power shortages will be felt the most.

PM and provincial decree:

Currently, regulatory decisions in the gas/LNG sector are still being made per prime ministerial approval and at the provincial level by people's committees and associated provincial government organizations.

Vietnam needs to develop a more established legal and regulatory framework for its LNG and LNG-to-power sector.

However, it does offer an existing framework of older laws and precedents to encourage private investment and has a developed risk allocation structure that the market is generally familiar with.

Slide 4

Notable LNG-to-Power projects in Vietnam



Vina Capital, GS Energy – a joint venture between Vina Capital and South Korean firm GS Energy to build a \$3 billion LNG-to-Power complex with 3,000 MW capacity in the Long An international port, one of the biggest seaports in Vietnam. The region is between Ho Chi Minh City in the north and the Mekong Delta

The venture accounted for 30% of FDI in Vietnam in the first quarter of this year.



Delta Offshore Energy (Singapore) – in 2020 the firm registered a \$4 billion LNG-to-Power complex in Bac Lieu province in the Mekong Delta, south of Soc Trang.

The company has also chosen the design and construction of the LNG floating storage unit (FSU). Though it's a IPP, in January it inked a 25-year power purchase agreement (PPA), a lifetime value of approximately \$50 billion, with the provincial government.



ExxonMobil - Vietnam's port city of Hai Phong, just north of Hanoi city on the coast, has approved a \$5.09 billion LNG-to-Power project and terminal due to be developed by Exxon Mobil, slated to start power generation in 2026-27. The power plant will have an initial 2.25 GW

capacity, with expansion to 4.5 GW by 2029-2030. Reportedly, the project

will also include a terminal with a capacity of six million tonnes of LNG per year.

No word if or when ExxonMobil will develop the Blue Whale Project and as such provide feed gas to the project.



Current status:

Currently, there are no LNG-to-Power projects operational yet in Vietnam, though there are as many as 22 listed in the PDP VIII.

Vietnam has two LNG import facilities under construction in the south, both in Vung Tau province. Vietnamese oil company Hai Linh Co.'s

terminal is to become operational by next year. Initial capacity of 2 mtpa-3mtpa with the potential to expand to 6 mtpa.

Second, state-owned PV Gas's Thi Vai terminal that will start up in 2022 in the same province. 1 mtpa in its first phase, to be expanded also 3 mtpa.

The list of registered LNG-to-Power projects in Vietnam has been growing, including Tokyo Gas, JERA, ExxonMobil, and KOGAS as well as others.

Slide 5

Opportunities for Vietnam's LNG, LNG-to-Power sector



Figure 1 Qatar Petroleum (QP) image

Continued market supply over-hang, more flexible contractual opportunities, myriad of term pricing options

LNG-to-Power Project stakeholders can take advantage of an ongoing LNG supply overhang that could now be prolonged even further due to Qatar Petroleum's (QP) North Field East Expansion, with 126 mtpa of liquefaction capacity by 2027, to secure advantageous prices, against a mix of potential benchmarks for term deals: the Japan Korea Marker (JKM), Hendy Hub, TTF and West India Marker.

Not only can term deals, likely 5–10 years in duration, be indexed against these benchmarks instead of traditional oil indexation formulas, but projects, particularly in the US, can offer more flexible contractual terms and destination clauses.

A portion of needed supply should also be set aside for spot market procurement. In essence, Vietnam, as well as other newer Asian LNG

importers can optimize changing dynamics in global and regional LNG markets.

Qatari LNG expansion could prolong the existing supply overhang in LNG markets. Qatari liquefaction capacity to increase from 77 mtpa currently to 110 by 2026 and 126 by 2027.

With term deals expiring, these new buildouts and Qatar's investment in the Golden Pass project in the US, as much as 70-75 mtpa of LNG volumes will be uncontracted by 2027 or later.

Example

An example of changing price/contracting dynamics: This month, Chinese oil and gas major Sinopec reached a 2 mtpa supply deal priced at a 10.9% slope against Brent crude prices, one of the lowest on record, instead of the usual 12-15% slope used in the past.