TITLE: Construction of LNG exporting infrastructure in the Republic of Cyprus. Supply of Cyprus LNG within the EU geographic boundaries in the medium term and outside in the long term.

By Costas Michail[1]

Abstract

Natural Gas prices are soaring, and the Ukrainian war reveals the urgency for EU to rethink its energy strategy by diversifying away from Russia. The Republic of Cyprus is situated in the Eastern Mediterranean region ('the region'). Huge discoveries made in the region. The surrounding circumstances foster upstream and midstream development of offshore Natural Gas deposits.

The region may inter alia contribute to the security of supply of EU while enabling the Host States to harness their natural resources for the benefit of their people. This paper lays down the surrounding circumstances and environment, the growing gas footprint in the region and in the Republic. At the same time, it outlines the possible monetisation pathways, but it favours the construction of LNG exporting infrastructure using Project Financing. The purpose of this paper is to briefly examine the monetisation of Cyprus gas using LNG exporting infrastructure.

---

1. Introduction

Generally, the exploitation of natural resources should lie at the heart of economic and energy policy, especially if the external and surrounding circumstances favour their development. Development of Natural Gas Deposits may generate myriad economic and social benefits to the Host State. The recent war in Ukraine, reveals the energy vulnerability of the old Continent due to its heavy reliance to the supply of Russia Gas. In this regard, EU Commission launched its RePower EU[2] action plan (**'the plan'**) aiming to phase down the reliance of the old Continent to the Russia Gas supplies. The plan stipulates the increase in LNG as one of the pillars to phase down the dependency.

The region is emerging as a hotspot for the global natural gas industry[3] as significant quantities of natural gas have already been discovered (proven/probable). The region lures International Oil Companies ("**the IOCs**"). The prospects are growing in view of the increasing discoveries of natural gas resources. In parallel the high price environment, the pivotal need for security of supply and the growing role of Natural Gas as bridging fuel provides a fertile ground for developing Natural Gas deposits.

---

[1] Costas Michail is a Tax Director in charge of Direct Tax Advisory at Scordis, Papapetrou & Co (Corporate Services) Ltd. For the last 2 years he studied Oil & Gas Law and policy, Downstream Energy Law, Taxation and Petroleum politics & economics, International Law, Financial and project analysis of Natural Resources and the International Legal Framework for international Project Financing at the University of Dundee, Centre for Energy, Petroleum and Mineral Law and Policy (CEPMLP)

[2] https://ec.europa.eu/commission/presscorner/detail/en/ip_22_1511

[3] Eastern Mediterranean Gas: What prospects for the New Decade, Symone Tagliapietra

The discovery of Tamar and Leviathan in Israel, Aphrodite in Cyprus and Zohr Egypt heightens the hopes and expectations in the region. The region may aid EU in the pursuit to diversify away from Russia gas in the short (using the Egypt's existing LNG infrastructure) and medium term.

In the body of this paper, we examine the surrounding circumstances that provide support for the development of Natural Gas deposits in the region, and specifically in the Republic, and the use of project financing for constructing LNG exporting infrastructure thereto.

2.High price environment and security of energy supply

Gas prices surged triggering shock wave in the world economy and specifically in Europe. The shock wave ultimately frustrates the private households by inter alia pushing the low-income households into the poverty zone. In turn, they ramp up pressure to the national governments to intervene shielding the society cohesion by raising a safety net and support the economic activity.

The plummeting EU indigenous Natural Gas, the heavy dependence on Russia supplies for Gas, the demonisation of Natural Gas as a corollary of the hasty Environmental, Social and Government ("**the ESG**") momentum, foster the high price environment within Europe (and outside). The current dreadful events in Ukraine, reveal the vulnerability of Europe to Russia. It may be posited that Europe's position is aggravated by the phase down of the production of the EU indigenous Natural Gas.

The ESG momentum, admittedly desirable as an ideal, precipitated the demise of fossil fuels derailing or suspending capital investments by International Oil Companies. Historically, in similar situations, the high price environment lured substantial risk capital in green field and/ or brownfield projects with the aim to scale up the Natural Gas production to meet rising demand. In turn the inflation tamed, and prices started falling. However, this time a different pattern unfolds, IOCs are paying out dividends or buying back their shares. The ESG momentum unleashes an existential threat to the Petroleum Companies dissuading them from pouring their risk capital for developing Natural Gas deposits. As a result, the high price environment is sustained bringing the low-income private households into poverty.

Admittedly, the climate change conceals disastrous effects on humanity. In this respect slashing the emissions should be a touchstone in the formulation of a global and/or national policy and strategy for attaining this. However, this should be well thought, structured, and executed. Reserving a seat for the Natural Gas in the decarbonisation bandwagon is desirable. Especially if it is combined with the deployment of Carbon Capture and Storage technology that substantially reduces the emissions. This in turn will encourage the Petroleum Companies to continue developing Natural Gas deposits. This does not mean that the expansion of the renewable power should be retarded or stalled.

Developing States seem to embrace the Natural Gas in their decarbonisation pathway. In parallel, at EU level, the taxonomy labels[4] the Natural Gas as green in the medium term, albeit not unconditional. In the same vein, the Brussels announce

[4] https://www.ft.com/content/7872a05f-9e38-4740-9b1b-4efc69ca316c?desktop=true&segmentId=7c8f09b9-9b61-4fbb-9430-9208a9e233c8#myft:notification:daily-email:content

the increase in the LNG supply, prima facie revealing the general acceptability of Natural Gas as bridging fuel.

The foregoing composes an overall positive backdrop underpinning the development of a Natural Gas deposit. As such the Republic may build on this positive momentum.

3.Unfolding the Cyprus case

The Republic occupies an enviable location at the crossroads of Europe, Middle East, and Africa. Since 1961[5], Cyprus is part of the Commonwealth. Cyprus has joined European Union back in 2004[6] and adopted euro since 2008. Cyprus is also member of UN[7] since its independence in 1960.

34% of Cyprus territory in the North, is under Turkey's illegal occupation since 1974. Turkey's aggressive position and apparent defiance of International Law is a destabilisation factor for the Republic and for the Region. Ankara recruits its gunboat diplomacy to support its unfounded maritime claims impeding the optimum exploitation of the Republic's offshore Natural Gas deposits. Notwithstanding, the Republic's political clout proliferates affording a strong countervailing bulwark.

The Republic offers a stable business environment and legal system drawing upon the English Common Law legal system hence incorporating legal principles such as, the trust and beneficiary principles, floating charge in the security area and contractual and business tenets. EU Law evolved the Republic's legal system aligning it to the EU legal order. The Republic deploys an attractive, stable, efficient, and equitable fiscal system[8]. In addition, it provides a flexible and business environment, the pool of high calibre labour, support by the Government, relatively low cost for conducting business compose an ideal international business centre.

3.1 Cyprus Sovereign Rights and forging of alliance

The Republic of Cyprus proclaimed its sovereign rights over its exclusive economic zone and continental shelf by passing a Law. The Law essentially implements the international maritime norms as codified in the United Nations Convention on the Law of the Sea ("the Law of the Sea"). The Republic delimited its maritime boundaries with neighbour States, Israel, Lebanon, and Egypt mainly using the median line. In this regard, bilateral agreements signed, in 2010[9] with Israel, in 2003[10] with Egypt and in in 2007[11] with Lebanon, and ratified (but for the ratification of the Lebanon's bilateral agreement).

Cyprus forges and expands energy alliances and partnerships with Eastern Mediterranean States. The energy triangle has been established back 2013, consisting of Israel, Greece and Cyprus established. US supported the energy triangle. In fact, US Congress passed a Law in 2019[12] applauding the new alliance. The Triangle pursues the common security and energy interests in the region. In parallel a tripartite partnership also established in 2014 between Cyprus, Greece in

[5] The.commonwealth.org
[6] Europa.eu/European-union
[7] https://www.cyprusun.org
[8] Investcyprus.org.cy/investor_s_guide
[9] ibid
[10] https://www.un.org/Depts/los/LEGISLATIONANDTREATIES/STATEFILES/CYP.htm
[11] https://www.mees.com/2012/9/28/op-ed-documents/cyprus-lebanon-cyprus-israel-offshore-delimitation/f994d750-6d1a-11e7-9675-d5a0b0510107
[12] Eastern Mediterranean Security and Energy Partnership Act of 2019

Egypt pursing greater energy cooperation between them. Notable is also the Eastern Mediterranean Forum that has been established in January 2019 purporting to coordinate policies and create a regional gas market. The members of the forum are, Greece, Cyprus, Israel, Egypt, Jordan, the Palestinian Authority, and Italy.

The Republic's membership in EU allows a considerable safety net. EU jointly and individually the Member States (e.g., France) recognised and supported the Republic's sovereign rights to its Exclusive Economic Zone ("**the EEZ**") condemning over and again Ankara's gunboat diplomacy.

3.2 Substantial Discoveries

Substantial discoveries have already been unlocked in the region. The hidden treasure indulged many IOCs and NOCs flooding the region in the hope to obtain exclusive license for undertaking upstream and midstream activities. Notable discoveries include Noble's findings in the Republic's Exclusive Economic Zone in block 12, the Aphrodite gas deposit with 4.5[13] tcf of natural gas. Tamar gas deposit with 11 tcf[14] and Leviathan field with 16tch[15] in Israel have also been discovered. In parallel, Egypt discovered massive quantity of natural gas of 30 tcf in Zhor[16].

ExxonMobil's and Qatar's petroleum's preliminary drilling in Glafkos (block 10 in the Cyprus EEZ) made a significant discovery (albeit currently provisional) for a gas deposit in the amount of 5-8 tcf[17]. The consortium completed its final appraisal drilling earlier this year, revealing good quality of gas. The appraisal results in relation to the quantity will be published later this year. The Consortium has also signed a new exploration agreement for Block 5 with the intention to start exploration later this year. The new licensing shows the Consortium's confidence to the rising prospects.

ENI also made significant findings in Calypso 1 (albeit currently provisional, "block 6") estimating that the block should contain Natural Gas of circa 6-8 tcf[18]. It is expected that ENI will conduct its final appraisal drilling in block 6, in the second 6-month period in 2022. Additional licenses for exploration and production issued by the Republic for blocks 2,3,8 and 9[19].

3.3 Monetising Cyprus Gas

Over the years, the Republic considered several monetisation paths. Initially the construction of Liquefaction plant came to the fore. However, the disappointing initial drillings annul initial plans and intention.

The only notable discovery at the time was Afrodite's block. In this regard, the Republic entered protracted discussions with Egypt culminating with a bilateral agreement reached in 2018[20] that envisaged the construction of a pipeline connecting the Aphrodite reserve with the Liquefaction plant in Egypt, Idco. The construction

[13] https://www.offshore-technology.com/projects/aphrodite-gas-field/
[14] https://eclass.uth.gr/modules/document/file.php/ECON_P_110/Geopolitics%20and%20energy%20in%20the%20East%20Med.%20The%20formation%20of%20new%20energy-alliances.pdf
[15] ibid
[16] NS Energy, Zohr Gas Field
[17] https://corporate.exxonmobil.com/news/newsroom/news-releases/2019/0228_exxonmobil-makes-natural-gas-discovery-offshore-cyprus
[18] https://www.balcanicaucaso.org/eng/Areas/Cyprus/Gas-in-Cyprus-blessing-or-curse-191948
[19] https://in-cyprus.philenews.com/total-eni-consortium-awarded-licence-for-cyprus-offshore-block-7/
[20] https://www.nsenergybusiness.com/projects/aphrodite-gas-field/

has yet to begin as the final investment decision is pending. Constructing this pipeline is still on the cards, albeit the circumstances and the external environment has changed. Prices have surged, pressure is mounted on EU to phase down reliance on Russia Gas, the increasing role of Natural Gas as bridge fuel within and outside the geographic boundaries of EU, and the Republic's provisional findings in Glafkos and Calypso significantly raise the cumulative Natural Gas reserves that lie within the Republic's Exclusive Economic Zone.

In parallel, the construction of a pipeline to bring East Med Gas to EU emerged. The East Mediterranean pipeline ("**the East Med**") dominated the headlines for some time. The project was endorsed as common interest project by EU as it pursued the transportation of East Med Gas to the Old Continent. The East Med entails the construction of circa 1900[21]km pipeline with initial capacity of 10bcm per annum. The East Med will start from Israel and through Cyprus and Crete will reach mainland Greece (possibly Italy also). In fact, Cyprus, Israel, and Greece reached a tripartite agreement[22] for constructing this with a final investment intended to be taken by 2022[23]. United States initially provided their support to the tripartite agreement for the construction of East Med. However, United States retracted its support early this year. The Ukrainian war may force US to make U-turn revitalising their support. In fact, pressure is mounting on US and voices favouring tis construction accelerate.

The high prospect for substantial cumulative Natural Gas quantities that lie within the Republic's Exclusive Economic Zone should revive the plans for constructing LNG in the Republic. The upfront capital investment is massive while at the same time it affords flexibility and mobility to destination. In turn, the Cyprus Gas may supply EU for an agreed time span and then diverted outside EU, to Asia markets, that intend to use the Natural Gas in their decarbonisation pathway. This paper favours this monetisation avenue.

4. Brief Economic analysis

We have showcased external conditions surrounding the current and future supply of LNG. These external conditions compose the external market environment that should underpin a final investment decision for the prospective construction of LNG Exporting Infrastructure in the Republic. In this section we consider the economic viability of the Liquefaction plant.

The construction of liquefaction plant, including inter alia storage, liquefaction and loading/Marine constitutes a key cost component in the LNG value chain, with the other value chain components, the upstream (exploration and production) and downstream (shipping, regassification, distribution and transport and sales) comprising the remaining. EU reportedly has spare capacity for regassification which approximates 45%[24].

The capital expenditure for the liquefaction plant over the total capital expenditure (up to the regasification stage) may range from 40%-70%[25]. The liquefaction plant

[21] https://energy.gov.cy/assets/entipo-iliko/%CE%88%CF%81%CE%B3%CE%BF%20EastMed%20Pipeline.pdf
[22] https://www.bloomberg.com/news/articles/2020-01-02/leaders-from-israel-to-greece-set-to-sign-eastmed-gas-pipe-deal
[23] https://greekcitytimes.com/2021/03/10/eastmed-pipeline-ready-five-years/
[24] https://www.economist.com/the-economist-explains/2022/02/26/if-the-supply-of-russian-gas-to-europe-were-cut-off-could-lng-plug-the-gap
[25] https://www.pwc.com/gx/en/mining/publications/assets/pwc-lng-progression-canada.pdf

includes inter alia LNG storage, liquefaction, and loading/Marine. We have compiled a base case model by recruiting generic data as those appear in publicly available sources and rules of thumb. As such, this model purports only to deliver high level preliminary results. Notwithstanding, this high-level base case model aids to provide a draft picture of the economic viability of the project.

The base case model recruits the Net Present Value ("**the NPV**") to assess the economic viability of this project. In this regard it only considers cash inflows and outflows over a fixed time span.

4.1Input Assumptions

In this section we lay out the input assumptions on which the economic base case relies on.

The starting preposition is that the preliminary discoveries in Glafkos and Calypso are validated containing cumulatively 12tcfs (recalling the higher cumulative band in the preliminary discoveries is 16tcfs). In this regard the cumulative proven Natural Gas quantity is assumed to rise to 16tcfs (including the already proven Aphrodite's gas quantity). For the purposes of this case study, we assume high level of confidence suggesting extraction of at least 80%. In this regard, it is assumed for the purposes of this draft financial analysis that 12tcfs will be extracted and liquefied.

It is also assumed that the contractors (all or some of them) under the current Production Sharing Contracts for Glafkos, Calypso and Aphrodite will set up a Special Purpose Vehicle ("the SPV") to undertake the construction of the Liquefaction plant. The construction will be based on a turnkey basis, fixed price, and fixed date.

It is assumed that 90% of the quantity will be sold under a long-term offtake agreement at a price of **$10/millions British thermal units ("mmbtu")**, as of year 5. The spot rate will be higher by 10%. It is assumed that the remaining 10% capacity will be sold at spot rate. We note that the current spot price is higher[26], soaring from the record low price of circa $2 in 2020.

The calculations only reflect the cost for constructing Liquefaction plant. The project will be developed over the ensuing 4 years (first year is year 0) and will be operational as from the 5th year, with a debt-to-equity ratio to be 75%. The debt is assumed to comprise a bank debt with a fixed interest rate of 6% (assumed to reflect the credit risk of the sponsors and off taker). A discount rate of 15% as opportunity cost of capital will be employed.

The debt repayment structure will begin as from the first year of operation. The debt will be drawdown at the beginning of each year over a 3-year period of construction, beginning from the first year of construction. The debt capital will be drawdown evenly over this horizon. The remaining requisite capital will be injected by the sponsors in the 4th year. Interest during construction ("**the IDC**") is capitalised until commencement of operations in year 5. The IDC each year is carried forward and capitalised in the following year. The equity capital will be injected during the year before completion.

[26] https://www.reuters.com/business/energy/lng-trade-grew-6-380-mln-tonnes-2021-amid-gas-price-volatility-shell-2022-02-21/

The cost for constructing a complete liquefaction plant will be set to $1,500/tonnes[27] per annum ("**tpa**"). The cost will be reduced to $600[28] for expanding the liquefaction plant by adding additional trains. The base case scenarios anticipate the construction of **three trains** with capacity of **4** metric tonnes per annum ("**mtpm**"). 1 mtpm equals 48.7 billion cubic feet ("**bcf**") or 1.38 billion cubic meters **("bcm").** That means the LNG output should be 576bcf on an annual basis (12mtpm x 48.7). 1bcf equals 576,000,000 mmbtu. The input assumption is that the 12tcf will be depleted in 20 years.

Operating expenses (e.g., personnel, administration) will be approximately 3% of the capital investment on a yearly basis starting from the first year of operations. No decommissioning costs will exist and there will be no residual value. The charter of LNG carrier at $80k on daily basis is also considered, so at an annual charter fee of $29m.

Tax and tax depreciation will be ignored for the purposes of this case study. Additionally, no growth in the prices is considered. Had we considered the tax component, then this should have reduced the net cash flows produced, by 12,5% (albeit the tax would have applied on the net project cash flows after accounting for the tax depreciation).

4.2 High Revel Results

The table below lays down the provisional results. These draw upon the input assumptions, and they are only constituting preliminary results. The absence of the tax element inflates these results. Equally, the cost base and price for LNG are only estimates. A high discount rate is employed, apparently a lower one it would have produced a different result. The interest rate employed also may be viewed as high, given that the Sponsors are expected to have high investment grade, the risk profile of Cyprus is at the investment grade and the assumption of the relative stable revenue stream.

Admittedly the preliminary results hide weaknesses. In this respect they cannot be relied upon. However, they do unfold a preliminary positive picture for the prospect of constructing LNG exporting infrastructure. We attach below two tables showing the provisional calculations and the resulting **positive NPV** and high internal rate of return, **IRR**

Table 1: Year 0- Year 11

[27] LNG Plant Cost Escalation, 2014 the Oxford Institute for Energy Studies
[28] ibid

Year			0	1	2	3	4	5	6	7	8	9	10	11
Financial information														
LNG Output		bcf					576	576	576	576	576	576	576	576
LNG Output	million	mmbtu					576	576	576	576	576	576	576	576
LNG Price (90%)	$million	mmbtu					5,184	5,184	5,184	5,184	5,184	5,184	5,184	5,184
LNG Spot Price (10%)	$million	mmbtu					634	634	634	634	634	634	634	634
	10						**5,818**	**5,818**	**5,818**	**5,818**	**5,818**	**5,818**	**5,818**	**5,818**
	11													
Capital Investment- debt	$million		- 2,700	- 2,700	- 2,700									
Capital Investment- equity	$million					- 2,700								
A) Project														
Revenue	$million						5,818	5,818	5,818	5,818	5,818	5,818	5,818	5,818
Total Revenue	$million						**5,818**	**5,818**	**5,818**	**5,818**	**5,818**	**5,818**	**5,818**	**5,818**
Operating Costs														
General Operating costs	$million						- 324	- 324	- 324	- 324	- 324	- 324	- 324	- 324
-Chartering a ship							- 29	- 29	- 29	- 29	- 29	- 29	- 29	- 29
Total							**- 353**	**- 353**	**- 353**	**- 353**	**- 353**	**- 353**	**- 353**	**- 353**
Project Net Cash Flow	**$million**		***- 2,700***	***- 2,700***	***- 2,700***	***- 2,700***	***5,465***	***5,465***	***5,465***	***5,465***	***5,465***	***5,465***	***5,465***	***5,465***
		Cost of Cap.												
NPV $000	$million	**15%**												
IRR														
B) Cash Flow After Financing														
Project Net Cash Flow (above (B))	$million		**- 2,700**	**- 2,700**	**- 2,700**	**- 2,700**	**5,465**	**5,465**	**5,465**	**5,465**	**5,465**	**5,465**	**5,465**	**5,465**
- Project Financing														
Loan received	$million		2,700	2,700	2,700									
Loan repayment							- 1,467	- 1,467	- 1,467	- 1,467	- 1,467	- 1,467	- 1,467	- 1,467
Interest							- 547	- 491	- 433	- 371	- 305	- 235	- 161	- 83
Principal							- 920	- 976	- 1,034	- 1,096	- 1,162	- 1,232	- 1,306	- 1,384
Cash flow after financing	$million		-	-	-	-	***3,998***	***3,998***	***3,998***	***3,998***	***3,998***	***3,998***	***3,998***	***3,998***
NPV $000		**15%**												

Table 2: Year 12- Year 23

Year			12	13	14	15	16	17	18	19	20	21	22	23	Total
Financial information															
LNG Output		bcf	576	576	576	576	576	576	576	576	576	576	576	576	10,944
LNG Output	million	mmbtu	576	576	576	576	576	576	576	576	576	576	576	576	10,944
LNG Price (90%)	$million	mmbtu	5,184	5,184	5,184	5,184	5,184	5,184	5,184	5,184	5,184	5,184	5,184	5,184	
LNG Spot Price (10%)	$million	mmbtu	634	634	634	634	634	634	634	634	634	634	634	634	
	10		**5,818**	**5,818**	**5,818**	**5,818**	**5,818**	**5,818**	**5,818**	**5,818**	**5,818**	**5,818**	**5,818**	**5,818**	
	11														
Capital Investment- debt	$million														- 8,100
Capital Investment- equity	$million														- 2,700
A) Project															
Revenue	$million		5,818	5,818	5,818	5,818	5,818	5,818	5,818	5,818	5,818	5,818	5,818	5,818	110,534
Total Revenue	$million		**5,818**	**5,818**	**5,818**	**5,818**	**5,818**	**5,818**	**5,818**	**5,818**	**5,818**	**5,818**	**5,818**	**5,818**	**110,534**
Operating Costs															
General Operating costs	$million		- 324	- 324	- 324	- 324	- 324	- 324	- 324	- 324	- 324	- 324	- 324	- 324	- 6,480
-Chartering a ship			- 29	- 29	- 29	- 29	- 29	- 29	- 29	- 29	- 29	- 29	- 29	- 29	- 580
Total			**- 353**	**- 353**	**- 353**	**- 353**	**- 353**	**- 353**	**- 353**	**- 353**	**- 353**	**- 353**	**- 353**	**- 353**	**- 6,707**
Project Net Cash Flow	**$million**		***5,465***	***5,465***	***5,465***	***5,465***	***5,465***	***5,465***	***5,465***	***5,465***	***5,465***	***5,465***	***5,465***	***5,465***	***103,827***
		Cost of Cap.													
NPV $000	$million	**15%**													***13,625***
IRR															***32%***
B) Cash Flow After Financing															
Project Net Cash Flow (above (B))	$million		5,465	5,465	5,465	5,465	5,465	5,465	5,465	5,465	5,465	5,465	5,465	5,465	93,027
- Project Financing															
Loan received	$million														8,100
Loan repayment															- 11,736
Interest															- 2,627
Principal															- 9,109
Cash flow after financing	$million		***5,465***	***5,465***	***5,465***	***5,465***	***5,465***	***5,465***	***5,465***	***5,465***	***5,465***	***5,465***	***5,465***	***5,465***	***92,091***
NPV $000		**15%**													***18,162***

5.Project Financing

5.1 Introducing project Financing

Finding the investment capital and building the debt-to-equity capital structure, the structure of debt payments, the cost for using this capital, as well as the requisite hurdle rate are key considerations in appraising the profitability of a project and its bankability. In this section we focus on Project Financing as a method for providing finance to capital intensive projects such as LNG exporting infrastructure.

Project Financing 'has long been used in the natural resources sector'[29] including LNG[30] projects. The 'limited recourse' or 'non-recourse' lies at the heart of Project Financing. This signifies the Sponsor's restricted exposure that may be confined to the subscription of the Sponsor's equity share. Although Sponsor's exposure may rise, especially in the construction phase, by giving guarantees to the lenders. Irrespective of their limited exposure, Sponsors' participation in the project is essential in providing confidence to the Lenders that the project will be completed in good time and quality. In this respect, Lenders commonly require for Sponsors not to exit the project or remain committed for a period stretching from the construction to at least the initial operational stage.

Project Financing allows the 'off balance sheet financing'. This in turn, does not erode Sponsor's overall debt capacity through not loading up the Sponsor's balance sheet with the project's bank loans. In parallel, the high-level leverage (debt: equity) that may be secured lowers the weighted average cost of capital (debt and equity)[31]. As a corollary, this will contribute for the product, LNG output, to be more competitive by the lowering the price due to the lower cost of capital component.

A key ingredient of project financing is that the Lenders provide loan to the project predominantly against the expected operating revenue streams. Prerequisite for the provision of financing is to ringfence the project's revenue streams and assets. In this respect, a special purpose vehicle ("**the SPV**"), corporate entity, is typically incorporated that undertakes calculated risks through a web of loans.

Prima facie, the SPV should be insulated from risks that it lacks the financial capacity to absorb otherwise the bankability of the project may be frustrated. A back-to-back[32] contractual network is commonly employed for shifting the risk away from the SPV.

5.2 Key risks inherent in LNG projects

Identifying, appraising, and dealing with the risks embedded in the project is a keystone of project financing. The due diligence purports to measure the likelihood and impact of the embedded risks to determine if these should be avoided, mitigated, or undertaken. The level of the risk ultimately affects the cost of debt and the size of the debt (hence sponsors' equity). In turn this will influence the profit margins and the commercial viability and bankability of the project.

[29] Principles of Project Finance, E.R. Yescombe, 2nd edition
[30] The principles of Project Finance, Morrison Rod, ch.16
[31] Principles of Project Finance, E.R. Yescombe ch.2
[32] Project Finance, Graham Vinter, ch.5

The risks may be broadly segregated into three general categories[33] (i) commercial risks that relate to the project itself or the market it functions, (ii) macroeconomic risks that revolve around the external economic circumstances and (c) political and regulatory risks that they are linked to changes in Law or subsequent governmental action or Political force Majeure events. In this section we elaborate on these broad categories of risks by reference to the construction and operation of a liquefaction plant.

5.2.1 Commercial risks

Beginning with Commercial Viability is at the core of the decision on whether to undertake a project. The decision-making process involves the consideration of multiple elements, stretching from the surrounding circumstances and external environment to the project itself. This results in a composite mosaic embedding legal, political, financial, market, economic and financial considerations. To state the obvious, the project must be underpinned by a sound commercial and economic rational.

Construction and completion risk is at the centre of a successful project. This involves the fulfilment of peculiar technical features and requirements, adherence to agreed technical standards and milestones and the timing of completing the project. The excessive delay in completion means holding back operation of the liquefaction plant resulting to delay in actual production of LNG output. In turn this will result to substantial losses, the spectre for SPV defaulting on its debt obligations, or even endanger its commercial viability.

Commonly, 'turnkey' construction contracts[34] are recruited. As a result, the responsibilities for construction of the liquefaction plant are aggregated by passing these to a key contractor. This in turn contributes to a more coordinated monitoring and aid to complete the project in good time and quality.

A key component of any financial analysis or business model is the revenue stream. In this regard, for determining whether the project is economically and commercially viable, the revenue stream should exceed the costs and provide a reasonable return. The revenue Risk may be split into two elements (i) volume and (ii) price. Commonly long-term agreements are used either (i) in the form of take or pay thus alleviating both elements and (ii) as a long-term agreement, thus fixating the volume, but not the pricing which should depend on the market, albeit a floor is likely to be introduced. Part of the anticipated production may be supplied using short term (or spot) contracts. The increasing trade in LNG enables the convergence of prices across the different regions and improves liquidity in markets, thus fostering the efficient and effective operation or establishment of Gas Hubs (such as the USA Henry Hub).

5.2.2 Macroeconomic, political, and regulatory risk

The macroeconomic risks represent the threat for interest rates, inflation, and currencies to negatively fluctuate afflicting the economics of the project. The risk will impede the scale of operational cash flows by exacerbating the costs. The country's profile and use of strong currency could mitigate the impact of such risks. Cyprus belongs in a strong economic block, with stable fiscal environment and trades in

[33] Principles of Project Finance, E.R. Yescombe chapter 9
[34] ibid

strong currency, macroeconomic risks such as catastrophic devaluation are significantly restrained, although not eradicated.

The political and regulatory risks may unleash devastating consequences on the project. These may involve regulatory changes ex post the project depriving advantages previously granted to the SPV or unfairly discriminate thus curbing its operations. The Republic provides a stable political and legislative framework honouring international laws and have an equitable, fair, consistent, and pro-business legal system and Government support. These factors provide a natural hedge to foreign investors.

6. The monetisation path

6.1 Favouring the construction of LNG in the Republic

Having introduced the project financing and embedded risks we now focus exclusively on the path that this paper fours for monetising the Cyprus Gas.

The base case input assumption is that the final appraisal drilling in Glafkos, and Calypso will raise the proven Cyprus Gas quantity in the region of at least16tcf, with at least 12tcf capable to be extracted. In this regard, all 3 blocks (Aphrodite, Glafkos and Calypso) should be jointly developed excusing the construction of LNG in the Republic. In turn, construction of a **greenfield three-train**, with cumulative capacity of at least 12 tonne/year should be commercially excused.

The said cumulative Gas quantities (proven and provisional) in the Republic's exclusive economic zone are substantial. The high price environment and the increasing role of the Natural Gas in the decarbonisation pathway provides a reasonable lifeline for Gas projects, upstream and midstream (pipeline or LNG). The LNG project affords flexibility, mobility and relatively liquidity to the output compared to pipeline project. At the same time, the existing idle regassification capacity in Europe is also a factor to consider. The location of Cyprus, its EU membership and its stable currency, euro, provide additional support and protection against macroeconomic or political risks.

The Republic's legal framework, that builds on the English Common Law and as evolved by EU Law, protects, and ensures fair treatment to foreign investors while at the same time fosters and preserves a stable business climate. S&Ps credit agency ranks Cyprus with -BBB investment credit rating with stable economic outlook[35].

Despite the notable positive features, the political situation and in particular Ankara's intransigence may be construed as a barrier to the optimum Cyprus Gas developments. However, the growing clout of the Republic and the mounting pressure on Brussels for security of supply create countervailing factors. An additional inhibiting factor may be the relative inexperience and absence of similar infrastructure in the Republic. It should be noted that the Republic has already started construction of regassification terminal. This should aid the Republic to gain experience on site preparation, space, environmental considerations, fast track for permits and issue of visas, in relation to high capital-intensive projects. In turn, these may allow the sharing of infrastructure (to the extent applicable) and use of experience.

[35] https://tradingeconomics.com/cyprus/rating

A final constraining factor may be the articulated aim of EU to scale down the Gas supplies by 2030 and up to 2050 (if not earlier) to attain Net Zero Emission goal. Assuming the Cyprus LNG is constructed and operational in 2027, the operational time span for producing sufficient revenue stream to recoup the vast up front capital costs and equity return will be substantially limited. However, Gas is favoured by several States around the world in their decarbonisation pathway, with their provisional intention to reach Net Zero Emission beyond 2050. In this regard Cyprus Gas (or even East Med Gas at large) may find markets beyond the geographic boundaries of EU, after a certain time span. As a result, supply agreements may be agreed by EU buyers in the short and medium term and thereafter with buyers outside EU.

6.2 Structuring the SPV and modus operandi

Designing and implementing a proper structure for facilitating the construction and operation of the LNG plant is a key determinant for achieving bankability and the ongoing financial health thereto. Relevant factors to consider are inter alia the ownership and blending of the sponsors, intention of Sponsors to divest their equity shareholding in the future and future expansion plans. Incorporating a corporate company, SPV, is typically a prerequisite to achieve project financing with limited recourse.

Three operational models can be deployed[36], (a) Vertical integration[37] of the upstream layer with the midstream layer (LNG plant). In this regard, the lenders will provide debt against the unified income streams of the merged structure and take security of all assets, (b) Merchant structure where the LNG plant is deployed independently using project financing. In this respect, the LNG plant enters into long term supply agreement for procuring the natural gas and long-term offtake agreement with the buyer(s) of the LNG. To achieve project financing, the agreements should draw upon the back-to-back contractual web of contracts. In this regard, they enable the passage of risks away from the SPV, so if the supply agreement includes a price adjustment clause the offtake agreement should also include similar clause. Finally, (c) the tolling structure may apply. Similarly to (b), the LNG will be a separate project. However, in this case, the SPV will only earn a tolling fee for liquifying the gas, so effectively the SPV will render a service to the gas suppliers. The SPV will not be exposed to market and other related risks (these will be undertaken by the gas suppliers). In this regard, they will only earn a fee compensating its cost plus a moderate equity return. The quid pro quo is that the gas suppliers will reap the bulk the economic rent.

Considering the above, the licensed IOCs in the Republic along with Cyprus National Oil Company could jointly incorporate SPV owning equity participation pro rata to their share to the dedicated gas reserves and deploy either (b) or (c) avenues for operating thus enabling project financing with limited recourse. The decision of the model will consider the risk the Republic will be eager to assume and the reciprocal reward. The trade off between risk and reward is evident in the choice between the two structure with (b) revealing a higher risk and higher reward.

6.3 Market for the Cyprus and Eastern Mediterranean LNG

[36] Global LNG Fundamentals, US Department of Energy
[37] Project Finance, Graham Vinter

The anticipated drop in the production of indigenous European gas due to the depletion of the North Sea and closure of Groningen in the Netherlands leaves a vacuum which needs to be substituted. In the same vein the dreadful war in Ukraine raises concerns for security of supply in EU and the reported need to diversify away from Russia Gas. Cyprus Gas and East Med Gas may provide an alternative avenue in the medium term.

At the same time, Asia region reveals a growing trend to increase the gas supply in its primary energy mix as part of its decarbonisation path, switching from coal. The India's intention supports this trend. Prime Minister of India announce its intention to ramp up the gas supply in the energy mix from the current 6,2% to 15%[38]. Cyprus liquefied gas may find home in India either by directly entering into a bilateral supply agreement or indirectly by agreeing with ExxonMobil, that currently supplies 1.5 million tonnes[39] of liquefied gas to India, to also supply Cyprus liquefied gas.

7. Conclusion

The production of indigenous European Gas production (depletion of the North Sea and closure of Groningen in the Netherlands) is on a slippery slope. It is submitted that this led to substantial supplies of non-indigenous EU Gas including heavy dependency on Russia Gas. EU has recently reached an agreement[40] with US for the latter to supply LNG output of 15bcm on annual basis. The agreement purports to haste the phase down of EU's reliance in Russia Gas. Notwithstanding, scaling up the EU indigenous gas production should be at the core of security of supply, hence a laudable course of action.

The Republic is an EU MS. In this regard, development and production of the Cyprus Gas deposits should be construed as accelerating the production of EU indigenous Gas. Using the provisional input assumptions of this paper, the Republic may supply EU with 16bcm of Natural Gas on an annual basis. Additionally East Med Gas, sourced from Israel, may also be channelled to EU by enhancing the suggested 3 train LNG capacity. This may function in coordination with the Egypt's available LNG capacity.

The paper also outlined the alternative avenues for monetisation of the Cyprus Gas. The East Med that occupied a high place for a long time and the current state of play revitalising the interest in the face of the Ukrainian War and its ramification on EU security of Supply thereto. At the same time the construction of a pipeline to connect the Aphrodite block to the Egyptian liquefaction plant is still on the cards. This paper favours the construction of liquefaction unit in the Republic by recruiting Project Financing. The LNG should provide flexibility and mobility in transporting the Cyprus Gas within and outside the geographic boundaries of EU

[38] https://www.reuters.com/business/energy/exxon-eyes-more-long-term-gas-supply-deals-with-india-2022-02-04/
[39] ibid
[40] https://www.cnbc.com/2022/03/25/eu-strikes-gas-deal-with-the-us-as-it-seeks-to-cut-its-reliance-on-russia.html

BiblioGraphy

Books

Graham Vinter, Gareth Price, David Lee, Project Finance 4th edition

E.R.Yescombe, Principles of Project Finance 2ND edition

Morrison Rod, The principles of Project Finance

Global LNG Fundamentals, US Department of Energy

Claude Duval, Honore Le Leuch, Andre Pertuzio, Jacqueline Lng Weaver, International Petroleum Exploration and Exploitation Agreements, second edition,

Dennis C. Stickley, A framework for Negotiating and Managing Gas Industry

Articles & Reports

Net Zero by 2050, A roadmap for the Global Energy Sector, IEA

IEA Gas Market report- Q3 2021

NS Energy, Zohr Gas Field

Greek energy forum, 2021

Eastern Mediterranean Security and Energy Partnership Act of 2019

Connecting Europe Facility Energy, Supported Actions- May 2020

Sophia Ruester, Financing LNG Projects and the Role of Long-Term Sales and purchase Agreements, 2015

Liquefied Natural Gas and gas storage will boost EU's energy security, EU, February 2016

Mason Inman, Greig Atiken, Scott Zimmerman, Europe Gas Tracker Report 2021

Anastasios Giamouridis & Nikos Tsafos, Financing Gas projects in the Eastern Mediterranean

Charles Ellinas, Financing LNG in the new Era

LNG: A Liquid Market, ECONOMIST, special report, July 14, 2012

Symone Tgliapietra, Eastern Mediterranean Gas: What prospects for the New Decade

Hudson Institute, U.S. Policy and the Strategic Relationship of Greece, Cyprus and Israel: Power Shifts in the Eastern Mediterranean

Anastasios Giamouridies, Natural Gas in Cyprus choosing the right option

Richard Keenan and Graham Vinter, Egypt on the verge of Gas Hub Status

Maite de Boncourt, Offshore Gas in East Mediterranean from Myth to Reality

Internet

icsid.worldbank.org/resources/databases/bilateral-investment-treaties

mof.gov.cy/en/taxation-investment-policy/double-taxation-agreements/double-taxation-treeties

Investcyprus.org.cy/investor_s_guide

https://www.pwc.com.cy/en/why-cyprus.html

https://www.offshore-technology.com/projects/aphrodite-gas-field/

eclass.uth.gr/modules/document/file.php/ECON_P_110/Geopolitics%20and%20energy%20in%20the%20East%20Med.%20The%20formation%20of%20new%20energy-alliances.pdf

corporate.exxonmobil.com/news/newsroom/news-releases/2019/0228_exxonmobil-makes-natural-gas-discovery-offshore-cyprus

www.eni.com/en-IT/media/press-release/2018/02/eni-announces-a-gas-discovery-offshore-cyprus.html

https://www.balcanicaucaso.org/eng/Areas/Cyprus/Gas-in-Cyprus-blessing-or-curse-191948

in-cyprus.philenews.com/cyprus-drilling-programme-to-resume-in-november-december/

https://in-cyprus.philenews.com/total-eni-consortium-awarded-licence-for-cyprus-offshore-block-7/

https://www.nsenergybusiness.com/projects/aphrodite-gas-field/

https://www.financialmirror.com/2021/01/29/eastmed-pipeline-gathers-support-from-balkans/

www.bloomberg.com/news/articles/2020-01-02/leaders-from-israel-to-greece-set-to-sign-eastmed-gas-pipe-deal

https://greekcitytimes.com/2021/03/10/eastmed-pipeline-ready-five-years/

https://energy.gov.cy/assets/entipo-iliko/%CE%88%CF%81%CE%B3%CE%BF%20EastMed%20Pipeline.pdf

https://tcf.org/content/commentary/east-mediterranean-pipeline-dreams/

https://www.hydrocarbons-technology.com/projects/pnglng/

https://pnglng.com/About/Project-overview

http://www.ivt.ntnu.no/ept/fag/tep4215/innhold/LNG%20Conferences/2004/Data/Papers-PDF/PS4-2-Thompson.pdf

https://www.ft.com/content/d14ec1a3-12f0-484e-9246-d2a2ae9bc004?desktop=true&segmentId=7c8f09b9-9b61-4fbb-9430-9208a9e233c8#myft:notification:daily-email:content

https://www.ft.com/content/7872a05f-9e38-4740-9b1b-4efc69ca316c?desktop=true&segmentId=7c8f09b9-9b61-4fbb-9430-9208a9e233c8#myft:notification:daily-email:content

https://euromenaenergy.com/cyprus-ponders-gas-monetisation-options/?print=print