



Research Article

The Estimation of Gas Export Price to Egypt from Cyprus (Base Scenario)

Mitra Khaksar^{1*}, Yas Malakoutian², Mohammadbagher Amjadi³

¹Department of Banking and Finance, Eastern Mediterranean University, Gazimagusa, Mersin 10, Turkey

²Department of Art and Architecture, University of Guilan, Rasht, Iran

³Department of Electronic Engineering, Royal Holloway University of London, London, United Kingdom

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Abstract

Natural gas is a kind of fossil fuel that is made when dried animals and plants are exposed to strong heat and pressure for more than 1000 years. In principle, the energy, which is deposited in the carcasses of animals and plants normally, comes from the sun that stores the carbon in the NG. However, access to natural gas sources has a direct effect on the economy. Therefore, the transfer process of this energy and finding the suitable market for it is a hot subject in the world. It should be mentioned that due to the significant reduction in natural gas supplies and an increase in domestic demand, the need to import the gas to Egypt is increasing. Accordingly, this target could be good markets for Cyprus Natural gas. The result shows that the Export gas price from Wellhead in Cyprus to treatment station in Egypt based on this study's assumption is about \$171.60 that has superiority with other prices in Egypt. Therefore, Gas pipeline construction from Cyprus to Egypt is economical.

1. Introduction

Global warming has been mainly linked to human activities, which release greenhouse gases [1]. Human life is tied to fossil fuels, and the increase in citizen population and urban sprawl has led to increased air pollution [2]. On the other hand, the efforts of transportation engineers to encourage urban users towards to pedestrian spaces have not been successful [3-6] and the service level of street has increased day by day [7, 8]. This issue is even more critical in developing countries so that with many management changes [9] and the introduction of different assessment frameworks [10], they are trying to replace fossil fuels with similar examples, including natural gas, electric vehicles or taking green approaches in their transportation networks. For instance, the authors in [11] investigated the electric vehicle routing problem to address the challenges that the logistic and transportation companies face in adopting the fleet of electric vehicles. Also, authors in [12, 13] considered green approaches by

* Corresponding Author: Mitra Khaksar
E-mail address: mitrakhaksar@gmail.com

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incorporating vehicle emissions into their transportation activities. Other predictive models [14-21] are presented in order to implement renewable systems and natural gas.

Offshores are one of the places with high potential for energy transfer and also a good place to build wind power plant site [22, 23]. Also, Cyprus has the potential to export natural gas to other countries from its coast, due to its location and abundant natural resources. On the other hand, Egypt is facing potential problems due to the increase in population as well as the increase in the price of gas imported from other neighboring countries. In this paper with investigating the influencing factors, the price of gas exported from Cyprus to Egypt is estimated to determine whether the construction of a gas pipeline between the two countries is economical or other solutions should be sought.

2. Methodology

Egypt is located around the Levant basin. According to the Egypt daily news that is published in June 2015 the agreement signed between the Cyprus and Egypt in order to check on natural gas export to Egypt via 400 km pipelines [24]. The treatment station in Egypt and Aphrodite field in Cyprus will be linked through Mediterranean Sea that is around 180 km (table 1).

Table 1. Data for Export Gas from Cyprus to Egypt

From wellhead	To Egypt	Length (Km)	Pipeline Off shore	Diameter (inches)	1000 cubic meter/day
		180		28	8.498.58

Given that, the pipeline technique information is not yet available. The pipeline diameter is assumed 28 inches in this study. It should be mentioned that the exportable gas to Egypt from Cyprus is 8,498.58 Mcm per day. Figure 1 shows the direction line between the Egypt to Cyprus.

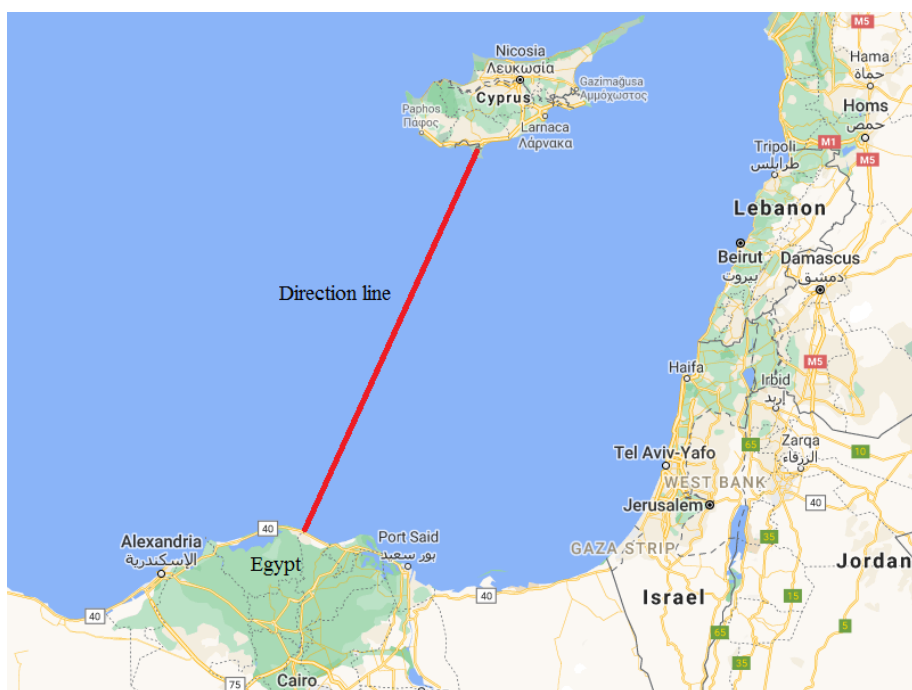


Figure 1. The pipeline route between Cyprus to Egypt.

3. Result and Discussion

The cost of the project is classified in four groups consisting of Material, Labor, Right of Way and Miscellaneous. However, based on this method, the total construction cost of onshore pipeline per diameter and the length of the route is \$85,960.74 and

for offshore pipeline is around \$156,292.26 per inch and km. The calculation of manufacturing cost based on this estimation is presented in the Table 2.

Table 2. Calculation of the Pipeline Construction Cost from Wellhead to Egypt

From	To	Type	Appr. (Km)	Dia.inch	Material	Labor	Misc	R.O.W	C.C
Well head	Egypt	Offshore	180	28	\$204.805.380	\$354.470.851	\$55.139.910	\$173.296.860	\$787.713.002

The construction cost of offshore pipeline with 28-inch diameter, between Cyprus and Egypt based on assumptions in this study consists of \$204,805,380.61 Material, \$354,470,851.06 Labor and \$228,436,770.68 Miscellaneous and Right of Way. The total cost is equal to \$787,713,002.35 for ~ 180 km length undersea pipeline [24, 25]. The percent of annual operating cost is 5% which is percentage of manufacturing cost that is shown in Table 3.

Table 3. The Annual Operating Cost for Egypt

Parameters	Wellhead to Egypt
Investment cost	\$787.713.002
Operating cost annually percent	5%
The operating cost per year	\$39.385.650

The annual maintenance and operating cost of 180km offshore pipeline route based on the assumption in this study is around \$39,385,650.12 from wellhead- Cyprus to treatment station in Egypt. In order to complete this computation, it is required to determine the amount of natural gas per cubic meters that will be exported annual (365 days). The amount of gas is around 8498.58 thousand cubic meters per day. As regards to the daily export, the amount of annual export of natural gas is 3,101,983 Mcm.

The Natural Gas that will be exported during the 15 years to Egypt from Cyprus is calculated and also discounted by the discount rate which is assumed 12%. The present value of gas, which will be exported during the life of project to Egypt, is around 21,127,177 Mcm. In order to determine the cost per 1000 cubic meters, the manufacturing cost is divided on the PV of amount exportable gas and operating cost is divided on annual exportable natural gas and finally the sum of these two factors determine the cost of each unit. As well as by adding the gas price at the wellhead on per unit cost, the export price to Egypt will be specified. The cost price per Mcm is around \$49.98 and the export gas price based on this formula is \$171.60 per Mcm that is shown in Table 4.

Table 1. The Cost and Export Price of Gas per Mcm for Egypt

Title of cost	Total cost	Wellhead to Egypt		Unit cost/1000 cubic meters	Cost Price/Mcm
		The amount of Gas that will be issued/1000 cubic meters			
		Annual	Pv of 15 Years		
Investment Cost	\$787.713.002	-	21.127.1785	\$37.28	\$49.98
Operating cost/year	\$39.385.650	3.101.983	-	\$12.70	
		Gas Price at Wellhead		\$121.62	
		Transportation Price to Mersin		\$171.60	

In order to determine that the export of natural gas to Egypt by pipeline from Cyprus is favorable or not, it is required to specify the import, extraction and production price in Egypt. The cooperation will be impossible in providing that Cyprus is able to supply the NG with certainly price. The cost of domestic production of natural gas in Egypt has been estimated about \$3.5-\$5 per MMBtu or ~\$127-\$181, the average of domestic production is ~\$154, and also the forecasted cost of new extraction by foreign company will be around \$5.54 per MMBtu or ~\$201 per Mcm as well as Israel LNG import price is stated at \$7 per

MMBtu that is equal to ~\$255.47 per Mcm of Natural gas [26-28]. For more clarification, some novel methods can be applied in the future [29-33].

4. Conclusion

The Export gas price from Wellhead in Cyprus to treatment station in Egypt based on this study's assumption is about \$171.60 that has been compared with other price in Egypt. Domestic production (\$154) is less than export price by Cyprus. Also, the foreign Production (\$201) and import price of Israel (\$255) are more than export price by Cyprus. In addition, in July 2015, the Cyprus news reported the feasibility study about the natural gas export from Cyprus to Egypt is finished. This report is provided by engineering company Enppi and also the results are under the review by Egypt state company, EGAS. However, the forecast of the gas price in this report is not more than 6\$ per MMBtu or \$218 per Mcm via pipeline and the LNG price is around \$10 per MMBtu or \$362.3 per Mcm. The price of LNG exportable from Israel is chosen in order to determine the saving for Egypt. The Israel LNG price is \$255.47 and \$171.60 is the export natural gas price from the Cyprus, the saving will be around \$83.87 per Mcm and \$712,799.56 per year. Therefore, the cooperation based on the assumptions in this study will be favorable.

Conflict of interest

The authors declare no conflict of interest.

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