Economic-Environmental Evaluation of Iran Gas Flaring Reduction Projects With GPPs: Case Study of NGL-3200 Plant of Iran

Roholla mahdavi, Ph.D Student of Oil & Gas Economic, Faculty of Economic, Allameh Tabataba'i University, Phone +98 911 922 3557, E-mail: R_mahdavi_ir@yahoo.com
Ali taheri, Ph.D Student of Oil & Gas Economic, Faculty of Economic, Ferdowsi University of Mashhad, Phone +98 912 838 1346, E-mail: taherifard1361@yahoo.com
Hamed sahebhonar, Ph.D Student of Oil & Gas Economic, Faculty of Economic, Ferdowsi University of Mashhad, Phone +98 935 532 3661, E-mail: h.sahebhonar@gmail.com

Overview

Reducing greenhouse gases emission is agreed globally as a most important issue in recent years. Investigations shows that one of the main sources of greenhouse gases emissions is the natural gas flaring and venting at the oil production sites around the globe. In fact, during oil production, some huge amount of associated natural gas is flared when barriers to the development of gas markets and gas infrastructure prevent it from being used. According to World Bank data, 147.56 bcm gas has been flared in 2015 which tended to releasing of 398.4 million tons of CO_2 to the atmosphere. With 12.1 bcm of gas flaring, Iran ranked top three among gas flaring countries and had the share of 8.2 percent of greenhouse gases emissions in 2015. Thus reducing gas flaring in Iran would help considerably to the reduction of greenhouse gases emissions.
In doing so and regarding Iran's proposed Intended Nationally Determined Contributions (INDC) at COP21, this country intend to reduce its gas flaring according to its obligations. Exploitation of Gas Process Plants (GPPs) is one of the most important program of Iran to gather the associated gas already being flared and to reduce the volume of greenhouse gases emissions. The share of associated gas flaring in total gas flaring of Iran is between 70-80 percent.
Among GPPs of Iran, NGL-3200 plant is the biggest plant of gathering associated gas. By having 14.15 Million Cubic Meters (mcm) per day (500 Million Cubic Feet (mcf) per day) capacity, this plant will gather the associated gas of west-Karoon region's oil fields. However, although this economic and environmental project have been defined in the early 2000s, because of some difficulties respecting to finance and economic sanctions of Iran, it hasn't been utilized as yet. Therefor national Iranian oil company (NIOC) put the privatization of this plant on the agenda.
However, because of the importance of profitability and economics of the project, this question can be raised that despite of recentoil market evolutionssuch as oil price decline and subsequently GPP's products (such as propane and butane) price decline, is establishing aGPP like as NGL-3200, economically feasible? This paper aims to evaluate the feasibility of the NGL-3200.

General structure of the project in this paper is as follow:

1- Private sector establishes the plant, and buy the required feedstock (associated gas) from NIOC (national Iranian Oil Company) according the determined pricing formula. In this formula the price of associated gas depends on the NGL price and the volume of the delivered feedstock.
2- According to the agenda of privatization of the NGL-3200, the produced lean gas of this plant will be delivered to the NIOC for free. So fluctuations of the natural gas won't have any effect on the economic evaluation of the project.
3- Investing on the project, the private sector after fractionating ethane, will sell the NGLs, LPG and condensate at the domestic market.
4- In the evaluation of this project, two scenarios regarding the CO_2 price have been considered:
    a. NIOC will not give any discount in the price of associated gas regarding the reduction of CO_2 emission.
    b. NIOC will give some discount in the price of associated gas regarding the volume of CO_2 emission reduction.

So as mentioned above, the natural gas price fluctuations will have no effect on the feasibility study of the project. Furthermore, in order to evaluating the project from the environmental aspect, the value of CO_2 emission reduction has been discussed.

Methods

The methodology of this paper will be Cost-Benefit Analysis and Feasibility study.

Results

Feasibility study of the NGL-3200 shows that:

1- Providing that the feedstock of this plant will be completely supplied, then the NPV of the project will be positive and the IRR and payback period will be 28.3% and 3.5 years, respectively.
2- If the utilization factor of the plant would be less than 78%, then this project won't be feasible.
3- Provided that the project would be technically revised, if the nominal capacity of this plant become less than 40% of current nominal capacity, then this project won't be feasible.
4- Assuming that the products prices (including ethane, LPG and condensate) decreased by 17% (Ceteris paribus), the project will not be feasible.
5- Sensitivity analysis of the of the price changes on NPV and IRR shows that LPG price changes has the most impact on this indexes in that 10% reduction of LPG price, ethane, and condensate cause to 5.8, 1.8, and 1.4 percent decrease of IRR, respectively.
6- Sensitivity analysis of the NPV of the project regarding to the associated gas price changes, shows that if this price reach to 6.6 cent per Cubic Meter, the project loses the feasibility.
7- Provided that the feedstock of this plant will be completely supplied, assuming the price of the feed (associated gas) equal to 5.1 cent per Cubic Meter, the IRR of the project will be 25%.

Conclusions

As regards the capacity of NGL-3200, this plant has a great significance in gathering associated gas and reduction of greenhouse gases emissions. As the volume of CO_2 emissions reduction after establishing this plant will be 12.7 million tons per annum. Feasibility study of this project shows that economics of this project depends on different factors like as associated gas price, LPG price, Capex, available feedstock amount, and type of technology (deep recovery or low recovery). In addition, assessments show that if the NGL plant considered integrated with downstream, for instance NGL plant with petrochemical plant, the economics of the project will be better off.

References

1. Argus International LPG (2015), Daily International LPG Prices and Market Commentary, Houston, Argus Media Inc.
2. Carbon Limit (2013), Associated Petroleum Gas Flaring Study for Russia, Kazakhstan, Turkmenistan, and Azerbaijan, European Bank for Reconstruction and Development.
3. Hong Tan Siah and I. Barton Paul (2016), Optimal Dynamic Allocation of Mobile Plants to Monetize Associated or Stranded Natural Gas, Part I: Bakken Shale Play Case Study, Energy, No. 93, pp. 1581-1594.
4. IEA (2012). *World Energy Outlook*, Paris, International Energy Agency.
5. PBL Netherlands Environmental Assessment Agency (2014), *Trends in global CO2 emissions: 2014 Report*, Institute for Environment and Sustainability (IES) of theEuropean Commission's Joint Research Centre (JRC), (: www.pbl.nl/en or edgar.jrc.ec.europa.eu).