

Technical description and the basic economics of the early gas delivery from Soroosh and Nowrooz fields project prior to commissioning of the NGL Plant

Overview Summary

Due to the progress in building the gas compression platforms and the offshore pipelines and the estimated time of commissioning the NGL plant in 2010, close studies on the gas gathering project in Kharg and Bahregansar areas began in IOOC. As a result, the possibility of delivery of the sweet gas from Soroosh and Nowrooz fields to the Kharg Island next year for internal temporary consumption including in a powerplant and IOOC facilities was scrutinized.

Due to the progress in fabrication and installation of the offshore platforms project and the offshore pipelines project, it is possible to transport the associated gas from the above platforms (prior to commissioning of the NGL Plant) in 2007. This can be accomplished by installing the platform jacket and the reception facility on Kharg Island as well as laying the onshore pipelines on the Island for transporting the gas into the facilities after laying the offshore pipelines according to the planned schedule.

This means the jackets and the tie-in and spools should be installed, the pipelines should be laid and the reception facilities on Kharg Island including a Slug Catcher and a pig receiver should be built. The cost of the above items is included in the different parts of the ongoing gas gathering and NGL plant project of Kharg and Bahregansar areas. It is also possible to use the pipelines to Dorood 1,2,3 facilities for transporting the gas from the reception facilities on Kharg Island to the existing facilities and the cost has already been included in the associated gas gathering project in Kharg and Bahregansar areas.

It only requires about 3.1 million dollars for the manifold on Aboozar platform, onshore pipelines to the different consumers on Kharg Island and to the Kharg powerplant and the associated gas pipeline to Dorood 3 facilities as well as the cost of registering this CDM project.

Thereafter implementing this project and transporting the sweet gas from Soroosh and Nowrooz fields provides temporary fuel to the consumers on the Island and also solves some operation problems so this project has been welcomed by the respectful Kharg and Bahregansar areas managements. Not only will the project provide the feed gas for the existing Methanol plant on Kharg Island but also it will be inline with the zero flaring policy and will reduce pollutions to the environment. Besides, in addition to the value of the transported sweet gas to the island, by registering the associated CDM project a considerable amount of about 31 million dollars will be gained prior to the commissioning of the Kharg NGL plant.

1- Introduction

In the gas gathering project in Kharg and Bahregansar areas, the feed gas will be provided from the associated gas in Foroozan, Dorood and Aboozar in Kharg area and Bahregabsar fields, Hendijan, Nowrooz and Soroosh in Bahregansar area. In this project, the Kharg NGL plant has been designed to process 600 MMscfd of associated gas of which about half of it will come from the Dorood fields (Dorood onshore facilities, 1,2,3).

About a quarter of the feed gas of the NGL plant meaning about 150 MMscfd will come from Foroozan field and will be transported to Kharg Island via a 20" offshore pipeline. About the same amount of gas will also come from Aboozar, Bahregansar, Hendijan, Soroosh and Nowrooz and the associated gas will be transported to Aboozar compression platform and from there the gas will be exported to Kharg Island via a 26" pipeline.

The Bahregansar and Hendijan associated gas after compression and dehydration on the Bahregansar compression platform will be transported to Aboozar compression platform via a 16" offshore pipeline. Nowrooz associated gas after compression and dehydration on the platform will connect to the 16" Bahregansar – Aboozar pipeline and will enter to Aboozar gas compression platform.

The Soroosh associated gas will be transported to Aboozar gas compression platform via an 8" offshore pipeline.

The associated gas from the tree Aboozar platforms after delivery to the Aboozar compression platform will be compressed and dehydrated and after mixing with the associated gas from Bahregan, Nowrooz and Soroosh will be transported to Kharg Island via a 26" pipeline.

Since the gas gathering project in Kharg and Bahregansar areas is too large, this project was divided to three projects. Offshore gas compression platforms, Offshore gas gathering pipelines and the NGL plant.

Currently, the first two projects meaning the offshore gas compression platforms and the offshore pipelines are ongoing and according to their time schedules the projects will commission in summer 2008 and fall 2007 respectively. However since the contract for building the NGL plant has just recently been signed, considering the estimated time of four years for implementing this project, this project will be commissioned in the middle 2010.

Thereafter due to the progress in fabrication and installation of the offshore gas compression platforms project and the offshore gas gathering pipelines project, different aspects of the possibility of transporting the sweet associated gas from the above platforms (within the timeframe of 2007 to 2010) to the Kharg Island prior to commissioning of the NGL Plant for temporary consumption on the island was studied.

2-Technical highlights and the required investment

2-1 Processing requirements on the Soroosh and Nowrooz platforms

The gas is in a good condition for transporting to the Island since the gas compression facilities on Soroosh and Nowrooz platforms can increase the pressure up to 35barg and dehydrate the gas. So according to the pipeline hydraulic analysis, the associated gas in Soroosh (10 MMSCFD) and Nowrooz (38 MMSCFD) platforms will reach to the Island having pressure of about 27barg (390psig) and a pressure of about 25barg (360psig) to the consumers. According to comments from the respectful management of Kharg area on the consumption volume and the pressure of the fuel gas, the condition of the imported gas is suitable for all the temporary consumers and the different facilities on Kharg Island. Therefore based on the conditions of the gas on the mentioned platforms there is no need for any additional facility for compression on the platforms in order to send the associated gas to Kharg Island.

2-2 Gas transporting requirements through offshore pipelines

Based on the progress on the offshore pipelines project for transporting the associated gas and the time schedule of the project, fabrication and laying of the pipes will finish next year. The only remaining task that needs to be noted is connecting the tie-in spools of the pipelines to the Soroosh and Nowrooz risers as well to the Aboozar compression platform manifold. The pipelines from Soroosh, Nowrooz, Bahregansar and Aboozar will connect to each other in this manifold and the gas will flow to the Island via a 26" pipeline.

Regarding connecting the pipelines to the risers of different platforms (including Soroosh, Nowrooz, Aboozar gas compression platform and Bahregansar gas compression platform) it is important to mention that fabrication and installing of all the tie-in spools is economically more attractive than only fabrication and installing of the tie-in spools to the risers of Soroosh and Nowrooz platforms. Therefore the overall cost for the fabrication and installing of all the tie-in spools should be considered in calculating the costs for the Early gas delivery of Soroosh and Nowrooz fields project. In the initial assumption this part of the project includes the fabrication and installation of the tie-in spools and also commissioning of the Kharg offshore pipelines which will take about 8 months costing about 9 Million dollars. This part of the project is a section in the gas gathering and NGL plant project in Kharg and Bahregansar areas and is not considered an extra cost.

2-3 Gas compression platforms requirements

Based on the current design, the different associated gas pipelines will enter the Aboozar gas compression platform manifold and then the gas will flow to Kharg Island. So the Aboozar platform manifold should be installed as the connecting point of the pipelines in order to enable delivering the gas from Soroosh and Nowrooz platforms to Kharg Island.

In order to reduce the cost of the manifold, it is recommended that the manifold also gets fabricated by the same contractor that is fabricating the offshore platforms in Aboozar and Bahregansar close to the location of the jackets of the gas compression platforms. The associated gas can then be transported after the installation of the jackets of the gas compression platforms.

On the other hand, the topside and decks of the gas compression platform will needlessly be exposed to humid and dusty air for 4 years until the Kharg NGL plant commissions however by delaying the installation of the topside and the facilities on the gas compression platform prior to commissioning, it will have much less corrosion and damage and the costs for inspection and maintenance of the installed facilities will also drop.

2-4 Reception facilities requirements for receiving and distribution of gas

According to the hydraulic analysis on the Kharg pipeline offshore pipelines, since Sorrosh associated gas is heavy, there will be a considerable amount of condensate separating in the pipeline. The amount of condensate is high enough to allocate facilities for receiving the liquids coming thru the 26" pipeline on Kharg Island. It means that by only utilizing a normal Slug catcher it will not be possible to receive this high volume of condensate.

On the other hand, in the current design of the onshore facilities and the NGL plant, a finger type Slug Catcher for this pipeline has been recommended. Because of the Soroosh and Nowrooz project, the design and installation of the slug catcher and the pig receiver should go forward with a high priority earlier than scheduled by the NGL plant project contractor. Since this part of the project is somehow independent from the Kharg NGL plant, it is possible for the contractor to start the fabrication and installation of the slug catcher earlier than the schedule. It will not be an extra cost since the receiving facilities are a part the scope of work for the NGL plant project contractor.

Also pipelines from the Slug catcher to the facilities and different consumers on the Island for transporting the gas should be laid. In the original design for the gas gathering project in Kharg and Bahregansar areas there are pipelines for transporting the associated gas from Dorroos 1,2 and 3 facilities to the location of NGL plant. It is recommended to use the same pipelines for transporting the associated gas in the Soroosh and Nowrooz project. In this regard the only additional cost would be the gas pipeline to powerplant and other consumers on the island. So the main cost which refers to the onshore pipelines from slug catcher to the facilities on the Island is also appropriated in the scope of work of the Kharg NGL contractor and it is not an extra cost.

According to the basic design and the 2 kilometer distance between Dorood 2 and the Kharg powerplant an 8" pipeline for transporting about 20 MMSCFD gas with the pressure of more than 20barg is suitable. The approximate cost for fabrication and laying of the pipes transporting the gas from Dorrod 2 to the powerplant is estimated to be approximately 500 thousand dollars.

2-5 The requirements for transporting the condensate from the reception facilities

As the temperature of the associated Nowrooz and Soroosh gas decreases in the offshore pipeline, there will be about 20 barrels a day of condensate separated in summer and about 200 barrels a day of condensate in winter time. Because of enough pressure at the slug catcher, flowing the liquids without using a pump to the separators in oil facilities of Dorrod2 is possible. Therefore not only will the project solve the problem of the separated condensate but also transporting the condensate and adding it to the produced oil will bring additional revenue (specifically in winter).

In order to transport the condensate a pipeline is required which according to the basic calculations should be about 3 kilometers long with the diameter of 4". The cost of fabrication and laying of the pipeline for transporting the condensate separated in the Slug catcher will be about 200 thousand dollars which is an additional cost for implementing Soroosh and Nowrooz project.

3- Benefits of this project

3.1 Environmental aspects

By transporting and using all the Soroosh and Nowrooz associated gas to Kharg Island about 40 to 50 MMSCFD will be sent and flaring will stop on the offshore platforms in Bahregan area. This will be inline with the zero flaring policy of the associated gas on the Soroosh and Nowrooz platforms prior to commissioning of the NGL plant and one of the greatest goals of implementing the associated gas gathering and NGL project in Kharg and Bahregansdar project will be achieved.

3.2 Good economics and fulfilling the consumption needs

By transporting about 40 to 50 MMSCFD of the associated gas to Kharg Island the major demand for the sweet fuel gas on the island will be fulfilled. According to the operation data from the Kharg Island, currently about 17 MMSCFD sweet gas is received from the Kharg petrochemical company that is used in the onshore section of Foroozan, Aboozar, Dorood 1,2 and IOOC turbines. Also currently Dorrod 3 consumes about 4 MMSCFD in the oil facilities which will need less than 24 MMSCFD in near future after full commissioning of Dorood 3 facilities. Also in Dorood 3 facilities rich sour gas will be consumed after sweetening the gas in the sweetening unit. So by not receiving the equivalent methane from the Kharg Petrochemical Company it will be possible to send the produced methane to the Methanol Plant. This will increase the production and the added value of the Kharg petrochemical company. The value of the sweet gas transported to the Kharg Island based on the price of 0.7 dollars per every thousand cubic foot will be about 33 million dollars. The added value of methanol production increases and the separated condensate should also be added to the above value.

Also considering operational problems and safety concerns it will be possible to use the above associated gas in Aboozar (AB) as fuel gas. This will out service the sweetening

unit on Aboozar platform (AB) so the technical problems of the sweetening unit and using diesel as fuel will be solved. According to the data received from Kharg area about 3 MMSCFD gas is flared on this platform.

Kharg powerplant requires 7 to 10 MMSCFD fuel gas and Soroosh and Nowrooz gas can also be transported there as fuel.

Below table is according to the latest data received from Kharg area about volumes of gas consumption and the required pressure in different facilities on Kharg Island.

Plant/Facility	Consumption volume(MMscfd)	Required Pressure(psi)	Gas from Petrochemical(MMscfd)
Aboozar Platform	3	320	---
Dorood 1 factory	1.5	230	1.5
Dorood 2 factory	6	230	6
Dorood 3 factory	24	320	---
Foroozan factory	1.8	130	1.8
Aboozar factory	3.3	130	3.3
Onshore Dorood turbines	4.4	300	4.4
TOTAL	44	---	17

3.3 Solving problems due to gas flaring on Nowrooz platform

Currently about 35 to 40 MMSCFD of associated gas is flared on Nowrooz platform due to the delay in building the Kharg NGL plant which has caused several problems for people working on the platform as well as operational problems on the facilities. The problems include the personnel being exposed closely to the flaring radiation, lower efficiency of the cooling and heating systems, MPP2 platform cranes, control cables, telecommunication and electricity cables being exposed to the flaring radiation, and other operational problems. By transporting the Nowrooz platform associated gas to Kharg Island all the problems relating to flaring of high volume of gas will be solved without any additional cost.

Also, in case of any temporary operational problem disabling consumption of the Soroosh and Nowrooz associated gas on Kharg Island– prior to commissioning of the NGL plant – there has to be plans for flaring the gas on Aboozar gas compression platform and on Kharg Island. These plans need to be further analyzed in order to solve the problems due to flaring of the gas on Nowrooz.

3.4 The benefits of implementing the CDM project

Based on the initial studies on the CDM project of the gas gathering project in Kharg and Bahregansar areas, another CDM project can also be defined by early delivery of Soroosh and Nowrooz associated gas. So after commissioning of the early delivery of Soroosh and Nowrooz associated gas project next year upon approving the CDM project at the CDM

executive board - prior to commissioning of NGL plant (from 2008 to 2010) - an income of about 31 million dollars will be gained from selling the carbon credits. In the basic calculations, the value of every ton of CO2 is assumed 10 dollars, and according to the project consultant, the current value is more than 10 dollars so this will strengthen the economics of this project.

4- Results from the economic evaluation of the project

Based on the technical and economical aspects that were covered in previous pages, the approximate amount of the required investment and the approximate income of the project are provided in below tables. Besides, the policy of zero flaring and stopping the pollutions as one of the most important goals of this project will be reached and some of the operational problems will also be resolved.

Table of total additional cost for implementing the project

Cost description	Approximate cost in USD
Onshore pipeline fabrication and installation for transporting the liquid gas	200,000
Onshore pipeline fabrication and installation for transporting the gas to Kharg powerplant	500,000
Joints and valves for delivering the gas to different consumers	200,000
Gas manifold fabrication and installation on Aboozar platform and the necessary tie-in	2,000,000
Implementing the CDM project	200,000
Total additional cost for implementing the project	3,100,000

Table of the approximate temporary income of the early delivery of the sweet gas project

Description	Approximate income in USD
Value of the delivered sweet gas to Kharg Island	33,000,000
CDM project income	31,000,000
Total additional income for implementing the project	64,000,000