Prospect of Iran Natural Gas Export Projects

By: HEDAYAT OMIDVAR
Member of IGU Marketing Committee
Head of Communication Affairs with Science & Research Centers,
Research & Technology Dept., National Iranian Gas Company
No.77-Southern Aban St. - Karimkhan Ave.-Tehran-1598753113-Iran
Tel:+98-21-81315646
Fax:+98-21-81315682
Email: omidvar@nigc.ir

Gas export projects via LNG

Concise Table of LNG Projects

Project Name	Project Executor	Project Shareholders	Project Objectives	Feed & Field
Gas Export through LNG (Pars LNG Project)	**Persian LNG Co**	**NEGEC representing NIOC(%50) Total Co(%40) Petronas(%10)**	**10 MT LNG production an annum**	**Phase 11 of South Pars Gas Field**
Gas Export through LNG (Persian LNG Project)	**Persian LNG Co**	**NIGEC representing NIOC(%50) Shell Co(%25) Repsol Co(%25)**	**16.2 MT LNG PRO production an annum within two trains**	**Phase 13.14 of south Pars Gas Field (The phases may be subject to change in view of NIOC Plans so as to expand the South Pars phases)**
Gas Export through LNG (Iran LNG Project)	**Natural Iranian Gas Liquefaction Co (Iran LNG)**	**NEGEC representing NIOC(%49) Pension Fund, Saving and Welfare of Oil industry staff Co(%1) Remissible stocks to LNG buyers and investors**	**11MT LNG production within two trains**	**Sour gas extracted from South Pars Phase 12**

		(%40)		
Gas Export through LNG (Golshan & Ferlowsi LNG Project)	**Malaysian Petrofild Co**	**Malaysian Pertofild %100 investment**	**Golshan&Ferdowsi field expansion and 10 MT of LNG production within two trains**	**Golshan&Ferdowsi gas fields**
Gas Export through LNG (North LNG Project)	**Chinese CINOOD Co**	**Chinese CINOOK %100 investment**	**North Pars Field expansion and 20 MT of LNG production within 4 trains**	**North Pars gas field**

Iran LNG Project

Introduction:

Iran LNG project aiming at establishing a liquefaction plant for natural gas is well underway in Tombak 50 Km NW of Asaluyeh and 15 km SE of Kangan-pars 2 (Tombak) . This project comprises two phases those of feasibility and execution. The latter phase is underway within two trains each of which has one liquefaction unit.

The capacity of each liquefaction unit is nearly 5.5 million tons annually. South Pars Gas Field, Phase 12 provides the feed gas for this plant and the German Linde Co. undertakes the liquefaction technology.

Current Shareholders			**Future Shareholders**	
NIGEC	**49%**		**NIGC & Saving**	
Saving, Welfare & Pension Funds Of petroleum Industry	**10%**		**Welfare & pension Funds of Petroleum Industry**	**20%**
Petroleum Industry Pension Fund	**1%**		**Investors**	**80%**
Ready for Investors	**40%**			

Upstream Responsible : POGC

Midstream Responsible: NIGEC

Applicant investor companies :

OMV, Eon , Enel,Enbw,Econgas and

Main Train Figures:

Feed gas	**27MM^3/Day**
LNG Production	**5.5MTPA**
Propane Production	**0.26MTPA**
Butane Production	**0.196MTPA**
Condensate Production	**0.21MTPA**
Sulphur Production	**0.133MTPA**

Plant Main Characteristics:

Liquefaction Technology	**Linde**
Mercaptan Removal	**Gas Phase (Molecular Sieve &Lurgi Purisol)**
Compressor Driver	**Electric Motor**
Sulphur Recovery	**Lurgi Oel-Gas-Chemie GmBH(Claus Provess)**
Acid Gas Removal	**BASF (AMDEA) through Lurgi Oel-Gas-Chemie GmBH**
Cooling Medium	**Hybrid-Sea Water&Air**
Heating Medium	**Steam**
Power Generation	**Combined Cycle Power Plant(1000MW)**
LNG Tanks	**3Full Containment Tanks,Each,140.000m^3**
LPG Tanks	**2Full Containment Tanks,Each30.000m^3**

Pars LNG Project

Introduction:

This Project is deemed to annually produce 10 million tons of LNG for which the daily input gas of the plant is nearly 46 million tons of sour gas supplied by South Pars Gas Field, phase 11.There are two 32-inch pipelines through molecular sieve and demercurization , it will get refrigerated and liquefied by Axens technology . Afterwards,

the product will be stored in two tanks each of which to 155000 m3 of capacity and then marketed by LNG ships from the jetty.

It is noteworthy that, a 1000 MW power plant utilizing gas turbines with the method that of combined cycle will provide the power required for the project.

Current Shareholders	
NIGEC	**50%**
TOTAL	**40%**
PETRONAS	**10%**

Project Specification:

Location	**50 km North West Assaluyeh,Tombak Village**
Feed Stock	**Supplied From South pars field-Phase11**
Liquefaction Units	**2**
Production	**10MT/Year by 2 Train**
Executing Agency	**Pars LNG**
Liquefaction Technology	**Axen**

Plant Main Characteristics/Train:

Feed gas	**46 MM / Day**	**H2S Cntent:0.4%-0.9%**
		Nitrogen:3.5%-4.5%
		Mercaptan:400ppm
		Co2 Content:2.3%-2.5%
		Other Hydrocarbons:8%
LNG Production	**5 MTPA/Train**	
Propane Production	**179 KTPA/Train**	
Butane Production	**212 KTPA/Train**	
Condensate Production	**3400 BODP/Train**	
Sulphur Production	**77 KTPA/Train**	
Project Start up	**2001**	

LNG Delivery Start Date	**2013**
The Iranian Local Content for construction of NIOC LNG Project Shall not be Less than 51%	

Persian LNG Project

Introduction:

Persian LNG Project in pursuit of the establishment of a liquefaction plant for natural gas , is well underway in Tombak region , 50 km NW of Asaluyeh and 15km SE of Kangan-Pars 2(Tombad) . This project is made up of two phases. The first phase includes two units for sweetening and condensation extraction and one unit for LNG production. In the second phase, one more unit that of sweetening and condensation extraction and one more for LNG Production will be added. Each LNG production unit is expected to annually meet 8.1 MT of production (16.2MT in total). South Pars Gas Field, phases 13 and 14 will provide the feed gas of the project which will daily totaling 78 MM3.

Current Shareholders	
NIGEC	**50%**
SHELL	**25%**
REPSOL	**25%**

Main Figures for Each Phase of Development:

Items	Train one	Train two
Feed Gas Amount MM^3/Day	**52**	**78**
LNG Production MTPA	**8.1**	**16.2**
Propane Production MTPA	**0.67**	**1**
Butane Production MTPA	**0.37**	**0.56**
Domestic Gas Production MTPA	**3.1**	**0.2**
Condensate Production MTPA	**0.29**	**0.43**

■ Plant Main Characteristics	
Liquefaction	**Shell – Double Mixed Refrigrant (DMR) process**
Mercaptan Removal	**Sulfinol – D/Molecular Sieve**
Compressor Driver	**SCOT**
Sulphur Recycle	**Electric Motors With Variable Speed**
Power Generation	**1200MW Combined Cycle Power Plant Concept Providing Heat and Power**
Acid Gas Removal	**Sulfinol-D**
Heating/Cooling Medium	**Steam/Air Cooling**
LNG Tanks	**3 Full Containment Tanks , Each 160.000m^3 For 2 LNG Trains**
LPG Tanks	**2Full Containment Tanks , Each 65.000m For Butane and 105.000m^3 for propane**
LNG Delivery Start Date	**2014**

North Pars Project

Introduction:

This Project based upon a barter and a counter purchase with a 7-year refund is after developing North Pars phase with 52 TCF of gas reserves in SE of Boushehr. The would-be gas from this phase will be put to use for LNG production in a plant to be constructed by Chinese CNOOC co. in Tombak region in 2013. This plant comprises 4 trains each of which is 5 MT of capacity totaling 20 MT. Half of the product belongs to NIOC for a 25-year tem and CNOOC will pay NIOC the cost of the remaining gas upon the agreement concluded. NIGEC is to sell CNOON the feed gas on behalf of NIOC. All the equipment will be ceded to NIOC after this 25-year term.

Current Shareholders	
CNOOC	**100%**

- **Based on agreements instead of tolling fee half of LNG production belongs to NIOC**
- **Plant ownership will be delivered to NIOC often 25-year time**

Location	**Tombak Port ,South East Bushehr**
Gas Field	**North Pars Gas Field**
No trains	**4**
Production MT/Year	**20**
Agreement Duration (Between Iran &China)	**25 Years**
Feed Gas Amount MM^3 /Day	**113.3**
Project Start Date(Negotiation)	**2006**
Production Start Date	**2014**

Golshan & Ferdowsi Projects

Introduction:

This project, based upon buy back with a 7-year refund through the sale of the fields gas and by – products is firstly intended to develop Golshan and Ferdousi Gas Fields in SE of Boushehr . Secondly this project is expected to bring an LNG plant into being through the investment of Malaysian Petrofield Company so as to produce two trains each of which gas 5 MT of annual capacity. Half of the product belongs to NIOC for a 25-year term, and Petrofield will pay NIOC the cost of the remaining gas upon the agreement concluded.

NIGEC is to sell Petrofield the feed gas on behalf of NIOC. All the equipment will be ceded to NIOC after this 25-year term.

Current Shareholders	
SKS	**100%**

- **Based on agreements instead of tolling fee half of LNG production belongs to NIOC**
- **Plant ownership will be delivered to NIOC often 25-year time**

Location	**Tombak Port South East Bushehr**
Gas Field	**Golshan & Ferdowsi Gas Field**
No trains	**2**

Production MT/Year	**10**
Agreement Duration (Between Iran & Malaysia)	**25years**
Feed Gas Amount MM^3/Day	**56.7**
Project Start Date	**2007**
Production Start Date	**2015**

Gas export projects via pipeline

Overview of pipeline projects

No		Projects Title	Requested Gas Volume or Transmitting Lines Capacity	The Latest Status	Commencement Date
Gas –Sale Contracts	1	Turkey	7-10	Gas export has been launched since 2001 and has annually reached nearly 10 BCM from 2007	2001
	2	Azerbaijan gas swap with Nakhchivan	0/3-0/35	Exchange Operation is underway	2005
	3	Iranian gas-Armenian electricity barter	1/1-2/3	The contract has been signed and the national Gas Company undertook the executive operations	2007
Gas-Purchase Contracts	1	Turkmenistan-Phase1	2-8	In progress	-
	2	Turkmenistan-Phase2	To 14	In progress	Since 2007
Concluded contracts and subject to be exported	1	Pakistan	21/5	Gas Sale and Purchase Agreement signed	2013-2014
	2	Swiss EGL	0/3-1/5 within	Gas Sale and Purchase Agreement signed operation	2010-2009 2012-2011

			phase1 2-4 within phase2	Agreement signed	
Projects being negotiated	1		30	The negotiations adjoumed by Indian party	2013-2014
	2		13/7	Term Sheet signed	2011
	3		28	Term Sheet signed	2013
	4		28	MOU initialed and confirmed FA signed and Term Shett proposed	2013
	5		8/6	Term sheet submitted by the ministers entourage to Kuwaiti party	3years ever since the contract
	6		----	MOU signed by the Iranian and Turkish ministers of oil andt Gas in Ankara, The preliminary feasibility studies carried out	-------
	7		----	Under consideration	-------
	8		5/5-13/7	MOU&CA signed	2015

Persian pipeline project (Exporting gas to Europe IGAT9)

Introduction:

So as to posses a more contributive and participatory role in potential markets those of European countries and more potently carry out transactions in the realm of energy as one of the major suppliers of gas in this continent the construction of this gas in this continent the construction of this gas pipeline under the name of IGAT9 was brought into being. This pipeline extends 1863 km from Asaluyeh (South Pars Gas Field) to Bazargan border and the other pipeline routes namely Nabucco Pipeline and Persian pipeline can potentially export Iranian gas from there on.

Given some anticipation into account this pipeline is to annually export 30-35 BM3 . To sell this amount of gas some negotiations are underway with countries namely Greece , Austria , Italy, Germany , Switzerland and so are talks with France and Spain in the coming future .

In view of the policies made, this Project is set to be designed and executed using the foreign investors capabilities and the domestic contactors.

Pipeline project of gas transfer to Switzerland

Introduction:

This pipeline is after exporting gas to EGL Company in Romania, Italy and Switzerland within 2 phases totaling 5.5 BCM in one hand and consolidating Iran's presence in European markets.

This project was launched in 2006 and it was ordained that the contract be concluded after the condition of feasibility study within the framework of the following table.

Project Specifications:

Gas Feed	**South Pars Gas Field-IGAT9**
Requested Volume	**Phase 1:0/3-1 BCM/Y** **Phase 2:4 BCM/Y**
Delivery Location	**Bazargan Border**
GAS Export Duration	**25 Years**

Pipeline project of gas transfer to Austria

Introduction:

The project is to export gas to Austria via pipeline. This project intends to step inside the Northern ' and Western market of Europe as well as to contribute Nobbaco Consortium.

This project was launched in 2006 and the gas is to be delivered to Econgas Company after the execution of phases those of studies and pipeline construction

Project Specifications:

Gas Feed	**South Pars Gas Field-IGAT9**
Requested Volume	**5BCM/Y**
Delivery Location	**Bazargan Bordre or Hub BaumGarten**
GAS Export Duration	**25Years**

Pipeline project of gas transfer to Pakistan and India (IPI)

Introduction:

The issue of exporting gas to India and Pakistan dates back to 1990. The tensions in between India and Pakistan made the project fail to noticeably proceed till early of the decade. National Iranian Oil Company embarked upon some studies backed by International companies so as to have a pipe construction route that best fits either through onshore, offshore, littoral lands or deep waters recognized. In so doing, Australian B.H.P Company conducted the feasibility studies and upgrading in 2003 and the former in 2001 out of which onshore pipe construction was picked up as the superior alternative. Pursuant to that, National Iranian Gas Export Company announced its readiness to deliver gas in Pakistan and Pakistan-India border. The second course of tri-lateral talks chasing the gas export to India and Pakistan commenced in 2003. three companies partook in the talks those of National Iranian Gas Export Company representing iran, Inter State Gas Systems Limited representing Pakistan , Indian Oil Company Limited and Gas Authority India Limited representing India. Manifold trilateral meetings have been run on the level of the counterpart deputies of the ministries of oil and energy accompanied

with some work teams from the three countries which helped them get the price formulae finalized.

Gas Feed	**Assalouyeh**
Requested Volume(Pakistan)	**7/8BCM/Y**
Requested Volume(India)	**10/9 BCM/Y**
Delivery Location	**Border of Iran & Pakistan**
Commencement Date	**2013-2014**

Pipeline project of as transfer to Kuwait

Introduction:

The agreement signed by the ministers of the two countries in 2000 gave birth to a contract concluded to export gas to Kuwait via pipeline. Accordingly, having several course of talks concerned with the allocated gas fields, methods of investment, and the administration of feasibility studies held, the draft of the contract and buy-sell Term Sheet for the year 2004 got signed by the two parties. The two sides - kept pursuing the talks in order to get all the articles of the contract finalized. However, in view of the events those of the drastic changes in the structure of energy global price, disputes over the price formulae, governing rules, price revision mechanism and finally Kuwait's refusal to stay on courseI; led the talks to be left dormant.

In view of the correspondence between the two countries and Kuwait's letter issued on NIGEC's comments over the agreed-upon Term Sheet, the second course of talks got started. In the second run of talks, while reconsidering the new formulae of gas price, Kuwaiti party was provided with the amended draft of the Term Sheet. The aforementioned talks are to be pursued.

Design and refine consultant Engineers Co. was in charge of conducting studies for the transition of Iranian gas to Kuwait. As agreed upon, Iranian gas is to be delivered to a consortium comprising Iranian and Kuwaiti international companies, an investment company, and an operator as a transition company in Genaveh region. In accordance with the contract, the aforementioned consortium will FW deliver gas to Kuwait KPC Co. in Rasozoor in Kuwait. The consortium's framework of activity based on B.O.O is to be devised.

Project Specifications:

Gas Feed	**Assalouyeh**
Requested Volume	**3/1BCM/Y**
Delivery Location	**Rasolzoor in Kuwait**
Gas Export Duration	**3years ever since the contract finalized**

Pipeline project of gas transfer to Oman

Introduction:

This project aiming at exporting gas to Oman via pipeline dates back to almost six years and became the subject of consideration for both countries ever since. There after, three

agreements were signed by the two parties in 2005 and 2006. These talks paralleled with the negotiations concerned with the expansion of Kish and Hengam gas fields by Iranian offshore Company (I.O.O.C) and NIGEC with Omani oil company regarding the feasibility studies so as to transform mm3 of export gas to LNG. 30% of the liquefied gas belongs to Iran in return of the processing fee. Due to some agreements over the price of the export gas and the Kuwaiti's low price proposal made the talks dormant and then the second course of talks began to reach a reasonable price for both parties. The issues namely Oman's investment plan in Kish fields, transformation of Iranian gas to LNG, the establishment of a IranianOmani joint company, price and the formulae of Iranian gas are all on the table in these on-going talks.

Project Specifications:

Gas Feed	**Kish Gas Field**
Requested Volume	**10/2BCM/Y**
Delivery Location	**Sea Border of two countries**
Gas Export Duration	**2013**

<u>Pipeline project of gas transfer to Bahrain</u>

Introduction:

After visits paid by the oil ministries of the two countries, an agreement was made to get a team to conduct a feasibility study for exporting gas to Bahrain and the Bahraini investment on Iranian oil and gas fields. The first official meeting in 2007 in Bahrain helped the two parties reach general agreements. Thereafter, in the second official meetings in 2007 in Tehran. The two parties agreed upon the finalization of MOU which was signed by the two countries' oil ministers. Some joint meetings ended in conclusions at which the two parties had the FWA signed in 2008. Bahrain will receive nearly 28 mm3/day and will invest nearly 4 billion dollar in phases 15 and 16 South Pars gas fields in return.

Project Specifications:

Gas Feed	**South Pars Phases 15-16**
Requested Volume	**10/2BCM/Y**
Delivery Location	**Sea Border of Iran & Bahrain**
Gas Export Duration	**2013**

Savex Project

Savex project standing for Save To Export project, was brought into being so as to optimize fuel consumption and increase the efficiency of thermal power plants. This project also aims at exporting the saved gas and absorbing investment utilizing foreign investors' resources.

Domestic necessities for the execution of Savex

1-The ever-decreasing volume of hydrocarbon resources and the importance of it's optimum consumption

2-The technology transference of modern power plants 3-Reducing ecological contaminations and green house gases 4-The mounting energy crisis and the growing global demand for gas and LNG

5-Prognosticating the ascending trend of the added value of natural gas resources as compared to oil in the decades ahead

6-The negative balance of power production and consumption in view of the growing domestic consumption.

The anticipation of annual revenue of savex (Quote in 200$)

1-Intensifying the efficiency of the power plants resulting in saving 36 MM3 of gas per day

2-Every million BTU of gas is prices at $12 and the convergence coefficient every cubic meter to thousand BTU equals 36.

36 MM3 of the gas saved x 365 days x 36 coefficient x $12 = $ 5.6billion

Methods to increase output performance and reduce lass

1-Using Turbo expanders and producing electrical energy in pressurereduction stations

2-Optimizing gas turbines within gas-boosting stations at distribution and export gas pipelines

3-Optimizing the design and the equipment of steam and gas turbines in non-power plant industries

4-Replacing the thermal power plants with modern cycle combination and steam power plants.

Activities carried out in Savex project

An agreement has been concluded and a joint group has been formed with some European companies so as to have arrangement made to initiate feasibility studies. The study phase of the project is expected to last 9 months. Once the study phase of the project gets terminated, the operational phase will get started.