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**REGIONAL AND INTRAREGIONAL COOPERATION FOR  
NATURAL GAS USE IN THE ESCWA REGION\***

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## I. Introduction

Oil occupies a distinct place among hydrocarbon resources with regard to ease of transportation from source to the consumer, and its availability at relatively low prices. However, sharp increase in the oil prices in the early seventies, worldwide economic growth, increasing energy demand, and increasing concerns about environmental issues have led to serious consideration for the utilization of natural gas as an alternative to oil. Natural gas is used in many sectors but is concentrated mainly in power generation and in the production of chemicals and other industrial uses. The gas consumption grew rapidly during the period between 1980-1985, reaching an average annual growth rate of 4.5%. This growth rate is expected to stabilize during the last decade of this century at the rate of 2%. Thus world consumption of natural gas, which amounted to about 2564 billion cubic meters in 1990, is expected to reach 2800 billion cubic meters by the year 2000. This estimated increase may be conservative.

Natural gas is a source of energy that can replace oil on a wide scale with relative ease. Also, its range of utilization is not limited to domestic uses and power generation, but is also used as a raw material in the petrochemical industry. Another factor in its favour is that it is easy to transport natural gas in its gaseous phase from the production locations to the consumers. Relatively little gas is lost during transportation. The thermal efficiency of gas when used in direct burning is higher in comparison with other hydrocarbon fuels and the direction and flame intensity can be controlled quickly according to its use. Natural gas is also superior over other fuels since it is a clean burning fuel and, from an environment point of view, its use does not lead to extensive air pollution or result in damage to ecological systems.

## II. Natural gas reserves in the world and their geographic distribution

Natural gas reserves at global level have increased significantly since 1970. Table 1 shows the development of these reserves from 1970 to 1991 in the different geographic areas of the world and the percentage of reserves in each area to the total world reserves. Total reserves increased by more than three-fold during the 21 year period. During the same period, reserves of the Middle East countries increased by about ten-fold.

Table 1. World proven natural gas reserves  
(Billion cubic meters)

Region	Year	1970	1975	1980	1985	1990	1991
North America		9428	8547	8015	8400	7464	7540
Latin America		1874	2353	4353	5440	7159	7562
Western Europe		3571	3962	3870	5645	5435	5734
Eastern Europe		12599	24274	31613	38059	52629	53393
Africa		3834	5243	5683	5888	8580	8601
Middle East		6627	15326	18541	25874	37862	37822
Asia/Australia		1550	3362	4796	7116	11129	11170
World total		39443	63067	76871	96427	130258	131822

Percentage of world gas reserves

Region	Year	1970	1975	1980	1985	1990	1991
North America		23.9	13.6	10.4	8.7	5.7	5.7
Latin America		4.7	3.7	5.7	5.6	5.5	5.7
Western Europe		9.1	6.3	5.1	5.9	4.2	4.3
Eastern Europe		31.9	38.5	41.1	39.5	40.4	40.6
Africa		9.7	8.3	7.4	6.1	6.6	6.5
Middle East		16.8	24.3	24.1	26.8	29.0	28.7
Asia/Australia		3.9	5.3	6.2	7.4	8.6	8.5

Source: CEDIGAS, 1991.

### III. Natural gas reserves in the ESCWA region

Table 2 shows the proven natural gas reserves in selected ESCWA countries in the years 1990 and 1991. The total reserves of these countries does not include the proven gas reserves in Iran which is reported to be 17,000 billion cubic meters. It should also be noted that a discovery was reported on 9 February 1992 in Oman which is estimated to be between 170-200 billion cubic meters, and arrangements have reportedly been made for a preliminary feasibility survey on the commercial viability setting up an LNG project with an annual capacity of five million tonnes.

Table 2. Proven natural gas reserves in  
selected ESCWA countries  
(Billion cubic meters)

Country	Year	1990	1991
Bahrain		183	177
Iraq		3115	3107
Jordan		11	15
Kuwait		1400	1394
Oman		279	290
Qatar		4620	4613
Saudi Arabia		5220	5184
Syrian Arab Republic		245	220
United Arab Emirates		5650	5623
Yemen Republic		198	198
Total		20921	20821

Source: CEDIGAS, 1991.

Natural gas is consumed in a variety of sectors, the most important of which are power plants (as a fuel substitute or by gas turbines), as fuel in cement and glass factories, in various household uses, and as a raw material for the production of fertilizers and petrochemicals. Gas, both LNG and Compressed Natural Gas (CNG), has been introduced as a fuel for vehicles on experimental or limited bases.

## IV. Consumption pattern of gas in the world by geographic area

Table 3 below shows gas consumption in the different utilization sectors for the major geographic areas of the world.

Table 3. World natural gas consumption, by sector, 1989

Region	Utilization sector				
	Power plants	Energy sector	Industry	Raw materials	Residential
North America	13.5	13.5	31.0	3.5	38.5
Latin America	19.0	25.0	36.5	7.0	12.5
Western Europe	15.5	7.5	29.0	6.0	42.0
Eastern Europe	17.0	27.0	26.0	14.0	16.0
Africa	33.0	39.0	20.0	4.0	8.0
Middle East	33.0	30.0	22.0	7.0	8.0
South East Asia	26.0	21.0	32.5	12.5	8.0
Selected countries					
Australia/New Zealand	25.0	19.0	35.5	6.0	14.5
Japan	71.5	25.0	2.0	1.5	0.0
USSR	37.5	13.0	31.5	5.0	13.0
World total	429	260	498	91	403

Source: CEDIGAS, 1991.

As shown in table 3, Japan leads the world with respect to the use of gas in power plants (71.5 percent of the total gas consumption). In Western Europe and the Far East it is forecasted that the gas used in power plants will double by the end of this century. This expansion will no doubt be the result of the construction of many more combined cycle gas turbines. Gas consumption by power plants in Europe reached more than 40 billion cubic meters in the year 1990. Similar quantities were also used in the same sector in the Far East, basically in Japan, in the same year. One of the main reasons for the anticipated increase in gas use is its relatively low price compared with other energy sources such as coal. Gas prices in Britain, for example, are US\$ 3.9 per one million BTU, which equals US\$ 45 for one metric ton of coal. This price equivalent per ton contrasts sharply with coal prices per metric ton which are US\$ 93 in Britain, US\$ 167 in Germany, US\$ 59 in Italy and US\$ 84 in Spain<sup>1/</sup>.

<sup>1/</sup> Oil and Gas Journal, Feb. 1992.

Table 4. Utilization of gas reserves in selected ESCWA countries  
in 1990  
(Billion cubic meters)

Country	Gross Production	Reinjected gas	Gas flared & vented	Other losses	Marketed production
Bahrain	8.30	2.00	0.00	0.20	6.20
Iraq	9.10	0.00	4.50	0.40	4.20
Jordan	0.10	0.00	0.00	0.00	0.10
Kuwait	7.10	0.10	0.40	1.00	5.20
Oman	5.20	2.00	0.20	0.30	2.80
Qatar	7.80	0.00	0.00	1.10	6.70
Saudi Arabia	49.30	2.60	5.20	11.00	30.50
Syrian Arab Republic	2.30	0.00	1.20	0.00	1.10
United Arab Emirates	29.80	3.60	1.20	2.90	22.10
Total	119.00	10.30	12.70	16.90	78.90

Table 4. (Cont'd.)

Country	Exports	Imports	Consumption
Bahrain	0.00	0.00	6.20
Jordan	0.00	0.00	0.10
Iraq	2.00	0.00	2.20
Kuwait	0.00	2.00	7.20
Oman	0.00	0.00	2.80
Qatar	0.00	0.00	6.70
Saudi Arabia	0.00	0.00	30.50
Syrian Arab Republic	0.00	0.00	1.10
United Arab Emirates	6.30	3.10	18.90
Total	8.30	5.10	75.70

Source: CIDIGAZ, 1991, Syria data from the SPC.

Table 4 shows the gas production, marketed and consumed quantities in selected ESCWA countries in 1990. It is noteworthy that these countries consume their natural gas production in power generation, fertilizers and petrochemical industries. Several gas treatment plants were built and gas pipelines were constructed to transport the gas from the production and treatment sources to the consumers. However, as shown in table 4, significant quantities of associated gas are still flared. Therefore, serious efforts must be undertaken to utilize this gas.

Currently gas export by the ESCWA region is limited to liquified natural gas (LNG) by special tankers to the Far East (mainly Japan). The United Arab Emirates is the leading exporter of LNG to Japan. LNG exports in 1990 amounted to 3.20 billion cubic meters. The North Dome in Qatar represents one of the largest gas fields in the world. The first phase for the development of this field was completed in 1991 when the production of LNG commenced. This gas is destined to be exported to Japan.

#### V. Potentials for cooperation among ESCWA countries for natural gas utilization

ESCWA countries can be classified into three groups according to energy resources, local consumption patterns and marketing facilities.

##### 1. Energy exporting countries:

The ESCWA region energy exporting countries represents the first group which includes the United Arab Emirates, Kuwait, Iraq, Qatar and Saudi Arabia. The majority of the region's gas reserves are located in these countries, i.e. about 96% of the total ESCWA gas reserves (excluding Egypt). This group also enjoys enormous reserves of oil and plays a major role in the international oil market. These countries are, however, the most affected by the changes of oil prices and consequently could benefit from diversifying sources of revenue with the export of gas.

In these countries natural gas is mainly utilized domestically to cover local energy demand and in the petrochemical industries. In addition, some gas is traded between Abu Dhabi, Dubai and Ras El-Khaimah and, in previous years, between Iraq and Kuwait. The LPG is exported by sea, using special LNG tankers, from the UAE and Qatar to Japan. Although not currently in this group, Oman is expected to become a gas exporter in a few years.

##### 2. Energy self-sufficient countries:

This group includes Oman, Bahrain, Egypt, Syria and Yemen. These countries are self sustained in energy (SSE). Sufficient amounts of oil and gas are produced to satisfy local demand, and



reasonable quantities of oil are exported, contributing to the foreign exchange earnings and overall growth of their national economies. These countries undertake exploration activities and hope to discover more oil and gas reserves.

Natural gas is typically utilized to cover the local market demand in energy generation and other sectors of industry. Several gas treatment plants were built in Bahrain, Egypt, Oman and Syria and gas transmission pipelines were constructed to transport the gas to the consumers.

### 3. Oil net importing countries:

This group consists of Lebanon and Jordan. These countries depend almost totally on import of raw materials necessary for energy generation. Although some oil and gas were discovered recently in Jordan, but only gas is contributing to the energy resources used domestically. This gas is used by the Risha power station (two gas turbines of 30 MW capacity each) which generated about 12 per cent of the total electric power in 1990. The bulk of the power stations are supplied by imported fuel<sup>1/</sup>.

In Lebanon the total nominal capacity of the main power stations was about 825 MW in 1990, of which 150 MW was produced by hydroelectric stations. Since Lebanon has begun the reconstruction process following the Civil War, the demand for electric power is expected to increase to reach about 1300 MW. Its ability to generate this electricity will require imported fuel<sup>2/</sup>. It is noteworthy that water resources currently utilized for electric generation are not considered reliable due to the depletion of these resources and supplies being susceptible to annual weather changes.

## VI. Recommendations

Based on the above and with the aim of achieving regional cooperation that holds mutual interest for all parties concerned, on both an internal and regional levels, we propose a project for the cooperation among various ESCWA countries to transport gas from Qatar, UAE, Oman, Kuwait and Saudi Arabia through Jordan and Syria, with a spur line to Lebanon, directed towards the eastern coast of the Mediterranean. This cooperation would ensure a better management of energy resources from one side, and furnish the opportunity for increased prosperity of each country's national economy on the other. If excess capacity is available then the gas can be transported to European markets by a pipeline, or can be liquified in special plants to be built in Syria and exported to Europe using special tankers.

1/ Jordan Electricity Authority, Annual Report, 1990.

2/ Al-Bina'a, no. 826, 7 March 1992.

Such a scheme could be executed with the cooperation of the ESCWA countries after carrying out the relevant studies to the ascertain feasibility of the project and the basic technical aspects. Certain agreements for financing such an arrangement including the share of each country in the capital and operating costs, should be made as well as determining pricing schedules for the gas. Procedures for dealing with other details which may arise should also be agreed upon. The advantages of such a scheme include:

1. Benefits to the energy exporting countries which depend mainly on oil export revenues to fund their development plans since they would diversify their revenue sources. Because they are most affected by the changes in the international oil price, they find themselves obliged to increase the production of oil to compensate for reduced prices. Also, these countries export the natural gas, in liquid phase, to a single market, the Far East (mainly Japan, which significantly, is busy securing other sources of gas from, for example, the Sakhalin project, Alaska and Indonesia) leaving them vulnerable to changes in Japanese demand. Market diversification would give these countries the chance to export gas, both in gas and liquid phases, to various markets and will provide the flexibility in obtaining reasonable gas prices. Such a project would also contribute to the control of oil production and consequently oil price stability and result in longer periods of oil production from known fields. Associated gas will be also utilized instead of being flared.

2. The self sufficient countries would benefit by using natural gas for local energy demand, as a fuel or raw material, and they would be able to increase oil exports. This would help to bring about improved energy balances and favourable overall economic prospects on the national levels.

3. For the energy importing countries, the replacement of imported oil and oil products by natural gas imported from other ESCWA countries will result in considerable savings of hard-earned foreign exchange which would positively affect overall economic performances as well as ensuring a clean and stable source of energy.

Such a scheme would also contribute to, through cooperation and achieved mutual interests, an overall positive economic climate for the entire ESCWA region.