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**The Oil-Based Economies
International Research
Project. The Case of Iran**

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Summary

In order to activate the cycle of wealth production, promote social justice and eliminate poverty and inequality, developing countries are currently faced with a multiplicity of structural problems. According to some economic theories, this is mainly due to inefficient or lack of access to financial resources, which has proved a major obstacle in activating the cycle of wealth production in such countries. On this assumption, countries with huge oil reserves including Iran, should not encounter obstacles in terms of creating and accelerating the national cycle of wealth production. However, the fact is almost all major oil-producing countries and the main exporters of petroleum products in the world are dealing with serious structural issues in establishing a natural cycle of wealth production and a cycle of wealth and income distribution. In order to examine the dependence of Iran's economic systems (as one of the major exporters of petroleum products) on oil revenues, the paper shall first present an overview of the energy sector in these countries by expounding on their conditions and features and redefine the issue. Thus, in addition to an overview of Iran's unique geographical and demographic features and a brief account of its history of oil discovery and its effects on the country's continuum of social and historical events, the paper is going to elaborate on its oil and gas reserves and resources. In the end, considering the huge effect of petroleum export on Iran's annual budget and its economy and the country's necessities and obligations, the paper explains some strategies for reducing the economy's dependence on oil and gas resources in the future and the main obstacles to implementation of these strategies.

Keywords: Oil-Based Economies, Iran, Wealth Production, Income Distribution

JEL Classification: O, O43, Q43, Q48

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Preface:

In order to activate the cycle of wealth production, promote social justice and eliminate poverty and inequality, developing countries are currently faced with a multiplicity of structural problems. According to some economic theories, this is mainly due to inefficient or lack of access to financial resources which has proved a major obstacle in activating the cycle of wealth production in such countries. On this assumption, countries with huge oil reserves including Iran, that has enjoyed the privilege of its substantial oil revenues during the past century, should not encounter any obstacles in terms of creating and accelerating the national cycle of wealth production. However, the fact is almost all major oil producing countries and the main exporters of petroleum products in the world are dealing with serious structural issues in establishing a natural cycle of wealth production and a cycle of wealth and income distribution.

Drawing upon petroleum revenues properly in a way that results in creation and reinforcement of economic infrastructures and prevents disproportionate development of the country in a variety of economic sectors, has been one of the greatest concerns of Iranian politicians. Nevertheless, despite adoption of various policies, the dependence of Iran's major economic sectors on oil income has not been reduced yet. Hence, a thorough analysis of the roots of this problem is deemed essential and will pave the way for formulating more effective policies.

In order to examine dependence of Iran's economic systems (as one of the major exporters of petroleum products) on oil revenues, we shall first present an overview of the energy sector in these countries by expounding on their conditions and features and redefine the issue. Thus, in addition to an overview of Iran's unique geographical and demographic features and a brief account of its history of oil discovery and its effects on the country's continuum of social and historical events, we are going to elaborate on its amount of oil and gas reserves and resources.

In the debate on energy policies, apart from explaining the most decisive factors in adoption of policies, and Iran's approach during the past three decades after the Islamic revolution, some of the most important policies enforced in this era have been mentioned. Moreover, with the increasing impact of Iran's vision statement as the most important reference for adoption of the country's major policies, its goals in the petroleum field have been set, so with the introduction of Iran's strategic goals until 2026, energy policies of Iran in the recent years will be clarified. In terms of article 44 (Iran's privatization plan) the most important factors involved in implementation of policies regarding low-level petroleum industries have been noted as follows: the need for large-scale investments for using the resources, reduction and abolishing of energy subsidies and etc.

In the end, considering the huge effect of petroleum export on Iran's annual budget and its economy and the country's necessities and obligations, we have explained some strategies for reducing the economy's dependence on oil and gas resources in the future and the main obstacles to implementation of these strategies. We hope by compiling this report, besides presenting an overall view of Iran's energy sector and its potential, and by cooperation, consultation and

interaction with the world's leading energy economists, we have taken a more efficient step towards a change in our approach from a resource-based economy to a knowledge-based one, and move towards a sustainable development which is the goal of all governments.

1. Introduction:

Iran as old as history itself inherits one of the most ancient civilizations of the planet. Throughout the years, its culture has influenced different parts of the globe from the Nile River to the heart of Europe. For many years, people from all over the world have traveled in the historic trade route of Silk Road, marveling at the varied glory of the Persian Empire's great civilization.

From 600 BC until 1935, the country was referred to in the West as Persia. The 18th largest country in the world in terms of area at 1,648,000 sq km (land: 1.636 million sq km, water: 12,000 sq km) is strategically located in the Middle East region, between the Gulf of Oman, the Persian Gulf, and the Caspian Sea; Iran is situated both in the northern hemisphere and east of Greenwich meridian on 25-40 degree lat and 43-63 degree long.

Iran shares its northern borders with three post-Soviet states: Armenia, Azerbaijan, and Turkmenistan. These borders extend for more than 2,000 kilometers (1,200 mi), including nearly 650 kilometers (400 mi) of water along the southern shore of the Caspian Sea. Iran's western borders are with Turkey in the north and Iraq in the south, terminating at the Shatt al-Arab, which Iranians call the Arvand Rud. The Persian Gulf and Gulf of Oman littorals form the entire 1,770 kilometers (1,100 mi) southern border. To the east lies Afghanistan on the north and Pakistan on the south.

Iran is a country of mountains and deserts. Eastern Iran is dominated by a high plateau, with large salt flats and vast sand deserts. The plateau is surrounded by even higher mountains, including the Zagros to the west and the Alburz to the north. Farming and settlement are largely concentrated in the narrow plains or valleys in the west or north, where there is more rainfall. Iran's huge oil reserves lie in the southwest, along the Persian Gulf.

2. Political Situation

The Islamic Republic of Iran was created in 1979, following a revolution that overthrew the monarchy of Mohammad Reza Pahlavi. The success of the Islamic revolution was a major event in Iran's political and economical systems. The revolution itself is not discussed here but its influences by some broad simplification might help to explain the country's economic and foreign policies since 1979.

In the first few years after revolution, Iranian public policies had an ideological bias. There was an increase in government control of the main economic activities, including foreign trade, a

tendency towards protectionism and less interest in international affairs, except in relations with other Muslim countries. An eight-year war with Iraq (1980 – 1988), began the following year, resulting in heavy Iranian casualties, massive infrastructural damage and a slump in oil production and exports. The Iran/Iraq war led to a crisis-management style of government accentuated this ideological tendency and overshadowed the more traditional domestic and international political and economical activities.

In the 1990s, the economy steadily recovered and political institutions were reformed along conservative lines. The elected parliament, the Majlis, rules alongside the religious leaders, to ensure the compatibility of key legislation with the constitution. During the two terms of Rafsanjani presidential, the country experienced some improvements in foreign relations.

In May 1997 with the election of President Khatami, the emphasis has been more on political reforms, personal freedom and the rule of law in domestic politics, as well as détente, mutual respect and cultural factors in foreign policy. (CGES)

In August 2005, Mahmoud Ahmedinejad became president of the Republic.

3. Economical Trends and Developments

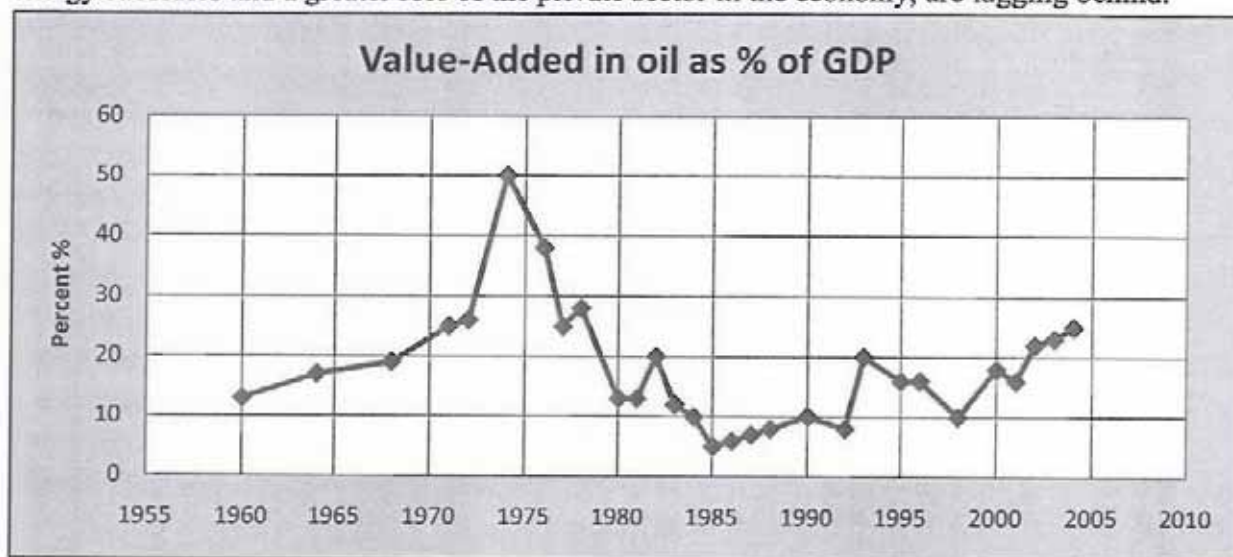
The oil and gas sector is the backbone of the Iranian economy: it provides resources for the domestic economy, generate a very substantial amount of foreign exchange resources, and account for a relatively significant proportion of domestic value added. The share of this sector in GDP is currently about 25.3 percent, slightly higher than 23 percent in 2003. Since downstream activities like refineries and petrochemicals are accounted under the industrial sector, the above-mentioned by sector GDP share is understatement.

The magnitude of value added in the oil and gas sector and its share in GDP is sensitive to crude oil prices and crude production volume. For example, the economy expanded fivefold between 1960 and 1976. During this period, Iran had one of the fastest growing economies in the world. This growth was a result of domestic political stability, low inflation and rapid growth in oil production. The economy stagnated from 1977 to 1988, as a result of unrest before and during the 1979 revolution and the eight-year war with Iraq Oil output and revenue plummeted. Economic growth recovered after 1989 averaging 5% per year in the fourteen years to 2003. the share of oil and gas in GDP was 14.6 per cent in 1999 when prices and crude production were lower.

Figure 1 depicts the share of value added in the oil sector (Current prices) in GDP during the period. Calculation of the oil sector's share in GDP in constant prices conceals sectoral relative prices and the term of trade movement.

Due to the fact mentioned above the oil sector's share in GDP shows very large fluctuations. In the past decade there has been growing internal acceptance of the need for economic and social reforms and increased transparency. Actual progress with reform has been patchy and intermittent. Some major economic reforms, including exchange rate unification and trade

liberalization, have been implemented. Other more contentious reforms, including removal of energy subsidies and a greater role of the private sector in the economy, are lagging behind.



Reference: Iran Energy Report

Figure 1- Value add in Oil as percentage of GDP

Although restrictions on foreign direct investment have been relaxed, the climate remains difficult because of bureaucracy, opaqueness and the relatively unattractive rate of returns that has been offered.

The key challenges facing Iran today are high unemployment, rising inflationary pressures and large energy subsidies. Unemployment declined to 10.3% in 2004/2005, from 14.1% in 2001, due to an increase in public-sector jobs and to a government-sponsored low-interest loan program for small and medium-sized enterprises.

However, the workforce is expected to double by 2030, due to population growth and the rising participation of women, which is now less than 15%. Some 700,000 new jobs will need to be created every year over the projection period just to prevent unemployment from rising. This will require an increased role for the private sector and higher quality investment (IMF, 2004a). A striking feature of the Iranian economy is its very high investment to GDP ratio. The ratio was very high in 1960-2002, more than 30% on average, compared to 26% in China and to 22% in Indonesia. The relatively poor efficiency of investment has nonetheless left Iran's physical infrastructure in need of upgrading and modernization. The current five-year plan mentions the removal of energy subsidies as one of the reforms to be introduced. Direct subsidies account for 25% of government spending and 10% of GDP. They contribute to the large share of government spending in GDP. However, the Majlis declared in 2005 its intention not to raise domestic energy prices.

The hydrocarbons sector currently accounts for 22% of GDP, in line with the Middle East average (IMF, 2004). Oil and gas export revenues were \$33 billion in 2004, or 80% of total export earnings. Over the past decade, Iran has successfully reduced its dependence on oil

production and exports, but how best to use oil revenues to promote growth and to further diversify the economy remains a major challenge.

In order to set more effective policies, explore new sources of income, learn about this industry, have a general view of Energy industries and learn about the roots of the problems in this sector, we shall first briefly review Iran's history since oil discovery and its consequences.

4. History Of Oil Discovery and policies in Iran:

Oil seeps in the Middle East have a long historical record, being mentioned by Herodotus in his *History*, by Strabo in his *Geography* and in other ancient texts. However, history and politics help to explain why the first Middle East oil was discovered in Iran.

At the beginning of the twentieth century, Iran was the only sovereign nation of the Middle East not under the domination of the Turkish Empire. The country had been the subject of geological reports that suggested the possibility of oil entrapment. British (1855) and French geologists (1892) had independently provided reports that encouraged *William D'Arcy*, a successful gold speculator, into the oil business. D'Arcy's exploits resulted in the first commercial Middle East oil production.

Oil seeps have played a role in many of the important oil discoveries of the Middle East and elsewhere in the world. In the early years of exploration, the presence of seeps was one of the most important criteria for drilling and initial investment. They were the essential clues to oil at depth. Perhaps their presence in Iran was the deciding factor for D'Arcy.

According to Jacques de Morgan, French geologist and archaeologist, exploration efforts began in 1903 with the drilling of wells on Chia Sarkh anticline, close to the Iran – Iraq border. Unfortunately, one of two wells drilled on this structure came up dry, while the other was noncommercial producer. However abundant shows of oil helped to maintain interest in this prospect.

With funds running out D'Arcy gained financial support from Burmah Oil Company, whose exploration program was encouraged by British Naval Fuel committee, which needed fuel for its fleet that was beginning to convert from coal to oil.

The next drill site selected was in Masjid-i- Nafton (The plain of Oil) (renamed Masjid-i-Sulayman in 1930), which took its name from the nearby fire temple. However, the site was very remote and drilling would have required the construction of a road. This led to two more dry holes being drilled in more accessible Mamtain (in Khuzestan area) in 1906. And finally on May 26, 1908 well came in, gushing oil 50 ft into the air from depth of 1180 ft.

The investment required making this, one of the world's biggest oil fields; was huge and resulted in the incorporation of *Anglo-Persian Oil Company* (APOC) in 1909. Four years later, a pipeline from Masjid-i-Sulayman field to the coast of Abadan was completed. This allowed the first oil to be exported. Almost a year later a refinery was completed at Abadan.

D'Arcy and Anglo-Persian Oil Company had to wait until 1914 for their first profits. However, they did receive considerable support from the British Empire. A new arrangement was made

that included a 25-years supply contract and the British government holding a controlling interest of 51%. This subsidiary D'Arcy *Explo Company* became *The British Petroleum*. Early success in Iran prompted further exploration work.

After discovery of oil and its many applications in social, industrial, and economic fields, Iran has undergone remarkable developments. Oil has been an effective factor in relations between people and government during the past 100 years and has been a major factor for creating economic and social welfare as well as injustice in our society. Therefore, oil has played a key role in causing cultural and social developments and composition of the Iranian government revenues because it has been provider of material resources and a determinant in political structures which have been the source of political and social incentives. Undoubtedly, oil will continue to play a similar role in economic, social, and cultural fields in the years to come.

On October 29th 1923, Reza khan became Iran's prime minister and finally on April 25th, 1926, he ascended the throne as the first king of the Pahlavi dynasty. At the time, a general movement had started in the country against the domination of APOC on Iran's oil resources and Reza khan's government found itself surrounded by financial crises and was under public pressure for organizing its financial affairs with APOC.

As talks between Iran and APOC Company had reached a deadlock, on November 26th, 1931, Reza khan terminated the contract one-sidedly. After the dispute was escalated and taken to the UN, and both sides were encouraged to resume talks and settle the dispute, a new contract was signed by representatives of both sides on April 29th, 1933. One article proposed by Iran in this contract was a change of name from APOC to AIOC. However, the terms of the contract had not improved much. The contract was signed for another term of 6 years, and not only Iran did not receive any significant benefit over the previously signed Darsi Contract, but also suffered more loss. The contract was valid and binding all through Reza khan's government until World War II, when Reza khan's inclination towards the Germans and also dependence of the Allied countries on vast resources of energy, caused the invasion of Iran from all borders by the Allied countries (Russia, England and the United States). Reza khan's Army, which was created and supported by oil income, collapsed in a couple of days and he was left with no choice but to resign. After some behind-the-scene conflicts, His son Mohammad Reza succeeded to the throne and during the war England gained control of Iran's oil fields and refineries.

Iran's oil, besides the railway and underground pathways, played a pivotal role in determining the victory of the Allied countries so that they referred to Iran as the "Bridge of Victory". However, at the same time, privations of poverty caused by the war fueled anger of the Iranian nation with foreigners. During the second war, companies from Russia, England and the United States offered various contracts with Iran. But Iranian MPs under the leadership of Dr. Mosadeq opposed the policy of Negative Equilibrium and passing any legal bill in October 1944 to sign any contract during the time of war. Later on, a bill was approved that prohibited the government

from awarding contracts to foreign countries and demanded it to reclaim the violated rights of the Iranian nation over its national reserves and resources.

Following the battles of the Iranian scholars alongside the people, eventually on March 15th, 1951, the Iranian Parliament passed the bill of nationalization of petroleum industry. In the same year, on April 28th, following the vote of the parliament, Dr. Mosadeq was named the prime minister and thus, as of March 20th, 1951, National Iranian Oil Company was born.

The significant points of this bill that for the next 28 months were the major concerns of the American and British governments and the leading petroleum companies of the world were as follows: Dispossession of AIOC under the supervision of the selected joint committee of the government, depositing 25 percent of oil income to a savings' account in Melli Bank to cover the expenses of the lawsuit of AIOC, and also from March 20th, 1951, the day the bill of nationalization of oil industry was passed by the parliament, all oil revenues would belong to Iran.

It's important to mention that at the time of the nationalization of the petroleum industry, Iran was the largest producer of oil in the Middle East region, and ranked fourth in the world after the United States, Venezuela and USSR.

Despite the mediation of the United States between the two sides, all negotiations between Iran's officials with Britain invariably ended in a deadlock, and eventually on August 23rd, in the same year, British Cabinet passed a bill to impose economic sanctions on Iran and refused to buy Iran's oil. The British also tried to win the support of the American administration to overthrow Mosadeq's government. Other international oil companies also followed the movement of nationalization of oil in Iran with pessimism and they announced they were ready to help AIOC so sanctions on Iran would continue. Consequently, with the support of the American government, the first powerful oil cartels were formed which included huge oil companies. In return, Iran's government announced it would directly sell its oil without any intermediary and therefore, by spreading huge propaganda, AIOC warned Iran's potential oil clients and declared any oil deal with Iran illegal.

The English administration showed no interest in conducting negotiations with Mosadeq's government. They were alarmed that Iran's nationalization of oil industry would irreparably tarnish their reputation and undermine their dominance in the Middle East. In order to defeat the resistance of Mosadeq's government, The British administration that was fully aware of the state of Iran's vulnerable economy as a result of sanctions, prolonged the duration of the talks and took the lawsuit against Iran to the UN and other international courts. However they refused to accept the verdict of such courts. On the one hand, Mosadeq tried hard to attract the support of the American administration; therefore on his trip to the United States, he tried to attract the

American public and the media. He successfully earned the respect of the Americans, but at the time conservatives and republicans came to power in England and the United States respectively. Following this, domestic and foreign conspiracies against his government escalated and eventually, on August 17th, 1953, American and British governments managed to launch a coup d'état which ousted his legitimate government and brought General Zahedi to power. England found itself under public pressure and consented to the establishment of an international consortium, 40 percent of whose shares were given to AIOC, another 40 percent to American companies, 14 percent to Shell Company and 6 percent to the French CFP company. This contract was concluded on October 21st, 1953. Ultimately foreign dominance on Iran's oil wells commenced and continued until the Islamic Revolution.

The Islamic Revolution was a response to various problems caused by the Pahlavi regime such as economic underdevelopment, injustice, widespread poverty and economic gap between urban and rural regions.

5. Resources and reserves:

It is widely that Iran is one of the large oil-reserve holders among the Middle East countries. However, the size of its reserves have been under discussion by analysts ,the Oil and Gas Journal puts Iran's reserves at 125.8 billion barrels, the second-largest in the middle East, after Saudi Arabia. The US Geological Survey puts undiscovered recoverable resources at 67 billion barrels. Two-thirds of the country is comprised of sedimentary basins with hydrocarbon potential. More than 60% of proven reserves are concentrated in six supërgiant fields: Agha Jari, Ahwaz, Bibi Hakimeh, Karanji, Gachsaran and Marun.

Table 1- Iranian oil & gas reserves

Oil & Gas	Reserves	Share in Total World Reserves	Rank in the World
Oil	138.4 billion barrels	11.2 percent	Second after Saudi Arabia
Natural gas	27.8 trillion cubic meters	15.7 percent	Second after Russia

Source: BP, 2008

6. Crude Oil Production

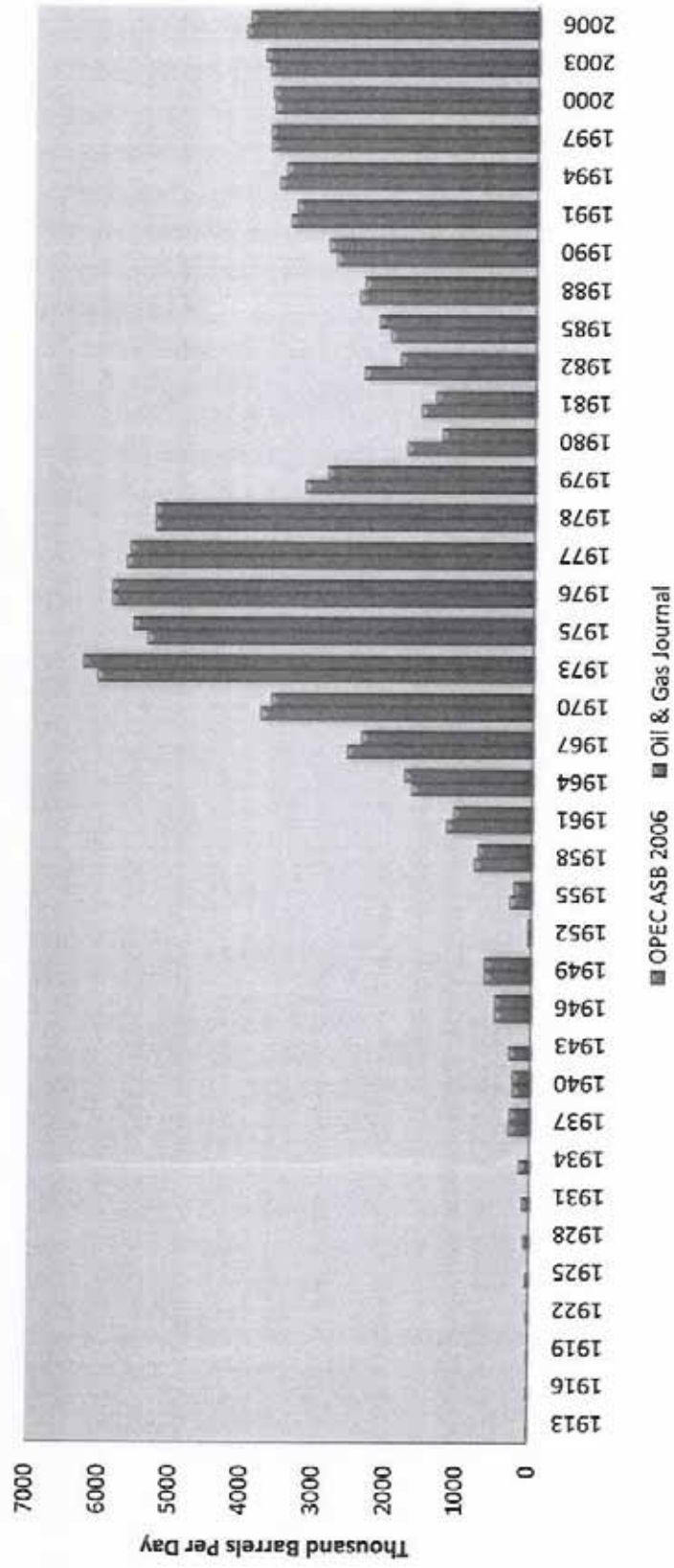
Iran's oil production dates back to 1908, as it was discussed above. The level of production remained low in the first few decades and only began to increase after the Second World War. Some interruption occurred in the early 1950s during the nationalization of Iran's oil industry under Dr.Mosaddegh, the Iranian prime minister. However, a persistent and impressive growth of Iran's oil production commenced in the second half of the 1950s.

Production rose from less than half a million barrels per day (MBPD) in 1955 to more than 6 MMBPD in 1974. (See figure 2) under the previous regime governance in 1970s, Iran's production target was to maintain the 6 MBPD level and to increase it later to 7 MBPD. However this proved a difficult task and production after 1974 was lower than 6 MBPD.

All resources were mobilized for massive exploration operations in onshore and offshore areas. However, the disturbance leading to Islamic Revolution caused disruptions in production, the new government, installed in February 1979, decided to limit Iran's crude oil to a ceiling of 4 MBPD. As it happened, Iraq's military attack in September 1980 did not allow this. Most of Iran's onshore fields and surface installations were almost in the war front or within the range of mortar and artillery, they were seriously damaged.

Moreover, Iraqi military aircraft and long-range missiles destroyed many oil installations further inland and also in the central and southeast parts of the Persian Gulf. Some offshore (e.g., Salman field) were also attacked by the US naval forces.

Iran's Crude Oil Production Profile



References: OPEC ASB 2006 - Oil & Gas Journal 2006

Figure 2- Iran's Crude Oil Production Profile

These extensive damages were in addition to human tragedy, destruction of infrastructure and bombing and missile attacks on many cities inside the country. The large number of expatriate staff working in the oil sector departed because of the revolution and due to the war. Many Iranian staff also left the industry. In addition, the country was under sanctions and the import of technical equipment was extremely difficult.

The opinion of many international observers and experts in 1979-80 was that Iran's oil production would soon collapse or at least its oil exports would cease. Yet, in spite of the war conditions and all the catastrophic events, Iranian oil production was maintained at an average rate of 2 MBPD during the eight years war. Those Iranian staff that had remained in the industry managed amazingly well and "learnt by doing".

The staff of Iran's oil industry had become quite competent in conventional field operations. Within few years after cease fire, Iranian production raised to the 3.5-4 MBOPD range. However, it was soon realized that the reconstruction and expansion work required heavy capital. The above were some of the reasons why Iran decided to open its upstream sector to foreign investment. However, the Islamic republic's constitution does not allow equity ownership of oil. The Buy-Back formula was devised to be acceptable to Iranian parliament. These are discussed in more detail in other part of this report.

Today, Iran has 68 oilfields currently in production, with onshore fields accounting for 80% of production. Offshore, however, production is rising thanks to field development contracts awarded to foreign companies. Over the past 15 years enhanced oil recovery facilities have been installed at many ageing Iranian oilfields suffering from declining reservoir pressure and water encroachment.

All the fields currently in production were discovered before the 1970s. The average natural decline rate of these fields is relatively high. Onshore fields are estimated to be declining on average at 8% per year and offshore fields at 10%.¹² The natural decline in production is thought to be about 270 kb/d per year. In addition to high decline rates, the average oil recovery rate in Iran oilfields is low, at 27%. This is mainly due to poor maintenance and outdated technology. For example, Iran has drilled only about 100 horizontal wells. The sulphur content of Iran's crude oil is generally regarded as medium, while gravities are mainly in the 28°-35° API range.

Heavier oil is found in the offshore field, Soroosh/Nowruz (20° API), and lighter oil in the onshore field, Naft-e-Safid (44.5° API). (see figure 3)

In 2003, the six super-giant oilfields accounted for some 60% of oil production in Iran. The three largest onshore producing oilfields are Ahwaz, with 765 kb/d, followed by Gachsaran, with 560 kb/d, and Marun, with 458 kb/d. These three fields account for two-thirds of total onshore production.

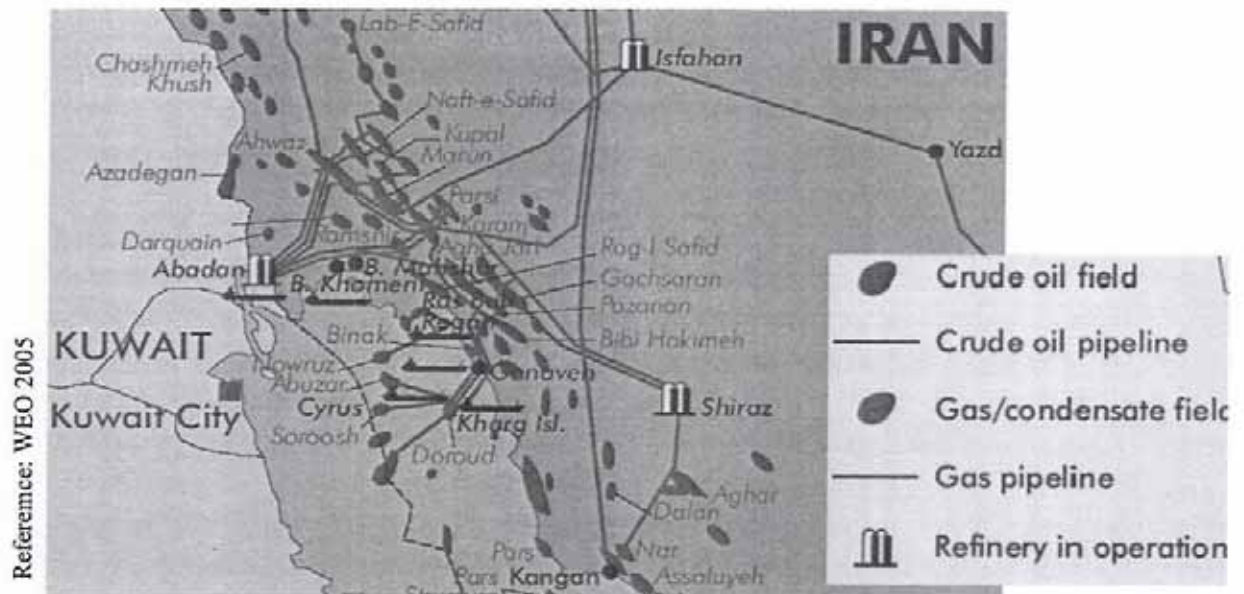


Figure 3- Main Oil and Gas Fields and Energy Infrastructure in Iran

In the absence of the application of advanced techniques, production from these fields will drop sharply. For this reason, NIOC is using a combination of infill drilling, well work overs and enhanced oil recovery techniques at all three fields.

Gas injection is used on a large scale at the Marun field, and it is likely to be used at Ahwaz. The Doroud and Aboozar fields combined account for more than 70% of offshore production.

Crude and NGL production is expected to reach 4.5 mb/d in 2010 and 6.8 mb/d in 2030. Production from currently producing fields is expected to increase by 7% to 2010. In 2010-2030, gas and water reinjection in a number of fields will increase recovery rates.

7. Gas production

Iran holds the world's second-largest gas reserves, after Russia. Of three fossil fuels, namely coal, crude oil, and natural gas providing the world with more than 90% of needed energy; natural gas is the most environment-friendly fuel.

Besides, while the ratio of crude oil reserves to production (crude oil R/P) is currently around 40 years, natural gas R/P is more than 60 years. In a past decade, drilling in natural gas fields resulted in more finds than in oil fields.

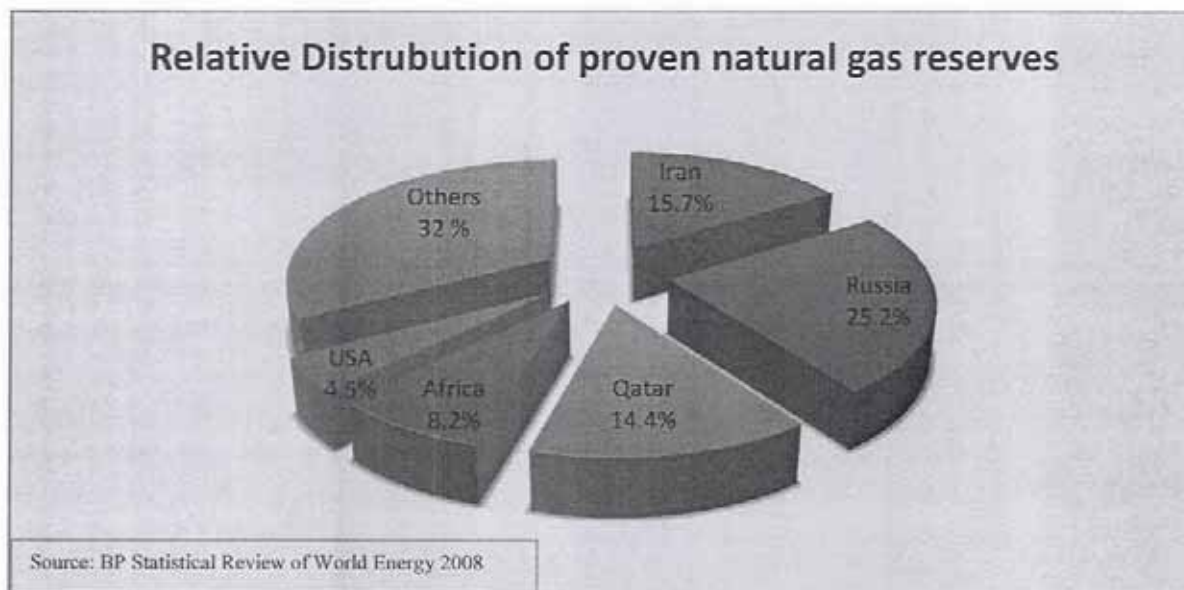


Figure 4- Relative Distribution of Proven Natural Gas Reserves

Iran is a vast country with a population of about 70 million people since the country shows a great potential for energy demand. Studies show that from the beginning of the first development plan (1989) to the end of the fourth development plan (2005) the country's energy mix was change in favor of natural gas.

In other words, natural gas replacement policy has caused natural gas to meet a major portion of total energy consumption in Iran. In the period of 1989-2005, annual growth rate of energy consumption averaged at some 6.4% where natural gas with the growth rate of 12.6% (equal to 511 million BOE¹) was the record holder. While the annual consumption of other oil products (despite a fall in the growth of such energy carriers as kerosene and liquid gas) grew at an average rate of 2.7% (equal to 171 million BOE). Such characteristics as relatively easy access, undisrupted flow of supply, and being environmentally friendly have played an important role in expediting natural gas replacement policies (expanding natural gas distribution networks) and promoting the consumption in different sectors of the country.

¹ Barrel Oil Equivalent

However, expansion of natural gas distribution networks and developing a decent consumption pattern together with maximizing efficiency of consumption in each sector is actually prerequisite to the planned achievement, "the sustainable security of energy supply and maximizing social welfare". Any negligence in this regard can bring about negative impacts on international trades leading with delayed achievement of the goals. The importance of the problem is fully understood when Iran's policy on minimizing export volume of hydrocarbon energy carriers is taken into consideration since turning a blind eye to the problem can result in decreased export of natural gas and weaker presence of Iran in international markets on the one hand and export of energy carriers at much lower prices (due to the low efficiency of production operations and cheap energy supply) and decreased competitiveness of local companies at international level on the other hand. This will irretrievably damage the productive sectors in the long run. Moreover, the government's key policies on expanding energy-intensive productive industries in the framework of making the best use of relative advantage of oil and gas in the long run will be impaired in this way.

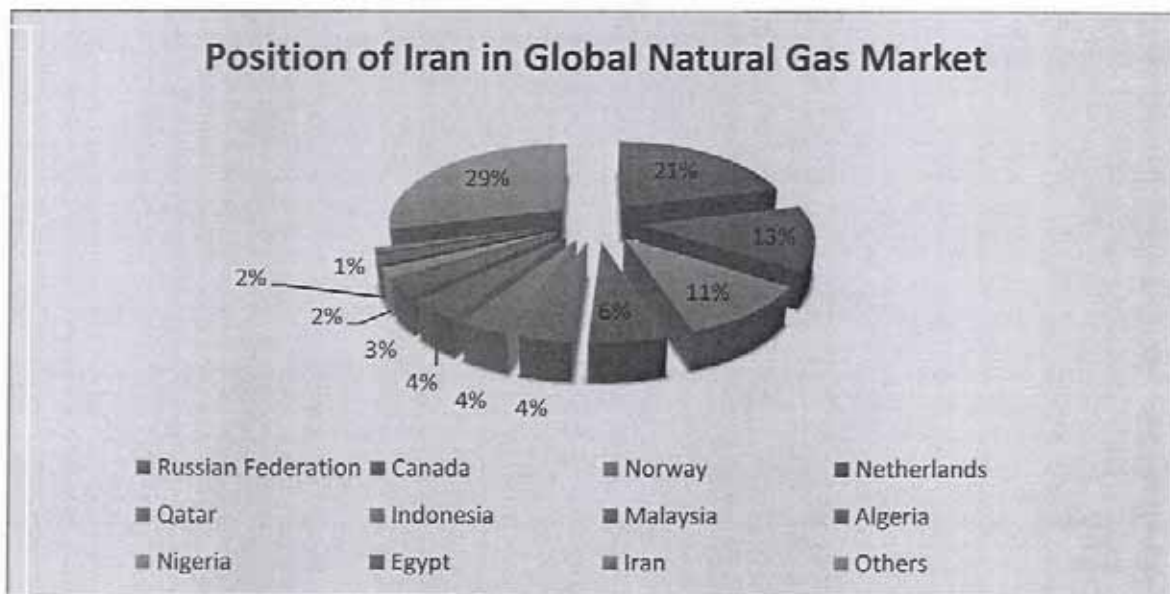


Figure 5- Iran Market share in Global Gas Market

8. Energy Policy

Iran has been a member of OPEC since 1960 and is currently the second largest OPEC producer, after Saudi Arabia. Iran's role has evolved throughout the years as its production capacity has not increased as fast as expected over the past two decades.

Currently, overall responsibility for the Iranian energy sector lies with the Supreme Energy Council, a supervisory body established in 2001. The Ministry of Petroleum controls the activities of all state-owned oil and gas companies from upstream to petrochemicals. The state-owned National Iranian Oil Company (NIOC) has 18 subsidiaries that cover the entire oil and gas chain.

Iranian planning system which was established six decades ago was based on the idea that oil is not renewable and resultant revenue should be used to invest in other areas which will not only be beneficial to the current generation, but also provide next generations with livelihood and occupation. This approach to oil as an intergenerational wealth was the main axis of development plans up to early 1970s.

Using oil revenues to cover government's current budget deficit was institutionalized after that date and infrastructural affairs were overshadowed by the current budget. However, "investor, not solely consumer state" has been a dominant paradigm in economic and budget planning during the past 60 years. According to that paradigm, governments both before and after Islamic Revolution, appropriated part of their annual projects (about 30 percent) to infrastructural and production plans. However, a large portion of that budget was practically channeled to current expenses of governments.

Using oil revenues to fund infrastructural and developmental projects and avoidance to use them to cover current expenses characterized the first five year development plan² of Iran (1988-1993). In later plans, oil revenues were considered a national wealth which should not be consumed. However, as governments grew in size, that cause was gradually forgotten. During the "*first and second FYDP*", most funds needed to implement those plans came through oil revenues. [5]

To stop this trend and its untoward consequences and in order to assure a constant flow of foreign exchange revenues, the "*third FYDP*" (2000-2005) established a system to stabilize government budget and protect it against fluctuations in oil prices. The following conditions were practical fundamentals and principles of the new system:

- a. Principle of preventing irregularities resulting from surplus oil revenues
- b. Principle of increasing productivity of foreign exchange reserves kept at Oil Stabilization Fund (OSF)
- c. Principle of differentiating between surplus reserves and total foreign exchange reserves
- d. Principle of liquidation of reserves in time of need

² AKA FYDP

e. Principle of law abidance and respect for development plans

- **Establishment of OSF:**

Establishment of an oil stabilization fund is a good way for management of oil revenues in oil-rich countries. The Oil Stabilization Fund has been established at the Central Bank of Iran according to amended Article 60 of the Third Economic, Social, and Cultural Development Plan to achieve the following goals:

- a. Stabilizing oil revenues during the Third Economic Development Plan
- b. Converting assets gained through oil sales to other forms of assets
- c. Developing investment by nongovernmental sectors and paving the way for achievement of development plan goals

The government was obligated according to Article 60 of the Third Economic Development Plan and its amendment (dated October 11, 2000) to deposit surplus oil revenues at the Oil Stabilization Fund which was run by the Central Bank of Iran. A maximum of 50 percent of the reserves were to be spent on industrial, mineral, agricultural, transportation as well as engineering and technical services projects by nongovernmental sector after feasibility studies. The credits were to be allocated through banks.

According to Article 60 of the Third Economic Development Plan, the government was only allowed to withdraw from the reserves if oil revenues decreased. Performance of the Oil Stabilization Fund shows that the industrial sector has accounted for 95 percent of credits disbursed through OSF because both the private sector is willing to invest there and the sector is capital-intensive. Investment plans in the sector were not restricted to the non-oil industries, but also included investment plans in petrochemical sector as well as downstream oil and petrochemical industries (where more than 746 million dollars has been invested). Other plans were also approved for investment, but due to different reasons were not made operational by the end of the Third Economic Development Plan and this showed how complicated the oil industry is.[5]

Table 1- Iran's Oil Stabilization fund (Million dollars)

	2000-01	2001-02	2002-03	2003-04
Oil Revenue	24,280	19,339	22,966	27,355
Budgeted use of oil revenue	11,731	12,864	11,058	11,579
Actual use of oil revenue	14,726	15,279	17,800	20,949

Source: Central Bank of Iran

Under the Iranian constitution, foreign companies cannot be granted rights to the country's natural resources. However, the government during the 3rd economic development plan has developed a form of contract, the buy-back, which allows foreign contractors, operating through an Iranian affiliate, to participate in exploration and development with NIOC. The government accepts that foreign investment is needed to maintain current oil production levels in fields with high decline rates and to achieve the ambitious gas-development program, which would allow Iran to become a major net exporter. The government also plans to diversify its economic base way from upstream oil and gas, among other things through LNG and petrochemical projects.

The fourth FYPD

The government was increasingly concerned about the high growth in domestic energy consumption and recognises that consumption must be curbed in order to free up oil for export and to mitigate environmental problems.

The fourth five-year plan gives priority to increasing energy efficiency in buildings, to improving vehicle efficiency and to expanding the use of vehicles fuelled with compressed natural gas (CNG). The price of CNG will be set at 40% of the price of gasoline, on a calorific-value basis.

The followings are some of the highlight of the fourth FYDP:

- a. GDP growth rate is aimed to be 8% per year, resulting in a decline in unemployment from the current 13% to 8% in 2009.
- b. Inflation is expected to be reduced to 10% from 13% in 2004.
- c. Foreign direct investment³ would need to increase tenfold compared to 2004. Non – oil exports are aimed to rise by 11% per year.
- d. Priority will be given to the development of energy- intensive industries, to which the plan allocates up to \$9 billion

In early 2004, the Majlis adopted a five-year plan for 2005-2009 calling for privatization and economic reforms. But the foreign investment climate was soured by recent international unease over Iran's nuclear development plans. The Iranian government has applied to join the World Trade Organization and, in May 2005, the WTO established a working party to examine the application.

In 2004 Iran expressed its interest in ratifying the Kyoto Protocol. It was suggested that its accession to the United Nations Framework Convention on Climate Change (UNFCCC) would follow Russia's ratification. The Majlis approved the ratification, but it was rejected by the Council of Guardians.

³ FDI

- **Policies Ratified for Privatization**

In addition to changing government's role from ownership to policymaking, Article 44 also stresses on empowerment of the private sector and transferring 80 percent of state-run companies' stocks to the private sector including those companies which are active in mines and parent industries such as major downstream oil and gas industries, excluding the National Iranian Oil Company and other companies involved in extracting and producing crude oil and gas. The article reads as such, "In view of the need to speed up economic growth of the country based on social justice and elimination of poverty as delineated by 20-Year Vision Plan, privatization policies which aim at increasing efficiency and competitiveness and expanding public ownership as proposed by the State Expediency Council, Clause J of general policies under Article 44 of the Islamic Republic of Iran's Constitution are notified according to Clause 1 of Article 110:

- a. Changing government's role from ownership to direct management of corporations to policymaking and supervision
- b. Empowerment of private and cooperative sectors in economy and supporting them to boost competitiveness of commodities in international markets
- c. Preparing domestic corporations to intelligently handle international trade rules through a gradual and purposeful process
- d. Developing basic and specialized human assets
- e. Developing and promoting national standards and adapting quality control systems to international standards."

- **Importance of Article 44 for Oil Industry**

Notification of Clause J of Article 44 policies has been a very great step taken in recent years. At present, the government has a big monopoly over the economy, especially state-run companies, which have led to emergence of an oversized government, low productivity and many other obstacles on the way of economic growth and development. This research project aims to review impact of Article 44 of the Constitution on realization of the Fourth Economic Development Plan's goals and 20-Year Vision Plan in terms of technological development of oil industry.

- **Iran's 20 years VISION**

To successfully integrate the national and international potentials in the most strategic industry of the country, having a clear roadmap for the industry was essential. Consequently in 2004 the outlook of the Islamic Republic of Iran's oil industry to 2024 was created, which is aligned with the country vision.

This vision defined the followings as the ideal conditions for the

- a. First producer of petrochemical materials and commodities in the region in terms of value
- b. Second producer of crude oil in OPEC accounting for 7 percent of market demand
- c. Third producer of gas in the world accounting for 8-10 percent of global gas trade
- d. Ranking first in oil and gas production in the region

9. Strategies:

Recent studies on profitability of national oil companies show that although international Oil companies (IOC) possess only 10 percent of the world's oil and gas resources, their income is considerably higher than that of national oil and gas companies. From approximately 1148 billion barrels of world's oil resources, around 77 percent are possessed by national oil and gas companies (NOC). In the list of top 20 largest producers of petroleum products in the world, 14 are governmental companies. From the discovered gas resources on Earth, 15 percent is at NIOC's disposal which ranks second in the world.

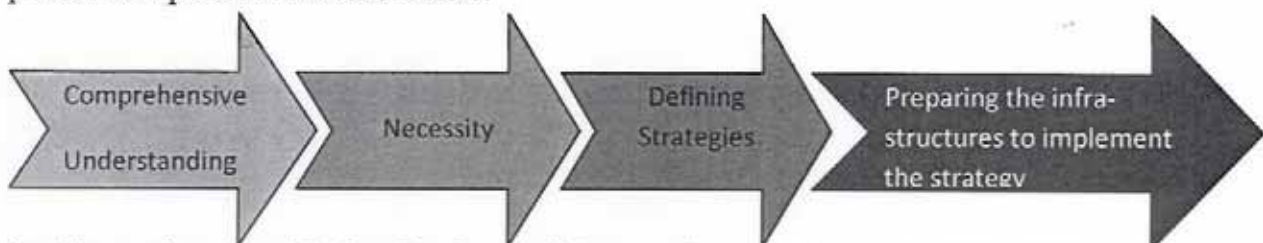
Comparative studies and surveys on profitability of national and international oil companies indicate that NIOC's profit rate is about 5 percent. If the resources are preserved at the same level and managed more efficiently, this company's income would rise up to 20 times more than what it is now. Japan's National Oil Company has the highest rate of profitability at 100 percent. Remarkable performance and efficiency of Japan's oil industry, draws attention to its value-added creation pattern.

Between 1930s and 1970s, value-added creation pattern was only limited to wealth generation by focusing on product based businesses (Mass production paradigm). However, competition in today's dynamic world has directed attentions on advertising, research and development activities. Once you analyze the successful patterns in the world's most advanced industries, you cannot ignore the increasingly important role of evolution of the cycle of scientific advancement in countries' sustainable development, that leads to localization and expansion of modern technologies (as the most vital competitive advantage of companies in regional and international businesses) and strengthens economies.

This change of economic paradigm has resulted in a conversion of resource-based approaches to technology-based and knowledge based ones. The importance of this approach is clearly understood by the chief policy makers of Iran's oil industry too, and led to creation of its vision goals for 2025.

With regard to the defined goals of the Vision, it appears they have been designed in careful consideration with environmental competitions and internal capabilities of Iran's oil industry. The need for a change has also been deeply felt. Thus, the fundamental need of Iran's oil industry is to design and plan viable competitive strategies to achieve a unique and pre-eminent position in the region and in the world.

A strategy is a comprehensive plan that directs all the details of the branches of oil and gas industry, and prepares all the required instruments and structures for the implementation of this strategy. Successful execution of the strategy is closely linked to provision of pre-requisites by designing effective and competitive plans for the petroleum industry. The above-mentioned process is depicted in the chart below:



In this section, considering Iran's conditions and necessities, potential pitfalls of energy industries and international obligations in sustainable development, we have tried to put forward some suggestions and strategies to avoid current complications in the industry.

9.1. Modifying the bureaucratic structure of National Oil Company and its affiliates.

The economy of today's world is based on science and basic knowledge. In this era, productivity is not just dependent on finance and equipment but on skills, knowledge and expertise of the workers. Nowadays, organizations are working in an environment where abrupt and complex changes are the key elements. The more complicated the problems are, the longer it would take to resolve them, and as the rhythm of change quickens, the more changes it will probably bring about and this causes short-term solutions to expire.

Therefore, traditional organizations that were once established on the hypothesis of stability are no longer capable of meeting the demands of the current structure of today's world of business. The future belongs to organizations that are highly responsive to change, adequately flexible to apply the changes, have innovation and continuous development as internalized qualities, and organizational learning is their indispensable feature. These companies, which are highly aware of the importance of knowledge, are restructuring themselves to live up to the environmental changes.

Educating and training workers, changing the vertical hierarchy to a flat one, decentralization and emphasizing innovation and continuous development are now at the top of the agenda in

large organizations. This is why these organizations set their strategies in a way that gives rise to the creation of knowledge-based resources.

One major obstacle to the development of this industry is the existence of the dominant traditional structure which hinders the possibility of growth and development in itself. In the discussion of modifying organizational structures, it is important to mention the fact that bureaucratic structures and outdated managerial approaches are no longer capable of tackling the new challenges of today's changing environment. Therefore, In the light of the significant competitive changes of today's world, it is absolutely essential to lay the groundwork for turning organizations into knowledge-centered ones, and modify organizational structures to develop technology in order to move towards economic institutionalization.

Due to this reason, performing structural modifications and conversion to agile organizations is the most vital step for NIOC to take in order to cut down on unnecessary expenses and increase cooperation and coordination between different units as to eventually achieve the goals of the development program.



One strategy for economic development that has received a lot of attention in the recent years is development through Industrial clusters. In 1990s, the fast spread of literature of Industrial Clusters, created close links with other related subjects such as commercial management, cultural, social and economic policies.

Creating industrial clusters and their consolidation in specialized fields will provide a good opportunity for their business development and effective presence in international markets and eventually leads to economic development. Experience shows countries' small and medium-sized industries that work in forms of clusters by using the advantages of these clusters, have been regarded as the most important sector of their country's economy.

In the recent decades, what has led to the popularity of Cluster Structures is the role they play in strengthening the base of wisdom-based economy rather than a product-based one. Once the clusters of science, technology, research, industry and development are formed like chain rings, they will orientate the business of industrial units towards the goals of the twenty-year perspective vision.

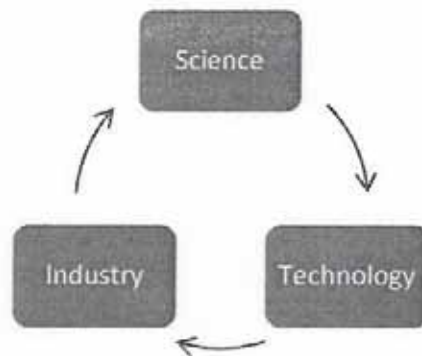


Figure 7 -The entire cycle of production and use of knowledge in the form of clusters

9.2. Reduction in domestic consumption and economizing on energy within the framework of “Reformation of Consumption Pattern”

Due to high intensity of energy in Iran, the need for correcting our consumption pattern is felt more than before. This is why the year 2009 was named “Year of Reformation of Consumption Pattern” which caused all Iranian organizations to try to reduce their energy consumption.

To enact the strategic policies of the country in the Energy sector according to Article 121 of the law of the third economic, social and cultural development plan of the Islamic republic of Iran (passed in 2000), and to perform related operations for optimum utilization of different energy carriers, the Iran’s oil ministry established Iranian Fuel Conservation Company (IFCO).

By 2005, government attempted to ease the economic burden of fuel subsidies, by asking parliament to approve a new pricing formula that would ration the supply of gasoline. The draft bill presented to the parliament stipulated that car owners be provided with “Smart Cards” that fix a subsidized gasoline allowance and force them to pay full price when they exceed the ration. This proposal was passed by the parliament and from 2006 Iranian are using “smart cards”.

IFCO’s main areas of activities are research and analysis, laying the groundwork and employing the necessary measures for conservation of fuel in all industries that use fuel either as consumer or for production processes. Therefore, setting benchmarks and standards for production of equipments, processes, systems and machinery that consume energy are some of its responsibilities. The major duties of IFCO are listed as follows:

- ❖ Carrying out the project of conservation of fuel in systems and machines.
- ❖ Conservation of fuel in housing and building construction.
- ❖ Conservation of fuel in industries.
- ❖ Assisting technology development and improving product quality in industries that produce fuel-consuming machinery.

- ❖ Fostering the culture of fuel conservation at all levels of society by publishing books, magazines and articles, designing the necessary programs for mass media, increasing public awareness and education and creating incentives to develop the culture of conservation of energy.
- ❖ Providing financial and technical support to the non-governmental sector and research institutes and universities, preparing an academic field for development of technologies of fuel conservation and efficient management of energy consumption.

9.3. Efficient use of Foreign Exchange Reserve Account.

As it was mentioned, to tackle fluctuations in international oil prices and its harmful effects and also establish a stable current for foreign exchange income from abundant exchange resources and crude oil exports, in the third development plan (2000-2004) along with creation of Foreign Exchange Reserve Account, a system was deployed to allocate the unexpected fluctuations in prices to promotion of stability in income resources of the government's budget and raising of capital for non-governmental sector.

Experience shows, since the establishment of this account, its reserves have been mainly used to cover the deficits in the country's current budget and only a small amount is allocated to infrastructural groundwork.

9.4. Preparing the proper groundwork for transfer of the necessary technology in oil and gas contracts.

Today, technology is the golden key of competition in the world of business and an indispensable element for economic development of organizations and countries. Years ago, people like Joseph Schumpeter and Robert Solow emphasized the importance of investment in developing and utilizing technology. Modern technologies bring about more efficient ways of doing things and raise new aspects in people's activities. Thus, they provide a possible improvement in services and products' quality, increased productivity, faster provision of new products in the market and fulfill the endless needs of humans. Providing the market with distinctly better services and products, technological advances, optimizing planning methods, establishing and maintaining technical changes and evaluating them are all considered as opportunities for increasing capabilities, competitiveness and development of industries.

However the definition and content of technology transfer in a science-based economy has changed greatly from what it was traditionally referred to as "know-how transfer". National oil companies regard the process of technology transfer as one of the most important access points to non-local knowledge, its acquisition and development and try to improve their capabilities in technology development by combining these technologies with domestic researches. Analyzing

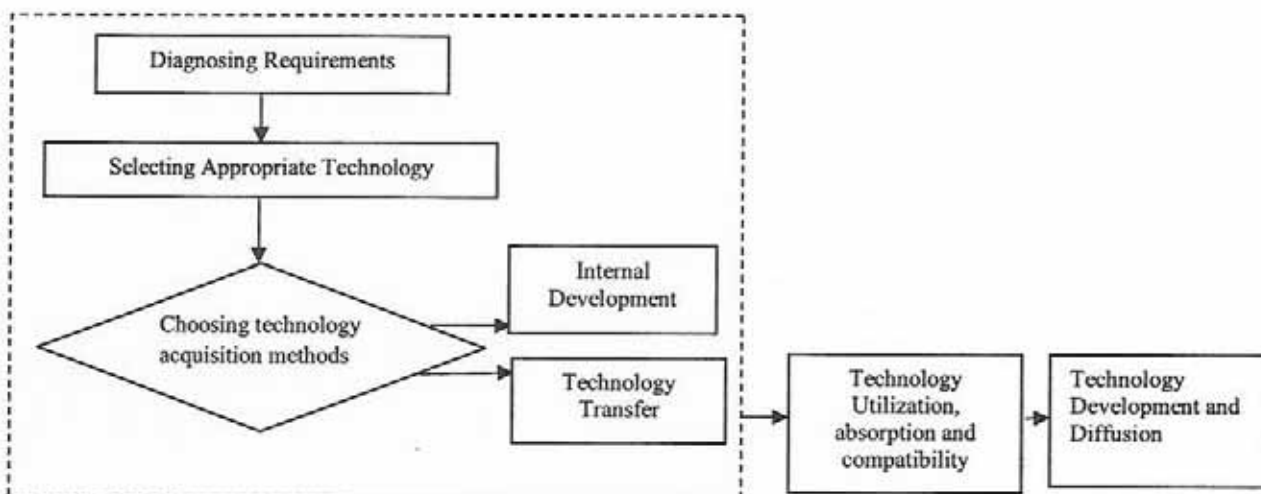
joint projects of Technology Transfer of domestic enterprises with companies that possess the technology and multinational corporations in Iran's oil industry indicates that the ultimate goal of Iran's policy makers and managers was only to buy the hardware and facilities to increase oil production, and the process of knowledge acquisition was majorly neglected in these projects. This fact is equally true for all the projects regarding discovery, operation and development of oil fields. Although some domestic enterprises and research centers are actively involved in the process of technology transfer and try to acquire the technical knowledge, lack of unanimous effective policies has only led to an increasing quantity in the country's oil production's capacity, and technological capabilities are being forgotten.

Technology transfer and its development in the country necessitate consideration of elements that facilitate and accelerate its process. Universities and Research centers are such elements that can play a substantial and constructive role in production and development of the required technology and its transfer to industry.

Below is a list of measures that should be adopted in the process of selection, transfer, adjustment and development of technology:

1. Detection of the technology.
2. Selection of the technology.
3. Possession and localization of the technology.
4. Application of the technology.
5. Protection of the acquired technology.
6. Application of the necessary modifications in the acquired technology.

Managing the above-mentioned steps for technology transfer and its development requires a suitable managerial pattern. Some other models of technology transfer have been illustrated in the following figure:



Empowerment policy in oil industry is from one side linked to companies and their strategies, and from another side to the government and policy makers that influence the advancement of industry by passing laws and adoption of policies. Because of this, company managers who are directly involved with the processes of technology development, should concentrate on acquisition and development of technology know-how in their strategies and develop individual and organizational learning. In this approach Knowledge management is regarded as a strategic obligation.

Adopting a model based on expansion of capabilities and technology infrastructures for optimum utilization of oil and gas fields, increasing productivity by performing engineering projects, manufacturing facilities and technical machinery besides drawing upon the profit from it, will create the possibility of a greater profit. Knowing this, we should adopt a development policy based on improving the level of technology, innovation and increased productivity. By using the development pattern based on technology we can gain the following advantages: substantial value-added creation, creating a boom in the economy as a result of the large network that meets the technological and service demands of the oil industry, ensuring the security of energy production, ending dependence, higher income and creation of career opportunities. Today, apart from human resources, financial resources and the consumer market, what is considered as the most important competitive advantage of our time and future, and the main field of competition in various industries, is human capital and technology.

In this field, the government can play two complementary roles in technological processes. From one side, it should guarantee a secure policy-making environment, provide sufficient technological infrastructures for private investments and promote strategic leadership of the private sector. It can also directly get involved in the activities of the market by the use of special means. If private companies and organizations cannot work actively in certain areas, the government can itself be the major investor in those areas.

9.5. Reducing Government role in the Oil and Gas Industry

Over 80 percent of Iran's economy is run by the government. However the Iranian government is planning to divert Iran's economy from its current governmental cycle by defining the governmental sector and modifying one of the most important articles of the constitution. Following the enactment of the general policies of Article 44 of the constitution, the privatization plan will be pursued more rigorously in a larger area and with a revision of laws and preparation of favorable environmental conditions. Currently, a huge part of the country's economy especially oil companies, are run by the government. This has led to increased size of the government, low productivity, slow pace of activities and tens of other obstacles to the growth and development of the country's industry. Therefore, since long ago, theorists, economists, politicians and managers of governmental organizations have considered the need for a change in

government's role and structure, from possession to management of economic enterprises, and their supervision and monitoring. After the introduction of general policies for Article 44, as of May 2005 it has entered a new phase.

The top general policies of Article 44 of the constitution and the terms of Article 43 are accelerating the national economic growth, increasing public ownership, improving the efficiency of economic enterprises, optimum utilization of financial, technological and human resources, promoting competitiveness in the national economy, encouraging involvement of the private sector in the national economy, reducing the governments expenditures and control over economic activities and increasing the general level of employment.

We can hope to have technology advancements provided that part of governments' activities is transferred to the private sector. The correct implementation of the privatization plan will link the different parts of the active players in scientific and technological fields to each other and to the society. This process will by itself affect the decision making and managerial policies, and will lead to cooperation and collaboration of industrial scientists, policy makers, universities, research centers and etc.

This way, there will be a link with the government's decision making processes that can have favorable effects on technology transfer and broaden the best experiences and create proper infrastructures for innovation and technology development in our country.

Eventually technology development is a potential instrument for a better implementation of Article 44 of the constitution, enactment of the twenty-year perspective document and creation of better solutions for management of sciences and technology in the Islamic Republic of Iran. It is welcomed by the private sector and is also regarded as a factor in a company's superiority, which by itself facilitates the implementation of Article 44.

9.6. Revision of financial, credit and banking laws to facilitate foreign investment:

Huge hydrocarbon resources as an energy source, generating foreign exchange income, and supplying raw materials for small industries are used as important means of wielding national power in launching massive plans and projects in the social and economic development of the country.

Some of the most significant factors to be taken into consideration when reaching decisions by Iran's policy makers are as follows: raising funds and financial collaboration to develop Iran's oil and gas fields, consistent prudence in maintaining the country's economic and political stability to lay the groundwork for discovery and development of oil and gas fields, adopting different policies towards political reactions in the middle east in order to maintain mutual interactions between them and other resource owners and consumers, preparing the facilities and a suitable environment for research projects and various reformations for raising investment.

In recent years, one of the most important and prominent mechanisms in pooling financial resources for running gas and oil projects is buyback that has been considered by Iran's

government too. Many large-scale oil and gas projects were financially supported by these contracts, some of which have been completed and delivered and the rest are pending completion.

In Iran's laws, the term "buyback" is mentioned and it is done by reimbursement of a project's expenditures from its income, and apart from some general conditions like the obligation for technology transfer and optimum utilization of domestic facilities and capabilities, no other conditions have been set by the lawmaker. Hence, national oil company can revise the buyback contracts and change their contents in accordance with the conditions of the market and new demands. In the budget law of Iran, NIOC has been permitted to use buyback mechanisms for discovery and development of oil fields. It is certain a revision of current buyback contracts is needed and this necessitates using the same terms in all contracts, especially joint production ones.

To reach the abovementioned goals and realize our beliefs, the following measures should be consistently taken into account by the governing poles of the country:

- ❖ Stable legislation for investment (4 years on average) and productivity and profitability (7 years on average) for the mentioned periods.
- ❖ Correction and reformation of regulations for governmental business deals including ministries and all organizations which are obliged under the same law.
- ❖ Adoption of uniform procedures in awarding international projects.
- ❖ Coordination between influential organizations such as municipalities, customs, state governors and etc in order to minimize the risk of foreign investment.

9.7. Using modern technologies within the framework of cooperation with well-known international companies that possess the cutting-edge technology.

The upward trend in the demand of the petroleum market is inextricably intertwined with the reduction of universal oil and gas resources and is predicted to continue in the future. Discovering new oil fields and accelerating the extraction rate of existing resources can fill this crack. On the other hand, the soaring demand will result in increasing oil prices which makes oil extraction from smaller fields with lower-quality crude oil economically feasible. Today we witness that international enterprises and developing countries are trying to increase their shares in high-level markets of oil producing countries and guarantee the current level of energy flow, and take advantage of this industrial market by introducing new technologies in the form of a black box and adopting political and economical exclusivity policies. As the development of oil, gas and petrochemical industries is inevitable in Iran's future, it will require huge investment resources. These investments also require technical and technological knowledge that is majorly possessed by other countries' engineering and industrial companies and enterprises. Using these technologies would involve enormous expenses that form a notable amount of total expenses of investment projects. Developing a vast industry such as oil or related technologies is influenced

by factors like the environment and surroundings with a unique culture and the potential and facilitating structures whose increasing interactions can trigger scientific, technical and economical advances. On the one hand, billion dollar investments in the vast energy industry would provide this golden opportunity for Iran's industries to broaden their experience in streamlining procedures, designing products and gaining the technology of manufacturing equipments so that Iranian companies, after improving their managerial and engineering capabilities, would be able to not only meet the domestic demands but also supply the region. On the other hand, paying proper regard to the environmental protection and enforcing the related standards would play a key role in directing the development of technology in the future, and this adjustment requires evolution of certain technologies in this field. Iran's hydrocarbon resources (oil and gas) are geologically enormous and enjoy a vast range of physical properties of stones and fluids. The existence of Fractured carbonate gas reservoirs, dry gas, liquefied petroleum gas, light and heavy crude oil, extra heavy crude oil and multi-layer reservoirs situated in different depths, from several hundred meters to several thousand meters, have all presented NIOC with numerous challenges in discovery, development and extraction of hydrocarbon reservoirs. The complex nature of these reservoirs has stressed the need for utilizing the latest technology related to higher-level oil industries in order to increase the rate of productivity and protective production of these reservoirs in all parts. Improvement of seismic technologies in petroleum industry has helped a great deal in refining oil reservoirs and detection of regions with extractable remaining reservoirs. Development of drilling technology has also enabled companies to extract oil and gas in ocean depths. Intelligent oil field technologies also can help deliver more oil more efficiently.

A great deal of hard effort is demanded for the development and more efficient productivity of oil fields at lower costs, and higher profitability in low-level industries and will provide Iran's petroleum industry and its affiliates with the opportunity to enter new fields and large markets of product sales and new engineering services. For instance, in 2002, the estimated financial flow for contractors in the overseas market was around 170 billion dollars which approximately equals the total oil exports of all OPEC members in the same year.

9.8. Conducting academic researches to generate clean energy sources as an alternative to fossil fuels.

With the world expected to rely heavily on fossil fuels for many decades to come, it is critical to ensure that future energy growth supports sustainable development, with its three intertwined and mutually-supportive pillars: economic development, social progress and the protection of the environment.

Iran's situation in relation to harnessing solar energy: Iran is situated between 25 to 40 degrees of the northern latitude, in a region that ranks among regions that receive the highest exposure to solar energy. Solar radiation in Iran is estimated at 1800 to 2200 kilowatts per square meter which is higher than the world average. On average, Iran reportedly has over 280 sunny days per year which is considerable. This fact shows Iran's high potential for investments in these energy

sources. In this regard, Iran Fuel Conservation Company with cooperation of universities and national research centers has many ongoing research and operational projects in hand, some of which are mentioned below:

- Designing a heat absorption system from sewage.
- Analyzing indicators of sustainable development in the energy sector, and qualitative and quantitative assessment of energy efficiency.
- Designing buildings free from fossil fuels.

9.9. Preparing the groundwork for training human resources for petroleum industry.

Technology development necessitates human development, and human development depends upon creation of human resources which does not take place without advanced infrastructures for human resource management.

Human development means a collection of procedures and processes in which oil industry human resources can acquire the necessary qualifications and become human capital by participating in on-the-job training courses, self-learning, gaining practical experience, or by any indirect means of learning such as careful observation, active physical presence beside experts (as trainees) and using teaching opportunities. These opportunities are usually mentioned in contracts under two different names; Visible and hidden opportunities. Visible opportunities are the ones that are mentioned in contracts under the responsibilities of the contractor company, and the investor is obliged to provide its human resources with these opportunities. Hidden opportunities are the ones that are not mentioned in the terms of the contract and in fact are created through use of internal sources and by active participation in a variety of processes including activities of the company.

Undoubtedly without advanced technology infrastructures and innovation and the capabilities of technology development, Iran will not be competitive in the world level and cannot meet its developmental needs. Consequently it requires certain resource persons, experts, scientists and managers who are possessed of the following qualifications:

Basic qualifications: Qualifications which help the oil industry meet its developmental demands. By definition, resource people in this industry should possess up-to-date professional knowledge, knowledge of modern management, the ability to constantly update their knowledge and skills, a good command of English language and high IT (Information Technology) literacy to use the Internet and related softwares.

Special Qualifications: Qualifications which help the oil industry acquire competitive advantage. In this level, resource people should be equipped with skills and knowledge of management, enhancement, advertising and international marketing and negotiations, complex projects management, risk management, crisis management, technology management, knowledge

management and other qualifications of this kind. By the means of these skills, the oil industry can achieve important qualities like competitive intelligence.

Strategic qualifications: Highest level qualifications are super skills whose acquisition guarantees constant development of human resources. They help the oil industry reach a suitable position in the world by creating qualified human resources and building the capacity for technology development. Resource people of this industry, especially high-ranking managers and leaders should be equipped with skills including strategic thinking, strategic change leadership which means the ability to convert inefficient circular organizations into innovative and competitive ones, the skill of international networking, the ability of constant innovativeness and other qualities of this kind. Apart from resource people, oil industry requires social capital too. Social capital means using wisdom networks, interpersonal, intrapersonal and organizational relations inside and outside the country, and more importantly possessing the ability to connect to networks of research, development and innovation, and human resources of multinational companies in a way that would enable the oil industry to establish new centers of innovation, educational networks, and technological development and continuously develop them, so by relying on such social infrastructure it could achieve its strategic goals. Without a doubt foreign investment projects would provide lots of valuable opportunities in this regard.

On the other hand, social capital formation is based on a combination of trust and emotional security. Without trust between people within an organization, particularly between scientists and managers, and scholars' lack of emotional security and trust in managers and their qualifications for dealing with national and international challenges, social capital cannot be formed or would not be sufficiently effective.

Moreover, efficiency and productivity of human resources and social capital rests on their motivation which means individuals should like their jobs and feel their abilities are continually enhancing, so that with high motivation they would devote their knowledge, skills, expertise and their communication network entirely to the development of oil industry. All of this requires an efficient system for human resource management.

Foreign investment in petroleum industry can lead to technology and human development in the host country, provided the conditions and the environment are suitable. If we suppose the oil industry without advanced technology infrastructure cannot reach an acceptable level of development, we can also claim that human capital will only have the required quality when it can facilitate constant technology development. Therefore, only qualifications that pave the way for technology development are called strategic. In other words, the responsibility of human resource management in the entire industry would be to lay the groundwork for technology development by using mechanisms and systems, employing proper procedures, and taking advantage of all opportunities, specifically visible and hidden opportunities in foreign investment contracts.

Not long ago, the amount of oil and gas resources played a key role in the ranking of companies, and in that environment the workers and employees were referred to as “workforce”. However, today with a change of views and approaches and with the passage of time throughout different developmental periods, the term “workforce” has given its place to “human resources”. For it is by the value effect of these resources that other values will be realized.

Learning and knowledge acquisition must be part of the strategic goals of companies and enterprises that are active in the oil industry. Managers should first support learning and enhancement of knowledge and facilitate its transfer in their organizations. The close cooperation between enterprises, scientific and research centers, and effective transfer of knowledge and exchange of skills, play a key role in the enhancement of technical knowledge and help move towards a knowledge-based economy.

In successful countries, experience shows government’s interference plays a major role in filling technical and scientific gaps particularly in the initial stages. The government’s role is a supportive role in increasing the capabilities of energy industries. One of the ways by which governmental decision making processes can help empower localization is increasing interaction between enterprises, research centers and universities. This could happen through setting new encouragement policies and reforming laws. In order to implement empowerment policies, and to fill the gap for technical knowledge in oil industry, not only do we need some policies to activate the inner enterprises, but also the manner of interaction with the outside world and using other countries’ knowledge play vital roles.

9.10. Enforcement of Article 44 and handing over low-level activities of oil and gas to the private sector.

The privatization process has spread in industrial fields in many countries and day by day world’s governments realize the importance and benefits of private companies in industry more than before. Unfortunately in our country, in many key industries such as oil and gas, the government is exclusively in control of the industry and there is no room for development of potential private companies.

According to Article 44 of the constitution, Iran’s economy is divided into three sectors: governmental, cooperative and private. The capital and the financial resources required for Iran’s petroleum and petrochemical industries to reach its long-awaited pre-eminent position are closely linked with the implementation process of policies of Article 44 regarding this industry. The fact indicates until 2025 (considering the basic investment price of 2005) around 230 billion dollars of investment in the high-level section (about %22) and 215 billion dollars for the low-level section is required.

Moreover, if the estimated high oil prices are realized during the next twenty years, Iran will eventually earn an income of about 2000 billion dollars, from which about 445 billion (about %20) will be spent on the development of low-level and high-level sectors, and this will decelerate the development of other economic sectors of the country or even stop them and will have destructive and dire consequences on the national economy.

Therefore, as it has been clearly stated in the declared policies of Article 44, by handing the low-level section of oil industry to the private sector and by the government's support for an active presence of the private sector in the field of oil, gas and petrochemical industries, the government will be able to move towards reaching its goals in terms of developing the high-level sector without worrying about investments in the low-level sector and increase the productivity of oil and gas to the target level of 7 million barrels a day in the year 2025.

If the abovementioned policies of Article 44 of the constitution are successfully carried out in the petroleum and petrochemical industries, the active private sector will present a massive need in the country's industry for financial resources both in the local currency and foreign exchange, for the ownership and development of the existing governmental organizations in this industry, and for the establishment of new petroleum plants.

9.11. Preparing optimal conditions for international investment in higher-level activities of oil and gas industries.

In the recent years the rate of foreign investment in oil and gas industries has clearly been in line with the rate of economic development in Iran, considering the fact that the world will continuously be dependent on oil to operate economies and industries, and that the role of middle east in supplying these resources will be significantly more crucial than before. In addition, with the rising investment prices in oil industry in the world, the vitality of attracting foreign investments in high-level and low-level sectors of oil and gas industries is undeniable in order to achieve the goals of Iran's perspective document. In any case, it is clear that the petroleum industry requires enormous investments in order to run investment projects and transfer the necessary technology. However, in order to gain financial resources in investment projects in all fields especially oil and gas, world's governments and enterprises use only a little sum of their resources to obtain foreign investments by taking out loans, direct foreign investment and investment markets. Therefore, investments in certain parts of production and market of oil industry are financially supported by high-risk investment markets such as oil discovery which is high risk and will either result in huge profits or great losses. Other sectors like extraction are so profitable that the governments and enterprises use internal resources and avoid foreign investments and joint ventures.

Due to the government's low financial resources and its inability to allocate a certain budget for petroleum-related projects, the budget law in 1994, for the first time after the revolution allows foreign investments in oil and gas industries through buyback contracts. However, the abovementioned contracts should be negotiated in a way that in addition to financing projects, foreign companies would be obliged to transfer the technology, train human resources and make optimum use of the country's potential in planning, designing, engineering, producing and installing the equipment and the machinery.

9.12. Regional investment in energy industry and forming economic, scientific, technological clusters of energy in fields' development.

Due to Iran's high resources and its geopolitical situation, we cannot deny the constructive role it can play in establishing stability and equilibrium in the energy market. Iran's energy policy is to make a network of regional energy exchanges in which energy supply is developed through import, export, exchange and transition in the region via Iran's vast transfer and distribution system and thus the countries in the region all benefit. To achieve this goal, Iran has begun the project of exporting natural gas to Armenia and Turkey, and continues its imports from Turkmenistan. Future plans are include exporting gas to Pakistan, India and Gulf states. Creation of a regional energy network will lead to an increase in transactions and obviously an improvement in social and political relations which will bring about peace, stability and security in the region.

In the current circumstances, the traditional methods of purchasing and selling natural gas on the basis of the agreements between the buyer and the seller are no longer effective. The existence of collaborative structures among producers will prevent unhealthy competitions and unprotected extraction of the resources and will result in more cooperation. By managing the market and defining its strategies, such a union can be beneficial for energy consumers too.

That being said, the establishment of the Organization of Gas Exporting Countries will have an effective role in coordination of the gas market. In the trade of exporting oil and natural gas, Cooperation of producers in economic and technical fields can accelerate the construction of transfer and export infrastructures in petroleum producing countries and reduce worries of secure energy supply.



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