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Future Scope of Energy Demand and Supply in Iran

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ABSTRACT

Environmental problems have been among the most eminent difficulties during last two decades in Iran but some part of these problems relate to energy demand and consumption which has risen 280% between 1980-2000. Much of this is accounted for by gasoline consumption. The Green Party of Iran reports that Iran ranks second (behind U.S.) in gasoline consumption with 4345 liters consumed annually per car. Upwards of 98% of energy consumption in Iran depends on fossil fuels so in recent years carbon emissions have increased 240%.

The installed capacity of power plant, now 33 000 MW, is expected to increase to 90 000MW in 2020 because of population and industrial growth. However, in the next few years there must be a serious effort to reduce Iran's reliance on oil and "petrodollars" so renewable energy production will not only help to decrease pollution, but will also help Iran diversify its economy. The paper aims to present an overview of the future scope of energy demand in Iran.

1. INTRODUCTION

From 1980-1998, Iran's total energy consumption ramped up from 1.6 quadrillion Btu (quads) in 1980 to 4.5 quads in 1998, more than a 280% increase (Fig. 1).

Much of this energy is accounted for by gasoline consumption. The Green Party of Iran reports that Iran ranks second (behind the United States) in gasoline consumption with 4,345 liters (1,148 gallons) consumed annually per car. Tehran's 2.5 million cars alone use around 20 million liters of gasoline daily.

With the rate of domestic consumption of crude oil products increasing more than 7% annually, Iran subsidizes energy at an estimated rate of $12 billions/year, 22.5 % for gasoline, 27.6% for diesel fuel, 8.0% for kerosene, 18.9% for natural gas and 12.6% for electricity. As a result, the final consumers pay only 25 percent of real prices for electricity and 25%, 15%, 8%, and 7% for gasoline, natural gas, diesel fuel and kerosene respectively while, 120 years after the initial signs for oil exploration, the country's energy mix is still highly dependent on fossil fuels.

With an approximate estimated population growth rate of 1.1% through next decade and considering industrialization motivations in different sectors, the country's energy outlook looks uncertain.

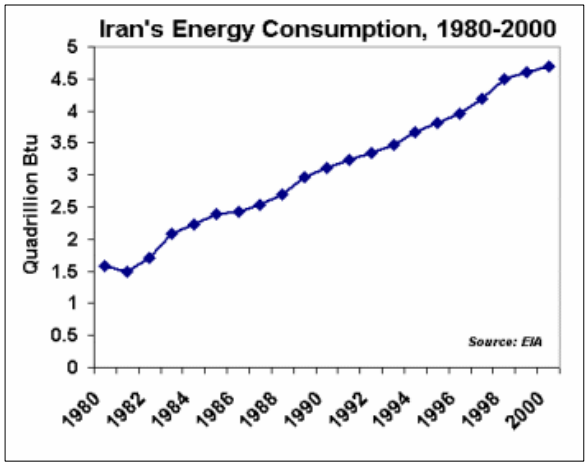

Figure 1: Increasing rate of Energy Consumption

Energy Mix:The economic structure of Iran has been closely linked to the oil industry throughout the last century and despite all the government's struggle to diversify the energy mix it still comprises 55% oil, 43% natural gas, 1% hydropower and negligible amounts of renewable energOthe other hand, the commercial and residential sectors account for 43% of energy consumption in Iran, followed by 29% and 28% for transportation and industry respectively. It means that old fashioned air conditioning systems, old mechanisms of trading and transportation and many other old operations in the residential sector have caused huge energy consumption while the country desperately needs to move towards an industrialized lifestyle.

Being caught up in a wide variety of large scale difficulties from the Gulf War to U.S. sanctions has made the economy's structure vulnerable and shaky so, despite numerous different factories and industrial groups producing many kinds of industrial products, energy intensity is critically high even by comparison with the average of developing countries. The energy intensity (ratio between total values for all of the products and services manufactured in a country and the total consumed energy for them) is estimated at 100 in Iran while the average for a developing country is 65.

2. CARBON EMISSION

While the energy demand and consumption has been increasing because of prevailing old technology in all aspects of industry and residence sectors, carbon emissions have been on a steady climb. Since 1980, carbon emissions in Iran have risen by 240%, from 33.1 million metric tons emitted in 1980 to 79.4 million metric tons emitted in 1998.(Fig . 2)

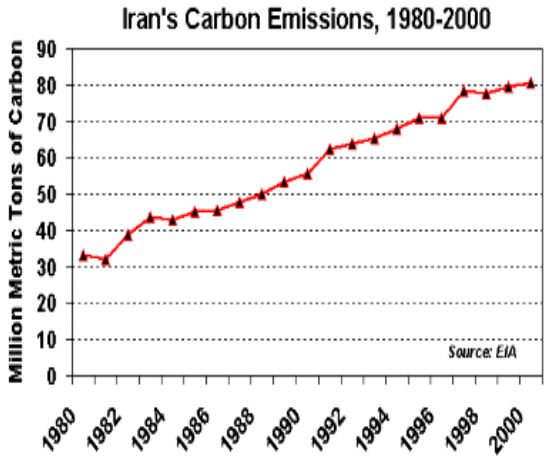

Figure. 2: Increasing rate of Carbon Emission

3.CRISIS IN TRANSPORTATION SECTOR:

The government policy of encouraging a domestic vehicle industry through the last couple of decades has caused an uncontrollable crisis in transportation sector: more than 40 % of 6 million cars are now more than 20 years old,700 000 more than 25 years old and 200 000 more than 30 years old. Although the total capacity of car makers' factories has reached about 1 million annually, still there is no clear and approved policy for scrapping old cars so, with 2.5 million cars driving in Tehran alone, it has the most polluted air conditions in the world. From the point of view of the economy, daily average gasoline consumption has reached 60 million liters and even 70 million on peak days, and is increasing 10% annually. 22 million liters per day must be imported.

This has caused an ever increasing demand to launch new refineries and harbors to support a continuous rhythm of gasoline imports while the country needs other infrastructures more intensely than the mentioned ones. Most of this ever growing problem originates in subsidization of energy and the prevalence of old technology, as shown in figs. 3 and 4.

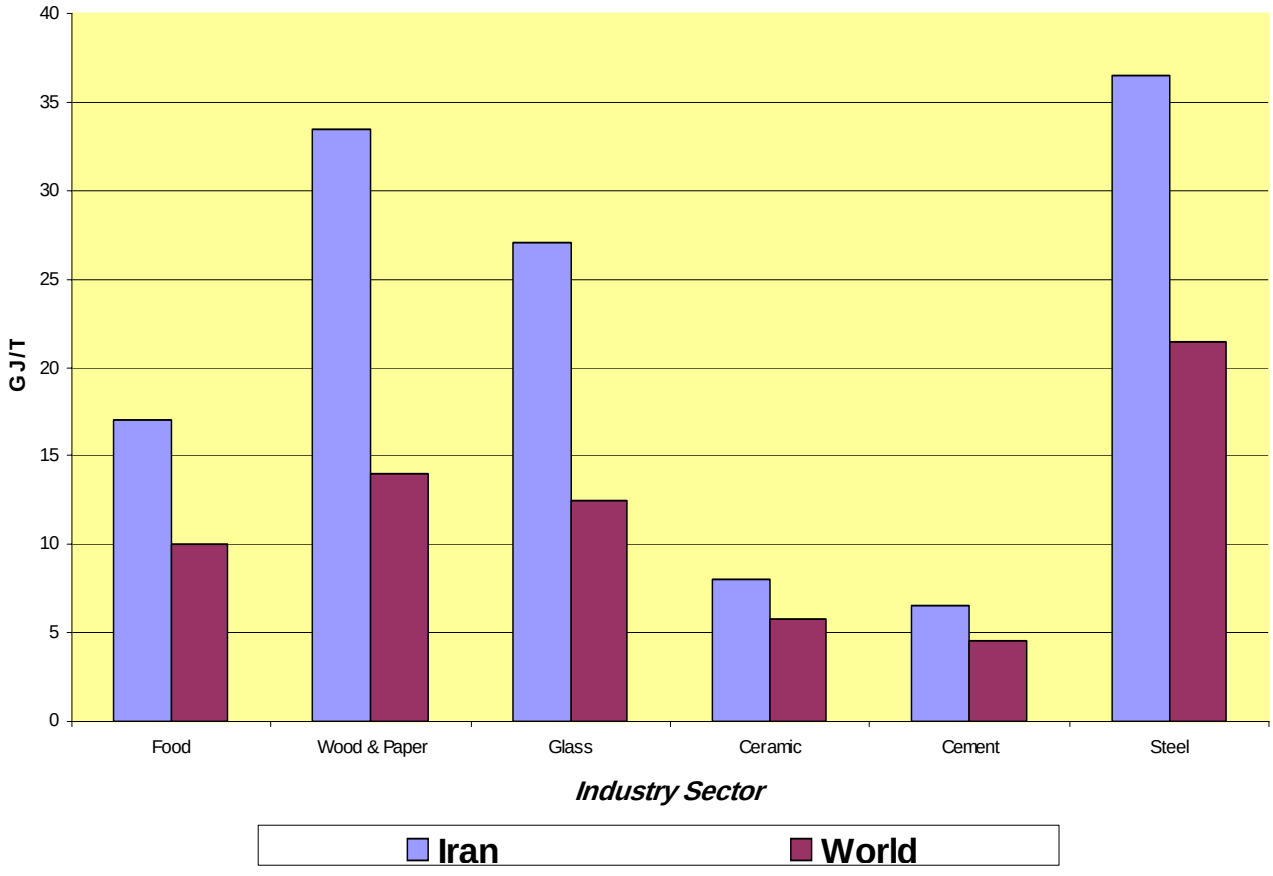

Figure 3: Comparison of Energy intensity between Iran and the world for different sectors.

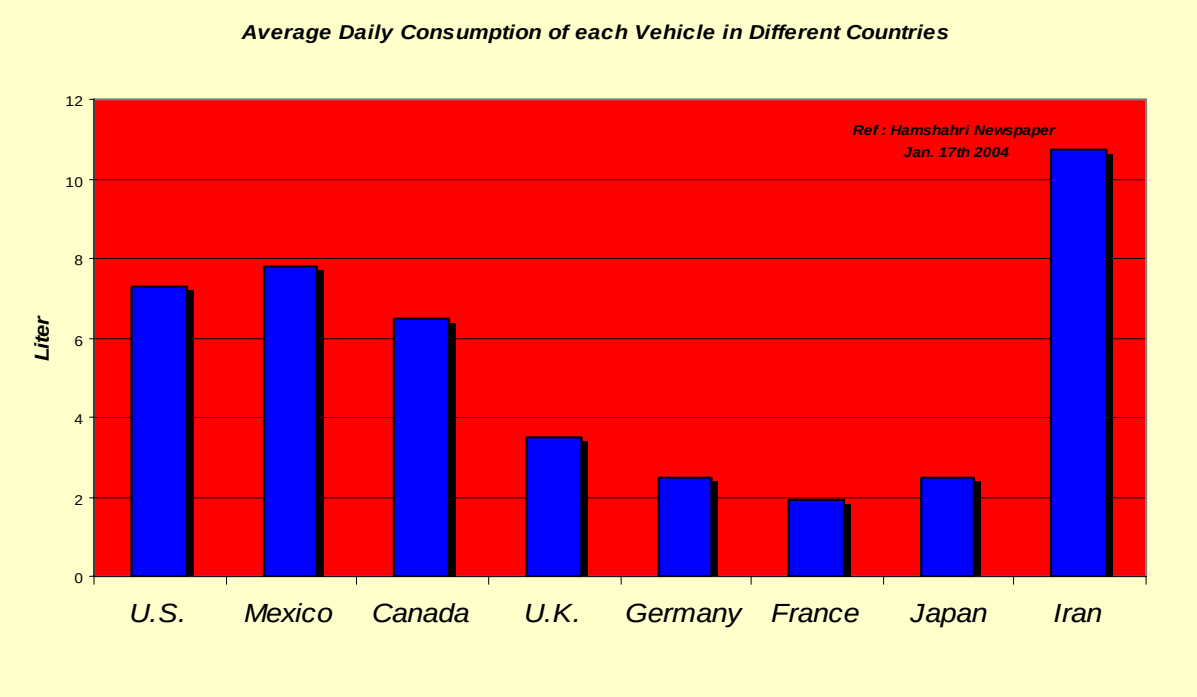

Figure 4: Average daily consumption of vehicle in different countries.

4. ELECTRICAL ENERGY OVERVIEW:

The outlook for electrical energy is as critical as for the other sectors. The total installed capacity, estimated at 7 000 MW in 1979, with multilateral efforts of the authorities has increased to 33 000 MW in 2004 but, considering that the total demand in 2020 will be somewhere around 90 000 MW, the policy makers are having to think about new resources for new power plants and are considering new financial strategies like the B.O.T method in construction contracts.

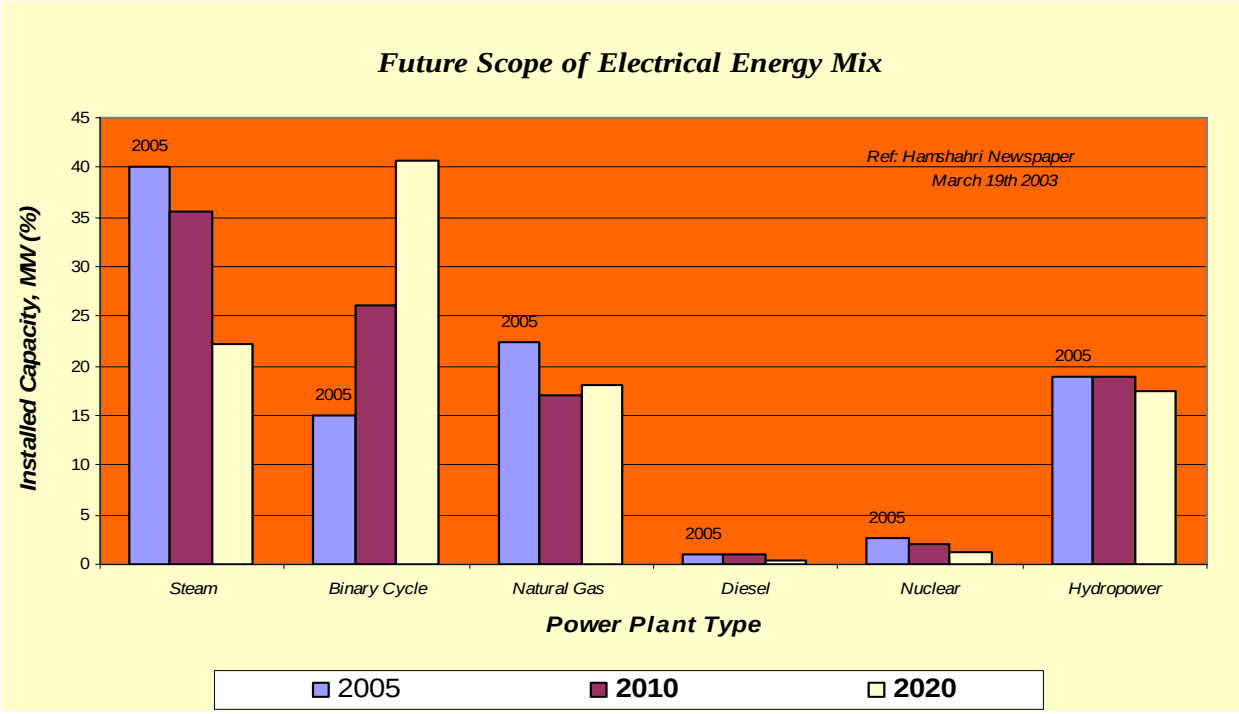

Figure 5: Future Scope of electrical energy mix.

Electricity generation, unfortunately, is also heavily dependent on fossil fuels so, even though the whole economy is tending to move towards resources other than oil and gas, it will stay oil-dependent unless nuclear power

plants can be launched on a large scale . So, given the political difficulties that link Iran's nuclear activities with weapons of mass destruction, the country's requirement for new reliable energy resources will inevitably grow acutely. The future scope of electrical energy mix may be seen in fig.5.

CONCLUSION

Iran has to change its energy mix because of three critical but inevitable factors:

- From the point of view of the economy, as shown in fig.6, the country has a pressing need of petrodollars to diversify its infrastructures. With more than 6 million barrels of daily production at the peak in the 1970s, oil fields now barely produce 4 million barrels. Of this, 1.5 million barrels goes for domestic consumption. The export capacity will fall below 50 % in 2007 and will meet a second critical point in 2015 when Iran will become a net oil importer. The oil dependent economy must therefore be diversified because of resources limitations.

- From the political point of view, Iran's share in the OPEC basket has fallen because of decreasing production capacity through last three decades and also because of increasing domestic consumption, so bargaining power is at its lowest since OPEC was established. It means that country's economy may not be able to rely on any future draft plan for its oil price to design and diversify the shaky oil economy, and the National Oil Production Company (NIOC) would have to sell its production at any price that the market conditions impose.NIOC may even have to accept buy-back or any other undesirable type of contract, as

- occurred in recent decades, just to develop old oil fields.

- From the environmental point of view, the industrial complexes and factories, transportation mechanisms, residential and other sectors cannot continue with old technologies, emitting high rates of CO_x and NO_x which have grown more than 240% over the last two decades. So, based on international protocols and conventions such as Rio , Kyoto and the others, high rates of carbon emission cannot be born by world society and this may cause more limitation and technical sanctions against old and decaying industry. It means that the whole economy has to shift toward some new models, and the energy economy, energy mix, energy consumption and other appropriate topics related to the energy outlook in Iran also need to diversify completely.

On the other hand, Iran has many potential options for energy production from renewable resources including solar, wind, biomass, and geothermal. Indicators for the latter have been investigated since 1972.

Despite suitable geological conditions, geothermal energy production has not been developed because of:

- a lack of any clear policy about the future scope of country's energy mix;

- huge resources of fossil fuels with cheap prices as a powerful energy competitor;

- a lack of high-tech instrumentation for launching new power plants.

As a final result, the future scope of energy demand and supply in Iran must be considered as uncertain because none of the policy makers and governmental offices have yet developed clear and approved views.

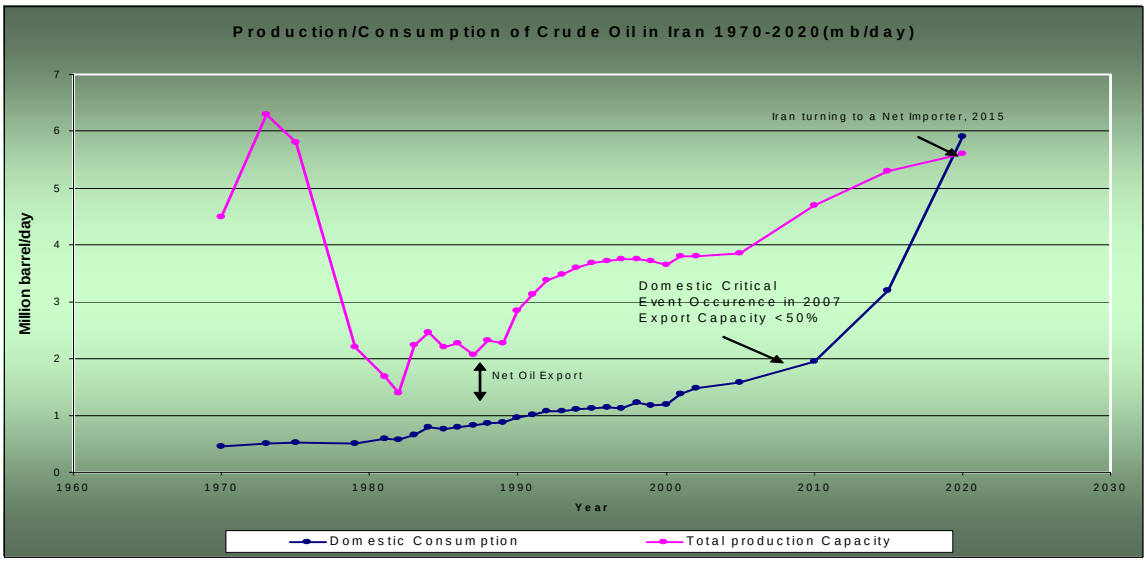

Figure 6: Outlook of Production/Consumption Crude oil in Iran

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