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NUCLEAR POWER PROGRAM APPROACHES IN SELECTED NEWCOMER COUNTRIES

Abstract: In this paper, approaches of some newcomer countries, different in their social and economic development, are analyzed with respect to nuclear power implementation. Characteristic social and economical factors, organization of the energy sector and especially nuclear sector are considered and compared. On the basis of newcomer countries experiences certain conclusions are carried out that may be useful to new countries entering into nuclear energy programs.

INTRODUCTION

Before Fokushima case governments in a number of countries where no nuclear power utilization is presently in place have expressed interest for nuclear power implementation. Also, in a number of countries where currently nuclear energy programs are in palce have announced revitalization and expansion of their nuclear programs. The IAEA document on *International Status and Prospects of Nuclear Power, September 2010* reported that about 65 countries without nuclear power plants expressed interest in considering or are actively planning for nuclear power implementation, and many governments have expressed interest in resuming their nuclear power programs after a relatively long period.

In this paper three newcomer countries are considered: Jordan, United Arab Emirates and Turkey because they are newcomers in nuclear program implementation, and they have different approaches in nuclear power implementation.

The main characteristic of these countries are:

– United Arab Emirates (UAE) is third largest economy in the Middle East (behind Saudi Arabia and Iran); GDP per capita is second in the Middle East (behind Qatar); the UAE is an important producer of natural gas and oil, ranking seventh

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globally in total proven reserves of both and net energy export is 2.5 times higher than energy use (2007) [1], [2].

– Jordan is net energy importer with very limited resources of its own (net energy import in 2007 in Jordan was 96% of energy use); Jordan is the only Middle East country with confirmed uranium, in a large quantities [1], [2],[3].

– Turkey's economy is growing fast. Turkey has coal, mostly lignite, and hydro resources for electricity generation, with net energy import about 73% of its energy use (2007) [1], [2] [4].

SELECTED INDICATORS FOR CHOSEN COUNTRIES COMPARED TO MACEDONIA

The next three figures present selected indicators from databases [1] and [2].

Populations and JDP as basic indicators are shown in Fig 1. It can be seen that regarding population Turkey has 12 to 35 times more habitants than other countries. Concerning JDP Turkey also has highest value.

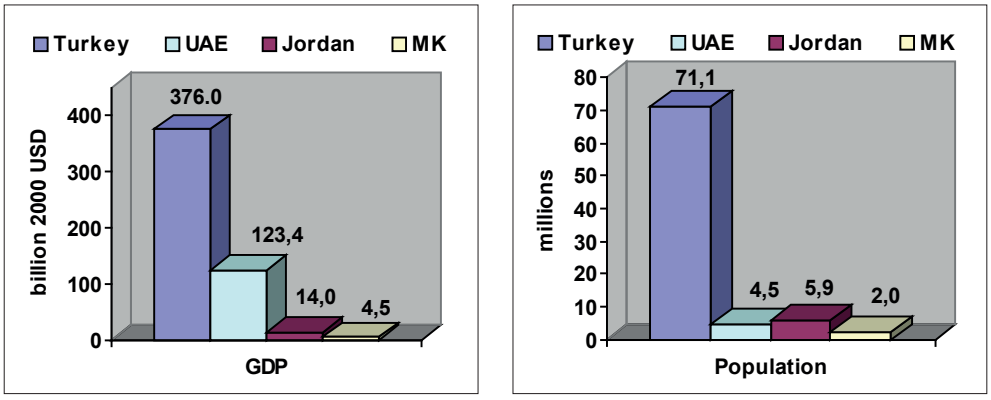

Fig. 1. Population and JDP of considered countries

Primary energy increase in the considered countries is presented in Fig. 2. Turkey an UAE have much faster increase than Jordan and Macedonia.

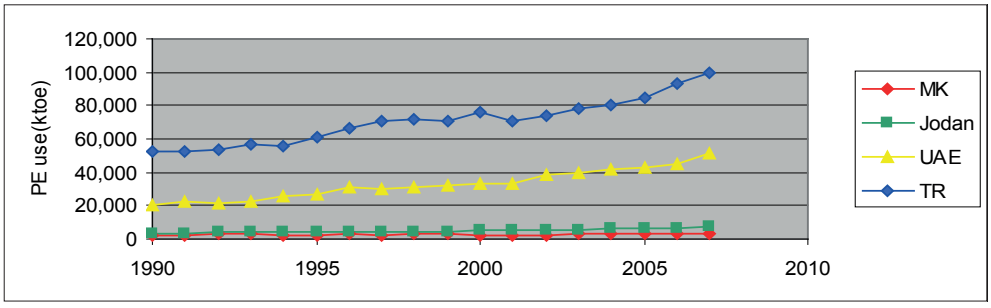

Fig. 2. Primary energy use of considered countries

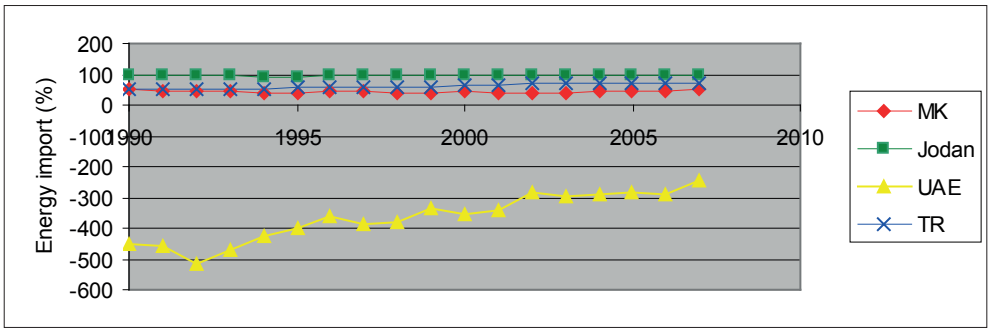

Fig. 3. Energy import (% of energy use) of selected countries

Figure 3. shows that Jordan has nearly constant energy import (about 96%), Macedonian and Turkish energy import increase during considered period and UAE export decrease.

NUCLEAR SECTOR IN SELECTED COUNTRIES

Responsible for energy supply in the selected countries are governments and ministries. In Turkey it is The Ministry of Energy and Natural Resources with General Directorate of Energy Affairs, in Jordan Ministry of Energy and Mineral Resources, in UAE Ministry of Energy and in Macedonia Ministry of Economy [5], [6], [7], [8].

The nuclear sector in these countries has close collaboration with cited ministries and governments. There are two main bodies in nuclear sectors of considered countries (except Turkey): for regulation and for implementation of nuclear energy.

Usually in each country the regulatory body is established before implementation of nuclear program is considered. The regulatory body is responsible for nuclear and radiation safety, transport, and management of nuclear and radioactive materials including radiation safety in medicine. The responsibilities of regulatory body expand when nuclear program is adopted. The regulatory body is effectively independent from the owner/operator and other government agencies responsible for developing the nuclear program, but may exist within the government [9].

As per IAEA recommendations, the Nuclear Energy Program Implementing Organization (NEPIO) needs to be formed first with the objective to manage the process of entering into a nuclear power program. NEPIO can be formed in the initial phase of implementation of a nuclear program, either when government decide to launch a nuclear program, or before such decision is made in order to help in making an appropriate decision.

In the analyzed countries the considered governments have organized these two bodies in different ways according to their own situation and needs.

Turkish nuclear program began in 1982. In Turkey the Turkish Atomic Energy Authority (TAEK) [10] is responsible for both regulation and implementation of nuclear energy. The main bodies of TAEK are: The Atomic Energy Commis-

sion (AEC), the Advisory Council and the Advisory Committee of Nuclear Safety. AEC set working principles and programs of TAEK and its proposals submits for approval to the Prime Minister. The Prime Minister Presides the Atomic Energy Commission meetings whenever is deemed necessary. The Advisory Council studies on the subjects submitted by the AEC and submit its results and proposals back to the Commission. The Advisory Committee of Nuclear Safety performs the duties specified in the Decree on Licensing of Nuclear Installations.

Jordan nuclear program began in 1964. Prior to 2001, nuclear activities (promotion and regulation) were handled by a Nuclear Energy Department within the Ministry of Energy & Mineral Resources. Now in Jordan there are two commissions: Jordan Nuclear Regulatory Commission (JNRC) and Jordanian Atomic Energy Commission (JAEC) [11], [12]. JNRC is established in 2008 for regulation, safety and safeguards with a legal personality with financial and administrative independence and tracking directly to the Prime Minister. JAEC was established in 2008 and it is under the authority of the Prime Minister. The main aims of the JAEC are exploitation and investment of the uranium and establishment of nuclear energy plants.

In UAE there are two bodies for nuclear energy utilization [13]. Federal Authority for Nuclear Regulation (FANR) was established in 2009 as the sole and exclusive independent regulatory body for Nuclear Safety, Nuclear Security, Radiation Protection and safeguards. The Board of FANR established a Radiation Protection Committee. Emirates Nuclear Energy Corporation (ENEC) was established in 2009 in Abu Dhabi. ENEC is responsible for the nuclear energy program implementation. ENEC specializes in the deployment, ownership and operation of nuclear power plants in Abu Dhabi and also serves as an investment arm of the government.

In Macedonia, Radiation Safety Directorate (RSD) is regulatory body in the field of nuclear energy carrying out managing and professional activities in the area of protection against ionizing radiation. The Director of RSD is responsible for his work in front of the Government of the Republic of Macedonia. Macedonia has not yet made a decision to enter into a nuclear power implementation program. Nevertheless, this paper provides some initial considerations and information that may be useful to the Macedonian government in the future.

CONCLUSIONS

It can be concluded, that motivations for implementation of nuclear energy in all of the considered countries including Macedonia are following:

– Expected increase of energy consumption
– Desire to reduce dependence upon imported energy
– Need for reliable base-load energy sources
– Limited their own resources
– Need to diversify the supplies (to enhance national security)
– Need to protect the environment

– Competitive price in comparison to the other non CO_2 sources.

In selected countries (except Turkey) there are two main bodies of great importance in realization of a nuclear program: a regulatory body and a body for implementation of nuclear program. These bodies are different in organizational structure depending on the level of nuclear program development and on the national interests, but basically they have similar functions.

All of the regulatory commissions (except Macedonia) have separate Department for nuclear safety, Department for radiation safety and Administration department.

All the bodies have close collaboration with government and cooperate with relevant government entities.

Macedonia has well-established regulatory body which needs to be developed further should nuclear energy implementation is initiated.

Governments are responsible for strategic decisions concerning nuclear programs.

All bodies pay special attention to close collaboration with the IAEA in ensuring that international obligations and legislation is followed and complied with.

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