

## A Giant Step for Developing Countries, Lessons Learned from Feasibility Studies

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### 1. Introduction

According to the IAEA(International Atomic Energy Agency, hereinafter "IAEA") research<sup>1</sup>, the booming trend of nuclear renaissance among developing countries have initiated to investigate economic feasibility studies regarding future electricity demand and supply for the introduction of nuclear power generation in massive volume. Although the ambitious dream of public servants in the third nations who desperately want to instill nuclear power generation capacity promising generation abundance in their homeland, it is not easy to calculate economic benefits and its related costs where lots of blurred areas could not defined in plain terminology. For this reason, IAEA urges the new entrant countries should prepare carefully and design cautiously not to deter large lump sum nuclear power plant construction project.

### 2. Elements to be considered

Some elements of the techniques used to model the economic feasibility studies are described in this section. The guidelines by IAEA can be illustrated and following factors are considered when new nuclear power plants construction process for entrant countries.

#### 2.1 Modeling tools

The IAEA provide their own practical tools for gauging the economic impact of new electricity capacity building in national status such as WASP(Wien Automatic System Planning Package), FinPlan(Financial Analysis of Electric Sector Expansion Plan), other packages<sup>2</sup> to newly nuclear aspiring member countries without any extra entrance premium. Basically, the Atoms for Peace, the slogan of the IAEA's establishing motive can help under privileged members launch pre-feasibility studies or feasibility studies when they desperately need financial support from the international agency.

<sup>1</sup> IAEA, IAEA Pre-FS/FS Studies Workshop Material(mimeo), 2014.

<sup>2</sup> MAED(Model for the Analysis of Energy Demand), MESSAGE Model for Energy Supply System Alternatives and their General Environmental impacts), SIMPACTS(Simplified Approach for Estimating Impacts of Electricity Generation), ISED(Indicators for Sustainable Energy Development), See Figure 1

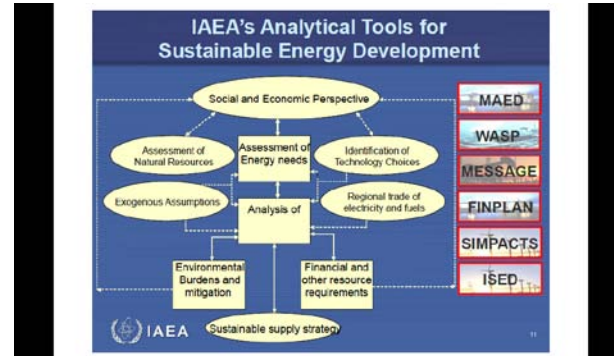


Fig. 1. Overview of IAEA Analytical Tools for Feasibility Studies

#### 2.2 Macro Economic Situation

Macro economic situation which enables the long term, high caliber, and huge capital intensive projects like social infrastructure construction determines destiny of nuclear power plants. The capacity of the national utility facilities depends on the economic development stage of the host countries. A large number of nations which do not have adequate economic conditions to support nuclear power plant projects due to less work forces, insufficient domestic capital, furthermore global financial market sentiment for sustainable energy growth would hamper nuclear project initiation.

#### 2.3 Geopolitical issues

Among other elements to designate the fate of first nuclear power project in third world countries, geopolitical issues are often the most critical factor for technology transfer treaties. The transfer of core technologies regarding the construction, operation of nuclear power plants are sometimes banned by exporting nations where political turmoil could be dangerous for national security against terrorism, internal conflicts and others. The more sensitive conditions related with neighboring countries' safety are aroused, the less possible implementation to start nuclear power plant projects in distressed situations.

#### 2.4 Long term Electricity Demand and Supply

The output of the electricity by nuclear energy can easily constitute the majority of electricity consumption during rapid electricity demand occurred. Challenging

tasks for countries who contemplate national electricity plan for next decades often make difficult obstacles for precise national level electricity demand and supply plan since over exaggeration on economic prosperity have been suggested by interest stakeholders (typically including public officers, private entrepreneurs, academic researchers).

### 2.5 Right Choice of Nuclear Technology

Although the advancement of nuclear technology have been achieved through different heat-water changing system[PWR(Pressurized Water Reactor), BWR(Boiling Water Reactor), PHWR(Pressurized Heavy Water Reactor)], the majority of current construction projects are under PWR type. Comparative cost-benefit analysis for new project must include possible nuclear safety issues after the Fukushima accident in 2011. Unlike other technology such as mobile telecommunication, civil engineering, nuclear power plant projects are less tempting for external financiers. Future project managers should think

Excluding the above criteria to be considered by first nuclear power plant project sponsors, other key elements are also thoroughly investigated with conscious time frame. Major elements which can change actual project schedule including long term energy strategy, national consensus for nuclear safety, public acceptance to nuclear power generation and etc. Some of exemplary success factors are illustrated below(See Table 1).

Table 1. Success factors of Korean Nuclear Power Projects<sup>3</sup>

§ The government-driven policy and strong dedication to supporting for localization
§ Local companies' active participation and investment
§ Step by step approach with specific goal to achieve technology self-reliance
§ Repeated construction of the same type reactor for local companies to build up technologies and capabilities
§ Willingness to absorb advanced technologies and to expand capacities
§ Close cooperation with experienced foreign companies

### 3. Conclusion

Nuclear power generation in civil area can be seen as righteous peaceful usage of nuclear energy in appropriate manner, although the advanced technology,

capital intensive characteristics would hinder for the developing countries to implement proper scheduled ambitious nuclear power projects in timely course. In particular, the complicated economic feasibility studies are major tasks for poverty struck sovereigns to fulfill their ambitions. Thus further detailed design might be requested in order to relieve international concerns on possible military usage. This article is exploring to gauge multiple aspects of peaceful usage of nuclear energy and its economic benefits which allow power huger nations to achieve sustainable development and make significant advancement.

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