International Journal of Trend in Scientific Research and Development (IJTSRD)
International Open Access Journal
ISSN No: 2456 - 6470 | www.ijtsrd.com | Volume - 1 | Issue – 6

The Required Policy Changein Energy Sector for India's Energy Security

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ABSTRACT

The existing clean energy technologies are wind and solar which are intermittent in nature and depends on the availability of the wind and sunlight. To give stability to the power supply another source of clean energy which does not depend on uncontrollable wind or sunlight is required. Currently nuclear energy is the only other clean energy technology which has been developed to such an extent to support the transition. This paper proposes that captive and private nuclear power generation shall be allowed using Small Modular Reactors (SMRs). Private Investments in the sector lead to more innovations in the field.

Keywords: *Energy, Nuclear Energy, Sustainable Energy*

I. INTRODUCTION

Energy can neither be created nor destroyed. It can only be transferred from one form to other. The ultimate source of energy is the energy within the atoms, though our technologies have not yet developed to exploit it to its best.[1]India is going through a transition phase in the energy sector. The transition from unsustainable energy sources to a sustainable system of energy production and consumption. With a view to achieve the same the new energy policy of India has been formulated by NITI Aayog.

The existing clean energy technologies are wind and solar which are intermittent in nature and depends on the availability of the wind and sunlight. To give stability to the power supply another source of clean energy which does not depend on uncontrollable wind or sunlight is required. Currently nuclear energy is the only other clean energy technology which has been developed to such an extent to support the transition. This paper considers the existing energy scenarios and the need of making a policy change in the energy sector. This paper proposes that captive and private nuclear power generation shall be allowed using Small Modular Reactors (SMRs).

II. The Energy Scenario Today

Maintaining economic growth and achieving sustainability are conflicting claims at times. Economic growth depends to a large extent on the availability of cheaper sources of energy. Currently the cheaper sources of energy are fossil fuels. Fossil fuels cannot but meet the sustainability standards. Creating an energy policy and devising an energy mix is a challenging exercise in this context. Yet the New Energy Policy 2017is making an attempt to meet all standards and demands to secure India's energy future. There are various factors affecting an energy policy decision. Availability and cost of resources, geopolitical situations, international commitments and the objectives to be achieved are some of the determining factors. The energy policy and energy mix of the countries vary accordingly. For example, India has more thermal power plants while France has most of its electricity produced from nuclear plants and Scotland from wind farms[i].

India Currently has an installed capacity of 329226.27 MW of power generation as on 31 August 2017[ii].

According to the Central Electricity Authority, the coal fired power plants have the largest contribution to the sector with 193466.50 MW of installed capacity. The other fossil fuels which contribute to India's power generation are gas with an installed capacity of 25185.38

MW and diesel having an installed capacity of 837.63 MW. The installed capacity of nuclear power plants is 6780 MW, hydro 44653.42 MW and renewable energy 58303.35 MW.

During the 12th Five Year Plan period the target for capacity addition was 88537 MW and we have achieved 112% by adding 99209.47 MW. While the capacity addition targets were not met for hydro and nuclear power plants, the achievement was more than 100 percent for thermal power plants with a total addition of 91730.45 MW in place of the target of 72340 MW. Thus the current status clearly shows the trajectory of the Indian power capacity addition, but the concern is the increasing addition of thermal plants which depend on imported fossil fuels and contributes to global warming.

During the last decade of 2000/01 to 2010/11 the industry sector in India has shown a consistent average growth of 7%. This sector has consumed 45% of the total commercial energy consumed during the period. India has a population of 18% of the total global population but is consuming an energy share of only 5.7%. The energy demand in India has grown 46% since 2000[iii]. The per capita energy consumption of India is much lower than the developed nations. The India Energy Security Scenarios 2047[iv], which has created various future energy scenarios and has made a forecast that the energy demand under the least effort scenario in 2047 will be 22140 TWh. The forecast suggests that with determined effort to bring energy efficiency and energy conservation, the demand can be estimated at 18634 TWh from the current demand of 4929TWh (2012). According to the forecast, the per capita demand also increases from 4053 KWh to 12991 KWh under least effort scenario and to 10934KWh. All these forecasts suggest that there is going to be a huge requirement of capacity addition in the energy sector.

III. Future Energy Objectives

The National Energy Policy of India, 2017 proposes to achieve 100 per cent electrification of all census villages by 2018 and universal electrification with 24 x 7 electricity by 2022. The Policy states that the primary objective is to banish energy poverty in India by making access to energy at affordable prices to the whole population of India. The other objectives of the policy are to achieve energy security, sustainability and economic growth through planning the energy future of India. Since all the energy forecasts suggest a huge surge in energy demand, the government of India shall plan its policy measures carefully to meet the future requirements. In addition to meet the energy demand, the government is also responsible to create demand for energy from the rural poor who have no access to clean energy.

India is over dependent on fossil fuels. More than 60% of its electricity is generated by thermal power plants. The Thermal Generation capacity will increase significantly in the coming decades according to NITI Ayog, the policy making body. According to the reports it has published[v] the thermal generation capacity to go up from the current 149GW (2012) to 290 GW in 2047. The coal based power generation will account for 253 GW while the remaining 37GW will be fired with gas. This is 25.3% of the total electricity requirement and this is possible only if the other major sources of energy such as renewable, large hydro and nuclear power make their contribution of the remaining 74.7% of power generation. The policy clearly envisages a reduction in the share of the carbon fuels in the energy mix, but it is also pertinent to note that the quantity of fossil fuels required for power generation is almost double to the current levels of consumption.

IV. Sustainable Energy options for India

Solar and the wind are dominating the sustainable energy policies across the globe. Based on various factors like geopolitical bargain of a nation and availability of natural resources, what a country may treat sustainable to them may not be sustainable to other nations. This is because sustainability has been understood to mean only the tradeoff between certain positive and negative factors of a particular energy system. For example, India is having huge energy requirement. It is also under international obligation to minimize the carbon footprint. More than 70% of its electricity production is using gas and coal[vi]. We are polluting environment and exhausting the resources, but are attempting to meet the needs of the present generation. Thus it is important to have an internationally acknowledged legal definition for sustainable energy.

Renewable energy is intermittent in nature. Since solar energy depends on the sun light, the climatic conditions will affect the power generation to a large extent. The seasonal differences also cast an important impact in the energy production. The energy production during summer will be greater, but the same level of production cannot be obtained during winter.

Solar power also uses huge area of land. To produce 1MW of solar power, it requires 2 hectares of land. Solar panels thus may actually affect the ecosystem of the area of installation. This makes it difficult to deploy huge solar power plants in population dense states.

V. Electricity Price Comparison From Various Sources

In India the domestic and agricultural sectors enjoy cross subsidy from the industrial and commercial users. The electricity tariffs set by CERC and SERCs vary by regions and hence make it difficult to provide a database of power prices in India[vii].Solar energy is propelled by the falling cost of power per unit, which has come below Rs. 5/- per unit. Solar has now become the cheapest source of energy and is driving Indian ambitions of achieving self-reliance of energy resources.

Nuclear energy is expensive compared to coal based power[viii]. Nuclear energy at current prices will cost Rs.6.3/- per unit. The cost may be further increased if there is any delay in the construction and commissioning of the plant. The experiences in the sector suggest such delay is possible. Such delay may happen due to public unrest and agitation against a nuclear power plant being built in their backyard or due to delay in commercial contracts sourcing and securing the supply of radioactive fuel. The world nuclear association in its report titled Nuclear Power Economics and Project Structuring suggest that the prices of nuclear energy based electricity is heavily influenced by the capital cost of the power plants, which accounts for almost 60% of the levelised cost of electricity. Even though Nuclear Energy is costly, it is still significant in a clean energy mix.

VI. The Inevitable Energy Transition to Clean Energy

To produce more electricity without increasing carbon emission India may have to switch to other sources like nuclear. Due to international restrictions on the sale and transfer of nuclear materials, India forced to consider the efficient use of fossil fuels as the currently sustainable way for its growth and have added more coal fired power plants[ix]. India thus making capacity addition in the thermal power plants to ensure the stable supply of electricity.

The proposed National Energy Policy 2017 acknowledges the over dependence of India on imported fossil fuels. We are at huge risk if the import is disrupted, and will undermine our energy security. To overcome this situation, the new policy proposes to enhance the energy security through diversification of the sources of imports and increased domestic production and efficiency.

As long as fossil fuels remain cheapest energy source sustainability concerns will take a back stage when it comes to addressing energy accessibility at affordable prices. Solar and wind technologies are yet not the cheapest sources of energy. They also cannot provide a stable supply of electricity unless supported by another source of power. It is inevitable that within a century, the fossil fuel deposits on earth will be completely consumed and burned into greenhouse gases. The energy sources will be completely non fossil fuel based. The transition is inevitable and it has begun.

No renewable technology is as reliable and cheap as fossil fuels and thus the transition is difficult unless and until, the fossil fuel deposits get completely dried up. If we are not prepared for such a situation, the future energy security of this country is at risk.

VII. Nuclear Energy as a source of Clean Energy

Nuclear energy is an option which can support this transition from a dominantly carbon dependant energy mix to completely sustainable energy mix by providing stability to the grid. Nuclear Energy can be used to create energy in abundance with continuous supply. Nuclear plants can support renewable sources and can create a more reliable grid. When the reactors are operating correctly, nuclear energy is not harmful to the environment[x]. There are various academic studies which suggest the ecological benefits of nuclear power[xi]. If spent fuel is recycled properly the concerns of nuclear waste can also be addressed[xii]. The Fukushima incident has raised the demand for abandoning nuclear fuels. But the surging demand for clean energy may still hold the nuclear claims valid.

VIII. The Cost of Nuclear Plants

The 2015 edition of the OECD study on Projected Costs of Generating Electricity considered the cost and deployment perspectives for small modular reactors (SMRs) and Generation IV reactor designs – including very high temperature reactors and fast reactors and observed that nuclear energy is competitive enough in those countries.[xiii]The US Energy Information Administration (EIA) calculated thatthe realized overnight cost of a nuclear power plant built in the USA grew from $1500/kWe in the early 1960s to $5339/kW today.

The International Atomic Energy Agency (IAEA) defines 'small' as under 300 MWe, and up to about 700 MWe as 'medium'. Together they are now referred to by IAEA as small and medium reactors (SMRs). However, 'SMR' is used more commonly as an acronym for 'small modular reactor', designed for serial construction and collectively to comprise a large nuclear power plant.[xiv]

A report published by Ontario Ministry of Energy, proposes designs for small off-grid remote sites. Ontario proposed reactors use a medium level technology and are expected to be competitive with diesel fired plants[xv]. SMR is development in western countries is at a progressive stage due to increased investment by private parties, including small companies. The surge in private investment indicates a progress in R&D in the private sector and expresses strong social entrepreneurship goals of investors to avoid carbon emission[xvi].

Small Modular Reactors (SMRs) have more simple designs with generation capacity of less than 10MW. They are expected to have economy of series production; short construction times, and reduced other costs. They are designed with high level of inherent safety in case of malfunction and are not susceptible to terrorist's attacks due to its underground design. SMR can be built in a controlled factory setting due to its small size. The inherent safety features is an advantage for countries with less experience to install and may lead to better financing options. The requirement of cooling water is also comparatively lesser and thus is suitable even for remote locations.

The International Atomic Energy Agency, in its 2009 estimates, observed that there will be 136 SMRs operational by 2030. Currently there are 125 SMRs in operation in 28 countries[xvii]. The most advanced SMR projects are in China. Europe is trying to develop a U-Battery, which can be used as plug and play, with inherent safety features and would run for 5-10 years without service or refueling.

India currently has two SMRs of which 220 MW project of NPCIL[xviii] is in operation and another project by BARC with 300MW capacity is yet to be commissioned[xix]. The International Atomic Energy Agency in which India is also a member, has developed a detailed program with a view to support the efforts of its members in identifying key enabling technologies in development of SMRs[xx]. They extend their support in technology development, safety measures, and in addressing common issues at technology level and policy and implementation level.

IX. Nuclear Energy and International Non Cooperation

The current nuclear energy capacity in India is 5,780 MW. We are in the process of adding another 4,900MW to make it a total of 10,680MW by the end of the decade.[xxi] The currently known Uranium deposits may get exhausted in short term, but the scientists suggests that the advancement of technology and recycling of the fuel can help the nuclear power to run for a long term[xxii]. The scarcity of uranium results in increased costs compared to renewable energy solutions.

One major challenge India face is the international restrictions in its nuclear energy program. Nuclear Supply Group is still not accessible to India. The major reason for all these restrictions is the nuclear weapons for peace program of the government of India. Though we follow the policy of 'no first use', the international community is not convinced with the promises of the government of India. They want a complete halt to Indian nuclear program. To put pressure on India they are continuing the non-cooperation in the international nuclear energy front.

India, in the past was successful in drawing some international bilateral agreements for nuclear cooperation which has given boost to India's national nuclear energy programs. Russia, Japan, USA and Australia are some such cases.

China is aggressively approaching the energy transition to a low carbon economy through its policy measures and deployment of new technologies. Deployment of more nuclear power stations is one of

the prominent policy measure they have adopted to achieve this objective[xxiii].

Co-benefits derived from international cooperation on climate change and clean air can be the nucleus for formation of coalitions and can result in achieving larger objectives[xxiv]. Thus India being a country which is one of the largest carbon gas emitter deserves international cooperation and support to develop a clean energy mechanism to meet its commitment to its own citizens with economic development and universal access to low cost energy. Since India is not a member to the nuclear no proliferation treaty and has not opened up all its nuclear facilities for inspection, it is facing non-cooperation from the Nuclear Supplier Group (NSG). Even though India was able to obtain some support for its entry to the group from countries like USA, Russia, Mexico, etc., China has opposed the entry strongly[xxv].

According to the guidelines adopted by the members of NSG in 1994, a transfer is authorized by a supplier only when it is satisfied that the transfer would not contribute to the proliferation of nuclear weapons[xxvi]. The group thus ensures the extended implementation of the Non-Proliferation Principle. Even though many NSG members oppose the entry of India due to it not being a member to the Nuclear Non Proliferation Treaty, India has also stated other political reasons for its entry denial. These include the Chinese opposition to India emerging as a global power and US inability to convince member nations[xxvii]. According to the NSG members, the India nuclear regime allows an easy diversion of nuclear materials from the civilian reactor complexes to the military uses. The international Community is critique about India's decision not to fully separate its civilian and military nuclear facilities[xxviii]. Another concern raised was that some of the civilian facilities in India are ostensibly safeguarded while others are not[xxix]. The Members believe that the inclusion of India with its suspicious civilian nuclear regime, will negatively affect the existing dynamic of the group. India is not signing NPT as it allows only five states to legally possess nuclear weapons[xxx].

India has explained that it has approached NSG not with any political or strategic considerations, and only for the expansion of its clean and green energy program. India is appealing that the NSG members should consider the actual performance of the country in non-proliferation and its commitment to international peace rather than raising the issue of not signing the treaty.

Bureau of Energy Efficiency, a statutory body under the Ministry of Power, Government of India has notified threshold energy consumption for 12 high energy consuming sectors vide S.O. 394 (E) dated 12th March 2007, 3542 (E) dated 29th December 2015 and S.O. 1388 (E) dated 02nd May, 2017. Imposing such barriers for energy consumption need not always result in the desired objective of energy efficiency and energy consumption but may affect the economic growth adversely.

X. The Required Policy Change

One key policy change that would enhance Indian chances of an improved international nuclear fuel access will be to allow private investments in the sector. Allowing private investment in any sector invites huge criticism in India. Having shared captive power generation using nuclear fuel is a way forward for industrial growth. Big industries like cement, fertilizer, steel, refinery etc has the requirement of huge power consumption. The existing thermal captive facilities can be converted into nuclear facilities.

This will help India to allow international organizations to have access to those power plants and international community will be confident to deal with the private investors as they can ensure that the fuel they supply will not be diverted for the defense purpose. This can secure India international cooperation in nuclear energy and energy security. Even though the western countries have achieved greater deployment of nuclear power plants, the near future surge in the nuclear energy will be witnessed in Asia driven by the high demand for energy from India and China[xxxi]. The nuclear energy policy and legal regime in India should be capable of dealing with the current state of affairs and has to gain international confidence and cooperation[xxxii], but not at the cost of its security interests.

XI. Conclusion

To Move forward and to secure clean energy and energy security, India should make some clear policy changes with respect to its nuclear energy program. One such measure can be allowing private investments in nuclear energy and allowing captive power plants for large industries. India should take some actions to reassure NSG members to gain confidence. This can be by completely separating its civilian nuclear program completely from the military

program. The efforts can be more beneficial if the civilian nuclear program is privatized. It will be difficult for India to ensure the NSG cooperation based only on its diplomatic efforts. India has to make necessary policy changes at home.

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