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NUCLEAR ENERGY & NUCLEAR INSURANCE IN INDIA

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I. INTRODUCTION

India is a developing economy and it is heading to be among the developed economies' club. This Herculean Task requires lot of sustained infrastructure development. Energy production is most pivotal among all infrastructure needs. Energy supports the development activities and its price and supplies have cascading effects on almost all facets of development. Out of all types of energy, electricity generation has been on painful stretch in recent times. On one hand, political economy does not allow price revisions for electricity consumption, derailed coal supplies and ever-inflating fossil-fuels and on the other hand, increasing demand on account of population explosion and need for infra development, are spreading panic across the economy and it is delaying the break-evens of power generating companies.

India with GDP of more then USD 1.23 bn (PPP basis USD 2.3 bn), is tagged as fifth largest economy but per capita energy consumption is 530 Kg of Oil Equivalent which is much below the world average of 1800 Kg of Oil Equivalent. India has been chiefly dependent on traditional thermal power generation while the alternative ways of power generation has gained importance in last decades because of depleting oil reserves. These alternative sources in nascent phase are hydro electric, wind energy, bio-mass, solar energy, geo-thermal and Nuclear energy. The Nuclear energy is found to be more efficient then others sources of power generation. Presently, power generation through nuclear facilities is around 4700 megawatt, which is 3% of total energy production. India aims to build nuclear energy production up to 20000 megawatt by 2020.

Nuclear Energy can be sourced from two types of plants—Nuclear Fission and Nuclear Fusion. The Energy released from Nuclear fusion and fission is highly productive then the thermal power energy. With benefits of no greenhouse gases release and high level of productivity, it is imperative for India to gain significant Nuclear energy establishment. On the other hand, as process involves highly risky nuclear reactions and radioactive radiations, the risks associated

with nuclear plants are much higher. The Nuclear plants use radioactive elements like Thorium or Uranium, which are highly dangerous to human life if exposed. Around 14 out of 19 nuclear power plants in India are operational and rests are in development phase.

(a) Nuclear Disasters: Structures

Nuclear facilities have two critical areas called as Hot Zone and Cold Zone. The Hot Zone is the area where nuclear reactions take place and nuclear fuels are preserved while the Cold Zone is non-nuclear reaction area in which people densely live and this area may be affected by nuclear disasters. The Hot Zone is congregation of nuclear assets, which are very costly and important for companies/ corporation to be covered.

Nuclear Disasters can destroy the hot zone's nuclear assets, which needs coverage by nuclear insurance. Secondly, it may expose nuclear fuel to contaminate environment and expose people to hazardous radiations, which may take decades to deplete to tolerable limits. The affected people may have following consequences:

a) Deaths due to exposed radiations

b) Spread of various types of fatal cancer like diseases,

c) Evacuation of people, loss of employment and social structures

d) Loss of natural resources due to contaminations and long run clean up exercises to reinstate the usability of resources,

e) Traditional problems of rehabilitation and

f) Reinstatement of power generation.

(b) Flashback: Nuclear Disasters

Chernobyl Nuclear Disaster in 1986 in Ukraine and recently, Fukushima Nuclear plant in Japan has awakened the world to the hazards of having Nuclear Power Plant. Chernobyl Disaster took place due to operational failure while Fukushima radiation threatened the coastal population of Japan due to exposed nuclear fuel in environment caused by intense earthquake. Nuclear facilities can be targets of terrorists or they can be used for amassing nuclear weapons. Release of nuclear wastes is highly unstable and it can cause fatal effects on life and health over very long periods i.e. more then 25-30 years. Break-even for nuclear facilities extends up to 15-20 years with heavy capital investments. Chernobyl Disaster affected the 500 km area and 335000 people in spite of the fact that it had one tenth of nuclear fuel in comparison to Fukushima Nuclear facility in Japan. The evacuation of people on large scale decamped the social structures and complicated the rehabilitation. Chernobyl was not covered through insurance.

Fukushima Disaster was caused by damages to nuclear plant due to natural catastrophe i.e. Tsunami and earthquakes. The disaster led to exodus of around 130000 people from 30 km

area near the facility. Fact of appreciation is that nuclear fuel in Fukushima facility was ten times more than the Chernobyl facility. Owing to high culture in Japan, people handled the disaster with cooperation but the people deny returning to the prone area, as the tolerable limit of radiation set by government is contentious. The accumulated deficit of Japan is twice the total GDP of Japan is another deterring factor in recovery. The liability of damages in Fukushima was mainly indemnified by the state.

II. CHALLENGES OF NUCLEAR INSURANCE AND POOLING

Wide variety of dimensions of risk associated with Nuclear power, Nuclear Insurance becomes inevitable and complicated. Each nuclear facility is unique in its structures hence traditional experience cannot be used in pricing the product and pooling the finances, which is possible in other form of insurance. The pricing of nuclear product depends on underwriters' inspections of plants, which is not allowed by many countries like India. The accumulation of nuclear experience is almost nil due to very few nuclear disasters occurred.

The Claim amounts can be so huge that single company cannot afford to offer nuclear insurance products and it may derail the company's solvency. The nuclear disasters can instigate cross-border issues which my fall in purview of international law which brings in more complexities in claim settlement process and estimating the nuclear liabilities. Nuclear disasters have effects that last more then 2-3 decades and accommodating such liabilities is cause of disagreement between state and insurers. Natures of claims and claimants vary widely because of claim settlement process and legal frameworks have lot of grey areas. Contrary to this, there is demand for one-policy for all variety of claims and claimants. The common claim settlement process should also exclude need of proving the damages by claimants.

Generally, insurance policies have exclusions related to casualties resulting from catastrophe like war, natural calamities, radiations etc. The Chernobyl disaster's compensation for governments of affected countries had provided civil liabilities and it had exceeded sever times the total capacity of entire nuclear insurance industry. Nuclear insurance is low frequency and high cost event business in comparison to other classes of insurance businesses. Potentially unlimited claims and lack of accumulated experience and statistics make it difficult to price nuclear insurance product difficult.

The pooling has been effective tool for coverage to nuclear industry where in all insurers jointly contribute the resources under an agent/underwriter and make a financial pool. There are almost 26 nuclear pools are functioning world wide to cover the nuclear facilities though there resources are itself not sufficient to cover all nuclear facilities in the world. According to study, the mortality rate of

wind energy is 0.15 deaths per terawatt-hour production, which is much higher, and then the mortality rate of nuclear energy i.e. 0.0009 deaths per terawatt-hour production even after including the mortality of Chernobyl disaster. According to US Nuclear Regulatory Commission (USNRC), following model-Probabilistic Risk Assessment (PRA) can be used to profile various levels of events and risk associated with nuclear disasters. These levels are Level-1, Level-2 and Level-3.

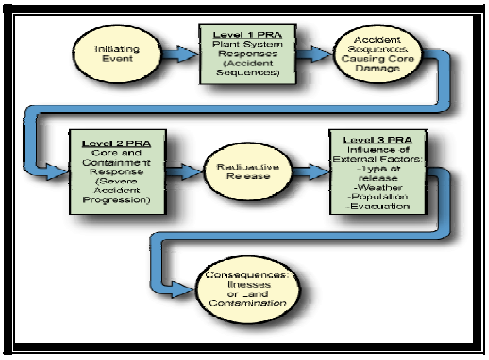

Fig.1 : Probabilistic Risk Assessment Model

Source: Website of US Nuclear Regulatory Commission, Probabilistic Risk Assessment

- A Level 1 PRA estimates the frequency of accidents that cause damage to the nuclear reactor core. This is commonly called core damage frequency (CDF).
- A Level 2 PRA, which starts with the Level 1 core damage accidents, estimates the frequency of accidents that release radioactivity from the nuclear power plant.
- A Level 3 PRA, which starts with the Level 2 radioactivity release accidents, estimates the consequences in terms of injury to the public and damage to the environment.

In USA, according to article by Insurance Information Institute-USA and regulations under Price-Anderson Act-1957, damages due to accidents arising from nuclear facilities are insured through two-tier system. The Tier-I of the system has pool by American Nuclear Insurer (ANI) to honor the private liability arising due to sabotage, theft, transportation of nuclear fuel, operational failures others that can cause casualties related to health, death, disease, evacuation, loss of employment etc. The Tier-2 responds to the accidents arising out of Earthquakes. The Tier-2 of the system has pool committed by nuclear operators. At the time of claims, the nuclear operator and insurer contest the amount of claim on the principle of indemnifying and assessing the eventual damage. So far, the Tier -2 pool has risen to USD 12.2 bn and only USD 78 mn have utilized for claims settlement. In spite of successful pooling, there are 2000 cases of injury claims pending in USA. These cases are difficult to settle as the radiations have long lasting effects, which are not visible instantly but erupts through genetic modifications in long run.

In case of Japan, aftermath Tsunami disaster in March 2011, the quake caused damages to

Fukushima plant and such event was not covered hence the burden of compensation amounted on state. Japan Atomic Energy Insurance Pool provides indemnification against damages due to terrorist attacks, property, general liability and nuclear liability. According to a study, effects of damages are dependent on culture of the nation/society. If culture is weak then damages are more intense then that of a strong culture nation.

After Chernobyl disaster of Ukraine, Ukraine outsourced its nuclear reinsurance to Russia for its Nuclear Insurance requirements. Russian and Chinese nuclear insurance-pools swap their nuclear risk worth USD 10 million in 2008 that started the inter-country cooperation in mitigating nuclear risks.

III. NUCLEAR INSURANCE IN INDIA: CHALLENGES

In Year 2011, IRDA initiated the draft discussions on creating nuclear insurance pool for accidental damages from nuclear disaster. The General Insurance Corporation has been given task of assessing the amount of risk pool required and definitions of damages from nuclear disasters. However, challenges are more diverse. As Indo-US nuclear deal is going to flood USD500 billion investments for nuclear facilities in India, the nuclear energy is going to experience great expansion phase. Presently around 3% of total power generation is contributed by Nuclear power in India.

The Civil Liability for Nuclear Damage Bill 2010 caps the liability of nuclear operator at Rs. 500 Crore, and damage exceeding up to SDR 300 mn is to be paid by Government of India. All private operators/ partner in PPP are required to cover their liabilities through nuclear insurance. The liability cap on the operator (a) may be inadequate to compensate victims in the event of a major nuclear disaster; (b) may block India's access to an international pool of funds; (c) is low compared to some other countries. The cap on the operator's liability is not required if all plants are owned by the government. It is not clear if the government intends to allow private operators to operate nuclear power plants. The government will notify the extent of environmental damage and consequent economic loss. This might create a conflict of interest in cases where the government is also the party liable to pay compensation. The right of recourse against the supplier provided in the Bill is not compliant with international agreements India may wish to sign.

The time limit of ten years for claiming compensation may be inadequate for those suffering from nuclear damage, which takes decades to overcome. Though the Bill allows operators and suppliers to be liable under other laws, it is not clear which other laws will be applicable. Different interpretations by courts may unduly constrict or expand the scope of provisions.On the model of Russia and China swaps of nuclear insurance risks, India may find

it difficult to have alliance for such swaps with its neighboring countries and at the same time, weak culture of handling disaster may aggravate the disasters. As nuclear power has been domain of government only, there was hardly any effort of covering the liability as government is supposed to pay compensation from its own resources so it is redundant that government should have extra burden of paying premium. Individual companies have never built up its capacities and expertise for nuclear insurance pool as there was no demand of nuclear insurance.The opaqueness in legal framework for handling claims, exclusion of reactor plate-form damages is also deterrent in attracting private players in nuclear energy. Only cold zone i.e. outside the reactor zone is covered by nuclear insurance is not amicable to private players. In absence of scientific mechanism of pricing and pooling of nuclear insurance, the inclination of insurer towards high price is obvious and it will make nuclear insurance unattractive and costly. Owing to high population density, the damage of nuclear accident may exceed the compensation available under Civil Liability on Nuclear Damage Bill 2010 and for the accesses; India must be member of international conventions to draw additional claims. As India adopts protectionism policy on nuclear development, India is unlikely to get membership of international conventions on nuclear energy, as it requires mandatory disclosures and inspection of nuclear facilities and membership of UN's Non Proliferation Treaty.

General Insurance Corporation Re of India has been successful in creating pool through insurers up to $78 million and Nuclear Civil Liability Bill is covering up to $342 million per event per reactor, which is the balance GIC Re is looking to offload to overseas reinsurers. Owing to reservation of India about inspections of nuclear plants by international underwriters, GIC Re is finding it difficult to convince the overseas reinsurers and suitable pricing of nuclear insurance.

IV. CONCLUSION

The main problems of nuclear insurance in India are creating adequate pool, pricing of product and legal framework. The creation of sufficient nuclear pool requires reinsurance to overseas, capital infusion in insurance companies through public issues, jointly making pools with neighboring countries, collecting energy cess from individual taxpayers and corporate taxpayers, charging inbound nominal tax on FIIs etc. Creation of pool through reinsurance requires international nuclear underwriters to visit the hot zone of nuclear facility which can be modeled as per China and Russia also allow the underwriter/inspector visits to their nuclear facilities. On the lines of education cess, nuclear cess can be added in tax brackets. Presently, total tax collection of Government of India is

estimated to Rs.9.3 lac Crore. Adding even 0.25 %, nuclear cess would bring great amount and that can be routed to nuclear pool. FIIs activities can also be taxed minimally to finance to nuclear pool.

As there is lack of experience and statistical data for pricing the nuclear insurance products, the pricing can be devised by understanding the market value of property and health expenses, which may arise due to nuclear catastrophe. An indexing agency can be formed to index the variations in the market values of above-mentioned expenses, it should revise its standards and indexing methods to be relevant to the real situation, and accordingly, insurance companies can price the products.

The population density in and around the nuclear plant should be regulated with due diligence so that it does not reach to a critical level where it can aggravate the nuclear disaster. The rehabilitation areas should be identified and the families residing near the nuclear facilities should be informed about rehabilitation areas so that they have clear idea of where to go in the event of evacuation. Medical facilities should be regularly updated about the medications required in the case of nuclear disaster and the stock of medications and diagnosis equipments should be readily available.

All these measures and many others will help in reducing the aftereffects of nuclear catastrophe and will help in pricing the nuclear insurance products.

REFERENCES

[1] Dr Manisha Singh and Dr Renu Verma, “Nuclear Insurance in India”, IRDA Journal, Volume X No.6, June 2012

[2] Roberta C. Barbalace. Chernobyl Nuclear DisasterRevisited.nvironmentalChemistry.com. 1999.Accessed on-line: 6/30/2012, http://EnvironmentalChemistry.com/yogi/hazmat/articles/chernobyl1.html.

[3] IAEAWorldatom web site

[4] G.C.Warren, “Nuclear Risks”, British Nuclear Insurers, 2000 (now: Nuclear Risk Insurers)

[5] Brown, O.F. 2004, Nuclear Liability paper at

[6] Brain, S. 2006, personal communication (former chairman of the Australian Nuclear Insurance Pool from 1985 to 1997) re initial section.

[7] NRC factsheet on Nuclear Insurance, May 2005.

[8] Website of World Nuclear Association, “Liability for Nuclear Damage”, Updated March 2012.

[9] Wikipedia contributors. "Comparison of Fukushima and Chernobyl nuclear accidents." [10]Wikipedia, The Free Encyclopedia. Wikipedia, The Free Encyclopedia, 30 Jun. 2012. Web. 1 Jul. 2012.

[11] Myles Gough, “Early estimates of Fukushima's toll”, Cosmos Online, 21st September 2011, http://www.cosmosmagazine.com/news/4764/www.cosmosmagazine.com.

[12] Acton J.M. & Hibbs M,“Why Fukushima was preventable”, March 2012 Carnegie Paper.

[13] “GIC Re Mobilizes $78 m for nuclear pool”, The Financial Express, 1st July 2012.“India may have

to look abroad for N-cover", The Times of India,
14th December 2011.