A FOCUS ON THE NEED FOR CIVIL NUCLEAR ENERGY RESOURCES IN INDIA AND IT'S THREATS TO THE ENVIRONMENT CRITICALLY ANALYZING THE INDIAN CIVIL NUCLEAR REGIME

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Abstract: While the development is invariably coupled with the energy without which it is impossible for the development to sustain,The globe in general and India in particularly after 1991 Economic reforms has taken an extravagant pace in development but then the proportionate energy supply is at cross roads owing to it's hyper exploitation.Most of the energy demands met in India by Coal followed by the other sources Since the Coal resources has been depleting, In order to safeguard the energy demands of our Nation it is indespensible to create an Alternate energy resources.At this juncture the Paper projects the Civil Nuclear energy with accurate scientific safeguards can become an effective alternate energy.At first the Paper discusses about the Nuclear history in India then it's Nuclear reactors at various places,Three step/phase development of nuclear industry,and other vital issues.Apart from the general information of Nuclear industry the Paper put's the Negative role of Civil nuclear energy effecting Environment which has to be addressed by means of Proper safe guards and acquiring scientific knowledge from the resourceful Nations.Finally with all the Pros and Cons pertaining to civil nuclear energy the Paper immensely elevates the Sustainable need for the civil nuclear energy because the present energy resources causes Anti Natures manifestation called Global warming that badly damages the Natures credibility and governance as well.

Keywords: Civil Nuclear energy, Environment, Nuclear reactor.

Introduction: Indian Nuclear History

1947: India becomes Independent, **1948**: Atomic Energy Commission established , **1956**: Negotiates with US andCanada for nuclear reactor,**1962**: War with China,**1963**: Two research reactors and four nuclear plants in operation, **1964**: China detonates nuclear bomb **1965:** War with Pakistan over Kashmir,**1968:** India refuses to signNuclear Non-Proliferation Treaty,**1974**:India performs 15kt

Nuclear Power in India

- India has a flourishing and largely indigenous nuclear power program and expects to have 14,600 MWe nuclear capacity on line by 2020. It aims to supply 25% of electricity from nuclear power by 2050.
- Because India is outside the Nuclear Non-Proliferation Treaty due to its weapons program, it was for 34 years largely excluded from trade in nuclear plant or materials, which has hampered its development of civil nuclear energy until 2009.
- Due to these trade bans and lack of indigenous uranium, India has uniquely been developing a nuclear fuel cycle to exploit its reserves of thorium.
- Now, foreign technology and fuel are expected to boost India's nuclear power plans considerably. All plants will have high indigenous engineering content.
- India has a vision of becoming a world leader in nuclear technology due to its expertise in fast reactors and thorium fuel cycle.

"Peaceful Nuclear Explosion". US & Canadasuspend their nuclear cooperation with India. Nuclear Supplier's Group formed

1998: India detonates both fissionand fusion devices,**1999**: Indian population exceeds 1 billion.Kargil War with Pakistan. Pakistan threatens to use nuclear weapons **2006**:President Bush declaresIndia a Nuclear Power,**2008**: NSG approves trade with India US-India Nuclear deal signed.

Nuclear power supplied 20 billion kWh (3.7%) of India's electricity in 2011 from 4.4 GWe (of 180 GWe total) capacity and after a dip in 2008-09 this is increasing as imported uranium becomes available and new plants come on line. Some 350 reactor-years of operation had been achieved by the end of 2011. India's fuel situation, with shortage of fossil fuels, is driving the nuclear investment for electricity, and 25% nuclear contribution is the ambition for 2050, when 1094 GWe of base-load capacity is expected to be required. Almost as much investment in the grid system as in power plants is necessary.

Three Stage Nuclear Fuel Cycle: Because of India's lack of uranium recourses, everyeffort has been made to draw as much power as possible out of the uranium they do have. Using a combination of their Advanced Heavy Water Reactor and Fast Breeder Reactors, the Indian program is able to reprocess thisfuel. After the uranium is run through the AHWR once, it is sent to a fast breeder reactor and used to produce energy once again. The plutonium which is extracted from the fast breeders is then used in the AHWR with 'thorium' as the mainfuel. At the end of

the third reaction, the nuclear waste is much less in volume and in a far less hazardous form.

Indian nuclear power industry development &Nuclear Reactors: The Atomic Energy Establishment was set up at Trombay, near Mumbai, in 1957 and renamed as Bhabha Atomic Research Centre (BARC) ten years later. Plans for building the first Pressurised Heavy Water Reactor (PHWR) were finalised in 1964, and this prototype – Rajasthan 1, which had Canada's Douglas Point reactor as a reference unit, was built as a collaborative venture between Atomic Energy of Canada Ltd (AECL) and NPCIL. It started up in 1972 and was duplicated Subsequent indigenous PHWR development has been based on these units, though several stages of evolution can be identified: PHWRs with dousing and single containment at Rajasthan 1-2, PHWRs with suppression pool and partial double containment at Madras, and later standardized PHWRs from Narora onwards having double containment, suppression pool, and calandria filled with heavy water, housed in a water-filled calandria vault.

The Indian Atomic Energy Commission (AEC) is the main policy body. 2.The Nuclear Power Corporation of India Ltd (NPCIL) is responsible for design, construction, commissioning and operation of thermal nuclear power plants.

India's operating nuclear power reactor					
Reactor	**State**	**Type**	**MWenet, each**	**Commercial operation**	**Safeguards status**
Tarapur 1 & 2	Maharashtra	BWR	150	1969	Item-specific
Kaiga 1 & 2	Karnataka	PHWR	202	1999-2000	
Kaiga 3 & 4	Karnataka	PHWR	202	2007,(due 2012)	
Kakrapar 1 & 2	Gujarat	PHWR	202	1993-95	December 2010 under new agreement
Madras 1 & 2 (MAPS)	Tamil Nadu	PHWR	202	1984-86	
Narora 1 & 2	Uttar Pradesh	PHWR	202	1991-92	In 2014 under new agreement
Rajasthan 1	Rajasthan	PHWR	90	1973	Item-specific
Rajasthan 2	Rajasthan	PHWR	187	1981	Item-specific
Rajasthan 3 & 4	Rajasthan	PHWR	202	1999-2000	Early 2010 under new agreement
Rajasthan 5 & 6	Rajasthan	PHWR	202	Feb &April 2010	Oct 2009 under new agreement
Tarapur 3 & 4	Maharashtra	PHWR	490	2006, 05	
Total (20)			**4385 MWe**		

Madras (MAPS) also known as Kalpakkam, Rajasthan/RAPS is located at Rawatbhata and sometimes called that Kaiga = KGS, Kakrapar = KAPS, Narora = NAPS, dates are for start of commercial operation

Source:World Nulear Assosiation

Safety Features of the Indian Thorium Advanced HeavyWater Reactor Design: The Indian thorium fueled Advanced Heavy WaterReactor has been designed with safety as a top priority. It has several innovative and and passivesafety features that would effectively shut downthe reactor in the event of any foreseeableaccident. Along with the conventional activeshutdown capabilities such as scramming orflooding the reactor with coolant, the reactor alsohas several passive shutdown systems that willautomatically activate in the event of a hotshutdown, prolonged shutdown, or loss of coolantaccident. During normal operation, coolant is circulated by natural convection instead of pumps,so a loss of power will not cause a loss of coolant.If a loss of coolant accident did happen, the risingtemperature would cause the automatic release ofa reactor poison into the system, that would kill thereaction. If this system were to fail, and thetemperature continued to rise, the large gravitydriven water pool at the top of the reactor buildingwould automatically start flooding the bottom the reactor cavity, effectively submersing the wholereactor core. If the reaction rate continues toincrease, there is enough coolant to keep there isenough coolant to keep the reaction in check for72 hours, more than enough time for the operatorto step in and manually shut down the reactor.

Environmental effects of Nuclear energy sector:

1.There is an every possible chances of accidental leakage(Technical faults) of Nuclear material into the environment that causes severe damage to all the spheres of environment be it is Atmosphere,Hydrosphere,Lithosphere.

2. Nuclear reactors catastrophes In case of natural calamities like Tsunamis Ex:Fukushima nuclear reactorof Japan.

3. Safety of Residential areas near by Nuclear reactors is always a matter of concern pertaing to the following issues

a. Local people's consensus.
b. Effective rehabilitation and Rescue during accidents.
c. Regular monitoring by the Higher authorities

4. The nuclear catastrophe if happens makes an area unfit for centuries owing to radiations may cause genetic disorders.

Conclusion: Since the Development is inevitably coupled with the energy where as the present Main energy resources Coal badly effecting the nature in the form of Global warming which has adverse effects both on the Nature and biota as well,Therefore Accurate scientific usage of civil nuclear energy with sound safety measures derived from resourceful nations like U.S,France has to be deployed for the the benefit of both the India,mankind and nature as well.

"It is wise to use sound technological principles that uplifts the Nature's Governence"

Note: The information presented by the author is intended for awareness purpose only.The author Neither claim the information presented as his research work nor have any association with the information presented, Which are obtained from reliable sources viz WNA and other related sources pertaing to the Indian Civil nuclear energy which are believed to be credible the author bears no responsibility for the damages to resources information.

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