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Searching Sustainability in Nuclear Power

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Abstract

The Human civilization in the 21st century is standing at such a saturation point where the economic development and the need to maintain the sustainable development goals as set by the United Nations will decide its movement in the times to come. Therefore, the developmental agenda from across all the sectors of human development is looking for the introduction of sustainability. In the quest to sustainability all Nations are trying their hands for nuclear power development. This paper investigates some of the aspects of nuclear energy based on which different countries are looking into nuclear energy sustainability.

Keywords: sustainability, global warming, nuclear energy, Technology, development

Introduction: Energy is central to all the causes of development. In the present times Nuclear Science and Technology (NST) advancement is one of the sources of human development in different indices. It is not possible to see the development of human civilization *san* rise of other indicators and simultaneously meeting the requirement of sustainability in the foreseeable future.[i] There are different metrics of sustainable development, however in general terms it is understood to be the development without compromising with the capacity and need of future generations to meet their own needs.[ii] Sustainability is long lasting without prejudice to equitable needs if the saga of the developmental process is not compromised in the hands of anthropocentrism.[iii] It becomes necessary therefore to look into ways to shatter the idea of supremacy of humans above all, and to find the long lasting solutions -that continuous flow of hundred year lives may better accommodate with mother earth.[iv] It is therefore central in India's case as being the third largest contributor of pollutants on the planet.

Nuclear Energy Requirement: Increasing the supply of energy and access to energy facilities is inevitable for the multisectoral developmental process. In many States, therefore, there seems to be a need for major investment in new electricity production plants, both to increase capacity

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to cope with the constant development of newer technologies for industry and consumer use, and to replace old, environmentally unsustainable, and uneconomic power plants and the hydroelectric projects that both are unsustainable in the long term. In this context, differently aligned other strategic key elements fuel increased interest in nuclear energy, in particular energy security and the environmental benefits attached with it. The period of technology denial[v] is already over.

The growing global demand for energy is invariably linked to the development concerns of the large populace, particularly of those residing in developing States including, India. According to one estimate as many as "1.1 billion people have no access to electricity and the 2 billion others have no access to modern energy systems".[vi] Energy, therefore, is central to the development. It is also indicated in terms of demography that "one in every six people on the planet - do not have access to electricity. Based on a business-as-usual scenario, some 780 million people are projected to remain without it by 2030. A radical new approach is needed if this trajectory is to be remedied".[vii]

As regards future projection is concerned World Energy Forum is stated to have predicted that the fossil-based oil, gaseous reserves and coal will be exhausted in less than another ninety years. Fossil fuels presently account for nearly 80 percent of the "primary energy consumed" in the world. This trend, unless reversed, is not going to account for the developed fate of living beings.

The global "concerns about supply security, triggered by the oil price shocks" in the decade of 1970s, could be regarded as a primary catalyst for civil nuclear expansion in the several States.[viii] But later after Stockholm conference[ix] and Our Common Future report[x], when world became aware of limitless potential in the nuclear power the situation started changing. Today more than 30 Nuclear Power State are dependent on nuclear energy.

Sustainability of Nuclear Power: Production and usage of all forms of energy must pass through the environmental clearances like Environment Impact Assessment (EIA) and nuclear energy as like other forms of energy is not an exception to it. The environmental clearances at times have caused the huge uproar including in India questioning the very idea behind sustainability.[xi] Whether or not the world regards the capacity of nuclear turbine capable of silencing mounting pressure of environmentalists is not the question. The question is what lies ahead.

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The further development around sustainability after 1986 is to be seen in the Earth Summit of 1992.[xii] Among the five documents signed importantly the "Rio Declaration" lays down a "basis on which States are to cooperate and further develop international law in the field of sustainable development." Rio Declaration, importantly, grows the awakening towards EIA by the States and embraces two of the well-known environmental law principles i.e. the polluter pays principle and the precaution principle.[xiii]

The main emphasis of sustainable development in nuclear law is on protection of environment and to not impose undue burden on future generations because of its activities. It has certain far-reaching implications in the civil nuclear energy. As Nuclear reactor technology remains at greater risk "because some fissile material and sources of ionizing radiation can pose health, safety and environmental risks for very long periods of time".[xiv] It is difficult to determine measures due to long lived character of these materials. The evident approach in application of the "sustainable development principle" in the civil nuclear energy "has been to urge that the current generation does whatever is possible for long term safety, but without foreclosing options for future generations and without relying unduly on long term forecasts, which are unlikely to be accurate over the extended timescales involved"[xv]. However, despite of many studies such as Brook and *et al* (2014), reflecting "maximum long term sustainability" with "zero-carbon energy", the principle still needs in terms, broader nuclear energy studies as geological deposition is in purview.[xvi]

The existing technology on nuclear power is not just utilised to supply electricity to the power grid, but at the same time, it is increasingly utilised these days in a wide variety of other uses such as medicinal requirements, heating technologies and increasing space research by different States. Technologically available nuclear medicines use radiation to allow doctors to make a quick and accurate diagnosis of the functioning of specific organs of the eukaryotic bodies particularly human beings, or to treat them specifically. Radiotherapy, as is known currently can better be used to treat some medical conditions, especially cancer, using "radiation to weaken or destroy" particularly targeted cellular bodies. Globally, "millions of affected persons are treated with nuclear medicine" every year. The existing "peaceful applications, of nuclear science and technology in medical, industrial, and agricultural areas have served human civilization" for past few decades. These "applications lead to the spread and use of nuclear and radioactive materials in the hospitals, factories, different research centers and universities". Those working "in nuclear fields recognized the importance of

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keeping their technologies reliable, clean, and improving their sustainability and safety" across all spectrum.

Hospitals too, across the globe use nuclear fuel generated radioisotopes in medicines and other different pursuits. The World Nuclear Association generated data reveals that "the most common radioisotope used in diagnosis is technetium-99, with about 40 million procedures carried out" in a year, accounting for "almost 80% of all nuclear medicine" procedures worldwide.[xvii] The "modern industry also uses radioisotopes in a variety of ways" for human development. Currently, "sealed radioactive sources are used in various ways in industrial radiography, gauging applications and mineral analysis" (IAEA: 2013). The heat, which is generated from the nuclear reactors, can be used directly or as is being used to generate electricity. Thus, there are number of beneficial uses of nuclear energy that make it potent on account of sustainability.

However, as is known that all energy processes required in energy production leave some or the other kinds of "adverse impact on the environment". One of such examples of this type of adverse "impact from nuclear power plants" is the potential "release of radioactive substances" in the territorial environment.[xviii] The "energy use in the long-term perspective should be sustainable and not degrade the environment", yet the "sustainability" of energy seem to be "an elusive and ambiguous concept", involving not only the environmental but also the "economic and social dimensions" of various kinds.[xix] Yet again, as pointed out by Zakaria[xx] that "there are some questions that are still not answered clearly regarding the nuclear energy. One of these questions is whether nuclear power is an economically and environmentally sustainable energy source or not. An apt answer to such question is unavailable but number of States provide answers to such question in different ways. For example, the United States promotes nuclear energy as sustainable source.[xxi]

Looking from the past, the public credence and credentials towards nuclear energy had become more laden with positive sentiments in the first two decades of twentieth century, due not least to improvements in safety and "growing concern about climate change" but more so can be attributed to number of factors that relate to civil nuclear cooperation tide among States including India. Also the "International Thermonuclear Experimental Reactor" (ITER) which is the culmination of ongoing more than three decades of research in the area of fusion energy is an effort in this direction. The ongoing development of this energy source has the dual objective of not only to make provide for sustainable power, but also fighting against the global warming. But, at the same time, it ensures that the "nuclear industry ought to remain

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open and transparent" in order to maintain and further generate the public trust towards it future growth.

When the question of sustainability poses there are "some of the essential components" of NST for any answer to such kind of questions which, must involve the factors like, the input of nuclear fuel, potential environmental effects from the whole fuel cycle (including its number of phases such as plant operation and decommissioning etc.), overall power "production economy" involved, "security measures" that are taken to ensure the safety of the nuclear power plants, management of generated nuclear waste, and that the nuclear byproducts are not put to use for the purpose of nuclear weapons or used in order to threaten the world peace[xxii].

"One of the many reasons" for taking recourse to "nuclear energy" emanates from the serious concerns relating to depletion of existing natural resources and the consequent damage resulting to environment in the new developmental paradigm. Concerns over the increasing "environmental degradation and increasing pollution" levels have led to "increased investment in green technologies". The "Montreal Protocol on Ozone Depleting Substance, 1987" has been successful in "phasing out the ozone-depleting substances; and atmospheric concentrations of these substances have either leveled off or decreased" since the protocol came into effect in the year 1989. On the energy point of view as regards investment is concerned, UNEP's "Global Trends in Sustainable Energy Investment 2019" reports that in year 2018, the global investment in renewable energy resource capacity has 'outstripped' the investment in new conventional resources. However, like in the present, in coming times too nuclear energy is recognized to contribute in the "energy mix policy" of States, as an important source of energy.

Yet, as is seen world over that unsuitable and unsustainable ways in energy "production and consumption" have led to ever more increased environmental law issues and concerns. For a longer duration that law largely overlooked the relevance of energy production and consumption in the discipline of environmental law. The energy related issues were *hitherto* seen with lesser significance in the cause of "sustainable development". This seems changing significantly, before the end of twentieth century, as a result of "increasing global concern about climate change", and in particular with the publications by the UN of the "World Energy Assessment Report".[xxiii] It is currently being followed by the "detailed consideration" of it, at the "World Summit on Sustainable Development" in Johannesburg in 2002 (Lyster and Adrian: 2006) and in its subsequent developments later.

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Conclusion: The relationship of energy consumption with human development is clear. Nevertheless, we are here in tumultuous times wherein the warfare is condescending itself. Taking on the nuclear weapons proliferation in "1996, in its *Advisory Opinion* on the Legality and Threat and Use of Nuclear Weapons", the ICJ recognized "for the first time that there existed the rules of general international law" on environment, though Court did not lay down anything of semblance on nuclear energy or its requirement. However, the subsequent developments recognized their need.

It is to note that warfare is inherently destructive of sustainable development. States shall therefore respect international law providing protection for the environment in times of armed conflict and cooperate in its further development, as necessary.

Currently, after the Fukushima (Japan) nuclear accident States like Germany and Japan have indicated to not to use this means of energy in future. But their reversal of policy is clear based on the developmental goals that they have set in, in their economies. It manifests in legal and policy issues behind some of such reasons too, that avowedly tend to spark debate on the future utility of this power. Having these arguments at times thwarts the purpose and utility of nuclear power.

The ongoing development of NST and this energy source has the dual objective of not only to make provide for sustainable power, but also fighting against the global warming. But, at the same time, it ensures that the "nuclear industry ought to remain open and transparent" in order to maintain and further generate the public trust towards its future growth.

Therefore, it can be said that viewing nuclear energy as sustainable energy source in the light of energy mix policies is fundamentally robust due to not only its innate energy density but also its capacity to internalize health and environmental costs at the given time.

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[ii] See also Sustainable Development Commission, *see* [Online: web] Accessed on 25 May 2024 URL: https://www.sd-commission.org.uk/pages/what-is-sustainable-development.html#:~:text=%22Sustainable%20development%20is%20development%20that,to%20meet%20their%20own%20needs.%22

[iii] Anthropocentrism in literal sense means human-centered, but in its most pertinent philosophical form it is the ethical belief by humans that humans alone possess intrinsic value and are overpowering above all. *see* [Online: web] Accessed on 20 April 2024 URL : https://www.sciencedirect.com/topics/social-sciences/anthropocentrism#:~:text=Anthropocentrism%20literally%20means%20human%2Dcentered,or%20in%20their%20instrumental%20value

[iv] For details *see* Gupta, Mohit Kumar (2017) *Nuclear Nonproliferation and Nuclear Liability: The Law at Crossroad.*

[v] The concept of technology denial carries clear meaning in this sentence. Further, These bodies are the informal bodies and thus do not enjoy any legal Status except in the matter of policies for States, however they affect the law making, e.g. India- United States Agreement on civil nuclear cooperation could only become possible after NSG's waiver approval. *See* IDSA Task Force Report The Nuclear Disarmament: The Way Forward (2010)

[vi]World Economic Forum, *see* [Online: web] Accessed on 16 October 2018 URL: https://www.weforum.org/agenda/2018/08/milagros-rivas-saiz-electricity-access-sdg7/.

[vii] *Ibid.*

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[xii] United Nations Conference on Environment and Sustainable Development see [Online: web] Accessed on 2 June 2024 URL: https://www.un.org/en/conferences/environment/rio1992

[xiii] In the national and international environmental law these days they are at the heart of environmental protection. It is for polluter to bear the costs of causing pollution, in a simplistic way it seeks to internalize the environmental costs through polluter (Principle 16); while the latter assumes (Principle 15) 'where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing such measures', that action should be taken to avoid the risk of damage to environment. *See* Shaw (2008).

[xiv] *Ionizing Radiation and Health Effects see* [Online: web] Accessed on 20 May 2024 URL : https://www.who.int/news-room/fact-sheets/detail/ionizing-radiation-and-health-effects

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