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Legal Dynamics of Intellectual Property Relating To Nuclear Innovations

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The objective of Civil Nuclear Co-operation Agreements is not only to facilitate bilateral co-operation between the two countries but also posit India as a key player in the civil applications of nuclear energy. Civil nuclear industry and companies are likely to capitalize this opportunity by pitching in with their technological inventions that are heavily scrutinized through intellectual property rights regime; particularly 'patents'. Civil Nuclear Co-operation Agreements does not alter India's strategic nuclear program; nevertheless it triggers critical questions with respect to various constraints on inventions in the area of atomic energy as enshrined in the provisions of Indian Patents Act, 1970. Owing to the concerns of dual-use technologies suitable for both civil and armed forces purposes, the rationale of 'national security' has been effectuated through the inter-linking provisions in the Patents Act, 1970 and the Atomic Energy Act, 1962. This has an impact on scientific and technological innovations. This paper investigates constraints on atomic energy inventions *vis-à-vis* the 'national security filters' engrafted in the provisions of Indian Patents Act, 1970. The increasing scope of civil application of nuclear energy on one hand and the lag in pace of legal mechanism that is patent protection, to cope up with fast-paced innovations, makes present study not only crucial but also imperative from both academic and industrial perspective. Based on the comparative review of legal stances adopted by selective regimes, this paper attempts to conceive a balanced approach to deal with the issue in Indian Patent Law.

Keywords: Nuclear Civil Co-operation Agreement, The Patents Act, 1970, The Atomic Energy Act, 1962, Indo-US Civil Nuclear Agreement, TRIPS Agreement, 123 Agreement, patent protection, nuclear energy, atomic energy, inventions, nuclear realities

The Civil Nuclear Co-Operation Agreements that India has entered into with other countries provide the opportunities of international co-operation between the industries relating to civil applications of nuclear energy from such countries. Year 2015 has witnessed major developments in respect of civil nuclear co-operation between India and the countries namely United States of America, Russia, France, Canada, Kazakhstan, Australia and Japan.[1] Such cooperations incidentally focus on the aspects related to Intellectual Property Rights; particularly Patent; the amendment to Atomic Energy Act though is in respect of government companies, but relevant[2] to the aspect of industrial collaboration and Patenting. The grant of patent in India is governed by the Patents Act, 1970, and the development, control, use of atomic energy for the welfare of the people of India for peaceful purposes and for matters connected therewith, is regulated by the Atomic Energy Act 1962.[3] These two laws are interlinked regarding inventions under the Intellectual Property Right, Patent. Section 4 of the Patents Act, 1970 expressly bars the grant of patent for inventions relating to atomic energy and related operations stipulated in Section 20(1) of the Atomic Energy Act 1962. Section 20(1) of Atomic Energy Act 1962 also correspondingly iterates the non-grant of patent to the inventions relating to the aspects stated under this sub-section.[4]

The inter-linking of the provisions amongst the said laws appears in addition to the provisions of 'secrecy directions relating to inventions relevant for defence purposes' and 'protection of security of India'5 under the Patents Act, 1970. Nuclear energy technology by nature is characterized as a 'dual use technology' – the technology suitable for both civil and armed forces purposes – and attracts the examination for 'secrecy directions relating to inventions relevant for defence purposes'; the non-disclosure of patentable information prejudicial to the interest of the security of India; and entitlement of taking any action – including revocation of patent – in the interest of the security of India.[6]

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Private sector entities contribute significantly to the overall research and development domain in relation to nuclear substances capable of 'dual use' applications and the inventions related to dual use nuclear substances being of commercial importance need patent protection. Thus inter-linking of provisions affects scientific and technological innovations related to nuclear substances and their non-nuclear application in private industrial sector.[7]

This paper while addressing 'national security filters'[8] engrafted in the provisions of Patents Act, 1970 of India, questions the inadequacy of the Patent law in terms of coping up with the fast-paced innovations particularly in the field of atomic inventions. It takes into consideration Section 4 of the Patents Act, 1970; as it is directly related to the grant of Patent to atomic inventions.[9] This paper enumerates the industrial collaborations between Indian and foreign companies alongwith some technological developments in the field of nuclear energy. This enumeration is with the intention to provide highlights of industrial collaborations that have existed so far and thus to corroborate the near future possibilities of industrial collaborations in the field of nuclear energy. Further, this paper mentions the Patent laws of selective jurisdictions and the approach with which they deal with nuclear inventions. While summing up the findings, the paper enquires whether Section 4 of the Patents Act, 1970 is an excessive measure for atomic energy related inventions when the 'dual use' technology context is taken into account. The selective jurisdictions that are taken into account reveal an approach to consider the grant of patents for atomic inventions, subjectively. This is in contrast with the Indian approach of absolute prohibition of grant of patent to atomic invention. The paper concludes on the proposition of a need to find a balance between the two approaches as such a balance will encourage international collaborations (wherein the ownership of intellectual property rights would need the appropriate recognition) and also address 'dual use' context.

Background

The issue arising out of the inter-linking provisions between the Patents Act, 1970 and the Atomic Energy Act, 1962 is particularly about whether the inventions related to atomic energy should be expressly excluded from the grant of patent in India? Accordingly it is argued in this paper that Section 4 is additional to provision with reference to Section 157A of the Patents Act, 1970 which is about 'protection of security of India'.[10] There is a need to review the basis of Section 4 of the Patents Act, 1970. Simultaneously Section 20(1) of the Atomic Energy Act, 1962 will also have a corresponding effect to suit the proposition made in this paper

The linking of provisions between two laws impacts innovations related to nuclear power technology in terms of industrial collaborations taking place in this domain in the light of the civil nuclear co-operation agreements like '123 Agreement' and others. Nuclear power technology due to its nature comes under the category of 'dual use' and the applications of 'dual use' technologies may vary from armament related technology to any other.[11] In case of armament technology application, the advantages of IPR may not be commercial but strategic and towards securing national interest - but importantly the technological base is derived from 'peaceful civil-purpose' usage. To cater to this requirement the security related provisions are inserted in the statutes of IPR.

Some nations have already captured an optimal balance by exercising a suitable approach in their statutory mechanisms. The following is the discussion of the same.

Atomic Energy Patents and National Security: The Approach in Selective Jurisdictions

A discussion about protection of inventions relating to atomic energy in India is incomplete without due address to approaches opted by other jurisdictions. Such approaches are essentially reflected in the patent legislations of the corresponding jurisdictions. The comparing of legal framework of other jurisdictions and particularly the provision therein regarding patentability of inventions related to atomic energy will help in deducing the justification of argument proposed in this study. Accordingly, the countries are stipulated selectively to demonstrate and support the argument proposed in this study. The selection of these countries is generally based on their active involvement in the field of nuclear energy. It may be noted that the detailed discussion on the particular relevance of these approaches with Indian scenario, is a matter of further investigations – and as such will require a further thorough study and analysis on other factors including economic, social, political – and hence beyond the scope of this discussion. Nonetheless, the legal provisions of the selected jurisdictions are of particular importance under this

study since they connect specifically to the issue proposed in the argument and may be considered in a comparative manner within the legal framework. The prominent approaches taken into account are American, Russian and European countries namely United Kingdom, France, Germany and Norway.

The approach that USA undertook towards patenting of inventions related to atomic energy has undergone changes with the passage of time. Before World War I, the United State Congress through Commissioner of Patent instructed the withholding of patents for those inventions which would prevent *'successful prosecution of war'.*[12] In 1940, such provision of law was amended and the withholding of patent under secrecy order was to apply only when the nation was at war.[13] Later in the Patent Act, 1952, the law provided that the inventions coming under 'secrecy order' be determined by the 'defence agency of United States' instead of Commissioner of Patents.[14] The issue of determining the inventions falling under 'secrecy order' also highlighted a particular nexus between Patent Act and Atomic Energy, as even USA the Atomic Energy Act of 1946 prohibited the inventions, relating to nuclear material or atomic energy particularly being used for the purpose of atomic weapon from issuance of patent.[15] However the Atomic Energy Act of 1954 of USA kept open other fields of atomic energy for patent application subject to prevention of monopoly on what is termed as 'fundamental patent' (or even generally referred to as 'building block patents') in that field of application.[16] It can be observed that though initial approach of absolute and express prohibition of patents to nuclear and atomic invention prevailed, later the atomic and nuclear energy invention were considered with a balanced perspective of allowing patent in the remainder portion of non-military or non-weapon application usage The condition of avoiding monopoly on 'fundamental patent' albeit maintained.

Professor Stefan A. Riesenfeld[17] while commenting on Atomic Energy Act, 1954, observed the basis of revising earlier and 1952 Acts and quoted the need for further revision as 'the initial Atomic Energy Act 1946 prohibiting the patents for inventions relating to atomic energy – could no longer cope with what he referred to as 'nuclear realities'.[18]

With the evolution and enactment of American law on Atomic Energy, i.e. Atomic Energy Act, 1946, there was also a rising concern about the nexus between 'atomic energy' and 'atomic energy related patents' in the context of 'national security'. Other jurisdictions for example the then 'Union of Socialist Soviet Republic (USSR)' had achieved the skills to control and utilize the atomic energy for peaceful purposes at such a pace that it was resulting in nuclear development program. Such nuclear reactor development programmes not only created the possibilities of private industry participation desirable but also made them feasible.[19] Thus, now the clarity of not patenting the weapon nuclear inventions prevails in America. It can be observed how the approach regarding 'atomic energy related patents' changed to cope with what was termed as 'nuclear realities'.[20]

Patent protection laws in European Union countries are in consonance with European Patent Convention and European Convention while addressing the patentable subject matter[21] does not exclude expressly the atomic inventions as non–patentable subject matter. In other words, atomic inventions are not barred from the grant of patent. Provisions relating to the filing of a European patent application stipulate the flexibility for 'Contracting State' – through its law governing inventions to impose the conditions of 'prior-authorization' – depending on the nature of the subject matter of the invention[22] with respect to application for grant of patent being filed. The above provisions particularly regulate the inventions which come under 'dual-use' purpose.

With the evolution of intellectual property regime, the patent law of United Kingdom was eventually legislated as Patents Act 1977 (the 1977 Act) and the same is considered as the main patent law, governing the patent system in United Kingdom[23] followed by the Patents Act 2004, which has limited scope of only amending certain aspects of Patent Act 1977.[24]

Nuclear inventions under United Kingdom Patent Law are dealt with the context of national security or public safety[25] wherein inventions are subject to the inspection and discretion of the Secretary of the State and no provision of UK Patent law expressly prohibit the grant of patent to nuclear or atomic related inventions. It is also worth noting that the Secretary of State is empowered to vary the patentable inventions that are excluded from patentability in order to maintain particular category invention in consonance with developments in science and technology.[26]

German Patent Act (Patentgesetz) in its version published on 16 December 1980 (Federal Law Gazette I 1981 p. 1), last amended by Article 1 of the

act of 19 October 2013 (Federal Law Gazette I p. 3830), does not prohibit expressly the grant of patent to nuclear related or atomic inventions. However, if a nuclear related or an atomic invention is capable of construing as state secret then the grant of patent to such an invention may be construed as state-secret wherein it will be subjected to the examining of the highest federal authority (as prescribed under the law) and the procedures and treatment as prescribed[27] will be applicable.

Intellectual Property Code of France in its Article L 611 – 19 lists explicitly the non-patentable subject matte wherein nuclear related inventions are out of the ambit of this article.[28]

The Norwegian Patent Act 1967 Section 71; makes it the subject matter of separate law, namely 'Act on Inventions of Importance to the Defence of the Realm (Act No. 8 of June 26, 1953) (consolidated version of 2002)'. There is no specific exclusion of patentability of atomic / nuclear inventions however the conditions of inventions relating to defense and national security apply through a separate law.

Civil Code of the Russian Federation was passed by the State Duma on November 24, 2006 – Article 1401 secret inventions or nuclear power inventions. It is subject to the scrutiny of federal executive authority for intellectual property but nuclear inventions are not excluded *per se* from patentability

The comparative observations in the above jurisdictions regarding their legislative provisions relating to patents reveal a common approach for atomic energy inventions that such inventions are predominantly considered under 'dual-use' category and subjected to scrutiny through a specific mechanism.

Is Section 4 of The Indian Patents Act, 1970 is an Excessive Measure?

Section 4 of the Patents Act, 1970 expressly prohibits the grant of patents to inventions relating to 'atomic inventions',[29] wherein the atomic inventions falling within the ambit of domains stated under sub-Section (1) of Section 20 of the Atomic Energy Act, 1962, will be the typical 'atomic inventions' barred from patentability. Sub-section (1) of Section 20 of Atomic Energy Act, 1962 correspondingly iterates the non-grant of patent for inventions relating to the specifically prescribed domains relating to atomic energy operations.[30]

Section 35 of the Patents Act, 1970 empowers the Controller of Patents to issue secrecy directions under the instructions of the Central Government regarding inventions capable of its defence purpose usage. Relevantly, Section 39 requires an Indian resident to take the permission of Controller before applying for a patent outside India. The Central Government empowered to withhold the publication of any information relating to patentable invention or an application for patent, or revoke a patent, in the interest of 'security of India'.[31] The explanation to the Section[32] elaborates the term 'security of India' as including any 'action' relating to fissionable material or any material from which it is derived.[33] Thus the 'dual use' technologies even in India, are addressed subject to 'national security' and 'public safety' concerns. However, there is the additional express provision in the Patents Act, 1970 to bar the grant of patent for 'nuclear related inventions'.[34]

The civil nuclear co-operation agreements were entered into, with the primary objective of seeking co-operation in the domains of and allied to nuclear power generation. For example, the Indo-US Civil Nuclear Agreement necessarily effectuates the nexus between inventions relating to atomic energy and their protection under intellectual property rights regime. Thus, on one side lie the opportunities for industrial collaborations alongwith incidental foreign investments and on the other side the stance of Indian Patent Law excluding the inventions related to atomic energy.[35] The interplay of all the provision of the Patents Act, 1970 especially alongwith Section 4 lays down an overall discouraging legal framework from the perspective of private industrial entities.[36]

This discussion would remain incomplete without giving the due recognition to the Trade Related Aspects of Intellectual Property Rights (TRIPS) Agreement. The Preamble while reciting the objectives of TRIPS i.e. reducing the distortion and hurdles of international trade, need of protecting intellectual property rights – have cautioned that the enforcement measures and procedures themselves should not become barriers to legitimate trade; the objective of promoting legitimate trade need not be confined to barriers due to enforcement measures and procedures.[37] This rationale very well extends to subject matter of inventions. Regarding patentable subject matter, TRIPS permits the exclusion of a patentable subject matter on the ground that the commercial exploitation of such invention is against morality and public order, and not on the ground of 'mere prohibition by law'.[38] Principles stated under TRIPS Agreement,[39] call upon member state to

undertake appropriate measures to prevent those practices, which "*unreasonably restrain the trade or adversely affect the international transfer of technology*".[40] Finally TRIPS does point out the security exceptions whereby a member state cannot be prevented from taking any action necessary for the protection of its essential security interests including and "*relating to fissionable materials or materials from which they are derived*".[41] However it is argued that the said exception is very well covered under Section 157-A of the Patents Act, 1970 related to 'protection of security of India'

The selective regimes explored above, reveal a common approach in the corresponding legal provisions relating to patentability of inventions related to nuclear energy. The inventions relating to atomic energy are treated under a mechanism meant to scrutinize 'dual-use' technologies, to which Section 157A of The Patents Act, 1970 is akin. There is no additional or express bar on the grant of patent for inventions relating to atomic energy *per se*. United States of America for example, initially did expressly bar the grant of patent to atomic energy inventions, but the same was with a very specific context namely 'for the purpose of successful prosecution of war'. The said approach was rectified later and the issue has been looked upon in a broader perspective. The selective jurisdictions considered presently appreciate the potential of making the inventions relating to atomic energy work for public advantage, but at the same time have established a robust legislative mechanism to tackle the unwanted or detrimental usage of the technology.

The prime argument of the present study revolves around Section 4 of the Patents Act, 1970 and it is submitted that, Section 4 in respect of the inventions relating to atomic energy additionally imposes an excessive restriction, though the category of inventions relating to atomic energy is acknowledged to be of its own kind and is given a importance in the interest of 'national well being'.[42] Treatment of additional precaution in respect of patentability of atomic inventions, need to be construed in the light of circumstances prevailing then.[43] The grant of patents, have been subjected to the primary requirements of local working, and the technological capabilities of the country to make it work[44] and so would be a view against the present argument. However there is also another aspect to this critical view. Critics have for that matter questioned the very basis of the Patents Act, 1970 in terms of meeting its objectives.[45] However, they have also acknowledged the assistance that the Patents Act, 1970 provided in order to make a quick start; the 'assisted start', typically through attracting foreign technologies and predominantly involving technology transfer aspect in industrial collaboration. There are various other factors like economic, infrastructural, political, which decide the role of patent systems in a country and thus impacts the success or failure to meet the objectives.[46]

Nuclear energy technology is no longer only about power generation, but has been elevated to advanced application, wherein it is being considered as a replacement to the current prime sources of power with respect to various technologies.[47] Industrial collaborations and research are expected to increase and as such are awaiting effectuation, due to the intellectual property right ownership issue.[48]

Industrial Collaborations and Foreign Investments in Nuclear Power(ed) Generation Technology in India

The importance and need for industrial collaboration needs no formal corroboration and also involves intellectual property rights ownership and sharing. The Nuclear Innovation and Research Advisory Board (Board) of United Kingdom[49] while questioning the technical capabilities of nations to sustain independently the evolving nuclear industry, has expressly acknowledged the advantages and the need for international collaboration. While commenting on the above, the Board has identified and simplified question about technical capabilities and technologies for providing a complete and wholesome reactor development.[50]

The role of patents is crucial when there is industrial collaboration in respect of a technology. The intention behind such collaborations is technology transfer and receipt, particularly when one of the entities in such collaborations is developing or under developed nation.[51] The industrial collaboration of Indian and foreign industries in the field of nuclear energy is not a recent phenomenon[52] and the civil nuclear co-operation agreements like '123 Agreement' are expected to provide thrust for possibilities of industrial collaborations, since these agreements are specifically about civil co-operation in the area of nuclear power generation.

The phenomenal ITER is a project[53] spanning over 35 nations, wherein signatories agreed that the seven

members namely China, the European Union, India, Japan, Korea, Russia and the United States while combining their resources, would share the project construction, operation and decommissioning costs. It is important to note that this includes the experimental results, and the 'intellectual property' generated through the operation phase also.[54]

The industrial collaboration thus is not merely a hypothetical consideration. In the absence of a robust statutory intellectual property rights protection for atomic energy inventions 'patent ownership' is a crucial consideration and needs to be accounted for through a due enquiry

The scope of nuclear technology in terms of 'nuclear power(ed)' technologies is increasing. Moreover nuclear energy technology per se is in the phase of shifting from 'nuclear fission' to 'nuclear fusion', wherein the newer form of technology is internationally accepted to be safe and generating relatively very less or almost nil nuclear waste.[55]

Technological Developments: Not Just Nuclear Power But Also Nuclear Power-Ed

The technological development in the field of nuclear energy needs a mention since it justifies and supports the discussion relating to industrial collaboration. Such technological developments encompass manifold dimensions, and following are some of the illustrations.

The first and foremost dimension is about nuclear power generation itself and is one of the species under the domain of 'eco-innovation', dedicated to sustainable development. It includes areas such as nuclear power generation, alternative energy production, energy conservation but is not limited to these. A typical analysis of patents granted from 1946 to 2010 in various regions and countries like Europe, United States of America, Japan, Britain, Russia and China reveal the patents filed under this domain.[56]

The problem of low carbon emission associated with nuclear waste disposal challenges, and safety concerns in current nuclear fission techniques has compelled another dimension in nuclear power generation to evolve, namely nuclear power generation through nuclear fusion; a preferred alternative for generating the power, contrary to nuclear fission technique[57]. Fukushima and Chernobyl nuclear reactor accidents are the examples of the concerns associated with power generation through nuclear fission technology. There is a serious note being taken on these concerns about safety, and nations employing the nuclear fission reactor technology are closing their nuclear fission plants.[58]

Nuclear fusion technology though at its developing stage has been successfully tested during the test runs by German 'Wendelstein 7-X fusion reactor'[59] and Chinese 'Experimental Advanced Superconducting Tokamak (EAST)' at the Institute of Plasma Physics at the Chinese Academy of Sciences in Jiangsu province. These are the latest developments where the energy released in the nuclear fusion has been practically and successfully harnessed.

Yet another dimension incidental in the field of nuclear technology is the designs of nuclear reactors. The current need for innovation in the field of nuclear power generation technology is subject to the principle goals of advocating safe, clean sustainable and zero (or least) carbon emission energy supply.[60] The focus currently is on the need for advanced nuclear reactor designs that would provide low-carbon energy existing nuclear designs.[61] It is not only the importance of nuclear energy – as clean and low-carbon energy supply – but also innovation of it in terms of nuclear reactor designs which is the very much need of the hour.[62]

The ITER project, is a experimental 'fusion reactor' being constructed presently at Cadarache in Southern France, and is essentially a step towards electricity production.[63]

Nuclear powered technologies are the facets of modern technology dimension wherein the nuclear energy source in itself is the primary source of power. The near future now, is not just about nuclear 'power' technologies but about nuclear 'power-ed' technologies and its applications. The demand for this technology is already carving out its place for itself. The recent 'laser-powered propulsion system' technology patented by Boeing Company (Chicago), would be the classic example wherein the said technology harnesses enormous energy released in nuclear fusion[64] and the same is also seen as an alternative to nuclear fission energy, to manage the considerable radioactive waste generated.[65]

Nuclear Co-operation for Civil Purposes Deals by India

Civil nuclear deal with other countries is one of the steps towards increasing the power generating capacity with the co-operation of such other country for example United States of America with whom

India has entered into a Civil Nuclear Agreement (123 Agreement). The clauses relate to the scope of cooperation,[66] transfer of information,[67] and nuclear trade.[68] The Agreement also, identifies the relevant areas of cooperation like, transfer of information and research and development as one of the prominent area.[69] Importantly, Article 4 provides for 'Nuclear Trade' wherein the sub-clause (1) expressly states the 'facilitation of nuclear trade between themselves' followed by sub-clause (2) that proposes the smooth and sound administering of this Agreement and not in any way that would restrict the trade. To take a fair note, the clauses relating to transfer of nuclear material, equipment, components, and related technology' are subject to applicable laws, regulations and license policies[70] but this does not affect the present argument. It requires no further explanation at this point that in the given context of transfer of equipment, and technology the role of Intellectual Property Law is not just significant but crucial.[71] The civil nuclear energy co-operation between India and Japan is termed as a landmark co-operation, wherein Japan has agreed to export its nuclear technology in terms of both fuel and equipment. Again the significant role of intellectual property involved in such export / transfer of technology, need not be iterated.

Technology Transfer in India

Technology transfer and reverse engineering have been the predominant contributors to technical progress alongwith attracting foreign direct investments and these factors together play a significant role in the Indian economy.[72] Being a developing country technology transfer vide availing of patent license and foreign direct investment is the most suitable channel to begin technical progress. Technology transfer is crucial as a primary approach and channel[51] (to begin for a developing country), as well as being initial objective of attracting knowledge in India wherein a start-up momentum and pace to innovate or make technical progress is gained. Inadequate technological support is argued as one of the important factors posing the problems in local working of patent.[73] One may take into account the incidental arguments in respect of technology transfers based on general principles applicable to working of patented inventions as stated in the Patents Act, 1970[74] and counterarguments criticizing such principles based on based on actual studies.[75] In any case the question remains that whether a developing country like India has a better alternative? One which will be able to cope up with the international pace of science and technology related developments in this domain.

India in its journey to become a developed nation should take the right steps, keeping in mind that the first goal of patent policy implementation needs to be reflected even in Indian Patent Law.[76] The role of Intellectual Property Rights in a technology transfer is acknowledged as integral in the modern context, particularly as industries are now vigilant about them.

The utilitarian approach of Intellectual Property Rights is applicable to inventions relating to atomic energy as well. The Labour Theory of Intellectual Property Rights,[77] the perspectives of Unfair Competition Theory[78] and Economic Incentive theory and yet other theories justifying intellectual property rights regime, provide a valuable foundation and a logical reasoning for investing funds in a research projects, which result in future generation inventions. The desire of economic reward is undoubtedly recognised as the main factor motivating inventions.[79]

The evolution of nuclear energy technology to the next level, international collaboration in the domain between Indian companies and the foreign entities (formerly and expected in the light of Civil Nuclear Co-operation Agreements), not only demands but necessitates the review of objective and purpose of Section 4 of the Patents Act, 1970. India can hardly afford to be reluctant to the nuclear related developments, if it wishes to encapsulate nuclear power technology to its advantage. With the growing recognition of and consensus on nuclear co-operation worldwide, India should take a stance on the same; and as a integral part of it, intellectual property rights protection –particularly patents– for inventions related to atomic energy needs due attention.

The patentability of inventions related to atomic energy by private entities undoubtedly need to be addressed and are worth receiving the intellectual property right protection. It has to be noted that the challenge is equally applicable for private domestic entities involved in the field of atomic energy. In the absence of a robust patent protection, the only alternate protection is through a confidentiality clause of contract, or through a separate confidentiality agreement. However such agreements have corresponding unresolved issues in the event of their breach.[44]

Summary and Findings

The above discussion reveal; enhancement in the possibilities of foreign investments on the basis of Civil Nuclear Co-operation Agreements like Indo – USA 123 Agreement', the integral issue of intellectual property right protection particularly patents to atomic inventions, position of the Patents Act, 1970 relating to atomic energy inventions (which can be understood vide the comparative study in the selected jurisdiction), a common approach (in selected jurisdictions that such inventions being subjected to the scrutiny of the statutory authority of their respective Patent laws) in grant of patents to 'dual-use' inventions wherein it needs to be noted here that no jurisdiction provide express bar on patenting the inventions related to atomic energy, in contrast to Section 4 of Patents Act 1970 of India.[80]

In India, Section 35, 39 and 157A of the Patents Act, 1970 deal with inventions relating to 'dual-use technologies' and the said provisions operate on lines analogous to the mechanisms of the jurisdictions considered. The above sections of the Patent Acts 1970 may be further suitably modified to constitute a robust mechanism to deal with the issue and wherein the inventions relating to atomic energy can be granted patent protection

Therefore, in the light of the circumstances an approach can be conceived which would balance the national security exception of atomic inventions under a robust mechanism. Section 4 is excessively restricting the grant of patent to the inventions relating to atomic energy and this affects the scientific and technological growth in the field of atomic energy.

Accordingly, Section 4 of the Patents Act, 1970 can be repealed and the 'national wellbeing'[44] concern may be balanced through strengthening of Sections 35, 39 and 157A in terms of providing specific and robust machinery. Another general approach proposed herein would be to amend Section 4 suitably– if not repealed, to create a balance as proposed in the argument of this study.

Recommendation/Suggestions

In furtherance of the argued issue, the following may be considered as particular steps which may construe the solution

- Developing of a *sui-generis* system of protection to grant the protection for a reasonably lesser term.
- The national security exceptions stated under Section 157 A (b)(i), be articulated with a further clarity The articulation with an objective to serve the purpose of standard criteria or parametric guidelines,
- Alongwith such guidelines, a statutory, body or board acting as robust machinery scrutinizing the inventions related to atomic energy, under 'dual use' technology category.

The above recommendations may not be the only solution and there remains the scope for further research wherein the current study may be improvised and elevated to the next level. In conclusion it is the right time to review atleast, the basis of Section 4 of the Patents Act 1970.

References

1 Civil Nuclear Cooperation – A Year of Solid Achievements, Press Information Bureau Government of India Department of Atomic Energy, http://pib.nic.in/newsite/printrelease.aspx?relid=134030 (accessed on 21 November 2016). India's strategic nuclear programme remains unaltered and most of such agreements are in respect of 'fuel supply', however such agreements also lead to considering the aspects related to intellectual property rights.

2 Section 2(b) Atomic Energy (Amendment) Act 2015, expands the definition of Government Company to include more than one such companies holding 51% of paid-up share capital. And enables Nuclear Power Corporation of India Limited (NPCIL) to enter into joint ventures with other 'Public Sector Units' http://www.prsindia.org/billtrack/the-atomic-energy-amendment-bill-2015-4086/.

3 Department of Atomic Energy Government of India, http://dae.nic.in/?q=node/153 (accessed on 16 August 2016)

4 Section 20(1) of Atomic Energy Act 1962 states that "no patents will be granted for inventions which in the opinion of Central Government are useful for or relate to production, control, use or disposal of atomic energy or the prospecting, mining, extraction, production, physical and chemical treatment, fabrication, enrichment, canning or use of any prescribed substance or radioactive substance or the ensuring of safety in atomic energy operations". The instances in the section cover a wide area of nuclear energy operations and applications hence almost all inventions related to nuclear energy are brought under the ambit of Section 4 of Patents Act 1970.

5 Section 35, 157-A Patent Act 1970.

6 Section 157-A Patent Act 1970.

7 Gupta V K, India: IPR and national security, *Journal of Intellectual Property Rights*, 13 (4) (2008) 318–325.

8 Fujitsu Intellectual Property Right Report, 2006, http://www.fujitsu.com/ downloads/IR/Library/intellectualproperty/ip-report2006.pdf (accessed on 1 July 2008).

9 Section 35 and 157-A Patent Act 1970.

10 Gupta V K, India: IPR and national security, *Journal of Intellectual Property Rights*, 13 (4) (2008) 319, need of modifying the relevant Atomic Energy Act and Patent Act clauses).

11 Damodaran A D, Implications of the new patent regime; Challenges summarized, *Part 6 Engineered Materials, Nuclear Materials and Systems* http://www.patentmatics.org /index.htm (accessed on 01 January 2006); the mention of

Section 4 is not explicit but enquiring the effect of Section 4 in the background of the above can be definitely questioned. 'National security' has not been defined under Patents Act 1970, however its context is very clear in Section 157A Patents Act 1970.

12 Gupta V K, *DESIDOC Bulletin of Information Technology,* 27 (4) (2007) 5-14, the 'dual use technologies' include the technologies relating to armaments; aeronautics; energetic materials; biological, biomedical, chemical technologies; electronics; information systems; security, signature control; manufacturing and fabrication; marine systems; sensors; ground combat; and energy systems. These are some general but not the only examples which can be listed to ascertain such dual application.

13 Security inventions: Compensation under Patent and Atomic Energy Acts, *Indiana Law Journal,* 31Iss. (1)- Article 5. The statute states in part: ". . . Whenever during a time when the United States is at war the publication of an invention by the granting of a patent might, in the opinion of the Commissioner of Patents, be detrimental to the public safety or defense or might assist the enemy or endanger the successful prosecution of the war he may order that the invention be kept secret and withhold the grant of a patent until the termination of the war" 40 STAT. 394 (1917). http://www.repository.law.indiana.edu/ilj/vol31/iss1/5 (accessed on 01 July 2016).

14 The wording of the act was changed to, "Whenever the publication . . .might . . .be detrimental...." thus leaving out the part making the act applicable only in time of war. 54 STAT. 710 (1940).

15 35 U.S.C. § 181 (1952). Inventions in which the Government has a legal interest are placed in a special category whereby the secrecy order is issued when so designated by the head of the interested agency. The determinations entirely in the discretion of the agency official and justification to the Commissioner of Patents is not 68 STAT. 943, 42 U.S.C. § 2181 (1954).

16 The Commission may declare an invention subject to a "public interest" in compliance with the purposes and policies of the Act. 68 STAT. 945, 42 U.S.C. § 2183 (1954). The broad policies of the Atomic Energy Act of 1954 are twofold. First, dissemination and classification of Restricted Data is to be controlled in such a manner as to assure the common defense and security. Second, the dissemination of scientific and technical information relating to atomic energy is to be permitted and encouraged so as to provide a free interchange of ideas and criticism. Message to Congress by President Eisenhower, 100 CONG. REc. 1828 (daily ed. Feb. 17, 1954).

17 Riesenfeld S A, Patent protection and Atomic Energy Legislation*, California Law Review*, 46 (1) (March 1958), 40-68, http://www.jstor.org/stable/3478397 (accessed on 09 July 2016).

18 Term used in Message from the President, Transmitting Recommendations Relative to the Atomic Energy Act of 1946, H.R. Doc. No. 328, 83d Cong., 2d Sess. (1954); 1 Legislative History of The Atomic Energy Act of 1954, 45 (AEC 1955).

19 Riesenfeld S A, Patent protection and Atomic Energy Legislation*, California Law Review*, 46 (1) (March 1958), 45, The need for and the scope of new legislation were the subject of extensive public hearings held by the Joint Committee on Atomic Energy during June and July 1953.

20 Atomic Power Development and Private Enterprise, Hearings before the Joint Committee on Atomic Energy, 83d Cong., 1st Sess. (1953).

21 Riesenfeld S A, Patent protection and Atomic Energy Legislation*, California Law Review*, 46 (1) (March 1958), 45, Term used in Message from the President, Transmitting Recommendations Relative to the Atomic Energy Act of 1946, H.R. Doc. No. 328, 83d Cong., 2d Sess. (1954); 1 Legislative History of The Atomic Energy Act of 1954 (AEC 1955).

22 Article 52 of European Patent Convention.

23 Article 75 of European Patent Convention.

24 http://www.wipo.int/wipolex/en/details.jsp?id=5417 (accessed on 07 August 2016).

25 The major purpose amongst some others, of such amendment was to synchronize United Kingdom Patent System with the revised European Patent Convention; the Patent Rules 2007 adds further corresponding amendments.

26 Patents Act 1977, Section 22, Section 23.

27 Section 1(5) Patents Act 1977. Such discretion of the Secretary is subject to approval from each House of Parliament.

28 https://www.gesetze-im-internet.de/englisch_patg/englisch_patg.html#p0322 (accessed on 12 Aug 2016) Section 50 to Section 56, German Patent Act the Patent Act (Patentgesetz) in its version published on 16 December 1980 (Federal Law Gazette* I 1981 p. 1), last amended by Article 1 of the act of 19 October 2013 (Federal Law Gazette I p. 3830).

29 http://www.wipo.int/wipolex/en/text.jsp?file_id=403397 (accessed in October 2016).

30 Section 4 of Indian Patent Act 1970 states that *" No patent shall be granted in respect of an invention relating to atomic energy falling within the sub-section (1) of section 20 of the Atomic Energy Act 1962 (33 of 1962)"*

31 Sub-section(1) of section 20 of Atomic Energy Act 1962 bars the grant of patent to inventions related to atomic energy operations in following words *" As from the commencement of this Act, no patents shall be granted for inventions which in the opinion of the Central Government are useful for or relate to the production, control, use or disposal of atomic energy or the prospecting, mining, extraction, production, physical and chemical treatment, fabrication, enrichment, canning or use of any prescribed substance or radioactive substance or the ensuring of safety in atomic energy operations"* http://dae.nic.in/?q=node/153 (accessed on 08 July 2016).

32 Section 157-A Patents Act 1970.

33 Section 157 – A sub-clause (b) Explanation (i) Patents Act 1970.

34 Section 157A Patents Act 1970.

35 Section 4 Patents Act 1970.

36 Section 20(1) of Atomic Energy Act 1962 states that "no patents will be granted for inventions which in the opinion of Central Government are useful for or relate to production, control, use or disposal of atomic energy or the prospecting, mining, extraction, production, physical and chemical treatment, fabrication, enrichment, canning or use of any prescribed substance or radioactive substance or the ensuring of safety in atomic energy operations". The instances in the section cover a wide area of nuclear energy operations and applications hence almost all inventions related to nuclear energy are brought under the ambit of Section 4 of Patents Act 1970.

37 Dalmia V P, (Indian) Patent Act & Nuclear Technology, 26 March 2014. Section 35 and 39 and 157A of Indian Patents Act, 1970. http://www.mondaq.com/india/x/302560/Patent/Indian+Patent+Act+Nuclear+Technology (accessed on 07 Aug 2016).

38 Preamble to Trade Related Aspects of Intellectual Property Rights(TRIPS); "Members, Desiring to reduce distortions and impediments to international trade, and taking into account the need to promote effective and adequate protection of intellectual property rights, and to ensure that measures and procedures to enforce intellectual property rights do not themselves become barriers to legitimate trade;…."

39 Article 27(2) TRIPS Agreement.

40 Article 8 (2) TRIPS Agreement.

41 Article 8 (2) TRIPS Agreement.

42 Article 73 (b)(i) TRIPS Agreement – Security Exceptions.

43 Justice Ayyengar, Ayyengar Committee Report at the time of enactment of Patent Act 1970.

44 Justice Ayyengar, Ayyengar Committee Report.

45 Damodaran A D, Indian Patent Law in the post-TRIPS Decade S&T policy appraisal, *Journal of Intellectual Property Rights,* (13) (5) (2008) 414 – 423.

46 Michel on Principal National Patent Systems, Vol. I, p15. "Patent systems are not created in the interest of the Inventor but in the interest of national economy. The rules and regulations of the patent systems are not governed by civil or common law but by political economy".

47 Budica R J, Herzberg J S & Chandler F O, Laser-powered propulsion system US Patent No US 9068562 B1 (The Boeing Company), 30 June 2015.

48 Dalmia V P, (Indian) Patent Act & Nuclear Technology, 26 March 2014. http://www.mondaq.com/india/x/302560/Patent/Indian+Patent+Act+Nuclear+Technology (accessed on 07 Aug 2016).

49 http://www.nirab.org.uk/(accessed on 16 Aug 2016). NIRAB has been established by Government to provide independent, expert advice on the research and innovation needed for nuclear energy to play a significant role in the UK's future low carbon and secure energy mix and to create the environment in which the UK nuclear industry can contribute significantly to our economy.

50 NIRAB, 'UK Nuclear Innovation and Research Programme Recommendations', March 2016.

51 Damodaran A, Indian Patent Law in the post-TRIPS Decade: S&T Policy Appraisal, *Journal of Intellectual Property Rights,* (13) (5) (2008) 414-423.

52 Some examples of earlier collaborations of Indian companies, Larsen & Toubro ventured into couple of agreements with nuclear power reactor vendors. One with Westinghouse to produce component modules for Westinghouse's AP1000 reactor; second with Atomic Energy of Canada Ltd (AECL) regarding a 'competitive cost/scope model for the ACR-1000'; third with Atomstroy export not only focusing on components for VVER reactors at Kudankulam, but beyond that to other Russian VVER plants even internationally. May 2009 it signed an agreement with GE Hitachi in respect of producing major components for ABWRs. The said venture was with a hope to utilize indigenous Indian capabilities for the complete construction of nuclear power plants including the supply of reactor equipment and systems, valves, electrical and instrumentation products for ABWR plants to be built in India; in 2010 with Rolls Royce to produce technology and components for light water reactors in India and even internationally. Tata Consulting Engineers Ltd ventured with GE Hitachi Nuclear Energy (GEH); in order to explore the 'potential project designs and workforce development opportunities' in support of GEH's future nuclear projects in India. Atomenergomash's Memorandum of Understanding with Walchandnagar Industries Ltd (India) in 2010; Atomenergomash explored the potential Indian partners in 2012; in respect of production and design of equipment for nuclear power plants built with Russian technology both in India and other Asian countries such as Bangladesh and Vietnam. In January 2016 the prime minister announced cooperation with Russia to increase Indian manufacturing content in future VVER reactors in India.http://www.world-nuclear.org/information-library/country-profiles/countries-g-n/india.aspx (Last visited 29 Aug 2016).

53 ITER Agreement 2006, https://www.iter.org/proj/ inafewlines. (accessed on 23 November 2016).

54 https://www.iter.org/proj/inafewlines#5 (accessed on 17 July 2016).

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56 Pereira G J, Teruya D Y, Guimarães R R R & Perry K da S P, Portfolio of patents after The Brazilian Innovation Act: The case of The Comissão Nacional De Energia Nuclear – Cnen (National Nuclear Energy Commission), *International Nuclear Atlantic Conference - INAC 2013 Recife, PE,* Brazil, (*2013)*. http://www.iaea.org/inis/collection/NCLCollectionStore/_Public/45/081/45081008.pdf (accessed on 10 November 2016).

57 In nuclear fusion reactors chain reaction is topped in the event of reactor failure and this is the most peculiar characteristic to address the safety concern, those were raised by the nuclear fission reactor accidents mentioned above. In its current state of art the energy generation typically through 'nuclear fission', but this technology also has a grave dangerous side, the typical concerns about nuclear fission reactors are safety and disposal of nuclear waste. http://www.wipo.int/export/sites/www/patentscope/en/programs/patent_landscapes/reports/documents/iRunway Nuclear FusionPLR.pdf iRunway research 2016 : " Safety of Nuclear Power Reactors", World Nuclear Association, August 2015 (Last visited 23 November 2016)

58 iRunway research 2016: The future of nuclear energy Half-death, *The Economist,* 31 October 2015 (Germany for example is closing down gradually its 17 nuclear fission plants by 2022) http://www.wipo.int/export/sites/www/patentscope/en/programs/patent_landscapes/reports/documents/iRunway NuclearFusionPLR.pdf, iRunway research 2016: Safety of Nuclear Power Reactors, *World Nuclear Association*, August 2015 (accessed on 23 November 2016).

59 http://www.dispatchtribunal.com/chinese-scientists-achieve-a-huge-milestone-in-nuclear-fusion-reaction/14844/ (accessed on 17 July 2016).

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75 The impact of international patent system on developing countries: A study, WIPO meeting document A/39/13 Add. 1 (2003), p 10. "the technology transfer that take place through licensing of patents to the developing countries is negligible, and accounts only for less than 2% of the technology transfer that takes place in total to such developing countries and the effective technology transfer is not possible in reality due to un-favourable terms and conditions stipulated in licensing agreement; onerous one sided terms, constituting restrictive trade practices or monopolistic abuses though prohibited by anti-trust legislations of developed countries, are imposed on developing countries."

76 Section 83(f) Indian Patents Act 1970.

77 Proposed by John Locke as an associated proposition with Natural Rights Theory. According to John Locke the goods usually beneficial to mankind are available in nature and held in common in their natural state, their objective benefit results only after converting those goods from their natural state – in which of course they cannot be enjoyed – to a form wherefrom an individual benefits, and such conversion is the result of labour exerted on the natural state of availability of such goods. The labour thus enjoined to the goods – available in the natural state and in which they are in-appropriable – adds the value to the goods and entitles the person exerting labour the ownership of such goods.

78 *International News Service* v Associated *Press* 248 U.S. 215, 39 S.Ct. 68. 'unfair competition' manifests itself through 'doctrine of misappropriation' which was acknowledged by Supreme Court of America in International News Service v Associated Press 248 U.S. 215, 39 S.Ct. 68.

79 Section 20(1) of Atomic Energy Act 1962 states that "no patents will be granted for inventions which in the opinion of Cenral Government are useful for or relate to production, control, use or disposal of atomic energy or the prospecting, mining, extraction, production, physical and chemical treatment, fabrication, enrichment, canning or use of any prescribed substance or radioactive substance or the ensuring of safety in atomic energy operations". The instances in the section cover a wide area of nuclear energy operations and applications hence almost all inventions related to nuclear energy are brought under the ambit of Section 4 of Patents Act 1970.

80 Saxena V, Nuclear technology transfer – Intellectual property issues. February 2014. http://www.nlain.org/blog/ nucleartechnologytransfer-intellectualpropertyissues (accessed on 18 August 2016). The remedy however, in case of breach will be enforceable against the buyer and not against the government or the regulatory authority to whom information of proprietary nature is communicated by the buyer in compliance with the legal and regulatory requirements, as in the absence of the probity of contract the government and regulatory authorities cannot be held liable for the breach of confidentiality.