



SOLAR ENERGY AND ITS LEGALIS: THE ENERGY FOR 21ST CENTURY

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INTRODUCTION TO SOLAR RENEWABLE ENERGY

Solar energy is the energy which is obtained by sun heat and light. Technology has presented several ways to use this abundant resource. It is considered a green technology because there is no emit greenhouse gases. Solar energy is abundant and has been used for a long time since electricity. Solar energy is an important role to cover the holes. Opportunity of this kind should be seen for low carbon emission, reduction in poverty and to enhance security of energy because solar energy can provide clean, emission-free and evenly distributed energy. Regions such as Asia pacific can specifically take advantages of it because of massive heat. Solar tech is indeed an economically efficient and geographically superior alternatives.¹ Solar energy in one form or another is the source of almost all energy on Earth. Humans, like all animals and other plants, depend on the sun for heat and food. However, people use the energy of the sun in many other different ways. For example, fossil fuels, a plant material from an earlier geological era, is used for the transportation and generation of electricity, which has essentially been storing solar energy for

millions of years. Similarly, biomass converts energy from the sun into fuel that can then be used for heat, transportation, or electricity. Wind energy has been used for hundreds of years to provide mechanical or transport energy, and wind currents generated by solar hot air and Earth's rotation. Today's wind turbines convert wind energy into electricity, as well as its traditional uses. Even hydroelectric power is derived from the sun. Hydroelectricity relies on the evaporation of water from the sun and its subsequent return to Earth as rain to provide water for dams. Photovoltaic (PV) cells are a simple and elegant way to harness the energy of the sun. Photovoltaic devices are unique in that they convert direct solar radiation into electricity, with no noise, pollution or moving parts, making them strong and reliable and long lasting.²

Solar technology can be broadly classified as

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Active Solar – Active solar techniques include the use of photovoltaic systems, concentrated solar power and solar water heating to harness the energy. Active solar is directly consumed in activities such as drying clothes and warming of air.³

Passive Solar – Passive solar techniques include orienting a building to the Sun, selecting materials with favorable thermal mass or light-dispersing properties, and designing spaces that naturally circulate air.⁴ In the 1830s, British astronomer John Herschel used a solar oven to cook food during an expedition to Africa. People now

¹Renewable energy in Asia Pacific, DLA Piper (12 April, 2021, 9:00 am) file:///C:/Users/pc/Desktop/Renewable_Energy_in_Asia_Pacific_3rd_Edition.PDF.

² Energy from the Sun, National Energy Education Development Project, 2, 4 (2017).

³ Id at 5.

⁴ Solar energy, EESI (13 April, 2021, 12:30pm) <https://www.eesi.org/topics/solar/description>.



use many different technologies for collecting and converting solar radiation into useful heat energy for a variety of purposes. Solar photovoltaic devices, or solar cells, change sunlight directly into electricity. Small Photovoltaic (PV) cells can power calculators, watches, and other small electronic devices. Arrangements of many solar cells in PV panels and arrangements of multiple PV panels in PV arrays can produce electricity for an entire house. Some PV power plants have large arrays that cover many acres to produce electricity for thousands of homes.⁵

Electricity connected to the solar grid: reactive solar energy from the grid is extracted from solar photovoltaic cells and large-scale solar power plants. The network connection is chosen for reasons:

- a. Solar power is available throughout the day and is peak demand time;
- b. Solar energy conversion equipment has a longer useful life and needs less maintenance, which provides greater security for the energy infrastructure;
- c. Low operating costs and returns on network connectivity;
- d. Unlike traditional thermal power generation from coal, it does not cause pollution; and
- e. The abundance of free solar energy can be used almost everywhere.⁶

For off-grid:

Areas where connectivity to a main grid seems almost impossible either to the very

remote locations or because the grid connectivity could be expensive enormously.

- a. The desire to use renewable energy that is environmentally safe and pollution-free;
- b. Combining different generation options available - hybrid power generation;
- c. A desire to be independent of an unreliable, error-prone, and intermittent network connection;
- d. Storage and Backup Options Available;
- e. No overhead cables - no transmission loss;
- f. Various applications and products: it includes lighting, communication systems, kitchen, heating, pumping and small-scale industrial use;
- g. Photovoltaic modules are made by collecting solar cells after strings, tabs, and the power tower system: reflected sunlight is always directed at the receiver, where temperatures above 1000 ° C can be reached; and
- h. Parabolic systems: Parabolic systems can reach 1000 ° C in the receiver and achieve the highest efficiency to convert solar energy into electricity.⁷

SOLAR ENERGY AND SUSTAINABLE DEVELOPMENT

The main objective of spreading the ideas of solar in India is to secure energy supply, develop its economy, to enhance affordability and therefore reach of energy should be improved and to mitigate the change of climate. "Sustainable development" is taking place with only the use of energy which is sustainable in nature and to ensure access to modern, reliable,

⁵ Sophie Turner, *History of solar energy*, Solar Energy Base (13 April, 2021, 12:45pm) <https://www.solarenergybase.com/history-of-solar-energy/>.

⁶ *Id.*

⁷ *ON grid solar power system v. off grid solar power system: their application and advantages*, Economics

Times (15 April, 2021, 2:00 pm) <https://economictimes.indiatimes.com/small-biz/productline/power-generation/on-grid-solar-power-systems-vs-off-grid-solar-power-systems-their-applicationsadvantages/articleshow/69200840.cms?from=mdr>.



sustainable and energy of twenty-first century for its subjects. Government support and a relatively preferable economic market and all lead India to become among the driving force in the energy market. The government has developed liberal policies, several programs and the environment to attract foreign investment to intensify the rate. The renewable energy sector is expected to give job opportunities in the following years. Renewable energy, generally speaking, is clean energy and non-polluting. Many forms do not emit any greenhouse gases or toxic waste in the process of producing electricity. It is a sustainable energy source that is reliable for the long-term. Renewable energy is cost-effective and efficient. The major challenge of climate change has forced many nations to aim on renewable energy even better solar since the sun is expected to continue shining for several billion years, calling solar energy a sustainable power supply is a pretty safe bet Economic sustainability should be emphasized too. Solar energy is considered a renewable resource. Solar energy is going to be endless notwithstanding the population of earth, it is even better to fight against the problems such as climate change.⁸ A study published found that in near minutes the amount of energy contained in the light of the sun that reaches the Earth is equivalent to the amount of electrical energy used on the planet in a year's time.⁹

It turned out to be a premonition, since, 80 years later and electricity is being supplied to **millions of human beings in the world from renewable energies such as solar.** Humanity has now declared its readiness to accelerate the transition to a low-carbon economy, conscious of the finite nature of fossil fuels and their prejudicial effects on the environment as the main cause of global warming.¹⁰ One of the Chilean poet, Pablo Neruda, stated following in *El Sol*:

"I am a man of light, of so much rose, such predestined clarity, I will die from shining". Solar energy, on the other hand, will never die of shining, since the Sun still has 6.5 billion years of life¹¹ Indeed, in rather less time, solar technology in some countries has evolved to compete with conventional sources of electricity generation. In just a few decades' time, it will become the major part of a sustainable energy system for the world."¹²

Non-Polluting

Unlike fossil fuels, energy through solar means does not cause pollution that is to incorporate sustainability principles. Solar panels reside stably on rooftops, and produce no waste, noise, or any other output simply by cleaning electrical power. Solar energy is sustainable in itself, it is clear that energy hasn't got rid of all the drawbacks and part of it depends on its degree of sustainability but these loopholes decrease if compared to the affirmative potential of solar energy as a

⁸ Chakrobarty Supava, Role of Solar Power and Sustainable Development in India, 34, 35 (2015).

⁹ J.N. Bahcall, Neutrinos from the Sun, 28, 30 (1969).

¹⁰ Science Service, *Use of solar energy is near a solution*, *New York Times* (20 April, 2021, 5:00pm) <https://www.nytimes.com/1931/04/04/archives/use-of-solar-energy-is-near-a-solution-german-scientists-improved.html>.

¹¹ *Solar System Exploration Overview*, NASA (20 April, 2021, 5:15 pm) <https://solarsystem.nasa.gov/solar-system/sun/overview/>.

¹² *Use of solar energy is near a solution*, Northern Solar (20 April, 2021, 5:30pm) <https://northernsolar.com.my/2019/10/24/hello-world/>.



sustainable energy provider. Due to the world population and the increase in wealth, the demand for energy is on a continuous rise. To check if the sources of energy have sustainability or not, there are three parameters which are:

- ◆ Environmental sustainability: This means that there shall be balance of positive energy. i.e. if we are producing renewable energy and the sources used for producing energy are more than the energy we would get from the source.
- ◆ Social sustainability: It deals with the social and welfare of the society which means that proper facilities for wages and facilities are provided.
- ◆ Economic sustainability: The technology used for the renewable energy should be sold without subsidized.

The most common sustainable electricity resources are solar, wind, hydro, and biomass. They all are renewable but they are sustainable or not it would be checked by the above mentioned parameters. As the biomass lack in the environmental sustainability is not is hard to say that it is sustainable resource.¹³ To make these renewable resources more sustainable, China in their speech regarding nuclear innovation to meet the climate goals developed under Paris Agreement, 2016 at “*International Conference on Climate Change and the role of nuclear power*” on 8th October, 2019. There are forty-eight operating nuclear power reactors and nine under construction reactors, they are developed and work according the

¹³ Marjolein Helder, *Renewable energy is not enough: it needs to be sustainable*, World Economic Forum (25 May, 2021, 8:30pm) <https://www.weforum.org/agenda/2015/09/renewable-energy-is-not-enough-it-needs-to-be-sustainable/>.

information provided under the IAEA’s Power Reactor Information System. China nuclear power is included with renewable energy sources in its nationally determined contribution for goals mention in the Paris Agreement, 2016 for limiting the global warming. For example they are lowering the carbon energy capacity by including solar, wind, hydroelectric with nuclear power plant with capacity of 53 GW(e), at least, by 2020.¹⁴

They are also developing new nuclear reactor technologies as well as they want to increase the potential of electric applications of nuclear power it will also include district heating and seawater desalination. For example HTR-PM, a high temperature gas-cooled reactor (HTGR), it will be cooled by helium which means no water and the temperature will reach to 750°C. Mr. Kejian Zhang regarding this stated the following:

“The HTGR demonstration project with fourth generation technology has made steady progress, and this reactor will be capable of hydrolytic hydrogen production and high temperature process heat and we have also recently completed the preliminary design of a pool-type, low-temperature heat reactor, the DHR-400, which may be used for district heating. Work on a small modular reactor design, the ACP-100, is also well underway.”

Small modular reactors are flexible and smaller than the old nuclear reactors and they can be used at those places where the need of electricity is less. They are supporting other

¹⁴ China, NTI, (26 May, 2021, 9:00pm) <https://www.nti.org/learn/countries/china/facilities/>.



states for developing same kind of nuclear programme as they can achieve the sustainable development goals. The Deputy Director General and Head of the department of nuclear energy, Mr. Mikhail Chudakov, said the following:

“Nuclear power has been a consistent source of low carbon electricity for decades, and utilizing its proven capabilities can help countries meet the Sustainable Development Goals and as the largest energy producer, China recognizes nuclear power can help combat environmental problems, while also contributing to the country’s economy.”¹⁵

INDIAN LEGAL ASPECT

“The Ministry of New and Renewable Energy (MNRE) is the nodal Ministry of the Government of India for all matters relating to new and renewable energy. The broad aim of the ministry is to develop and deploy new and renewable energy for supplementing the energy requirements of the country. They provide direct and indirect tax benefits such as sales tax, excise duty exemptions, and custom duty exemptions.”¹⁶

The enactment of the Electricity Act, 2003 is considered as an intense shift within the power sector towards a globally competitive model, with an emphasis on renewable power. Section 86(1)(e) of the Electricity Act, 2003 specifically included promotion and cogeneration of electricity from renewable sources of energy and setting of

Renewable Purchase Obligation (RPO) targets among the functions of State Electricity Regulatory Commission (SERC).¹⁷ The Electricity Act, 2003 also authorized the states of the Gulf Cooperation Council to define the terms and conditions for determining tariffs, and in doing so, they should be guided by "promoting cogeneration and the generation of electricity from renewable energy sources". The Electricity Law aims to make the energy distribution sector more transparent and accountable by dismantling the electricity councils in the state, which has led to the formation of independent companies with separate financial accounts for generation, transmission and distribution. Energy, and the establishment of independent regulatory committees at the state and middle levels and the Court of Appeal. However, problems persist in this sector as institutional entities continue to operate as public institutions and distribution companies that end up with massive debt. Causes attributable to this debt include fees that are not commercially applicable, losses due to theft along with transportation, and inefficiency of bills were intended to achieve with instruments such as the National Electricity Policy 2005 since it would take time for renewable technology to achieve grid parity,¹⁸ The Competent Authority under the are derived power to power to determine preferential rates for electricity generate from renewable energy sources. After, the National Tariff Policy was issued in 2006, the objective of which is to

¹⁵ Matt Fisher, *China Highlights Nuclear Innovation to meet climate goals at IAEA Conference*, IAEA (5 October, 2019, 10:00pm) <https://www.iaea.org/newscenter/news/china-highlights-nuclear-innovation-to-meet-climate-goals-at-iaea-conference>.

¹⁶ Saamy Prrateek, *MNRE Details roles and responsibilities of DISCOMs under the 12 GW solar*

CPSU program, Mercom (22 April, 2021, 5:00 pm) <https://mercomindia.com/mnre-roles-discoms-12gw-cpsu-solar/>.

¹⁷ The Electricity Act 2003, No. 33, Acts of Parliament, 2003 (India).

¹⁸ National Electricity Policy, Ministry of Power 1, 14 (2005).



dictate central and international regulators when setting the tariff. The latest version of NTP in 2016 points to the promotion of renewable energy as an important policy objective, which is technological development and political innovation aimed at promoting research and development in renewable sector. TDP's strategy encouraged "exploration of innovative approaches" and capabilities to achieve long-term goals. It also persuaded the transfer of knowledge to technology through a technologically advanced system to monitor and to develop solar technology that meets India's electricity requirement. "The Research Center of Excellence" approved several TDI projects, which were funded to promote research and development. The Ministry of Renewable Energy is making a data of research and development in the sector.¹⁹ The regulatory interventions are to determine tariff, to define RPO, to promote grid connectivity and to lay emphasis on market growth.

Tariff Amendment Policy 2018

The objective of these amendments was to promote the generation of electricity from renewable energy sources. The Ministry of Energy, in talks with MNRE, declared the lasting path for RPO, SERC has achieved a positive response to the growth of the renewable energy sector through its RPO regulations, later in 2018 established a Cell Compliance RPO for access to solar energy in India Strength as there is no proper exercising of regulations laid down by RPO, several states in India due to negligence and ultimately in the structure did not achieve the goals set by the goals. The cell is designed to

work with Central Electricity Regulatory Commission (CERC) and SERC to gets statements on RPO compliance every month and to file complaints about non-compliant solar energy infrastructure to achieve better services for consumers through an electrical infrastructure reliable and efficient. Other objective includes to provide adequate supply to consumers and to enhance reserve capacity.²⁰

National Solar Mission, 2010

Jawaharlal Nehru National Solar Mission 2010 AKA the Solar Mission, is a part of India's National Action Plan on Climate Change (NAPCC). Divided into three phases, Phase I (2010–12), II (2013–17), and III (2017–22). Under Phase I, the Rooftop PV and Small Scale Generation Programme is designed to encourage the development of rooftop and ground-mounted solar systems.²¹ The mission is once amended in 2014 which intends to enhance capacity in 2022 by 100GW. To fulfill this hard to achieve target, the government declared numerous policies for the development of solar sector. It includes-

◆ Integrated Energy Policy, 2006

This integrated policy suggests a specific attention on the sector driven by renewable means particularly solar, along with this a particular bunch of targets are set to achieve developing its capacity.²²

◆ Generation Based Incentives for Solar

The purpose of generation based incentives is for projects which are for of grid less than 33kw. They also aim to cover the difference

¹⁹ National Tariff Policy, Ministry of Power 1, 5 (2006).

²⁰ National Tariff Amendment Policy, Ministry of Power 1, 14 (2016).

²¹ Jawaharlal Nehru National Solar Mission, Ministry of New and Renewable Energy 1, 5 (2010).

²² Integrated Energy Policy, NITI Aayog, Government of India 1, 20 (2006).



of base tariff Rs. 5.5 and tariff laid by CERC and an incentive.²³

◆ **Renewable Energy Certificates (RECs) 2011**

RECs is completely market dependent, introduced to develop renewable capacity. *"It levels the inter-state divergences of renewable energy generation and the requirement of the obligated entities to meet their RPOs with a differentiated price for solar and non-solar."*²⁴

◆ **Joint Liability Group for off-grid installations**

By synthesizing business and social potential, as it supports in loan seeking for activities no focused in farming and could be applicable for installations of micro grid.²⁵ Safeguard duties on solar panel have been levied by Indian government with the sole purpose of reducing import of raw materials from china which is of course is cheaper and to push materials made in India on the producers.²⁶

Pradhan Mantri Sahaj Bijli Har Ghar Yojana (Saubhagya Scheme)

It is launched by central government in September 2017 with aim "to achieve universal household electrification by December 2018 by providing last mile connectivity to all households in rural and urban areas in India".¹⁸ Resident household in areas which are not accessible or are remote are promised to be allotted

decentralized "solar PV-based systems of 200–300 Watt peak each with battery packs, 5 LED lights, a fan and a power plug, along with free maintenance for five years."¹⁹ *the Deendayal Upadhyaya Gram Jyoti Yojana* 2015 electrifying intention to all 18,000 non electrified villages by mid-2018 were preached earlier. Latter, '24×7 Power for All programme was launched in 2015 with the objective of providing 24×7 power to all consumers across India by 2019 .²⁰ although successful enactment of it is questionable, there are reports that contradicts.

Rajasthan

In terms of Rajasthan, New draft of Rajasthan solar Policy in 2019 has been stated *The Rajasthan Electricity Regulatory Commission* in coordination with *Rajasthan Renewable Energy Corporation Limited* objectives of which includes- GW capacity Grid Connected Solar power projects in the country up to 2021-2022 the target of 25 GW out of the total 100. To fulfill the Renewable Purchase Obligation of state distribution Companies as determined by RERC, To promote Open Access allowing the sale of power to other parties other than distribution companies in and outside Rajasthan and allowing captive consumption within the state.²⁷

Availability of it in not limited to but includes-

²³ Solar GBI, Indian Renewable energy development agency Limited, Solar 1,2018.

²⁴ S K Soonee, *Renewable energy certificate mechanism in India*, RECRI (25 April, 2021, 9:00 am)https://www.recregistryindia.nic.in/pdf/Others/Renewable_Energy_Certificate_Mechanism_in_India,_16th_NATIONAL_POWER_SYSTEMS_CONFERENCE.pdf.

²⁵ Amol Khanvilkar, *What are JLG*, NELITO (25 April, 2021, 9:15 am) <https://www.nelito.com/blog/what-are-jlg.html>.

²⁶ *India Levied safeguard duty on Chinese and Malaysian solar tech*, Power Technology (25 April, 2021, 9:30am) <https://www.power-technology.com/comment/india-levies-safeguard-duty-chinese-malaysian-solar-tech/>.

²⁷ Rajasthan Solar Energy Policy, Government of Rajasthan 1, 2 (2019).



- Small Decentralized Grid-connected solar power projects at load centers;
- Rooftop solar with Net Metering;
- Solar projects with battery storage;
- Charging stations by solar energy; and
- Development of solar parks.²⁸

Developers of the projects are discussed to pay a registration fee ranging from Rs.50,000 to Rs. 3,00,000 for registration depends on what is their project size. Also as per the new policy the developers are asked to contribute in the fund of local area development of around 25,000/MW. The policy as guided by state regulation allows banking of power. Likewise other charges such as "wheeling, transmission charges, and electricity duty" are also taken care of as per guidelines laid by RERC. Purchase of distribution companies are not allowed to registration done after 31st March 2019.²⁹

INTERNATIONAL LAWS AND POLICIES

To commence international cooperation with respect to energy use reform had already started around 1987, with the "*Brunt-Land Report*" of the "*World Commission on Environmental Development*". Albeit energy reform is indirectly mentioned, but Brundtland report introduced the term "untapped potential energy", development was discussed after the 21st century. Interestingly The *UNs' General Assembly*

declared the year 2012 as "*International Year of Sustainable Energy for All*"³⁰, The UN Secretary-General in order to strengthen further has laid a series of performance targets for 2030, among other things: most of the energy agreements formally established in the international treaty, However, Despite the agreement based on treaty, it does falls in customary and non-binding law. The global community has become readily inclined on non-binding means of international law, mainly due to many problems that traditional sources of international legal platform, it cannot easily address, although the debate continues but cannot be ignored. The role of non-binding law in development is energy law. International community is very supporting, especially in the role of integrating the base, expanding influence, and responding to energy problems quickly. In addition, it is useful to organize energy activities because they are more elastic and can be better adapted.³¹

The approach by using the general principles: Conference took place in 1992 based on environment in Stockholm, it produced documents. The 26 principle of that came to rise is the most crucial output of the conference. Principle 21 and 22 is relevant for sustainable development.³²

The most important issue for the field of environment was when the "*World Commission on Environment and Development (WCED)*" 1987 published a

²⁸Rajasthan allows new draft to solar policies, Reconnect (25 April, 2021, 9:45 am) <http://reconnectenergy.com/blog/2019/09/rajasthan-announces-new-draft-solar-policy-2019/>.

²⁹Rajasthan Solar Energy Policy, RajRas (26 April, 2021, 3:00 pm) <https://www.rajras.in/index.php/rajasthan-solar-energy-policy-2019/>.

³⁰ Jennifer Layke, *Unlocking Low carbon growth through energy efficient cities, Building efficiency, Building Efficiency Initiative* (26 April, 2021, 3:15 pm) <https://buildingefficiencyinitiative.org/tags/see4all>.

³¹ Redgwell, '*International Regulation of Energy Activities*', above n 19, 142.

³² Stockholm Declaration, 5th June, 1972.



report. It has immense contribution in the environmental field because it emphasizes the importance of considering environmental problems. It underlines on educating the public about the consequence of environmental damage and underlines why a legislations necessary in both domestic as well as global stage, the need to cohabit the principle of "sustainable development" in the state's ways to be embodied in state's laws. The United Nations Environment Program to encourage the development "of research in the field of the environment and regulations in line with United Nations standards." The main objective is making energy management and penning of policies more efficient in the sector. Institutional aspects of it commenced in *International Renewable Energy Conference*, with perception of 154 countries.³³ It was considered a notable time where "nations come together to achieve a common goal", plus the conferences firmly supported and infact contributed to the development of renewable energy policy to the domestic level by increasing attention and facilitation of policy change and transfer of technology. The next years, held a number of conferences with similar objective of use of renewable energy hosted in 2005 in Beijing. Wherein countries nodded and embraced their commitment of *the UN Commission on Sustainable Development*. At a conference in 2013 in Abu Dhabi almost 160 representatives of state appreciated the initiative³⁴ "The states attended declare that they will continue to encourage attempts to step up the use of modern energy is directed to the use of renewable energy, and improving energy efficiency Also, they

agreed to declare energy year with emphasis on the importance of renewable energy, to further increase use of renewable energy at national as well as global level". *International Renewable Energy Agency (IRENA)* was further established to promote corporation between states for renewable energy and of course sustainable development. As contained in the statute, "IRENA has been given the exclusive mandate to promote and encourage the widespread use of renewable energy, analyzing and monitoring renewable energy policy, cooperating with government agencies and NGOs, providing advice and guidance to many member states related to them and promoting research and development activities through transfer of knowledge and technology" IRENA is a platform for the principles of the UN and congratulates the United Nations regarding energy.

Renewable Energy and Energy Efficiency Partnership (REEEP) and the Renewable Energy Policy Network for the 21st Century (REN21), which regards specifically the development of solar means IRENA has performed closely with them to develop the same.³⁵

2002 commitment was discussed in "*Johannesburg Plan of Implementation*." It intends to expressly support the development, implementation; commercialization and technology transfer for renewable. Albeit the legal instrument was ambiguous and was not binding in nature but it did create awareness where economic

³³ Stuart Bruce, *International Law And Renewable Energy: Facilitating Sustainable Energy For All*, Melbourne Journal of International Law, 1, 24(2013).

³⁴ *Id.*

³⁵ *Renewable energy directives (RED I, RED II)*, RHEVA (28 April, 2021, 2:00 pm) <https://www.rehva.eu/eu-policy/renewable-energy-directive-red-red-ii>.



consumption and degradation of environment were linked, the Plan considered to have brought energy issues from the domestic level to the international level.³⁶ COP was held in Nairobi, Kenya in 2006, discussed, "*Further discussion of the climate change regime post 2012, the initiation of the Clean Development Mechanism and Joint Implementation, the formulation of the principles and modalities of the Adaptation Fund*"³⁷ With respect to the *European Energy Charter*, it is the legal outline for the development of renewable energy and *Protocol on Energy Efficiency*. It sooner turned into a platform that consistently asked nations in EU to "*reduce environmental degradation, promote sustainable development by means inter alia, improving energy efficiency, developing and utilization of renewable energy, encouraging the use of fuels that are environmentally friendly, as well as using technology to reduce pollution.*"³⁸ Various obligations were binded by the protocol to the parties for incorporation of laws and policies with respect to environment and sustainability,³⁹ *energy efficiency strategy*⁴⁰, and a number of programs⁴¹. *The Renewable Energy Directive* has made a list of aims which shall be achieved by the participant nations in adding certain percentage of renewables in their energy mix. Obligations on state are laid to promote legal certainty to investors and promoting technological development in the same.⁴²

National Action Plan on Climate Change
India has participated actively in 1 negotiations dealing with global challenges posed by climate change including the *United Nations Framework Convention on Climate Change* albeit its commitment for a cleaner environment is terse to implement because of massive population develop nations out commitment are decided to provide technical and financial assistance.⁴³

International Solar Alliance

The vision and mission of the International Solar Alliance is to provide a dedicated platform for cooperation between countries rich in solar resources where the international community, including bilateral and multilateral organizations, companies, industry and other interested parties. To assist and help achieve common goals of increasing the use of solar energy at the meeting, the energy needs of potential ISA member states are safe, appropriate, affordable, fair and sustainable. Even for the needs of the family till 2020. Countries can freely define a plan and forms for renewable energy, but they must indicate the objectives established by the secretariat. Progress reports should be submitted to the body for evaluation every couple years. Application to secretariat of the financial aid plan to support the national plan for the development of solar

³⁶ Johannesburg Plan of Implementation, 14th June, 1992.

³⁷ *The history of UNFCCC negotiation*, the National Board of Climate Change, 2012.

³⁸ Energy Charter Treaty (ECT), Article 19, 17th Dec., 1991.

³⁹ *Id.* at Article 3.

⁴⁰ *Id.* at Article 5.

⁴¹ *Id.* at Article 8.

⁴² EU directive 2018/2001/EC on the promotion of the use of energy from renewable source (2018).

⁴³ *International Solar Alliance, Ministry of Europe and foreign Affairs, Ministère de L'Europe et des Affaires Étrangères* (29 April, 2021, 5:30pm) <https://www.diplomatie.gouv.fr/en/french-foreign-policy/climate-and-environment/international-solar-alliance/>.



generation can be made by each member ⁴⁴ the *renewable energy directives* laid down bunch of objectives that must be achieved among all member states. The directive does not specify a fine, if the country cannot achieve the average goal the Secretariat has the "right to conduct an evaluation and make recommendations if there is a violation, especially when the state does not take any necessary action to achieve the stated objectives." Although the provision of renewable energy has advanced somewhat at the regional level, the ambition of international energy cooperation is not easy to achieve. If international environmental cooperation takes a long time to achieve, energy cooperation takes longer, and international law requires legal initiatives to strengthen arrangements for renewable energy in the energy sector to be supportive of the interest of other countries. Establish rules to facilitate the development of this activity. By facilitating the disposal of renewable energy at the international level, international law faces a number of challenges including concerns about state sovereignty over natural resources and each country's internal energy security policy. Legal issues appear to be an impediment to the *development of renewable energy sources* the will to facilitate the development of international law in the field.⁴⁵

DEVELOPMENT AND PROBLEMS IN THE SECTOR:

Despite this uplifted trend by courts and regulatory authorities to support compliance

with RPOs, many cases of relaxation of RPOs by SERC persist. In 2014, the Chhattisgarh State Electricity Regulatory Commission issued a default order for RPO of Chhattisgarh and MP distribution companies until 2015 that has not yet achieved its RPO target for previous years. In this context, the Green Energy Association submitted another petition to Madhya Pradesh Electricity Regulatory Commission (MPERC) to request a cumulative Solar RPO tax on distribution companies for the 2015-16 fiscal year. Surprisingly, MPERC decided not to impose any penalties on distribution companies and only direct it to make efforts to implement its RPO. It also enabled distribution companies to reduce prepayment by overvaluing solar energy in the coming years. This decision clearly contravenes the principles established by Appellate Tribunal for Electricity (APTEL) in earlier orders.⁴⁶ Another recent case before the APTEL dealt with the issue of utilization of the RPO fund by the Himachal Pradesh Electricity Regulatory Commission (HPERC). The HPERC RPO Regulations provided that compensation recovered because of non-fulfillment should not be used fully. Part of which is for the purchase of RECs and partly for the development of sub transmission infrastructure. In contravention of these regulations, HPERC allowed the entire compensation of Rs. 17.23 crores to be spent on development of sub-transmission infrastructure. While the APTEL did not strike down HPERC's decision in this particular instance, it held HPERC will have

⁴⁴ *Key objectives of international solar alliance and challenges it face today*, Insights IAS (29 April, 2021, 5:45pm)

<https://www.insightsonindia.com/2018/03/19/2-examine-the-key-objectives-of-the-international-solar-alliance-isa-and-the-challenges-it-faces-today/>.

⁴⁵ *Supra* at 44.

⁴⁶ *MPERC imposes penalty for noncompliance of RPO*, Reconnect (30 April, 2021, 4:00 pm) <http://reconnectenergy.com/blog/2014/10/mperc-imposes-penalty-for-non-compliance-of-rpo/>.



to decide the percentage of the compensation fund which will be utilized towards purchase of RECs in case of shortfall in meeting RPO by Obligated Entities.⁴⁷ In a similar move, the Rajasthan Electricity Regulatory Commission has gone as far as to amend its RPO regulations to allow utilization of the RPO fund exclusively by state transmission utilities to develop transmission infrastructure, without any obligation to purchase RECs. These decisions clearly militate against the entire rationale of setting up a fund under RPO regulations.⁴⁸

In absence of competition, there have been serious lapses in their functioning, making it necessary to effectively break their stronghold. With a purpose to encourage competition in the electricity supply sector, the Electricity Bill, 2014 was introduced in the Lok Sabha. Indian solar installations in 2017 raised extensively with the addition of 9629 MW. The warning of solar import tariffs and conflicts between developers and distribution firms are growing investor concerns. The investments into renewable energy in India increased by 22% in the first half of 2018 compared to 2017, while the investments in China dropped by 15% during the same period⁴⁹ at this rate, India may overtake China by end of 2020 or beginning of 2021. It is seeking to transformation in renewable energy by reaching 175 GW by 2020. It is quickly ramping up investments in this sector. The country added more renewable capacity than conventional capacity in 2018. India hosted the ISA first

official summit, this will provide a standard platform to work toward the ambitious targets for renewable energy. The summit will emphasize India's dedication to meet global engagements in a time-bound method. The country is also constructing many sizeable solar power parks comparable to, but larger than, those in China.

Ultra-mega Solar Park in Kurnool has produced 800 million units of energy in late 2018 and 700,000 tons of carbon dioxide is apparently saved. Rainwater is harvested using a tank that helps clean solar panels. The farm of Kamuthi is cleaned by robots. As the national economy is expanding consistently so is consumption of electricity which is expected to reach 15,280 terawatt hours by 2040. Government's aspiration, green energy targets, are growing dramatically from attractive way with both foreign and national investments. It is expected to seek investments worth 80 billion dollars in the next four years. The Government of India has raised to 225 GW of renewable energy capacity by 2022. As per the statement released by Government of India there about 60 cities to be built in India as a section of MNRE's "Solar cities program".⁵⁰

The electricity generation through solar means coincides with the normal peak demand during daylight hours in most places, thus mitigating peak energy costs, brings total energy bills down, and obviates the need to build as much additional generation and

⁴⁷ *Green Energy Association v. HPERC and others*, Order dated December 10, 2015 in Appeal no. 54 of 2015 before the APTEL.

⁴⁸ (Renewable Energy Certificate and Renewable Purchase Obligation Compliance Framework) (First Amendment) Regulations, 2016.

⁴⁹ *New energy outlook 2020*, Bloomberg NEF (1 May, 2021, 3:00pm) <https://about.bnef.com/new-energy-outlook/>.

⁵⁰ V. Ridhi Kumar, *Global Focus on Kurnool Solar Park*, Hindu Business Line, (3 May, 2021, 8:00 am) <https://www.thehindubusinessline.com/news/national/global-focus-on-kurnool-solar-park/article9945725.ece>.



transmission capacity as would be the case without PV. India being a tropical country receives adequate solar radiation for 300 days, equivalent to over 5,000 trillion kWh. Almost all the regions receive 4-7 kWh of solar radiation per sq. mtrs. with about 2,300–3,200 sunshine hours/year, Potential areas for setting up solar power plant can be analyzed using Solar irradiation map of India.⁵¹ *The Impacting Research Innovation and Technology program* seeks to develop engineering and technology on a national scale. IMPRINT is steered by the *Indian Institute of Technologies and Indian Institute of science*. It covers all areas of engineering and technology, including renewable technology. *The Ministry of Human Resources Development* funds up to 50% of the total project cost. The remaining costs of the project are funded by the Ministry through the research and development program for renewable projects. Currently around five projects are being implemented in the field of solar thermal systems, the storage of which is funded by MNRE and IMPRINT. National technology development and quality control are strengthened through published laboratory policies. Policies of labs were tested, *standardize, and certify renewable energy products and projects.*⁵²

Power grids in India

The Indian Power system for planning and operational purposes is divided into five regional grids. The integration of regional

grids, and thereby establishment of National Grid, was conceptualized in early nineties the initial inter-regional links were planned for exchange of operational surpluses amongst the regions. However, later on when the planning philosophy had graduated from Regional self-sufficiency to National basis, the Inter-regional links were planned associated with the generation projects that had beneficiaries across the regional boundaries. India without a doubt is facilitating a solar revolution reflected in founding and Hosting ISA, it has moved decisively to increasing access to solar finance, lowering the cost of technology and building the solar skills needed among engineers, planners and administrators but it has also set an unparalleled deployment target for solar power generation.⁵³ *The National Solar Mission* aims to reach 100 GW of solar power generation by 2022 and has spurred intense activity in solar development across India it is evident that solar can boost renewable's share in our power mix, increase energy efficiency and bring electricity to remote parts of the region India without a doubt should aims to maximize the potential to adopt sustainable energy through *technical support and capacity building*, Work to develop a regional master plan on sustainable energy connectivity, vital to make the most of solar power by supporting the growth of cross border power systems.⁵⁴ The ultimate purpose of sustainable development is to use

⁵¹ Chetan Maini, *The environment: India is an ideal country for solar energy story*, Business Today (3 May, 2021, 8:30am) <https://www.businesstoday.in/magazine/cover-story/the-environment-india-is-an-ideal-country-for-solar-energy/story/227500.html>.

⁵² Megha Kaladharan, *An Analysis on regulatory environment and evolving policy trend*, Centre for Policy Research (5 May, 2021, 9:00 pm)

<https://www.cprindia.org/research/papers/renewable-energy-india-analysis-regulatory-environment-and-evolving-policy-trends>.

⁵³ *Creation of National Grid*, Ministry of Power (8 May, 2021, 12:00 pm) <https://powermin.nic.in/en/content/creation-national-grid>.

⁵⁴ *Supra* at 1



resources in such a way that they can be used in future. India here has a massive role to guide the world and to constantly evolve technologies for promotion of solar energy.

CONCLUSION

Energy is one of the most important aspects of a person's existence. plus growing human energy needs while focusing on nature conservation, to develop alternative environmentally friendly sources of energy is important; The development of renewable energy is inevitable as a result of the depletion of fossil fuels and environmental degradation due to the exploitation and exploration of energy today, although a series of provisions with regards to *renewable* energy are still Limited, on positive side we can witness that countries are beginning to take renewable energy in the *Energy Mix Policy*. The renewable energy deal in evident not just internationally, but also regionally. International law must see that the use of renewable energy is implemented as per the principles that have been developed in the international arena, and this also highlights the need to consider with greater interest the long-term nature of the reform process. While the change in policy may not necessarily account for the interests of all stakeholders, it should definitely be recognized. This could not be healthier for India's energy sector, as the participation mechanism is not only recommended, but necessary, given the division of powers under the constitution. While the shift to renewable energy may not be accepted by all countries, the center also needs to take a closer look at the specific realities of the state and address existing institutional deficiencies before moving forward with the reform agenda. The growth of the solar platform has raised concerns about the spiral of public services, a

situation in which households switch to solar energy, reducing their use of electricity on the grid. As a result, the customer base required to cover distribution companies fixed costs decreased, increasing rates. Rising rates are turning more customers into solar energy to cut their bills, making solar energy more competitive and the grid less and less attractive. The mechanism of the solar cover has resulted in a much-needed interruption of the sector. With solar power configured to achieve grid parity, distribution companies need to be aware that high-value commercial and industrial users may abandon the grid in favor of building their rooftop solar plants. Distribution companies should develop a business plan to estimate potential losses if this change occurs on a large scale and define measures to offset its financial impact.

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