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International solar alliance: India's potential in clean energy

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Abstract
The demand for energy grows every day in the world, but with grave threat of environmental decay and limited conventional resources. There is a radical shift in demand for clean and sustainable energy resources and consumption. International Solar Alliance is thus a potent mechanism with key idea to *"harmonize and aggregate demand for solar finance, solar technologies, innovation, R&D, and capacity building"*. It aims to mobilize USD 1 trillion for deployment of solar power capacity of 1000 GW by 2030 and bring together 121 countries that lie between the Tropics of Cancer and Capricorn that receive abundance of sunlight. Thus, the study will outline the strategy and approach India is taking to enhance its solar power potential, how India will achieve *SDG 7: Affordable and Clean Energy* and bring out India's potential to position itself in key global leadership role in area of climate change, renewable energy and sustainable development.

Keywords: climate change, renewable energy, international solar alliance, solar energy, sustainable development goals

1. Introduction

Energy is one of the most vital building blocks in human development and a key factor in sustainable development of any nation. Presently, an exigent and fastest growing need of the world is energy requirement of the world with reduction in the conventional non-renewable resources like coal and petroleum. Due to grave threat of climate change, environmental decay, limitations on conventional resources, and subsequent growing demands has led to radical shift of the narrative towards consumption of clean and sustainable energy resources. Therefore, countries are emphasizing on development of renewable energy sources, as it has a potential to provide solutions to the long-term energy problems for developing countries like India. Renewable energy comes from resources which are continually replenished like sunlight, wind, rain, tides, waves, geothermal heat. It plays an important role in the long-term energy supply security, diversification of energy mix, energy access, environmental security and sustainability. Thus renewable energy is bound to play an increasing role in future energy systems.

Solar energy plays significant role in this aspect. It is one of the cleanest sources of energy with least carbon emission and pollution, has the potential to significantly reduce reliance on coal and other fossil fuels, and has got tremendous prospects of energy that can be harnessed using a variety of devices. By expanding renewable energy base like solar energy, we can improve air quality, reduce global warming emissions, create 'green' industries and 'green' jobs and move world towards cleaner, safer and affordable energy. With recent developments, solar energy systems are easily available for industrial and domestic use with the added advantage of minimum maintenance.

India is facing an acute energy scarcity which is hampering its industrial growth and economic progress in certain aspects. Setting up of new power plants is inevitably dependent on import of highly volatile fossil fuels. Hence, it is essential for India to tackle the energy crises through judicious utilization of abundant renewable and clean energy resources like solar energy. India's need to increase energy provision for its population and fast-growing economy poses a formidable challenge which is perceived as both a great opportunity as well as a necessity for the country to increase the share of renewables in the overall energy mix. Development of solar energy, which is indigenous and has low marginal cost of generation, can increase energy security by diversifying supply, reducing import dependence, and mitigating fuel price volatility. Solar energy development in India can also be an important tool for spurring regional economic development, particularly for many underdeveloped states, which have the greatest potential for developing unlimited and clean source of energy. It can provide secure electricity supply to foster domestic industrial development. According to National Action Plan on Climate Change, *"India is a tropical country, where sunshine is available for longer hours per day and in great intensity. Solar energy, therefore, has great potential as future energy source. It also has the advantage of permitting the decentralized distribution of energy, thereby empowering people at the grassroots level".* To make the country self-sufficient in electricity large number of solar energy projects are to be installed. This would also reduce polluting emissions in the atmosphere and will reduce pressure on environment. Hence the initiative can be taken to provide clean and green energy to the common people as the energy demand since last few years had been increased.

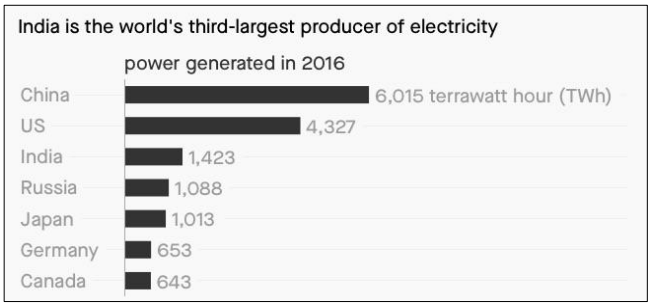
Countries lying fully or partially between Tropic of Cancer and Tropic of Capricorn are blessed with very good solar insolation and this could be harnessed and used for sustainable future. To maximize the effect of energy security, an importance of globalization aspect of supply chain was thought by Indian Government and the idea of joining hands was conceived at the Paris Climate Summit in December 2015. These countries need a voice on international stage where they can share their experiences and mobilize in order to close technological gaps by cooperating with each other. This cooperation and coordination role is proposed in the form of International Solar Alliance (ISA), a grouping of countries who are keen to transform their solar resource wealth into improved conditions of the environment and

improved lives of the people through applications of solar technologies. Key idea of ISA is to *"harmonize and aggregate demand for solar finance, solar technologies, innovation, R&D, and capacity building"*. Hence, ISA will harvest both a great opportunity as well as necessity for the country to increase the share of renewables in overall energy mix and reduce dependence on fossil fuels. Taking the lead for the Alliance, Indian PM has deliberated that the goal of India is to make solar energy an integral part of common man's life and reach it to the most unconnected villages and communities.

Thus, the study aims to outline the strategy and approach India is taking to enhance its solar power potential. It provides an overview on solar energy in India. It will review the current status of solar energy in terms of existing capacity, along with historical trends of solar energy. It will focus on how India will benefit from ISA, thereby aiming to achieve Sustainable Development Goals (*SDG) 7: Affordable and Clean Energy*. Finally, it will bring out India's potential to position itself in key global leadership role in area of climate change, renewable energy and sustainable development, while answering a significant question, if India is aspiring to become global leader in clean energy and sustainable development.

2. India's Strategy/Approach to enhance Solar Power Potential

Electricity is a crucial component for any nation's development process, including urbanization, industrialization, improvement of living standard, economic growth. India is currently third largest producer of electricity in world generating 1160.1 billion units of electricity in year 2017. Total electricity production stood at 1003.52 billion units in India between year 2017 and 2018. Multiple drivers relating to industrial expansion and rising per capita income are leading to growth in power demand.

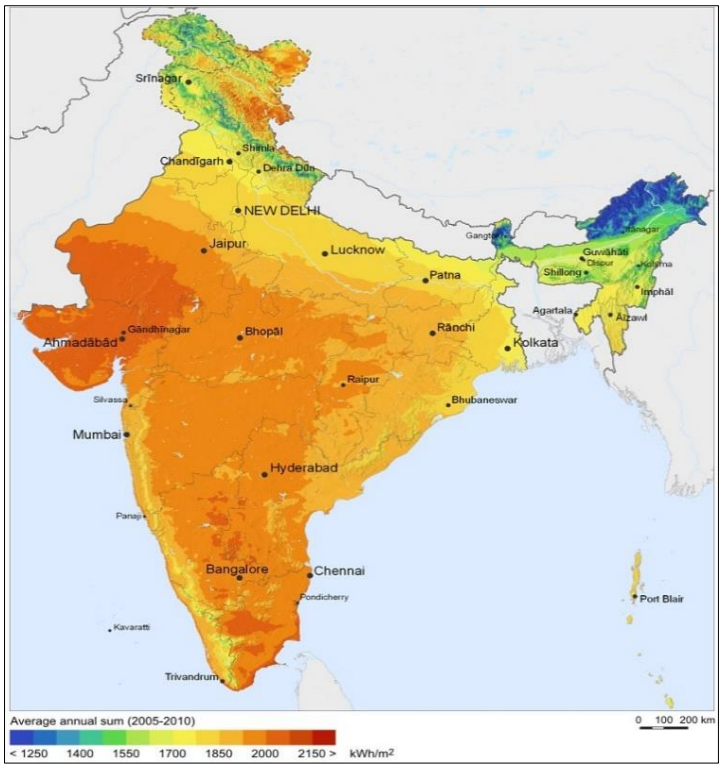


***Source*:** Data - India Brand Equity Foundation (Ministry of Commerce, Government of India)

Fig 1: India's Rank in Electricity Generation

India's power sector is based on fossil fuels, with three-fifth of country's power generated by reserves of coal. Consequently, thermal power plants that utilize non-renewable resources like coal, oil, gas to produce heat and then electricity emit high amount of toxic gases, such as, nitrogen oxide, sodium oxide, carbon oxide which is harmful to health and environment. However, in past few years India has taken various steps to reduce the use of fossil fuels-based energy and promote renewable energy generation. A notable contribution goes towards solar energy with which India is highly endowed. Solar energy technology is a significant mechanism that can lower carbon emissions in the environment, as well as augment the development process.

Solar power can be generated directly by photovoltaic (PV) or indirectly by solar thermal power. In photovoltaic power plant a device called solar cell or photovoltaic cell (PV) is used that converts light into electric power using the photoelectric effect. The PV cell is a solid-state device consisting of thin layers of semiconductor materials that produce electricity when exposed to light. India, located in the sunny belt of world, is endowed with vast solar energy potential.



***Source*:** Solar Energy Association

Fig 2: Solar Radiation in India

Most parts of India get 300 days of sunshine a year. About 5000 trillion kWh per year energy is incident over Indian lands with most area receiving 4-7 kWh per sq. meter per day. Hence, both the technologies - solar thermal and solar photovoltaic - can effectively provide huge capability for solar power in India.

Figure 2 shows solar radiation data map of India. It can be observed that highest annual global radiation is received in Rajasthan and northern Gujarat. Therefore, much emphasis on solar power is laid due to three reasons; first, sunshine is a freely available, abundant and non-polluting source; second, it can help to electrify remote villages where grid lines are absent or difficult to reach or suffer from sporadic supply; third, with falling costs it is financially viable for industrial and commercial consumers.

According to International Energy Agency, India is among top ten largest solar energy-producing countries in the world. India has substantially paved an upward path in terms of solar power capacity achievement since 2008. It started off with 3 MW in 2008-09 and has touched 8000 MW (8GW) by July end, 2016. India has set a target of 100 GW by 2022, which is divided as: 60GW of land-mounted grid connected solar power and 40GW of rooftop grid interactive solar power. Jawaharlal Nehru National Solar Mission (JNNSM), also known as National Solar Mission (NSM), is a Government of India initiative to promote solar power growth in the country. Inaugurated in 2010, the mission set target of 20 GW by 2022, but has been increased to 100 GW in 2015. With this India increased its solar power generation capacity by nearly five times from 2014 to 2017. Moreover, the market is set to grow significantly in the next ten years, driven mainly by rising power demand and prices for fossil fuels, the ambitious NSM, various state level initiatives, renewable energy quotas including solar energy quotas for utilities as well as by falling international technology costs. Encouraging the spread of solar power generation by 2022, it is a key element in India's comprehensive, long-term energy supply strategy. If this energy is harnessed efficiently, it can easily reduce our energy deficit scenario and that to with no carbon emission. Keeping in view the solar annual insolation, solar power could therefore easily address India's long-term power requirements. However, it has to be cost-competitive.

To elaborate more on importance and relevance of solar energy in India some of the key parameters are;

Cost: Solar power is still high on absolute costs compared to other conventional sources of power such as coal. The objective of the Solar Mission is to create conditions, through rapid scale-up of capacity and technological innovation to drive down costs towards grid parity. Cost trajectory will depend upon the scale of global deployment, technology development and transfer.

Scalability: India is endowed with vast solar energy potential. About 5,000 trillion kWh per year energy is incident over India's land area with most parts receiving 4-7 kWh per sq. meter per day. Hence both technology routes for conversion of solar radiation into heat and electricity, namely, solar thermal and solar photovoltaic, can effectively be harnessed providing huge scalability for solar in India. The constraint on scalability will be the availability of space since in all current applications solar power is space intensive. In addition, without effective storage, solar power is characterized by a high degree of variability. In India, this would be particularly true in the monsoon season.

Environmental impact: Solar energy is environmentally friendly, as it has zero emissions while generating electricity or heat.

Security of Source: From energy security perspective, solar is the most secure of all sources, since it is abundantly available. It is also clear that given the large proportion of poor and energy un-served population in the country, every effort needs to be made to exploit the relatively abundant sources of energy available to the country. While, today, domestic coal-based power generation is the cheapest electricity source, future scenarios suggest that this could well change.

To assess India's path breaking endeavor and achievements to intensify solar power potential, it is important to emphasize on Jawaharlal Nehru National Solar Mission (JNNSM). It is a major initiative of the Government of India with active participation from States to promote ecologically sustainable growth while addressing India's energy security challenge. It plays a major role in India's contribution to fight against the global issues of climate change. Objective of program was to make energy-efficient economic development for India, where economic activities should be based on non-fossil fuels sources with reliance on clean energy. Based on this vision JNNSM was launched under the brand name "Solar India".

Under the original plan, the Government aimed to achieve a total installed solar capacity of 20 GW by 2022. The Government revised the target from 20 GW to 100 GW on 1 July 2015. To reach 100 GW by 2022, the yearly targets from 2015-16 onwards were also revised upwards. As of March 31 2018, India as installed capacity of 21,651.48 MW.

Phase 1 of the Mission was largely focused on grid-connected projects, divided into two batches. In Batch I, capacity addition of 150 MW of grid connected solar PV plants and 500 MW of grid connected solar thermal plants was envisaged. Whereas, in Batch II the remaining targeted capacity for Solar PV, that is, 350 MW was awarded. Apart from this grid connected large-scale plants, small rooftop plants of capacity less than 2MW were also allotted under Rooftop PV and Small Solar Power Generation Program (RPSSGP). In order to facilitate grid connected solar power generation, without any direct funding by the Government, Government approved NTPC (National Thermal Power Corporation Limited) Vidyut Vyapar Nigam (NVVN) as the nodal agency to purchase 1000 MW of solar power from the project developers, bundle it with the unallocated power available from the NTPC coal-based stations and sell this "bundled" power to the Distribution Utilities. In addition to initiatives at national level, State Governments too announced solar power development programs in order to fulfill the targets of solar mission. Strategic development of Phase-I has made India's grid-connected solar energy market grow tremendously, with an increased number of developers, lower prices, and participation from interested financial institutions.

Phase-II targeted to bring cumulative solar capacity to 10 GW by 2017. To make Phase-II another success story wider participation of States is required with development of transmission and distribution network to connect areas with high solar potential. Developing cluster of solar parks will help reduction in costs further and fair market play will prevail and help in development of various technologies used for achieving phase-II targets. Thrust areas for promotion of

off-grid solar during phase II are as follows;

- Improved energy access for remote areas
- Heating/Cooling applications needs to be encouraged (such as, cooling, cold storage, water purification, space heating)
- Replacement of diesel and kerosene
- Industrial process heat applications
- Solar water irrigation pumping systems

During Phase-II, it was envisaged that around 20,000 villages/hamlets should be covered through 'Energy Access' scheme by way of deployment of Off-Grid electricity generation projects. Therefore, deployment of around ten lakhs off grid lighting systems was decided. Moreover, under Phase II of JNNSM, target for deployment of 25000 solar pumps and target of at-least 15-20 cities where solar water heaters would become the main source of heating water replacing electric geysers was envisaged.

In December 2014, the Government of India introduced a scheme to establish at least 25 solar parks and Ultra Mega Solar Power Projects to add over 20 GW of installed solar power capacity. The Central Government provides financial support for the construction of these solar projects. Each power project has a minimum capacity of 500 MW. By April 2017, 34 solar parks were under construction across 21 states. The solar park is a concentrated zone for development of solar power generation projects and provides developers an area that is well characterized, with proper infrastructure and access to amenities and where the risk of the projects can be minimized. Solar Parks would include all required facilities for generation of solar power, which may include evacuation and transmission infrastructure, solar radiation monitoring station, water availability, access roads to the park, interior roads in the park, telecommunication facility, fire station, green belt and security. Other elements of the solar park could be manufacturing facilities, testing and characterization facilities, R&D and demonstration in accordance with the State policy in this regard.

However, various barriers and challenges for solar energy in India are also evident;

- Land is a secret reserve in India and as per capital availability is low. Large land area is required, which sometimes is not feasible.
- 100 GW of solar would mean about 10.5% share for solar power in total generation of power in India. Such large share of intermittent sources requires huge investments in the power grid infrastructure for transmission smart supply and demand management.
- To achieve a capacity of 60 GW for utility scale projects by 2022, there would be a requirement of about USD 40 billion. The government currently expects a big share of this to come from international sources.
- Storage problem is also very serious. Suppose if the demand of power is not so high then the electricity produced by the solar plant will have to be stored somewhere to supply when demanded. This increases the cost of the project.

Thus, JNNSM is a hardline approach of the Government of India and State Governments to promote ecologically sustainable growth while addressing India's energy security challenge. It is also a major contribution by India to the global effort to meet the challenges of climate change, with objective to establish India as a global leader in solar energy, by creating the policy conditions for its diffusion across the country as quickly as possible. Hence, aim of the Mission to focus on setting up an enabling environment for solar technology penetration in the country both at a centralized and decentralized level is considered a success story. In this regard, it becomes pivotal to embrace India's role in International Solar Alliance, as it strengthens India's footprint in leading environment-friendly sustainable development with optimum harnessing of affordable and clean energy (Sustainable Development Goals 7).

3. International Solar Alliance (ISA)

Indian Prime Minister Narendra Modi and French President François Hollande launched the International Solar Alliance on 30 November 2015 on the fringe of the Conference of Parties (COP) 21 opening ceremony in Paris. The Alliance aims to harmonize demands in solar power (investment, technology, R&D) across the 121 high-solar potential countries that have territory between Tropic of Cancer and Tropic of Capricorn. The project reflects the reality that development of renewable energies is one of the most obvious ways of reducing greenhouse gas emissions. Solar power is the most abundant renewable energy source in Southern countries, but technology and funding are still lacking.

The aim of the Alliance is to leverage on the fact that the same challenges are encountered within geographically distant regions. If these regions come together in an Alliance, they could carry much more clout. Therefore, this '121 country-coalition' aims to make ISA a cooperation platform for developed countries with solar technologies and developing countries between the Tropics of Cancer and Capricorn to develop their solar potential. The plan is to bring together all solar stakeholders (bilateral and multilateral organizations, businesses, industrial producers, civil society) so that they may play their part in meeting objectives. Signatory countries undertake to make joint efforts through innovative policies, programs and projects, capacity-building measures and financial instruments.

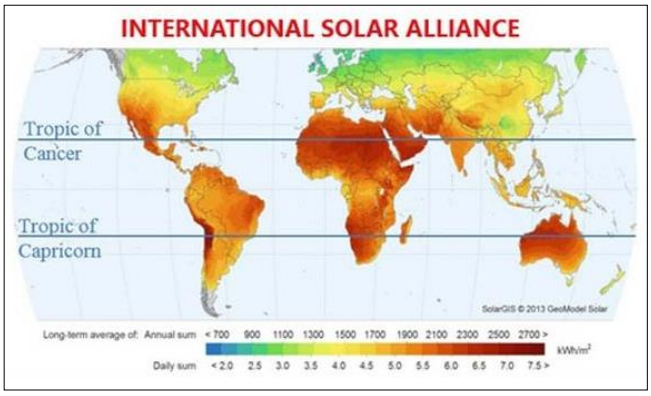


Fig 3: 121 Countries between Tropic of Cancer and Tropic of Capricorn

Headquartered in India, the alliance is a treaty-based inter-governmental organization. Countries that do not fall within the Tropics can join the alliance and enjoy all benefits as other members, with the exception of voting rights. At present 65 countries have signed/ratified the framework of ISA. Countries of ISA are mainly developing countries, with 20 percent of population of these countries having no access to electricity. These countries also account for 73 percent of

world population, 36 percent of global GDP and 55 percent of world energy consumption.

What has happened since COP 21?

- 60 Countries have joined the Alliance, which obtained the status of an international organization on 6 December 2017
- 5 programs of action have been launched on rural and decentralized applications, finance, mini-grids, rooftop installations and solar e-mobility
- 6 meetings of the ISA international Steering Committee have been held, co- chaired by France and India
- Forums to bring together private sector provision, finance and solar energy demand have been organized in Paris and New Delhi
- 100 first projects for solar applications have been identified from 34 ISA member countries
- A common financial guarantee mechanism is being established to foster affordable access to finance
- Action to Transaction Meets to bring Stakeholders together

The Alliance's five programs of action

- Rural and decentralized applications: Most Alliance member countries are agrarian economies. This program aims to improve yields and economic benefits by providing reliable, affordable solar applications that are suited to needs and accessible to all farmers in various fields.
- Access to affordable finance: Financial cost is currently the major obstacle to the deployment of solar technologies, despite rapid technological progress. The countries taking part in the program work on drawing up common principles for legislative and regulatory frameworks, and on risk-reduction instruments aimed at enhancing their chances of accessing finance.
- Island and village solar mini-grids: Islands and non-interconnected communities are among those most interested in renewables, and solar in particular. This program aims to develop and replicate commercial models, adopt common standards and launch calls for tender for the installation of mini-grids.
- Rooftop installations: Thanks to its ability to generate small quantities of energy at multiple feed-in points, rooftop solar can produce decentralized energy, thus limiting the costs of upgrading grids and pooling electrical production variations across a large number of installations. This program aims to lift barriers to its development.
- Solar e-mobility: Solar e-mobility technologies (including roads, vehicles and scooters) are seeing very rapid development. This program seeks to develop these applications and promote their deployment, including through energy storage, and to harmonize practices across the countries taking part in the program.

Recognizing that sustainable development, universal energy access, and energy security are critical to the shared prosperity and future of our planet and acknowledging that clean and renewable energy needs to be made affordable for all, governments of countries declared that their intention is to support India's proposal to launch ISA as a common platform for cooperation among solar resource rich countries lying fully or partially between the Tropics of Cancer and Capricorn. United by a shared vision to bring clean, affordable and renewable energy within the reach of all, objectives of ISA are to ensure the promotion of green, clean and sustainable energy, and to draw on the beneficence of the Sun in this endeavor. These solar rich countries share the collective ambition to undertake innovative and concerted efforts with a view to reducing the cost of finance and cost of technology for immediate deployment of competitive solar generation assets in all our countries and to pave the way for future solar generation, storage and good technologies adapted to our countries' individual needs. They aspire to make joint efforts through innovative policies, projects, programs, capacity-building measures and financial instruments to mobilize more than 1000 billion USD of investments that are needed by 2030 for the massive deployment of affordable solar energy, compatible with national contributions planned. The solar alliance will act in three directions: first, bringing together the demand of the countries with strong solar potential to reduce financing costs. Second, open the markets to reduce investment costs. Third, transfer the necessary technologies of developed countries to developing ones. The alliance is also called International Agency for Solar Policy and Application (IASPA).

4. How India will benefit from ISA and Achieve SDG 7?

India would benefit immensely from ISA as it is making its commitment to the Paris Declaration unambiguous and is taking the leadership role in making solar energy an important component of its energy mix. The ISA can go a long way in helping developing countries of the global South to be energy-sufficient to a significant extent.

The Summit has significant geopolitical implications. The Permanent Secretariat of ISA will also be located in India at Gurugram, the first time that an inter-governmental treaty-based alliance will have its headquarters in India. This will allow India the opportunity to position itself in a key global leadership role in the arena of climate change, renewable energy and sustainable development. The Indian leadership also sees its active role within the ISA as a reiteration of India's commitment to fulfilling its global commitment on addressing climate change in a time-bound manner, help boost global confidence in India's capacities, and achieve targets of Sustainable Development Goal (SDG) 7, that is, *Affordable and Clean Energy: Ensure access to affordable, reliable, sustainable and modern energy for all*. The alliance shall also enhance and concretize India's soft power. This India-led alliance nudges the orientation of India's foreign affairs and manifest it in global arena.

Under ISA, India will work with partner countries in the identification of national opportunities to accelerate development and deployment of existing clean solar energy technologies, the potential for which largely remains untapped. The increased deployment of solar technologies will benefit the countries in terms of direct and indirect employment opportunities generated and the economic activity that will be triggered through electricity and solar appliance access to predominantly rural households. Across developing countries, it is mostly micro, small and medium enterprises that generate most of the economic activity and are the ones that benefit the most from electricity access, as they will be able to operate into the evening and increase their turnover. Increased deployment will also go a long way in realizing social benefits, for example through solar lanterns

that improve educational outcomes from increased study hours, and lead to better health service delivery levels across communities.

The ISA is not only expected to spur innovation in the renewable energy space but also help make India a technological hub with independent manufacturing capabilities of clean energy equipment like solar panels, rather than being dependent on imports, through initiatives like 'Make in India'. It is the Indian government's flagship campaign intended to boost the domestic industries and attract foreign investors to invest into the Indian economy. The campaign is with an intention of reviving manufacturing businesses and emphasizing key sectors in India amidst growing concerns that most entrepreneurs are moving out of the country due to its low rank in ease of doing business ratings. In the process, the government expects to generate jobs, attract much foreign direct investment, and transform India into a manufacturing hub preferred around the globe. The government has identified 25 priority sectors that shall be promoted adequately. These are the sectors where likelihood of FDI (foreign direct investment) is the highest and investment shall be promoted by the government of India.

To achieve the above overarching objectives mainly in energy sector, ISA, by way of supplementing the national efforts of the member countries, through appropriate means would contribute in following areas:

1. Collaborations for joint research, development and demonstration, sharing information and knowledge, capacity building, supporting technology hubs and creating networks
2. Acquisition, diffusion and indigenization and absorption of knowledge, technology and skills by local stakeholders in the member countries
3. Creation of expert groups for development of common standards, test, monitoring and verification protocols
4. Creation of partnerships among country specific technology centers for supporting technology absorption for promoting energy security and energy access
5. Exchange of officials/ technology specialists for participation in the training programs on different aspects of solar energy in the member countries
6. Encourage companies in the member countries to set up joint ventures
7. Sharing of solar energy development experiences, analysis on short and longer-term issues in key energy supply, financing practices, business models particularly for decentralized applications and off-grid applications, including creation of local platforms focusing on implementation solutions and grass root participation
8. Establish new financial mechanisms to reduce cost of capital in the renewable energy sector and innovative financing to develop
9. Collaborate with other multilateral bodies like International Renewable Energy Agency (IRENA), Renewable Energy and Energy Efficiency Partnership (REEEP), International Energy Agency (IEA), Renewable Energy Policy Network for the 21st Century (REN), United Nations bodies; bilateral organizations; Corporates, industry, and other stakeholders can contribute towards the goal of increasing utilization of solar energy in ISA member countries.

While ISA is a global initiative, its ramifications are profound for India. Apart from resolving her energy crisis, the alliance shall also give legs to her largely inert foreign policy and is likely to guide India to a more revisionist global approach, which is also expected from a country of India's size and strength.

5. Conclusion

There is no development without fuelling the engine of growth. According to United Nations, energy is critical and people with no sustainable access to energy are deprived of the opportunity to become part of national and global progress. And yet, one billion people around the world live without access to energy. More than 781 million people in 2016, or 39 percent of the world's population, do not have access to clean fuels and technologies for cooking. The Secretary-General of the United Nations, Ban Ki-moon, has said, "Energy is the golden thread that connects economic growth, social equity, and environmental sustainability. With access to energy, people can study, go to university, get a job, start a business - and reach their full potential." Energy is central to nearly every major challenge and opportunity the world faces today – security, climate change, food production, jobs or increasing incomes. Sustainable energy generates opportunity, it transforms lives, economies and the planet. There are tangible health benefits to having access to electricity, and a demonstrable improvement in wellbeing. Energy access therefore constitutes a core component of the sustainable development agenda for energy. The production of useable energy can also be a source for climate change, which is accounting for around 60 percent of total global greenhouse gas emissions.

Goal 7 of the SDGs aims to correct this enormous imbalance by ensuring everyone has access to affordable, reliable, and modern energy services by the year 2030. To expand energy access, it is crucial to enhance energy efficiency and to invest in renewable energy. Asia has been the driver of progress in this area. Energy from renewable resources – wind, water, solar, biomass and geothermal energy – is inexhaustible and clean. It is time for a new global partnership on sustainable energy for all, guided by Sustainable Development Goal 7 on universally accessible, efficient, clean, and reliable energy sources and services.

Solar power is sustainable green energy to protect the economy and environment. The agreed countries for solar alliance can potentially harness solar energy in a cost-effective manner, if a concerted and coordinated effort is made to share experience from other similar countries and concentrate on finding solutions which are designed to be locally appropriate for difficult conditions. A coalition of these countries for solar energy development and solar technology applications would also help in addressing the climate change effects. Through simple devices such as solar panels and solar appliances that already exist and need to be scaled up and made accessible where they are needed.

It is also seen as an alliance by the developing countries to form a united front and to undertake research and development for making solar power equipment within developing countries. There is great optimism that the solar alliance would help in pushing 'power for all' into a more realistic realm. Furthermore, the ISA could be greatly beneficial in boosting technology transfer and emphasizing the need for greater storage technologies. ISA member countries could also cooperate in developing an integrated electronic mobility ecosystem that is fueled by solar energy.

ISA has been envisioned as a specialized platform and will

contribute towards the common goal of increasing utilization and promotion of solar energy and solar applications in its member countries. The ISA states that the countries share the collective ambition to undertake innovative and concerted efforts for reducing the cost of finance and cost of technology for immediate deployment of competitive solar generation, financial instruments to mobilize more than 1000 billion USD of investments needed by 2030 for the massive deployment of affordable solar energy and to pave the way for future solar generation, storage and good technologies for countries' individual needs.

In inter-governmental mechanism like ISA, important question that arises is, if India is a global leader in clean energy and sustainable development. India is projected to be a significant contributor to the rise in global energy demand, as well as, a philanthropist and a global leader in endeavouring and accessing clean energy, especially by tapping its huge solar potential. However, as of 2016, more than 205 million people in India do not have access to electricity. The government's National Solar Mission is playing an important role in the work towards renewable energy, and interventions in rural electrification and new ultra-mega power projects are moving India towards achieving universal energy access.

The way ahead for India, therefore is exciting and challenging for scaling up solar power in an accelerated fashion. This is an innovation that India needs to explore at a large scale to emerge as a global leader in generating clean energy in a cost competitive and inclusive manner. While some players have already begun preparing, most have yet to place a bet on solar, given the uncertainties within the sector. Success in solar energy will require a long-term commitment and a sound understanding of local dynamics. India too would benefit immensely from the Alliance. Not only would it facilitate it in its endeavor to meet its commitments under the Paris Agreement, but would also allow it to take a leadership role in the developing world. Solar technology is evolving, costs are coming down and grid connectivity is improving. The dream of universal access to clean energy is becoming more real. This will be the foundation of the new economy of the new century. Furthermore, ISA is arguably the most potent tool for the job and currently is at nascent stage. As they say, a job well begun is half done—the planners of the alliance, especially India, need to ensure that its foundations are dug deep to usher seamless expansion and operationalization. The energy sector is highly disruptive in nature and shall keep the alliance on its toes to adapt with time and reform continuously to remain relevant.

However, three major inferences that can be drawn from the study are;

India's solar market could be worth billions of dollars over the next decade: India's solar potential is real enough, forecast is of UDS 6 billion to USD 7 billion capital-equipment market and close to USD 4 billion in annual revenues for grid-connected solar generators over the next decade.

Project execution, financing, and localization are crucial

A frugal cost base will be at the core of successful Indian solar ventures. As the number of projects and players increases, procurement effectiveness will become a hygiene requirement. Longer-term value will come from efficiently executed projects, low-cost (and often innovative) financing, and localization.

Local players will dominate the downstream solar industry

In contrast to the global nature of the upstream industry (solar modules), it is expected that well-localized players should dominate the downstream side, including project development, installation, and distribution, in the initial years. Given sufficient time to fine-tune their business models, global players entering India for the first time can prosper. Entering and learning the ropes early will be important for both local and global players.

ISA will be instrumental in providing enhanced understanding of the role that solar energy could play in providing energy services, particularly for the rural poor in countries with great solar resource endowments, but who are currently lacking the means to tap this potential energy source and convert it into an opportunity for rural transformation. It will also demonstrate in various ISA partner countries how the widespread usage of solar energy and appropriate technologies and appliances powered by solar energy could reduce cost, save foreign exchange and expand the energy infrastructure without unduly heavy investment. In addition, it will help in contributing towards increased employment generation and promote the transfer of research to industry. More importantly it will act as a voice for raising common issues for development and deployment of solar energy at international fora.

Thus, International Solar Alliance is a new era of "sunrise of new hope for clean energy at affordable price and with reliant source."

7. References

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