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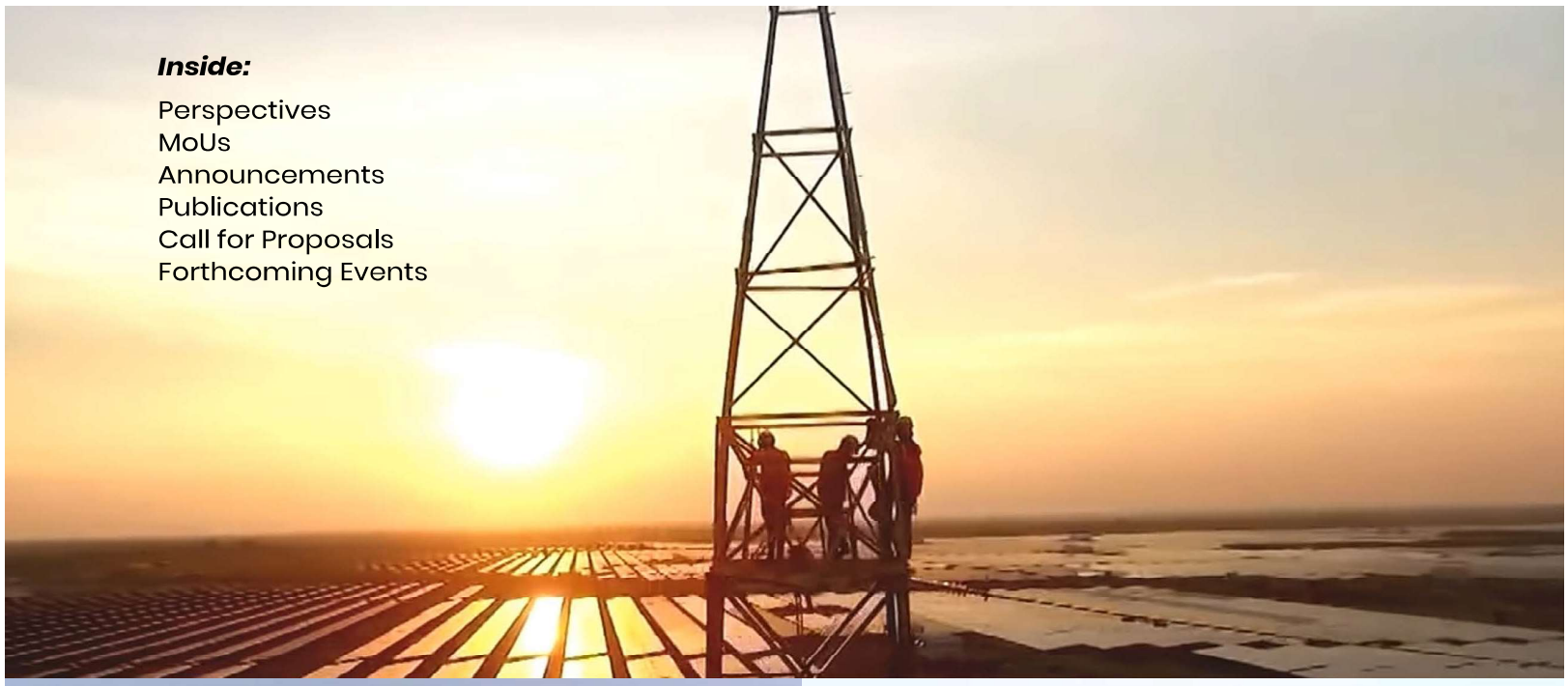

Role of India's Diplomatic Initiative 'International Solar Alliance (ISA)' in addressing Global Renewable Energy Development

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The human race faces numerous challenges and issues in attaining harmony between the environment, economy and society in the current century. Our planet is experiencing the critical challenges of increasing environmental pollution, massive climate change, species extinction, depleting resources and many other global concerns. To combat and address these emerging global challenges, a global acceptance and application of the concept of sustainable development is required.

The idea of 'Sustainable Development' was widely disseminated under the 'World Conservation Strategy' in the early 1980s.[1] The World Commission on Environment and Development's 1987 Brundtland Report[2] 'Our Common Future', defines sustainable development as "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*". Renewable energy sources such as solar, wind and geothermal are widely explored for sustainable development.

Solar energy is one of the most abundant, inexhaustible and clean energies that can readily transfer in any other forms of energy such as thermal, electrical, mechanical and chemical.[3] In the current state of environmental degradation and increasing global warming, nations worldwide have realized the significance of renewable energy. As a result, the countries are aligning themselves with a renewed focus on renewable sources of energy.

India also plans to reduce its carbon footprint by 33–35% by 2030 (as compared to 2005 levels). It aims to meet 40% of its electricity needs from non-fossil fuel sources with an ambition to create 450 gigawatts (GW) of renewable energy capacity by 2030. A share of 280 GW is expected to be from solar, thus requiring a 25 GW capacity increase each year. To achieve this, in 2011, India launched the 'National Solar Mission' to promote solar power in the country. The Ministry of New & Renewable Energy (MNRE) on 12-12-2014 rolled out the scheme for 'Development of Solar Parks and Ultra Mega Solar Power Projects'. Bhadla Solar Park in Jodhpur, India, with a total capacity of 2.25 GW across 14,000 acres, is the largest solar farm in the world to date. Patoda Solar Park, the largest private-sector solar energy park, has also been established in Maharashtra,

to support the solar power sector in India. Thus, India is running the world's largest clean energy programme to achieve 175 GW of renewable capacity, including 100 GW of solar power by 2022.

Both the Central and State governments are collectively implementing the solar mission in urban and rural India (Figure 1). It has played a significant role in achieving rural electrification. India has also set up more than 50 photovoltaic power plants across the nation.[4] MNRE has launched a number of schemes such as Pradhan Mantri Kisan Urja Suraksha evem Utthan Mahabhiyan (PM KUSUM) scheme, Atal Jyoti Yojana (AJAY), etc. to scale up the access to clean energy for rural areas.

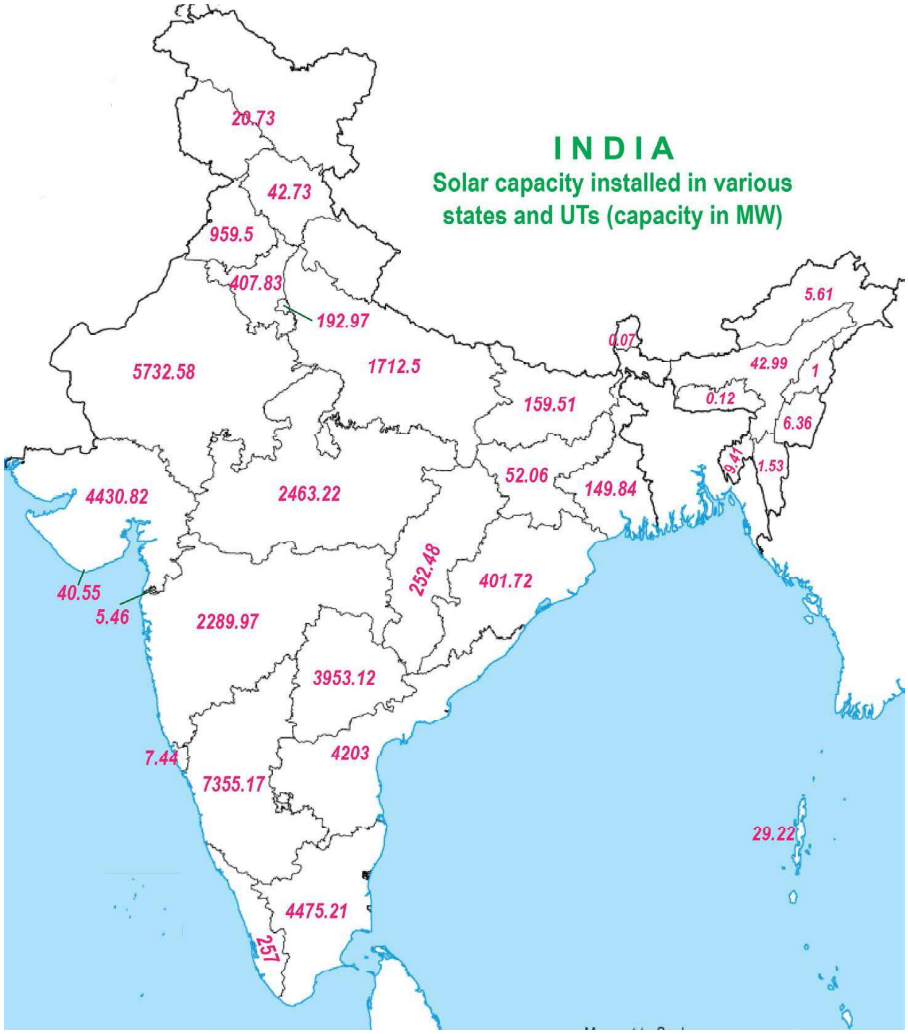

Figure 1. Solar capacity installed in States and Union Territories of India as on 31 March 2021
(Data source: https://mnre.gov.in/solar/current-status/)

As of 2019, India is amongst the top 5 countries worldwide in cumulative renewable energy capacity (globally ranked 4th, next to China, US and Brazil); cumulative solar photovoltaic capacity (globally ranked 5th, next to China, US, Japan and Germany) and annual solar PV capacity (globally ranked 3rd next to China and US).[5] The solar power of India has become one of the fast-developing industries in India. As per March 2021 data, India has installed a solar capacity of 40.97 GW.[6] In the 2021–22 union budget, a capital infusion of ₹10 billion in Solar Energy Corporation of India (SECI) and ₹15 billion in the Indian Renewable Energy Development Agency (IREDA) has been announced. This will enable SECI to tender for 15 GW of new solar energy generation capacity and reduce CO_2 emissions by 28.5 million tonnes per year.

Although India has made substantial progress in the field of solar power, it still faces numerous impediments. The most pressing challenges[7] are listed below:

- Land scarcity for installation of solar power plants and solar grids;
- Inadequate resources, mainly financial resources and research infrastructure to develop cost-competitive and efficient solar photovoltaic technological products to address highly dense population needs;
- Lack of scale-up of solar power technologies due to weak interconnect between industry and government;

- The complex structure of subsidy due to the involvement of multiple agencies;
- Lack of training and capacity building in this particular domain;
- Inadequate consumer awareness and usage.

To overcome the above-mentioned hindrances, the government has implemented financial support mechanisms and incentives to strengthen the country's solar energy sector. For example, it has introduced a renewable energy certification, capital subsidies, viability gap funding, assured power purchase agreement for solar power projects and 100% foreign direct investment (FDI) to install solar power plants.[8,9] Likewise, strategies should be devised for small and big industries to shift to solar power from their existing non-renewable sources of energy.

India has taken the lead in establishing a diplomatic science channel by bringing solar resource-rich countries* together to formulate the 'International Solar Alliance' (ISA). The ISA was launched in 2015 in Paris, France through the Paris Declaration on ISA dated 30 November 2015. It was formulated to connect countries globally and undertake joint efforts for massive deployment of solar energy and develop futuristic sustainable technologies as per country needs and demands. The signing of the 'Framework Agreement on the establishment of the International Solar Alliance' was officially introduced in 2016. To date, 98 countries have signed the framework agreement and 80 countries out of these signatory countries have ratified the same. 2018 was a golden year for ISA, where its roots were further strengthened. ISA got registered with the United Nations (UN; under Article 102, UN Charter). Government of India (Gazette of India notification on application of UN (privileges and immunities) Act, 1947) officially recognized ISA and 'Headquarter Agreement' was signed. ISA is governed through a standing committee and the regional committees (set up for Africa, Asia and Pacific, Europe and others, and the Latin America and the Caribbean regions), with India as a Chair and France as a Co-chair.

ISA is evolving as a cooperation platform for its member countries to attain solar-friendly technology roadmaps, create policies and regulatory frameworks for strengthening the solar energy sector, and creating global coherence on common standards related to the solar sector. ISA has partnered with nearly 32 international organizations (such as International Energy Alliance, France; UN Environment, Kenya; Green Climate Fund, S. Korea; The World Bank, US and many others)# and 19 corporate partners to create and mobilize USD 1000 billion investment in the solar sector in its member countries by 2030. The key programs and initiatives of ISA to promote and adopt technologies and capabilities of the solar sector are listed in Table 1.

Table 1. Key Programmes and Initiatives of ISA

S. No.	Programme/ Initiative	Brief Details
1	Solar Risk Mitigation Initiative (SRMI)	The initiative was launched in collaboration with the World Bank (WB) and the Agence Francaise de Développement (AFD) to develop a Bankable Solar Program exclusively for developing countries and aims to leverage private sector investments in the same.
2	Scaling Solar Applications for Agriculture Use (SSAAU)	The program focuses on providing energy access (mainly through solar water pumping systems) for agricultural purposes in member countries. ISA undertook four-country missions at Benin and Uganda, Mali, Niger and Togo, to give critical insights and support for the solar water pumping program.
3	Solar Cooling Initiative	It aims to assist member countries in developing solar energy-linked cooling systems and cold chains for agricultural purposes.

*Countries that lie either completely or partly between the Tropic of Cancer and the Tropic of Capricorn
#https://isolaralliance.org/partners/organisations

4	Mini-grids Programme	The scaling of the solar mini-grid initiative was undertaken as a diplomatic mission where 36 countries visited model plants of the solar mini-grid and understood the fundamental mechanisms associated with that. It also prepared a model framework for creating this mini-grid in member countries to assist member countries in taking the process forward.
5	Roof-top projects	ISA is providing assistance and support for the preparation of solar rooftop projects in select member countries. ISA has also facilitated the installation of this rooftop in select countries under agreement.
6	Scaling Solar E-Mobility & Storage	ISA has undertaken elaborative studies on assessing the capacities and capabilities of member countries in domains of solar electric mobility and storage. ISA is also benchmarking existing technologies on solar e-mobility and related technologies to replicate best practices and models in member countries by their needs and demands.
7	Solar Park Concept in Cluster/Group of ISA Member Countries	ISA has initiated a development plan for creating large-scale solar generation capacity in member countries that can be managed and governed through bi-lateral, regional and inter-regional connections. Initially, ten countries (Togo, Mali, Ghana, Sudan, Egypt, Malawi, Sri Lanka, Uganda, Rwanda and Cuba) will formulate the solar park concept.
8	ISA Solar Awards	ISA incentivizes exemplary work carried out in the solar sector by providing specific financial awards and recognitions to the individual or the organization.

In addition, ISA has also created the 'ISA Solar Technology and Application Resource Centre (ISTAR C)' to provide a technical support system to its member countries. The Centre offers necessary support as solar finance for the deployment of solar technologies, research and innovation activities in the solar energy sector and building capacity in the particular domain. Under the 'Indian Technical and Economic Cooperation (ITEC) Scheme', the Government of India has actively undertaken training programs in solar energy for other member countries. In 2018-19, the National Institute of Solar Energy, Gurugram, through the ITEC scheme, trained 133 candidates from over 25 countries. To build the capacity in the solar sector, ISA has also commenced the 'ISA Solar Fellowship for Mid-career Professional'. In addition, India has started a dedicated 'Master's degree in Renewable Energy Management and Economics', and over 21 candidates from 18 member countries are currently pursuing this course. In the wake of COVID-19, to digitally connect all the member countries, ISA, in support of the European Union, has created an online platform, 'Infopedia', to disseminate knowledge, information and best practices in the solar sector amongst its member countries.

The ISA has evolved as an engaging diplomatic channel for promoting and facilitating the solar energy sector across the globe. In the next five years, ISA aspires to attain universal membership to all the UN member countries, achieving financial sustainability (by various mechanisms such as membership fee and grants received by the host countries), optimizing resource mobilisation to member countries (especially to Least Developed Countries- LDCs and small island developing states- SIDS) and reaching the target of 1001 solar projects in member countries. These will attract investments and create employment opportunities in the solar sector in the near future. ISA is one of the largest and most significant thematic science diplomatic missions to promote the solar sector globally. ISA has adopted a broad vision of working towards a solar future and inducted a multidimensional approach to promote science diplomacy for building global solar capacity. It is creating innovative avenues to provide financial and technical support for solar projects, enhance policy support for the solar sector in member countries, and ensure economic sustainability and strengthened governance of ISA holistically.

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