



India and Egypt Cooperation- Growing together through Co-operation in Solar Energy



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Introduction

Academic professors define science diplomacy as using scientific collaborations among nations to address common problems and to build constructive international partnerships. We would define it just as it is about notions of growing together which though said in a few words has deepest meaning. In other words, every country helps the other to grow as far as possible to achieve a common interest.

India in recent years has proved that it is sincere about this idea through its support to South-South cooperation strategy which helps other developing nations to overcome obstacles in their way towards people welfare. So our target for every stage of science diplomacy is to improve citizens' life as Dr. T. Ramasami, Former Secretary, Ministry of Science and Technology, Govt, of India said that on account of non-sustainability of current resource intense models, it might seem beneficial to design and develop alternate models for developing affordable innovations with people centric priorities for the countries in the stage of economic development. Process of innovation might overlook the purpose of innovation for serving the needs of poor people, residing in low income and low middle group countries.

In Egypt, which is at the crossroads after 25th January revolution, has starved for this kind of cooperation. There is a huge opportunity to go deep in using science of diplomacy to proceed with reforms plans that would not succeed without help from friends, like India. Egyptian economic development plan 2030 needs more than 130 billion dollars to invest in energy sector, especially renewable energy like wind turbine and solar panel.

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While Egypt has an unusually hot, sunny and dry climate, but India has a wide experience in solar energy sector since 1978 has come out with solar panels for tapping solar energy. In the World Bank's 'Doing Business 2017' Report, Egypt leapt to 41st place for 'getting electricity'.

This paper attempted to discuss, how India can support Egypt to improve its solar sector for clean power through science diplomacy. For that purpose we would make a brief review of the history of relationship between the two countries, current situation in both of them, Indo-SSC success stories with other countries and at the end would give some suggestions with regard to future cooperation between Cairo and New Delhi.

Historic Overview

Relationship between India and Egypt has had a general tone of cooperation and cordiality. The political dispensation in India is favourable and supportive towards Egypt since its independence.

India and Egypt share civilizational ties with a long history of people-to-people contacts. Egypt under President Gamal Abdel Nasser and India under the leadership of its first Prime Minister Jawaharlal Nehru were torchbearers of the Non-Aligned Movement (NAM). Their commitment to socialism kept both the leaders and countries drawn towards each other. After the end of the Nehru-Nasser era, the relationship between the two lost much of its old sheen. Subsequent leaderships in both the countries acknowledged the importance of the other, but there was a discernible absence of any meaningful efforts from both the sides to strengthen the relationship.

For India, cordial relations with Egypt present an opportunity to build on historical ties, and also to forge an enduring partnership for meet emerging global challenges in the field of energy security, terrorism and climate change. India has invested about USD 2.5 billion in Egypt, involving 46 Indian companies .

From the special bonhomie of 1950s and early 1960s between New Delhi and Cairo, tone and the tenor of the relationship in recent times has gravitated towards a more pragmatic one,

manifesting in booming bilateral trade and robust investments from India to Egypt. Trade has crossed \$5 billion and India has emerged as Egypt's 7th largest trading partner. India has invested \$ 2.5 bn through companies like Alexandria Carbon Black, TCI Sanmar, Dabur, SCIB Paints, Marico and Oberoi Group. New Indian companies from sectors like pharmaceutical, garments and education have established their operations since January Revolution, while Dhunseri Tea and Petrochem are on track with the completion of their PET plant in Egypt. It is important for India to contribute in making Egypt for strong trade partnerships, besides establishing local joint venture researches.

Egypt showed goodwill after 25 January revolution when it established Indo-Egyptian Business Council in partnership with the FICCI. The IEBC agenda is focused on: helping Indian companies for resolving issues in Egypt, supporting Egyptian Government's efforts to protect interests of the Indian companies and find solutions to issues pertaining to security and visa; and exposing Indian members to newer opportunities in Egypt and helping Egyptian companies in their Indian foray. It is expected to catalyze interactions and exchanges between the business enterprises of both countries and their enhancing trade and investment.

So we hope that would help to improve cooperation in a better way than the Bilateral Investment Protection Agreement between India and Egypt signed in November 2000. This agreement was needed for encouraging foreign investment. The growing momentum in ties dictates a need for a double taxation avoidance agreement between the two countries.

Solar Energy in India

During a visit to the Central Electronic Limited company for manufacturing solar panel officials insisted on wearing safety clothes and switching off mobile. CEL, which was established in 1978, has a full support from the government and their yearly gains soared to \$ 250 million. India launched the largest solar power plant in the world in Kamuthi (Tamil Nadu) in 2016, which

took less than a year to build. The plant produces about 1000 hectares of panels, which can produce 648 megawatts of electricity. When operation of Azure Power began in 2009, India had only 10 MW of installed solar generation capacity. India has more than eight gig watts of installed capacity, and is among the fastest growing markets in the world for solar power;

The growth of India's clean-energy market has triggered significant price drops; power costs for Azure Power's customers have fallen by 74% in the last five years. This benefits customers and creates right conditions for the country to meet its target of raising installed capacity for solar energy to 100 GW by 2022. With almost a quarter of its population still having no access to electricity; India would need an estimated \$250 billion new investment to achieve that goal. Most of the funding would have to come from the private sector. Thus, evidently that India's use of solar power is increasing.

In 2015, CNN reported that India has become the first country to operate an airport completely on solar power. That year, the Cochin International Airport installed a solar plant on the unused land near some of its buildings; the airport has not to pay electric bills; instead, it plans to sell its extra electricity back to the state. Other airports in India are also using solar power, including an international airport in Kolkata, which launched a two megawatt rooftop solar energy farm in 2015. At the beginning of 2010, India launched the Jawaharlal Nehru National Solar Mission to increase renewable energy, which includes solar energy. By 2022, the government plans to produce enough solar electricity to power more than 60 million homes. According to the World Resources Institute, Indian government may to increase solar power production from four gig watts to 100 gig watts by 2022.

Indio-French Cooperation Model

PR Fonroche, a joint-venture between PR Clean Energy from India and Fonroche Energie S.a.s from France, commissioned two solar photovoltaic based power plants (5 MW and 15 MW) in Bikaner, Rajasthan. These were awarded

to the company under the Jawaharlal Nehru National Solar Mission's Phase I Batch II scheme.

Incidentally, the first of the two projects of 5 MW capacity commissioned in December 2012, was the first Indo-French collaboration in the Indian renewable energy sector. (Under the contract, AREVA was to build two 125 MW CSP plants using Compact Linear Fresnel Reflector (CLFR) technology in Rajasthan. With Areva Solar closing its shutters, only one plant has been realized, and came online during last year. The second unit is said to be in the planning phase). In another interesting partnership, Bangalore based Enzen Global Solutions Pvt Ltd. (EGSPL) has joined hands with the French company Ciel et Terre to build floating solar power plants in India. The State of Karnataka alone is said to have 36,000 irrigation lakes of more than 24 acres. For expansion in Eastern and North-Eastern India, Ciel et Terre has entered into an agreement with Klystron Electronics, which is one of the leading Electrical Construction House in the Eastern India. Other French companies present in the Indian solar space include the oil major, Total, present through its subsidiary Sun Power. Alstom Power is engaged in four solar power plants of 25 MW for supplying steam-turbines.

Solar Energy in Egypt

Egypt is gifted desert land, with sunny weather and high wind speeds which make it a country having tremendous potential for renewable energy sources. Egyptian government intends to supply 20% of generated electricity from renewable source by 2022 (wind 12, hydro power 5.8 pt, and solar 2.2%).

Government plans utilization of solar at 3.5 GW by 2027, including 2.8 GW of PV and 700 MW of CSP. In addition generation of 7.2 GW (12% of generated electricity) from wind by 2022 is also planned. Significant private sector involvement by taking lead on 67% of the total is expected. Egypt's need at least 7 percent annual growth in electricity production or around 2500 MW/year to meet increasing energy demand, which is critical for its sustained economic growth.

The New and Renewable Energy Authority (NREA) plays a strategic role in government's renewable energy plans. In January, Egypt selected 67 companies to participate in developing 4.3 GW of renewable energy projects; the qualified companies are at present involved in the land allocation process. Presently, the total installed capacity from solar energy is about 45 MW solar Photovoltaic (PV), including 15 MW, distributed in advertisements, telecommunications and irrigation sectors. There are also others plants, including the 1st off-grid power plant with capacity of 10 MW at Siwa, North West of Egypt, 6 MW in Elfarafra and 14 MW PV power plants in Red Sea Governorate. Also, 20 MW for Concentrated Solar Power (CSP), as a solar portion of integrated combined cycle power plant, with total capacity 140 MW is located in Elkurimat.

Solar Energy Resources and Facilities

Egypt's Solar Atlas states that Egypt should be considered a "sun belt" country with 2,000 to 3,000 kWh/m²/year of direct solar radiation. The sun shines 9-11 hours a day from North to South in Egypt with a few cloudy days.

In 2011, the first Solar Thermal Power Plant at Kuraymat was established, with a total installed capacity of 140MW, with solar share of 20MW based on parabolic trough technology integrated with a combined cycle power plant using natural gas. A 10-MW power plant is operating in Siwa since March 2015, is functioning satisfactorily.

Opportunities in Egypt

GoE has announced an interim target for the first regulatory period (2015-2017) to contract 4300 MW of both solar and wind energies as follows:

- 300 MW for small solar systems PV roof top systems (less than 500 KW),
- 2000 MW of Medium and large size of Solar grid connected PV plants (maximum 50 MW), and

- 2000 MW of Medium and large size of Wind plants (maximum 50 MW).

Sixty seven international and local consortia have qualified for PV projects with a total capacity of 2880 MW, and twenty seven international and local consortia have qualified for wind projects with total of 1670 MW. These projects are under development. Egypt is also considering financing options for the following projects

- Solar-thermal power plant, using CSP technology for both electricity generation and water desalination; solar-thermal power plant for industrial purpose;
- Designing a technical-financial mechanism to promote using solar water heaters in residential sector in Egypt; and local manufacturing of renewable energy equipment.

In November, the Government signed power-purchase agreements (PPAs) worth some €600m (\$662m) for approximately 400MW of solar-power capacity.

Among the projects, where we are behind this uptake in capacity is a €8bn (\$511.2) deal Germany's Siemens, signed in 2015 with the Egyptian government to build three 4.8 GW combined-cycle gas-fired power plants. The first 4.4 GW of capacity is expected on-line by year-end, with a full 14.4 GW from the combined-cycle plants by mid-2018 (African Brand Link, marketing company, 16 Dec. 2016).

By 2030 MERE expects a total of 51.7GW to be added to the grid, requiring an investment of \$135bn. The long-term plan for 2019-30 foresees Egypt building on its goal of 20 percent renewables by 2022; by generating 16 per cent from solar power and 10 per cent from wind, with 49 per cent from oil and gas and 15 per cent from coal.

The Government's ongoing programme of easing electricity subsidies is also expected to help encourage investment which means more burden on Egyptian shoulders. Perhaps Indian science diplomacy would help in this regards.

India helping Egypt through science diplomacy

Transfer of technology

Technological development is an essential component of building productive capacity which strengthens competitiveness to sustain growth. Also, it enables creation of capabilities critical for dynamic learning and achieving SDGs. India already has come a long way; thanks to its exposure to advanced countries like the USA and France. The first stage of cooperation would be direct technology transfer from India to Egypt.

Capacity- building

It involves improving national capabilities for formulation, implementation, monitoring, and review of policies and plans concerning national S&T activities.

Capacity- building in India depends on international training programmes for S&T personnel and better management of technology. Training is important for science managers and decision-makers to remain up to date with the changing needs of the S&T Society.

It is very critical to stimulate interest among the public and get their support for national initiatives in science diplomacy.

India can help Egypt build its capacity by conducting training programmes for post-graduates, especially keeping in view the following parameters:

- Universities in Egypt need labs, including scientists from both the countries, for example.
- Both countries should exchange visiting professors at university and institute levels.
- Establish research missions working jointly in Egypt and India in common research agenda to serve both the countries people.

Joint R&D for solar energy

Generation of knowledge in developing countries, on most occasions, has largely happened through technological learning, where R&D efforts were primarily directed towards technological learning rather than basic science or path breaking innovations

R&D is largely concentrated in the developed world, and the USA still dominates, with 28 per cent of global investment in R&D. The EU (19 per cent) and Japan (10 per cent) share 29 per cent. China has moved into second place (20 per cent). The rest of the world represents 67 per cent of the global population but just 23 per cent of global investment in R&D.

- India has capacity of R&D but spends less than 1 per cent of GDP on it. In fact, the share of developing countries lately in knowledge generation and transfers is growing.
- Egypt should have a platform to share knowledge with India and with other developing countries.

The main platform for sharing knowledge should be joint research conducted by teams of scientists of both countries.

Research-Academic-Industry Mobility between India and Egypt

India has great cooperation in research and academic cooperation with EU and this should be followed by other developing countries.

- Work-programme for India-EU Call, established jointly by EC and Government of India for balanced advantages to both India and EU. Equal Opportunity for Indian and EU scientists to file India-EU RTD project proposals with DST and EC.
- Joint Selection Process by EC and Government of India with mixed panel of Indian and EU evaluators, co-funding by EC and GoI especially project-based mobility of researchers.
- IPR sharing by India-EU RTD project partners effective.

Conclusion

Egypt should establish an university or instate research for people belonging to both the countries. They should work as research teams among local academicians of countries. Participants from both countries should exchange experience and have cooperative ambitions in securing their research capability