

End of the solar eclipse

Solar power has played practically no role in India up to now. But that may change soon. The **government** has introduced an ambitious program to **expand the country's solar output to 20 gigawatt (GW)** by 2020 and boost the local manufacturing market.

By Andrea Röder



And then there was light: the solar eclipse is over. After years of zero solar growth, India is watching the sunrise. Twenty GW of solar capacity is to be installed by 2020.

With about 300 days of sun per year, India is practically predestined for solar energy. The government estimates the country's potential at 600,000 megawatts (MW). The currently installed capacity is light years from this value – in the single-digit range. But that may change quickly over the next few decades. In line with the National Solar Mission, the government plans to expand output from just about zero to 20 GW by 2020. By 2030, it hopes to have 100 GW; by 2050, as much as 200. These plans are set out in black on white on official documents. India's solar eclipse seems to be retreating.

The mission is a component of the National Action Plan on Climate Change called for by Prime Minister Manmohan Singh last summer. At present, about nine percent of Indian electricity comes from renewable sources, with about half still coming from coal-fired power plants. Singh says that India's effort to "pioneer a graduated shift from fossil fuels to renewable sources of energy" focuses on the sun. The National Solar Mission not only supports large commercial projects but also aims to fund distributed solutions in rural areas. After all, one of the greatest advantages of solar power – its off-grid use – is also India's greatest hope. Today, more than 400 million Indians – nearly half of the population – remain unconnected to the grid. Singh is therefore sure that those living in the more developed parts of the country are not the only ones who will benefit.

EUR twelve billion in subsidies

In early August, the committee for the national climate plan – including Singh, Minister of Environment Jairam Ramesh, and director general of The Energy and Resources Institute (TERI) and chair of the Intergovernmental Panel on Climate Change (IPCC) Rajendra Pachauri – basically approved the final draft of the Solar Mission's program. The goal of 20 GW is a sure thing, but other points are still under some debate,

according to those involved in the process. Some committee members, for example, say there's an imbalance between the technologies funded, with photovoltaics getting all the attention and solar thermal projects not getting enough. To clear up such controversies, the official launch has been postponed from August 20th to November 14th. Farooq Abdullah became the new Minister of Renewable Energy early this summer and quickly pointed out the Solar Mission as one of his top priorities. The government plans to make more than EUR 13.5 billion available for this cause over the next 30 years, though the Ministry of New and Renewable Energy (MNRE) has not yet given details about where the money will come from. All we know is that a portion of it will come from the upcoming taxation of gasoline and diesel, which are currently still subsidized in India. Prime Minister Singh is also counting on support from international funds. The lion's share of the anticipated spending for the solar program, about EUR twelve billion, will go to federal subsidies. EUR 650 million will be made available for government-run pilot projects, 700 million for building research facilities, and 170 million for installing solar lanterns in rural areas.

Three steps to success

Abdullah's Solar Mission is divided into three steps. The goal of the first phase is to lower costs by 2010 by boosting local photovoltaic production and researching the cost-effectiveness of various technologies. The phase focuses particularly on funding large solar power plants – especially ground-mounted PV arrays, although solar thermal projects are not excluded – and the installation of PV panels and solar thermal systems on government and administration buildings. New public hospitals, retirement homes, and residential complexes with more than 500 square meters of roof area will be required to install these roof arrays. The draft of the national solar

plan says that this could lead to as much as 100 MW being installed on 2,000 to 3,000 buildings. The MNRE says that financial incentives will also motivate owners of commercial real estate with a roof area of over 500 square meters to look into PV arrays. Also, in the Solar Mission's first step, energy suppliers will be encouraged – and later possibly required by law – to install solar panels on free areas on their land and buildings. The Ministry of Renewables estimates that 800 to 1,000 MW could thereby be installed on about 2,000 hectares. In addition, those operating fossil fuel power plants are to be required to generate at least five percent of their annual additional power from solar sources. In the second program phase, the technologies and projects that showed their value in the first phase are to be expanded and subsidized until 2017. In the third step (2017-2020), the government hopes to largely move away from subsidies.

Of the 20 GW goal, twelve are to come especially from ground-mounted photovoltaics and solar thermal power plants, three from roof arrays, another three from off-grid PV arrays in villages, and two from other PV projects, such as on telecommunications towers.

The government estimates 51 MW of installed capacity for the current fiscal year and 190 MW for the next fiscal year. It hopes to cross the one-GW threshold by 2013 and expand more quickly every year until 2020 (see graphic).

Grid parity by 2020

Depending on each planned array's location and coverage, the price for a kilowatt-hour (kWh) of solar energy in India is between 13 and 18 rupees (EUR 19 and 26 cents). "That's much too expensive," Abdullah said recently at a session of Parliament, promising that "we will get these costs down." The government hopes to bring the figure down to four to five rupees (EUR six to seven cents) per kWh by 2020. Solar energy ►



Good business: Photovoltaic panels such as the ones offered by this Indian trader could be a hot commodity soon.

could then possibly cost the same as conventional electricity and achieve one of the national solar program's goals.

In addition, Abdullah's Ministry plans to implement further support mechanisms – such as tax exemption – for the solar industry in the first ten years. Public regulatory authorities are to determine expansion objectives for the states. By 2017, the states should get one to three percent of their electricity from solar power. Certificate trading within India should ensure that less advanced states can still meet their goals. Finally, the MNRE plans to organize a solar authority to watch over the implementation of the Solar Mission.

There is also talk of abolishing the capacity limit for the generation-based incentive (GBI). MNRE introduced a feed-in tariff for photovoltaic arrays for the first time last year (new energy 2/2008), giving PV array operators 12 rupees (EUR 18 cents) per kWh. So far, however, this program has only applied up to a policy ceiling of 50 MW. "That's a major flaw in the model," criticizes Ajay Prakash Shrivastava, president of the Solar Energy Society India (SESI). He is certain that it's the reason for the complete lack of large PV farms in India. A position paper from the PV Group India also argues that India cannot entice notable investments with such limiting funding guidelines. The group, a regional industry initiative from the international semiconductor and microelectronics association SEMI, uses the paper to stress that the GBI "needs

to be expanded in scale and requires review and rework to make it more attractive to investors."

Gujarat leads the way

Some states have introduced subsidy packages for solar projects independent of the central government. At the head of the group is Gujarat, which is on India's western coast and portrays itself as a "hot spot" for solar energy. The state's government approved a 25-year funding program for PV arrays of five to 500 MW installed before December 31, 2010. According to the new guidelines, producers of solar power will receive a fixed compensation of 13 rupees (EUR 19 cents) per kWh for the first twelve years and three rupees (EUR four cents) per kWh for the next 13 years. The state government expects investments of about EUR seven billion. This January, various companies signed declarations of intent, including Essar Abengoa Solar (40 MW), Swiss Park (100 MW), OPG Energy (100 MW), Acme Group (110 MW), and Welspun Group (100 MW).

Naturally, Gujarat, with its large open spaces and great insolation, has the right conditions to become "the leader in the country's solar sector," says Arun Mehta. As director of Refex Energy Ltd. of Bombay, he is overseeing the construction of a 50 MW PV array in Gujarat. Meanwhile, Moser Baer is preparing to install two five MW arrays in Rajasthan and Punjab. Bharat Heavy Electricals (BHEL) recently commissi-

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oned two more solar arrays on the Lakshadweep Islands, a union territory off India's southwestern coast administered by the central government in Delhi. The BHEL arrays, now counting eleven, together generate more than a megawatt of solar energy, thereby covering about 15 percent of the islands' total demand. The island group can thus forgo 300,000 expensive liters of diesel transported from the mainland each year.

Change visible in order books

More installations attracts more manufacturers, the Indian government figures. According to an India Semiconductor Association (ISA) study, the country currently has nine solar cell producers and about 20 panel manufacturers. Annual PV production volume is about 300 MW, three fourths of which is exported. ISA president Poornima Shenoy believes that the National Solar Mission comes "at just the right time." If sufficient subsidies are available in the capital-intensive initial phase, India could become the international market leader in the semiconductor and PV industry, Shenoy optimistically predicts – although many Europeans and Chinese may disagree with her.

The solar program suggests that India's manufacturing capacity will grow to four or five GW by 2017. Sathya Prasad, president of the regional association SEMI India, headquartered in Bangalore, also expects "significant growth on the photovoltaic market." More than a dozen companies have announced construction of chip fac-

ories, and Prasad is convinced that "government initiatives like SIPS could bring investments of about EUR seven billion to India by 2010." SIPS is the Special Incentive Package Scheme introduced by the Department of Information Technology (DIT) for the Indian semiconductor industry two years ago. For manufacturers of PV elements, funding from SIPS means that their production locations could become a special economic zone (SEZ), so manufacturers could have 20 percent of investments reimbursed in the first ten years. DIT received funding applications for PV projects with a total volume of eleven GW. A few weeks ago, twelve applicants were given the green light – as long as they submitted their final itemization of costs by the end of August.

SIPS funding for manufacturers

The approved companies are Titan Energy Systems, Reliance Industries, Tata BP Solar Power, PV Technologies India, KSK Surya PV Ventures, Signet Solar, Indo-Solar (formerly Phoenix Solar India), Solar Semiconductors, TF Solar Power, Lanco Solar, EPV Solar, and Bhaskar Silicon. Signet Solar plans to build a 300 MW production facility for thin-film modules in the state of Tamil Nadu. Estimated costs amount to USD 500 million. The company, with headquarters in California, wants to open three factories in India with a total capacity of one gigawatt. Titan Energy Systems is planning a 500 MW plant for solar cells, modules, and wafers. KSK Surya PV Ventures has an-

nounced plans for capacities of 50 to 700 MW in India within the next few years.

Tata BP Solar India CEO Krishnappa Subramanya also has big goals: "We want to expand our capacity to 300 MW." Tata BP Solar India – a joint venture between the Tata Group and BP Solar – will invest almost EUR 250 million in its PV factory. TF Solar Power of Hyderabad is spending EUR 340 million on a production hall for thin-film modules. Lanco Solar is looking at almost twice as much (EUR 640 million) to manufacture PV modules.

Indeed, the photovoltaic market seems to be attractive to investors even without SIPS funding. Indian industry giants Bharat Electronics and Bharat Heavy Electricals, for example, created a joint venture to start producing a capacity of 250 MW. The public crude oil conglomerate ONGC is currently in negotiation with four business partners for a 60 MW PV factory, according to ONGC chairman Radhe Shyam Sharma.

Not everything is running smoothly, as shown by a project of Moser Baer Photo Voltaic (MBPV), a subsidiary of Moser Baer India. The company wanted to set up a PV module factory near Chennai for about EUR 290 million, but the project is currently on hold. Industry experts say there are liquidity problems. However, as TERI director general Rajendra Pachauri points out, if all planned solar activities in India were actually implemented, "that would pave the way for more affordable PV power production." ◀

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