Solar Plan Could Revolutionize India's Energy Sector

India’s solar resources are among the most abundant in the world, with more than 1 million square miles (3 million square kilometers) of land spread beneath an average 250–300 clear sunny days a year. A leaked early version of the Indian Government’s national solar energy plan indicates that India may be thinking more ambitiously about a “clean energy” roadmap than was previously anticipated.

The draft strategy, first published in The Hindu, outlines plans for a national target of 200,000 megawatts of solar generation capacity by 2050. This is 1.3 times India’s current installed power generation capacity of 150,000 megawatts across all energy sectors. Although the Prime Minister’s Council on Climate Change is yet to approve the plan, and the Ministry of New and Renewable Energy has not confirmed the claim, this possibility raises important questions for India’s energy future, namely: Could a large-scale transition to solar power and other renewables be economically and technically possible? And if so, what would it take?

India is home to one of the most abundant solar resources in the world, with 2.97 million square kilometers of tropical and subtropical land and an average of 250-300 clear sunny days a year. As such, solar power offers significant potential to meet a large share of the country’s energy needs using both centralized and decentralized production.

Such changes, if realized, could dwarf current solar leaders Germany, Spain, Japan, and the United States in both domestic market size and export manufacturing. They would also create a hefty job market in solar manufacturing and installation.

According to the leaked document, India’s “solar mission” will include measures for rapidly expanding the use of small-scale photovoltaic panels, solar lighting systems, and commercial-scale solar plants, in order to drive down costs and encourage domestic solar manufacturing. The efforts would occur in both rural and urban areas and target residential as well as commercial users. The plan also proposes scaling-up centralized solar thermal power generation, with the aim of achieving cost parity with conventional grid power by 2020 and the full necessary energy infrastructure by 2050.

With India’s installed solar capacity currently at only 3 megawatts, this would be the most ambitious solar plan that any country has laid out so far. The scope of the initiative would also match and ultimately far exceed India’s plans for nuclear power generation.

Several recent studies have outlined wider renewable-energy scenarios for India, including Energy Revolution, a report released by Greenpeace and the European Renewable Energy Council in March and Mitigation Options for India: The Role of the International Community released by The Energy and Resources Institute (TERI) in December 2007. Both reports encourage the transition to solar power as a critical way for India to boost its energy security and help to reduce greenhouse gas emissions globally.

Both the Greenpeace and TERI studies operate from the premise that global carbon emissions must peak by no later than 2015 to avoid dangerous emission levels. They make the case that it is not only technically and economically feasible for India to make the shift to renewable energy sources (if this rollout is combined with energy-efficiency measures), but also prudent to begin this transition now.

There are several reasons for this urgency. First, the reports note that India’s power-generation infrastructure is undergoing rapid expansion to meet national development objectives, with the country still facing unmet power demands that equate to as much as 80 percent of current installed capacity. Second, they point to rising energy security concerns as energy prices go up and supplies shrink, making it a ripe time to shift to a new model of energy production.

Crucially, however, once the high upfront investment costs have been circumnavigated, the shift to renewables would actually be cost positive, the reports conclude. “The fuel savings up to 2030 would amount to $2,170 billion, seven times more than the additional investment costs,” said Sven Teske, an author of Energy Revolution. “Over 30 years, India would make money.”

Both reports offer recommendations for how such a shift could happen. Proposed steps include a widespread scaling-up of both decentralized energy production and centralized renewable energy production (particularly solar photovoltaics, concentrating solar power, wind, and biomass); the use of combined heat-and-
power systems at the point of generation; the decarbonization of transport fuel (with an emphasis on electric vehicles and other sustainable forms of transportation); an increase in research and development across energy segments; and improvements in the energy efficiency of buildings, transport, appliances, industrial processes, and power transmission.

They also suggest granting priority access to the grid for renewables, creating an innovative legal structure for incentivization and taxation, and rallying both public support and international technological and financial assistance to accelerate fast and effective change.

The reports differ in their approach to nuclear energy, with TERI stating that nuclear will play a key role in India's power sector in the medium to long term, and the Greenpeace study not including it at all.

According to both reports, the primary obstacles facing India's rapid shift to renewable energy are the upfront investment costs required and the need for strong political will.

On the issue of investment costs, TERI found that a shift to a 92-percent renewables share in India's energy supply would result in a doubling of domestic carbon emissions by 2031 (compared with a seven-time increase under the current trajectory) and would cost an estimated 457 trillion Rupees (US$9.6 trillion). This is contrasted with a 75-percent renewables share, which would result in a tripling of emissions by 2031 and cost an estimated 260 trillion Rupees ($5.4 trillion).

Solar would be pivotal in both cases, with concentrated solar power alone making up 61 percent and 31 percent of the total mix for the two scenarios, respectively.

*Energy [R]evolution* concluded that it is possible for 69 percent of India's electricity and 70 percent of India's heating and cooking needs to come from renewable sources by 2050 - but capturing this opportunity "would require at an additional investment of $154 billion," Teske said.

Meanwhile, the government's leaked national solar strategy proposes investments amounting to some 85,000-105,000 Crore Rupees ($18-22 billion) over this same period. This would clearly fall far short of the estimated funding needs for such a massive and rapid rollout of solar energy, if compared with the estimates above.

Both Greenpeace and TERI suggest the use of international financing mechanisms to bridge the cost gap, a proposal in line with the Indian government's rhetoric in the ongoing international climate negotiations. These proposals include the full utilization of a carbon-credit mechanism such as the Kyoto Protocol's Clean Development Mechanism (CDM), as well as the establishment of a $200 billion international fund "supported by a feed-in tariff mechanism," according to *Energy [R]evolution*.

"The proposed feed-in law structure, which would be combined with an emission trading mechanism, allows for the upfront investment costs to be met and for planning from local project developers, thanks to a fixed-return guarantee," Teske said.

With regard to the need for political will, there are certainly signs that change is afoot. In addition to the government's potential new solar target, initiatives under way across India include the development and implementation of energy-efficiency improvements for appliances, buildings, power generation, and industry; a revised national policy to upgrade and "smarten" much of India's power grid; a growing portfolio of CDM projects; and emerging leadership in states like Maharashtra, Tamil Nadu, and Rajasthan to adopt and implement progressive renewable energy policies.

Civil society and the private sector are increasingly active in implementing renewables and smart energy projects across many parts of the country as well. However, some observers remain skeptical about the feasibility of India's energy transition plans, with concerns running deeper than the need for finance and strong policy frameworks.

V. Subramanian, former Secretary of the Ministry of New and Renewable Energy, said the strategy outlined in *Energy [R]evolution* would face significant implementation challenges. "The government of India does not currently have the machinery to implement such a strategy at a national level," said Subramanian, who now serves as CEO of India's Wind Energy Association. "This has to be done by state governments, and as yet the engagement between the two on this is not strong."

In Mr. Subramanian's view, financing is not the key issue. "If India leveraged 1 paisa, or one-hundredth of a rupee, on every kilowatt hour generated by coal-fired utilities, we would have enough money to implement all renewables here in India," he said.

It is clear that changes toward a renewable energy future are under way in India - but is the current pace fast enough? Many environmentalists argue that it is still not in line with the stated need and opportunity, and that some barriers are not being addressed. Targets such as those outlined in the leaked solar energy report and recommended in the recent renewables studies would raise the bar of opportunity for scale, pace, impact, and actionable political will. However, India would need a significant machinery overhaul to implement such a change, relying upon the support of international collaboration.