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20GW

India Solar Mission's original goal for 2022 domestic PV capacity

43.6GW

Installed PV in India, November 2020

Clean Energy Trade Policy Case Study: India

As the economic opportunities presented by the transition to a lower-carbon economy have become more apparent, individual nations have sought to implement policies specifically intended to subsidize directly their domestic clean energy manufacturers, erect barriers to protect them from foreign competition, or some combination of both. We examine here the strategy India pursued in 2009 through its Solar Mission as it sought to expand domestic deployment of solar power-generating capacity while protecting its nascent solar equipment manufacturing base.

- Launched in 2009, India's National Solar Mission aimed to create a thriving domestic PV market through the build-out of power-generating capacity and local-content requirements intended to ensure that new projects would use PV equipment made in India.
- To qualify for a particularly favorable categorization in the tenders, developers had to demonstrate their projects would use certain volumes of domestically made equipment.
- The rule as first written contained a major loophole that allowed projects to use non-crystalline silicon, "thin-film" PV modules on projects. These were supplied by U.S.-based manufacturer, First Solar and underwritten by U.S. development finance agencies. India then closed the loophole to ensure the rules also applied to thin-film equipment.
- In February 2016, the WTO sided with the U.S. in ruling that India's local content requirements unfairly discriminated against imported cells and modules.
- In terms of installed solar generating capacity, India has vastly exceeded its original goal of 20GW by 2022. The country had 43.6GW of operating PV as of November 2020.
- The Mission and accompanying local-content rules ended up spurring growth in solar manufacturing. India does today have a significant presence in the production of finished PV modules and, to a lesser degree, PV cells.
- However, the country still lacks almost any manufacturing capacity in higher value segments further up the value chain. It has virtually no polysilicon, ingot, or wafer production capacity.
- The government is now contemplating other ways to support domestic production. One possible move would be to impose a "basic customs duty" that would impose higher tariffs on a longer-term basis. Indian manufacturers are petitioning for the new tariff to be set at 50%.

1. The Mission

Concerned over growing imports of Chinese-made PV equipment and hoping to launch a thriving industry of its own, India in 2009 launched its National Solar Mission. The scheme sought to vastly expand local PV power-generating capacity from approximately zero to 20GW by 2022 while ensuring a substantial portion of equipment deployed was made in India. To achieve this latter goal, India implemented a local-content rule mandating that projects use certain volumes of Indian-made PV.

India's energy policymakers have long had dual goals of expanding citizens' basic energy access while maintaining or improving energy security. These objectives were both at play as the country's utility-scale PV market came to life in the late 2000s. Compared to wealthier Western nations, India's PV market got off to a later start, largely because PV on an unsubsidized basis

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was higher cost than conventional coal generation on a levelized basis. The country saw installations of approximately 50MW per year of PV in 2008 and 2009.

A number of India's first utility-scale projects used equipment imported from regional rival, China. This was due both to aggressive pricing offered by Chinese module makers and the fact that India itself had limited manufacturing capacity online at the time. Indian policymakers did not relish the idea of a promising new industry being beholden to foreign suppliers.

2. Policy goal

Launched in 2009, India's National Solar Mission aimed to create a thriving domestic PV market through the build-out of power-generating capacity and through the expansion of a domestic supply chain to provide the requisite equipment. The Mission set installation goals regarded as ambitious at the time. It also outlined local-content requirements intended to ensure that new projects would use PV equipment produced on Indian soil.

The policy originally sought to have 20GW of grid-connected solar power operating in India by 2022, to create "favourable conditions for solar manufacturing capability" and to reach "a 4-5GW equivalent of installed [manufacturing] capacity by 2020".

To create demand for that equipment through the addition of operating capacity, the Mission established a series tenders for power-supply contracts exclusively for solar developers. On the manufacturing supply side, the Mission put in place local-content rules requiring developers to use locally made PV equipment in their projects. The two policies were intended to work hand in hand.

3. Implementation

To qualify for a particularly favorable categorization in the tenders, developers had to demonstrate their projects would use certain volumes of domestically made equipment. During the first phase of the program from 2010-12, the local content rules only applied to crystalline-silicon (c-Si) technologies. The program sought to work up the c-Si value chain, starting with the segment deemed easiest to fulfil domestically – the assembly of finished PV modules. During the first "batch" (tender), projects needed only to use locally made modules; the cells contained in those modules could be imported (Table 1). In the second batch of Phase 1, developers had to use both modules and cells made in India. Importantly, none of the Phase 1 rules applied to projects that used "thin-film" modules, which are made from cadmium telluride, not c-Si.

In Phase II, which included four more batches, the rules tightened while also giving developers flexibility. Developers participating in a "domestic-content requirement" (DCR) segment of the tenders' process had to source both their modules and cells locally. Alternatively, they could take part in the "open" category where local-content rules did not apply. Or they could take part in both by submitting separate bids. For the first time, projects seeking to use thin-film modules were subject to local-content requirements as well.

Table 1: India's local-content rules for PV under the Solar Mission

	Phase I (2010-12)		Phase II (2013-17)
	Batch I	**Batch II**	**Batch I-IV**
Crystalline silicon	Locally manufactured modules. Cells may be imported	Locally manufactured modules & cells	*DCR category*: locally manufactured modules & cells *Open category*: no requirements

Thin film	May be imported	*DCR category*: locally manufactured modules & cells *Open category*: no requirements

Source: India Ministry of New & Renewable Energy

The program also had explicit targets that it hoped would help India achieve its long-term installed power-generating capacity goals. It was hoped that Phase I would result in 1-2GW of new build, followed by 4-10GW in Phase II. A later, Phase III from 2017-2022 would add another 20GW. Below each of these headline objectives were carve-out objectives for off-grid solar to boost energy access rates in the country.

Table 2: India Solar Mission original power-generating capacity build targets

Phase	Period	Cumulative grid connected power including rooftop projects (MW)	Off grid solar applications (MW)
Phase I	November 2009 – March 2013	1,000-2,000	200
Phase II	April 2013 – March 2017	4,000-10,000	1,000
Phase III	April 2017 – March 2022	20,000	2,000

Source: India Ministry of New and Renewable Energy

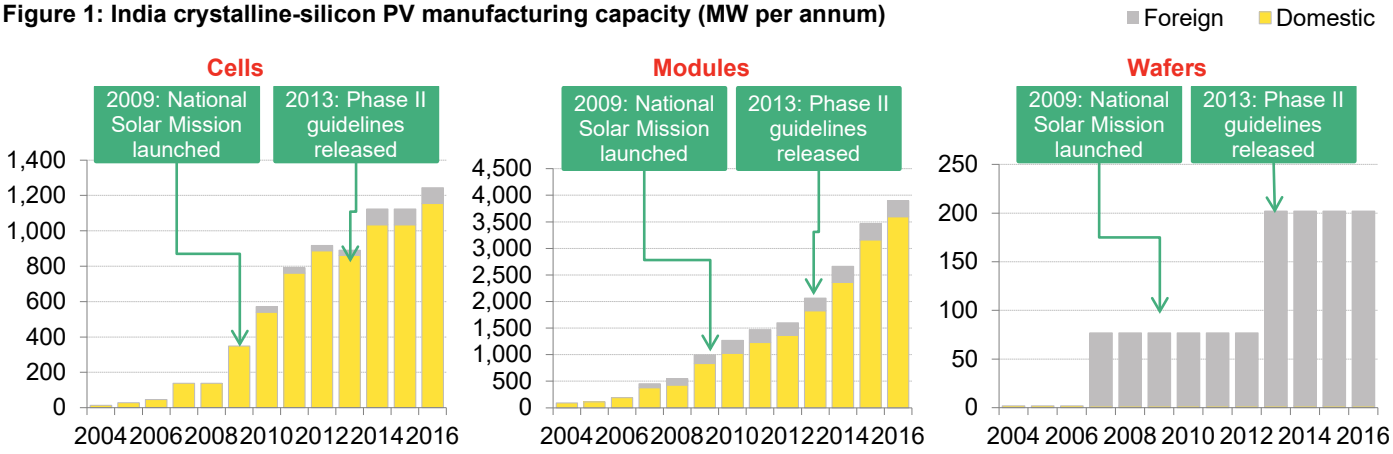
4. Market impact

When the auctions kicked off, the local content rules in Phase I essentially favored thin-film products as they were exempt from the requirements, tended to be cheaper and could be procured by developers affordably thanks to low-cost international financing. Thin-film modules offered lower capacity factors than crystalline-silicon (c-si) equipment but were considerably less expensive on a dollar-per-Watt basis. They are also quite suitable to regions with particularly strong sun, including many parts of India.

Arizona-based First Solar, the world's largest manufacturer of thin-film equipment, saw opportunity in India and leveraged support from the U.S. Export-Import Bank and the U.S. Overseas Private Investment Corporation. The two U.S. credit agencies offered cut-rate loans to Indian developers to buy First Solar equipment for the projects. The interest rate was reportedly approximately 3% and denominated in dollars. By comparison, local banks were offering developers rates as high as 14% on loans issued in rupees. In 2010-11, the U.S. Ex-Im Bank lent $248m to Indian companies to buy thin-film modules.

India had only a tiny volume of domestic thin-film module manufacturing at the time. Those plants did not enjoy the same economies of scale as the First Solar plants, and developers using that equipment could not access U.S. Ex-Im financing. As a result, half of installations in Phase I Batch I used thin-film. That rose to 59% in the following batch. By comparison, the share of thin-film in solar plants developed globally during those years was around 14%.

Figure 1: India crystalline-silicon PV manufacturing capacity (MW per annum)



Source: BloombergNEF

Overseas manufacturers objected that India's domestic-content rules ran afoul of World Trade Organization rules. In February 2013, the U.S. filed a complaint, invoking the General Agreement on Tariffs and Trade, to press the case that India's domestic content requirements granted Indian manufacturers "certain benefits and advantages, including subsidies through guaranteed, long-term tariffs for electricity, contingent on their purchase and use of solar cells and modules of domestic origin."

Three years later, in February 2016, the WTO sided with the U.S., ruling that India's local content requirements under Phase I and II (Batch I) unfairly discriminated against imported cells and modules. India said it would implement the WTO's findings but would not revisit contracts awarded to earlier projects.

5. Did it succeed?

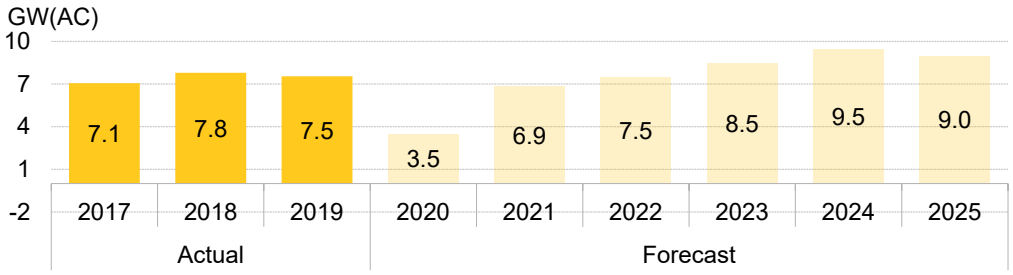
The Mission and accompanying local-content rules spurred growth in India solar manufacturing. The country today has a significant presence in the production of finished PV modules and, to a lesser degree, in the manufacturing of PV cells. These represent the last two segment of the PV manufacturing value chain. However, the country still lacks almost any manufacturing capacity in higher value segments further up the value chain. It has virtually no polysilicon, ingot, or wafer production capacity.

6. The current situation

In 2020, India's entire renewables value chain – from manufacturing to project commissioning – was disrupted by Covid-19 and the lockdown. Nonetheless, solar auctions continued at a brisk pace in 2020, with new, complex auctions gaining prominence. This suggests that the market was poised to recover as projects contracted get built in coming years.

Specifically, as of September 2020, BNEF expected 3.5GW (AC) of utility-scale PV to be completed by year-end 2020 in India (Figure 2). In 2021, build should rebound to 6.9GW then to 9.5GW in 2024.

Figure 2: Recent and projected India utility-scale PV build



Source: BloombergNEF. Note that 2020 figures are not final and are thus an estimate.

While India has made some progress expanding its supply chain for PV modules the country was a net importer of $160 million of equipment during 1H 2020 with China accounting for 78% of the $220 million in imports (Figure 3, Figure 4). The Indian government has voiced concern that local projects remain reliant on foreign equipment and has come to aid local manufacturers through manufacturing linked solar tenders and government procurement rules that may offer preferential treatment to projects that use local equipment. It has also imposed tariffs.

Figure 3: India 1H 2020 PV imports by supplier country

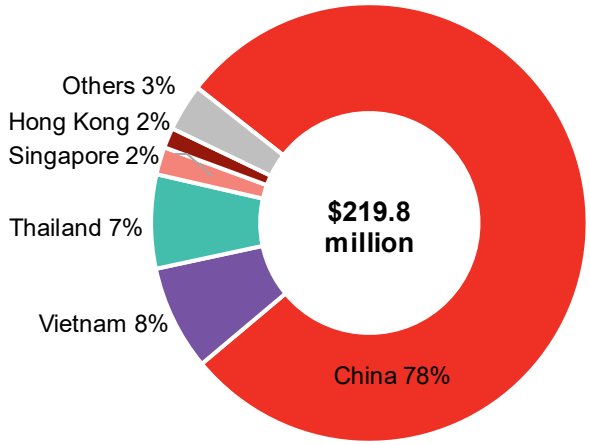
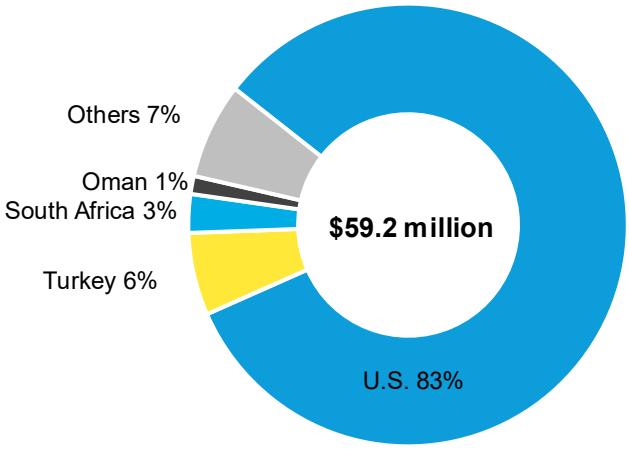


Figure 4: India 1H 2020 exports by destination country



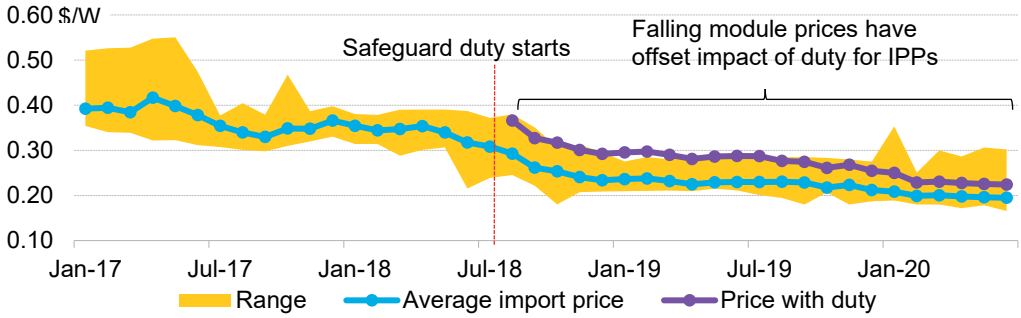
Source: Department of Commerce, BloombergNEF. Note: Data includes both modules and cells imported and exported from January to June 2020 under HS Code 85414011.

In mid-2018, the India government put in place a "safeguard duty" set initially at 25% on imported cells and modules with an eye toward making local manufacturing more competitive. The explicit target was on countries the Indian government deemed to be "developed", a category which included China and Malaysia.

Over the course of two years, the safeguard duty provided only limited protection to Indian manufacturers for several reasons. First, projects that signed contracts under tenders held pre-2018 were able to pass through the tariff cost to their original offtaker and thus maintained the contracts they had signed with foreign equipment suppliers. Second, some projects simply turned to Vietnam and Thailand for equipment since both nations were exempt from the tariff. Third, and perhaps most importantly, the tariffs were largely offset by the continuing rapid decline in

equipment prices overall (Figure 5). The decline allowed Chinese equipment to be cost-competitive, even after taking into account the tariff.

Figure 5: Average prices of modules imported into India



Source: Sinoimex, BloombergNEF. Note: The prices are weighted average for delivery month but the orders could have been placed earlier. The range is calculated using data in the 5th to 95th percentile.

In addition, Indian manufacturers complained that because the tariff was of limited duration and scheduled to expire after just two years, it did not prompt developers to fundamentally reconsider their relationships with existing overseas suppliers.

The safeguard tariff duty expired at the end of July 2020 as scheduled. In response to local manufacturers, the government moved to extend it an additional year and added Thailand and Vietnam to the list of countries subject to the tariffs. However, the tariff is set at 14.9% through July 2021, well below what domestic manufacturers would like.

The government is now contemplating additional steps to support domestic production. One possible move would be to impose a "basic customs duty" that would impose higher tariffs on a longer-term basis. Indian manufacturers are petitioning for the new tariff to be set at 50%. Developers, understandably, are staunchly opposed. The government is also contemplating more direct support for manufacturers, potentially in the form of cut-rate loans that would allow equipment makers to scale production and move up the value chain at lower cost.

With the Indian market poised for further growth and still far from achieving the Modi government's target of 100GW PV installed, some further policy action seems likely as the original goals of India's Solar Mission have yet to be fully achieved. In fact, Delhi may be raising its sights even higher. There is now discussions that the government will up India's 2030 solar target to 280GW by 2030, though this had not yet been announced as of November 2020.

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