

# Section 14

## Case study – India (Bihar)

**B**ihar has a 100 percent electrification rate at the household level but the power supply from the main grid remains intermittent. Rural communities often pay higher rates for a reliable electricity supply via diesel-powered generators and the state therefore offers ample opportunities for mini-grid development. Bihar and India in general has seen rapid improvements in electricity access over the last few years under the *Saubhagya* scheme. The main use case for mini-grids lies in improving the reliability of the grid power supply through connection to sub-stations and providing power for commercial and industrial (C&I) customers. There is an appreciation of mini-grids in state-level policy, but more work needs to be done to develop the sector.

According to official statistics, just 18,734 households or 0.01 percent of all those in the country have yet to be electrified (The Ministry of Power, n.d.). However, the government makes its 100 percent claim by employing quite a loose definition of *electrification*. For its purposes, all households in the village are considered electrified if public buildings and 10 percent of the total number of households in that community are connected to the main grid. In addition, a large portion of households formally connected receive only limited service.

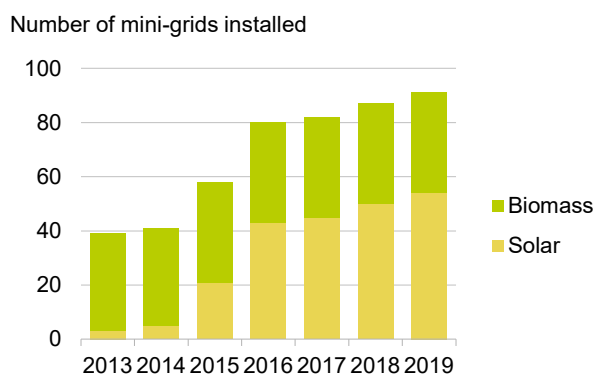
Situated in the east of the country, Bihar is one of India's poorest states and has historically suffered one of its lowest electricity access rates (CEEW, 2018). Despite these severe disadvantages, Bihar has seen less mini-grid investment and project development than its much larger neighbor Uttar Pradesh. Still, there are 146 mini-grids installed worth 4MW in generating capacity (Figure 118, Figure 119). Barriers have included a lack of sufficient regulations and uncertainty about main grid arrival rules.

### 14.1 Overview

In 2019, the Indian government announced that the country had achieved 100 percent household electrification through grid extensions under its *Saubhagya*

**Figure 118**

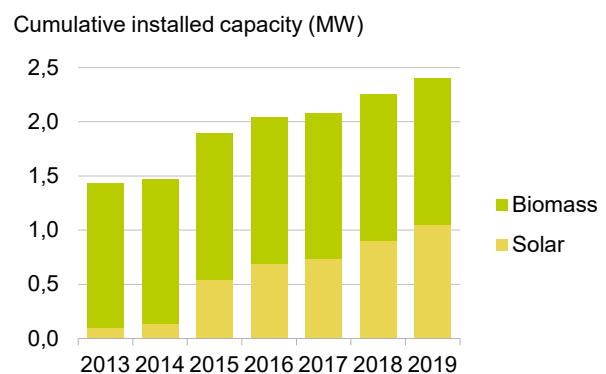
**Bihar's installed mini-grids, by project**



**Source:** BloombergNEF. **Note:** Operating projects without a specified commissioning year are not included.

**Figure 119**

**Bihar's installed mini-grids, by capacity**



## 14.2 Distributed power market structure

India's power market includes a mix of state-owned and private entities. At the national level, the Central Electricity Regulatory Commission (CERC) regulates inter-state transfer of electricity. The Bihar Electricity Regulatory Commission (BERC) coordinates state-level regulations and implementation, including determining tariffs and overseeing licensing. Stakeholders interviewed by the authors noted that having to deal with both state-level and national authorities has been a challenge in setting up their projects.

## 14.3 Current market status

The authors identified 146 installed mini-grids in Bihar, which represent 8 percent of all projects confirmed to be operating in India. Typical mini-grids

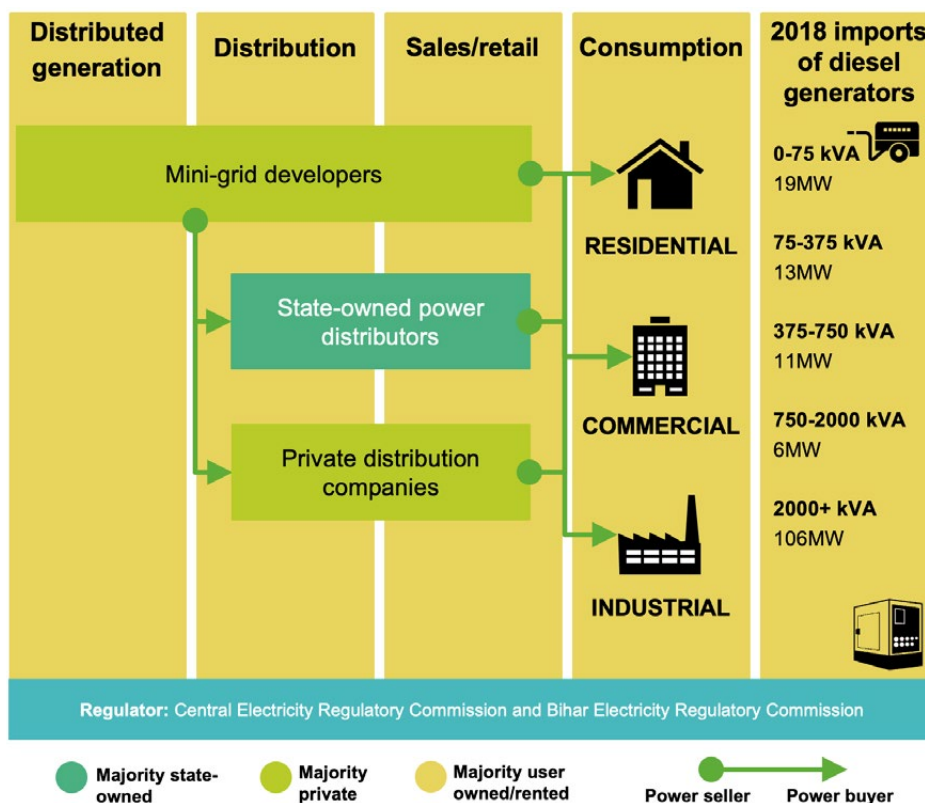
serve residential and commercial customers, and small factories. They often include anchor loads such as agricultural facilities, telecom towers, water purification or cold storage facilities.

Mini-grid developers have flexibility in tariff setting. For instance, one developer interviewed by the authors charges a discounted tariff when the power demand of its main customer exceeds a certain threshold (e.g. 100kWh/month). While mini-grid tariffs are higher than those offered by the main grid, customers are often willing to pay a premium for reliability.

Grid reliability varies significantly by location within Bihar. Rural households were far from access to reliable grid electricity as of 2018, according to a survey from the Council on Energy, Environment and Water (CEEW), a Delhi-based think tank (Figure 121). However, overall main grid reliability has improved in recent years (Figure 122), posing a potential risk that mini-grids could become stranded. Still, quality of power (e.g. voltage fluctuations) con-

Figure 120

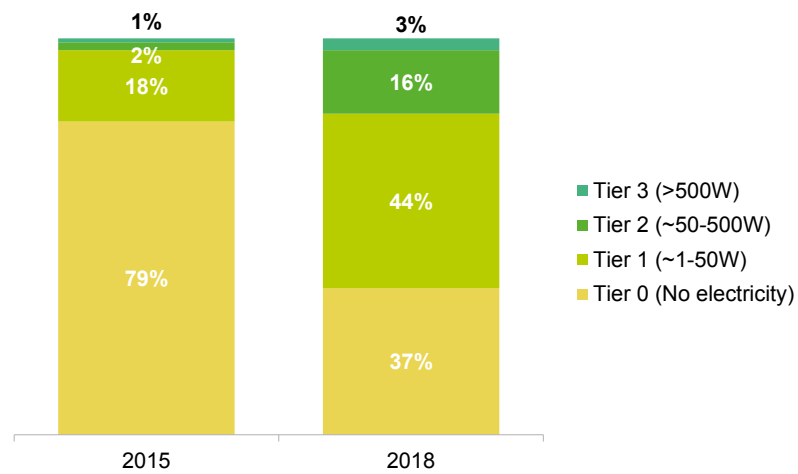
Bihar's distributed power market structure



Source: BloombergNEF. Note: Backup diesel imports are at the national level.

Figure 121

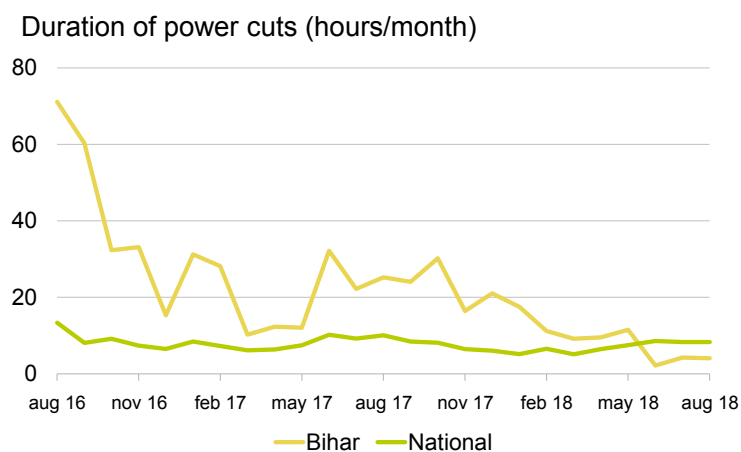
Bihar's distribution of households by electricity access tier



Source: BloombergNEF, CEEW. Note: Tier system used differs from the Multi-Tier Framework.

Figure 122

Bihar's duration of power outages



Source: BloombergNEF, Government of India.

tinues to be a problem, according to one research organization. There remain opportunities for double-digit megawatts of mini-grids for commercial and industrial customers who prioritize reliability.

While large corporates and non-governmental organizations (NGOs) have financed mini-grids in Bihar, virtually all developers of such projects have been local companies (Figure 123). Most of their focus is not only on Bihar, but on several states such as Uttar Pradesh and Odisha. Haryana-based OMC Power and Bihar-based Husk Power have been active in Bihar since as early as 2008. The former is well known as one of the leading builders of mini-

grids that serve major anchor customers paired with commercial and residential customers nearby.

In 2017, OMC Power received a USD 9 million equity investment from Japanese trading house Mitsubishi. Husk Power raised USD 20 million from Shell Technology Ventures, Swedfund International and ENGIE Rassembleurs d'Energies in January 2018. The developer earlier focused on building biomass mini-grids, but more recently turned its attention to solar hybrid mini-grids in collaboration with ABB.

Shell Foundation and the Rockefeller Foundation have provided important assistance to India-based

Figure 123

Mini-grid developer landscape in Bihar



Source: BloombergNEF, company websites.

mini-grid developers. In November 2019, Rockefeller and Tata Power announced plans for the development of 10,000 new mini-grids throughout India to serve over 800 million people by 2026 (The Rockefeller Foundation, 2019).

## 14.4 Policy and regulations

Approved in May 2017, Bihar’s Policy for Promotion of New & Renewable Energy Sources aims to install 100MW of <500kW renewable mini-grids by 2022 (CEED). If successful, this would account for about 3 percent of an overall target of 3,533MW of clean capacity additions by the same year.

Mini-grid projects may be built under three state policy framework models:

- **Tendering** – The Bihar Renewable Energy Development Agency (BREDA) may issue a tender under the existing central off-grid electrification scheme known as *Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY)*. However, to date, the government has yet to hold a tender or announce plans for one.
- **State subsidy** – BREDA can offer subsidies to developers but has yet to release details on how and at what level it will do so. In exchange for accepting subsidies, developers would need to structure their tariffs to customers in compliance with the state’s anticipated mini-grid regulation.

### Box 13

#### Serving anchor loads

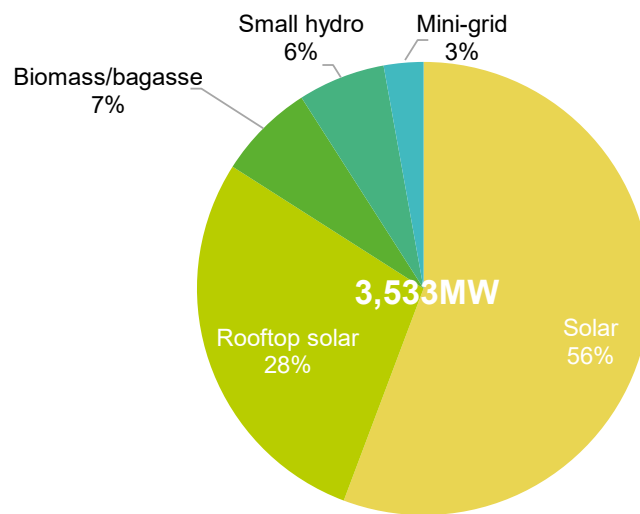
DESI Power builds biomass and solar hybrid mini-grids that supply electricity to anchor consumers such as irrigation water pumps, agricultural facilities, shops and telecom towers. These customers are the main revenue sources for DESI as they have larger and more predictable power demands than those of residential customers.

DESI charges anchors on a per-unit-of-consumption basis, while a flat tariff is used for residential consumption. Separating consumers

by type and applying different tariff structures is a useful way of optimizing revenue generation. Residential consumers may not have significant energy requirements, hence a fixed tariff eliminates the need for installing meters at their premises and DESI can assess mini-grid consumption via centralized monitoring. On the other hand, the cost of installing meters is a smaller proportion of the potential revenue from commercial consumers who have higher energy requirements.

Figure 124

Bihar's policy for Promotion of New & Renewable Energy Sources 2022, targets by technology



Source: BloombergNEF, CEED 2017. Note: Small hydro refers to hydro projects less than 25MW that are expected to deliver power to the nearest power sub-station.

That regulation was expected to be released by the Bihar Electricity Regulatory Commission (BERC) in 2018 but had not been issued by the end of 2019.

- **Energy service company (ESCO)** – ESCOs can develop mini-grids without subsidy in Bihar. They can choose the location independently and charge consumers a mutually agreed tariff under this model. OMC Power, Husk Power, DESI Power, Freespanz and Tara Urja are notable ESCOs currently active in Bihar.

### Mini-grid regulations

Bihar's 2017 Policy for Promotion of New & Renewable Energy Sources suggests that BERC "should develop a mini-grid regulatory framework". However such a framework specific to mini-grids has yet to come into existence. This limits the government's ability to enforce the recommendations laid out in the policy.

### Licensing

India has no licensing requirements for off-grid projects, including mini-grids. This generally reduces the time and complexity for mini-grid development in the country. According to the Electricity Act, 2003 (Ministry of Law and Justice, 2003), any generation

company may develop, operate and maintain a generation plant without obtaining a licence so long as technical standards relating to grid connectivity are met. This also applies to mini-grids in Bihar.

### Cost-reflective tariffs

For projects not seeking direct subsidies in Bihar, there are no regulations on mini-grid tariffs. As a result, developers can set tariffs as they see fit and charge customers at cost-reflective rates.

### Arrival of the main grid

The biggest concern for investors and mini-grid developers is the viability of a business if the main grid is extended to their area of operation. Unlike the policies of some other states, Bihar's Policy for Promotion of New & Renewable Energy Sources does however state several options:

- Continue to operate, i.e. parallel to the grid.
- Sell excess or all power to the disco at a feed-in tariff annually determined by the regulator.
- Transfer ownership of the assets/distribution network to the disco.
- Developers may be able to engage with the disco as a distribution franchise.

Despite a general level of flexibility in Bihar, developers raised concerns around the lack of regulation that could undermine the above options.

Some developers suggested that they will avoid connecting to the central grid until such rules are made more explicit.

**Box 14**

**Customers opt for mini-grid power over the central grid**

The arrival of the central grid may not mean the end of autonomy for an existing mini-grid. Take for instance Husk Power’s 32kW biomass gasifier, 20kW PV array and lead-acid battery mini-grid project near the town of Pipra Kothi. Since the project was commissioned in 2017, the distribution grid has expanded to come within 2.5km of the community of 250 households and businesses served by the mini-grid. This

raised the prospect of customers switching to the central grid for power – and paying lower tariffs. However, customers opted to stay with the mini-grid, primarily because they value the more reliable electricity it provides. Husk employs a local electrician, a security guard and an operator to manually add feedstock to the biomass gasifier. All ensure more reliable power delivery.