other areas.[41, 42] Feedback Energy Distribution Company (FEDCO) has had success with this model in Odisha. It has been replicated in other states such as Meghalaya, Tripura, Rajasthan and Madhya Pradesh.[43]

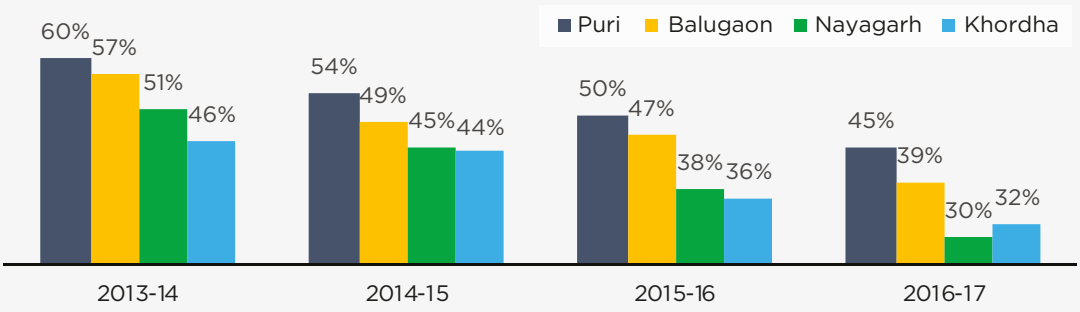
Box 2: A Distribution Franchisee Model in Odisha[44]

Odisha was the first state in India to privatise its discoms in 1999. The first attempt at privatisation failed when the distribution licensees operating with CESU–AES Corporation and BSES–couldn't pay their power dues a few years post operation. The overall AT&C losses remained above 38%, resulting in cumulative losses of over $250 million in 2012–13.

With no financial institution willing to lend money to CESU in 2012 and insufficient revenues, CESU decided to implement the input-based franchisee with incremental revenue sharing (IBF-IRS) model, where the franchisee would infuse the capital required for system upgrades and the incremental revenue generated would be shared between CESU and franchisees in a mutually agreed ratio.

CESU engaged FEDCO as a franchisee in four divisions in 2013. FEDCO achieved an average 23% reduction in AT&C losses between 2013 and 2017. The overall collection doubled in the same period as well. They also managed to bring down the power purchase cost below the revenue collection. FEDCO claims this to be the steepest reduction in AT&C losses achieved in a predominantly rural area.

AT&C Loss Reduction by FEDCO in Odisha



Recently, Tata Power has taken over the management and operations of five discoms in Odisha, having won the bids for the licenses.

However, India has also seen multiple cancellations of DF contracts, including in Aurangabad, Nagpur and Jalgaon,[45] due to non-payment of dues, and in states such as Madhya Pradesh, Uttar Pradesh, Rajasthan and Jharkhand. These cancellations have brought to light the need for provision of transitional support, and a favourable policy environment in ensuring success of this model.[46] Clear legal and policy frameworks are needed to avoid issues such as delays in takeover of franchisee areas as well as post-bidding dilution of contracts as in the cases of Bhiwandi, Kanpur and Agra, observed between 2007 and 2012.[47] DF is also not immune to the larger political issues surrounding

the sector. For example, enforcing cost-reflective tariffs and streamlining billing and collection processes can see resistance from some consumer quarters, as was the case with Essel Utilities in Madhya Pradesh.[48] However, discoms have been able to mitigate some of these risks as a result of experiential learning; this model has been mostly successful since 2015.

Depending on the level of functions, the DF model can be classified into three groups: (i) input-based distribution franchisee (IBDF), (ii) revenue franchisee/collection-based distribution franchisee (CBDF); and (iii) outsourcing.

IBDF involves the DF procuring electricity from the licensee (usually state-owned discoms) at a predetermined input rate. The DF's role is to bill and collect effectively, such that any surplus generated beyond the payment for the electricity purchased becomes the commercial profit for the DF. They also undertake some capex commitment, at times with contribution from the state government—this can enable efficiency and reduce losses. In some models, some form of asset management roles are also performed by the DF, which provides room for technical loss reduction beyond billing and collection.[49]

In CBDF, the role of the DF is limited to billing and improving collection. Success in this group is linked to monthly revenue generation and improving billing, collection, complaint redressal mechanisms, etc.; it is not tied to the reduction of loss in input energy. Power procurement, which makes up 75–80 percent of the total distribution cost, remains the responsibility of the distribution licensee. The CBDF model is currently running in Assam.

The outsourcing model involves direct outsourcing of discom functions—mainly billing and collection—at a flat margin, without performance-based incentives. Such contracts come in the form of management operator and service operator models, such as those in West Bengal, Bihar, Uttar Pradesh and Maharashtra.

States such as Andhra Pradesh[50] have experimented with the concept of rural electric cooperative societies (RESCOs), where the ownership and maintenance of assets and provision of services are the responsibilities of the members of the cooperative. RESCOs as a model need to be assessed further, given the success they enjoyed in countries such as the USA where a total of 930 rural cooperatives (864 distribution ones) are currently serving 42 million people in 47 states.[51] Similar models, such as Smart Power India (SPI)'s model distribution zone (MDZ) programme in Odisha, have also emerged where a network of women self-help groups has helped improve billing, collection, and customer care for grid-tied households. MDZ was able to reduce losses and increase incremental revenue for CESU, the utility.[52, 53]

Although DF models show promise, their impact on strengthening overall systems and in reducing losses is limited, depending on the specific DF model, the relationship with the state machinery, and the rural/urban nature of the landscape. Given the limited control that DFs have on distribution system operations, tariffs, and cost of supply, their ultimate impact on transforming the sector is limited. DFs have minimal incentive or ability in the form of capital investments to enable innovation. Lastly, the model also faces a degree of long-term risk from grid-modernisation efforts, especially from smart grids, if its performance incentives remain tied to billing and collection only.

2.1.3 Distribution Licensee Model

In this model, the private party owns the distribution assets and performs all distribution-related functions—from the purchase of power from suppliers of its own choice and supply to end users, to billing and collection. In urban areas, where there is a high density of population and a reasonably homogenous consumer mix, private parties might be more enthusiastic about acquiring an existing state-owned utility. Industrial areas are also suitable candidates for privatisation.

Depending on the financial viability, privatisation could be complete (100 percent ownership by the private party) or partial, with the government retaining a minority stake in the utility. In either case, the management control resides with the private owner. This model was successfully implemented in places such as Delhi, Ahmedabad, and Surat. The Power Ministry has recently issued draft bidding documents for this model of private participation.[54]

The transformation of DVB, by unbundling and sale of majority stakes to Tata Power and BSES, is often cited as a model of successful privatisation. The billing and collection efficiencies of TPDDL in Delhi are 92 percent and 100 percent, respectively, leading to an aggregate AT&C loss of just 8 percent, far lower than the 22 percent AT&C loss of all public utilities (see Appendix 4 for the details). The transition of the Delhi discoms was supported by government subsidy, and also the transfer of all DVB employees to the new discoms with benefits, thereby ensuring job security. Importantly though, the consumer mix in Delhi is relatively homogenous, with a marginal agricultural sector and a largely middle-class residential sector, with a high demand for efficiency. It must be kept in mind that this landscape is not entirely representative of the rest of the country.

While the private distribution licensee model provides greater ownership and control over improving the system, it is relatively more financially demanding for the private sector. The model has been successful in major cities such as Delhi and Surat where government support, consumer mix and geography helped it succeed. Furthermore, privatisation becomes difficult to achieve when the discom service area is more rural. Given the tariff differential and difficulty of billing, collection, and, in some cases, metering, the cost of servicing rural and agricultural consumers is commercially challenging. For full-scale privatisation, the consumer mix and geography are ultimately factors in achieving commercial viability.

The case in point was the attempt made at privatisation in Odisha (Box 2), where the contracted licensee, CESU – AES Corp, eventually had to give way to a franchisee model led by FEDCO. FEDCO's performance on loss reduction, on the other hand, has been reasonably impressive, even in rural areas, making the case for the franchisee model even in less urban geographies. Tata Power has recently taken over as the distribution licensee for Odisha.[55]

Recently, the government has declared its intent to delicense the distribution sector.[56] This is meant to promote competition in the industry (see Section 2.3.3).

2.2 VERTICAL UNBUNDLING

Table 3: Discom structure in states

Vertically Integrated–Power Department	Transmission separation–GEDCO (Generation & Distribution Co)	Unbundled with Single Public Discoms	Unbundled with Multiple Public Discoms and/or Private Licensee / Franchisee	
Arunachal Pradesh	Himachal Pradesh	Assam*	Andhra Pradesh	Maharashtra*#
Goa	Kerala	Chhattisgarh	Bihar	Odisha*#
Jammu & Kashmir[I]	Manipur	Jharkhand	Delhi#	Rajasthan*
Mizoram	Punjab	Meghalaya*	Gujarat*#	Uttar Pradesh*#
Nagaland	Tamil Nadu	Uttarakhand	Haryana	West Bengal*#
Puducherry	Tripura*		Karnataka	
Sikkim			Madhya Pradesh*	

Note:

* *indicates presence of private franchisee model; # indicates presence of private licensee model,*

\# *J&K's GENCO was set up as a private limited company.*

Vertical unbundling has progressed quite well on paper—most states have unbundled their power utilities (Table 3). However, actual separation and functional independence of generation, transmission, and distribution may be less than they appear. For instance, state-owned discoms may prefer to purchase power from state-owned generators, even if they can purchase cheaper power from elsewhere.[57, 58]

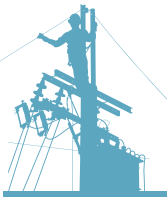
2.3 HORIZONTAL UNBUNDLING

Horizontal unbundling-related reforms can produce significant operational and financial efficiencies for discoms by enabling flexibility in short-term power procurement through power markets. Horizontal unbundling can also empower consumers by offering them a choice of more than one supplier of electricity. These reforms have already started to take shape but face roadblocks that can prevent their complete realisation.

2.3.1 Unlocking Short-Term Power Markets

Horizontal unbundling has generated cautious optimism in the area of power procurement, given the success of privatisation of the function of generation, introduction of short-term markets through the Discovery of Efficient Electricity Price (DEEP)[viii] mechanism, and the advent of the wholesale power market (see Box 5). Yet, the current state of power procurement remains enmeshed in the many long-term PPAs, limiting

viii DEEP is an e-Bidding and e-Reverse auction portal for procurement of short-term power by Discoms. Short-term procurement could be from a period of more than one day up to one year. Power plants that do not have PPAs today are now allowed coal linkages between three months and one year, if they sell in the DAM or DEEP.



the utility of market reforms. This restricts discoms' ability to procure low-cost power available at the power exchange or sign up for low-cost RE power.

Based on over-optimistic projections of power demand, discoms committed themselves to expensive and long-term thermal PPAs[59] which consist of two parts (fixed and variable). Discoms incur fixed costs regardless of the power consumed by their end customers. For a few states, such as Maharashtra, Rajasthan and Madhya Pradesh, these costs make up more than 30 percent of the total contracted power purchase cost.[60] States such as Chhattisgarh, Gujarat, Maharashtra and Uttar Pradesh have banned new thermal PPAs till 2022[61] and discoms have been given the liberty to procure electricity from the exchange during seasonal peak loads.

2.3.2 Open Access

The concept of open access (OA) was introduced in the EA 2003. OA promotes competition by allowing large consumers (> 1MW) non-discriminatory access to suppliers of power other than the discoms.

After EA 2003 was passed, the CERC and the SERCs notified regulations allowing procurement of power through OA. However, varying state policies, high OA charges, and procedural hurdles imposed by discoms have led to the slow progress of OA. Even so, OA and captive sales have increased rapidly.

Given the cross-subsidy regime in the country, discoms stand to lose out on higher paying customers if the OA regime is widely utilised. While the Act requires that cross-subsidies and surcharges be progressively reduced and eliminated, they have been increasing over the last few years.[62] In this light, reforms such as tariff rationalisation become even more important (see section 3.1.1), as OA becomes more widespread.

2.3.3 Consumer Retail Choice

While vertical unbundling has had some degree of success, when it comes to horizontal unbundling and providing choice to the consumer, the sector has been struggling. Even where discoms are privatised, each one (licensee or franchisee) still has a monopoly over its service area, thus limiting any real retail competition.

Box 3: Expanding consumer retail choice via rooftop solar

Related to OA and indirect consumer choice is the rooftop solar (RTS) programme. As a DER, RTS helps reduce transmission and distribution losses, as generation and distribution are co-located. It offers large consumers such as the commercial and industrial (C&I) ones options to optimise costs and releases them from the burden of high tariffs for cross-subsidisation. They can also source solar electricity from the OA route or third-party developers who supply power to the market. Smaller consumers (<1MW) such as those in the residential sector also stand to benefit from RTS by being able to access reliable electricity and get compensated for the sale of surplus electricity back to the discoms under net or gross metering arrangements. Additional benefits to the discoms include availability of more RE to fulfil their renewable purchase obligations (RPOs).

The central government's recent Budget announcement on promoting consumer choice and avoiding discom monopoly has the potential to overhaul the power distribution sector.[63] The separation of content (retail electricity) and carriage (wires) is the proposed means of creating retail customer choice in India. In global markets, this is typically referred to as retail choice. Once this separation is achieved, there could be multiple firms (called *distribution companies*) supplying power through the same grid infrastructure. Consumers can choose the supplier who provides them the best quality–cost combination. However, this reform can be challenging to achieve, and should be accompanied by careful market design.

In India, such a system already exists in Mumbai which has had a long tradition of electricity supply by private companies. Most of the cables are underground and losses are low.[64] Even so, competition in distribution is not very successful. Consumers who want to change suppliers face heavy regulatory charges and surcharges, making it unviable for them to migrate. Also, the high level of cross-subsidies shouldered by C&I consumers entices suppliers to cherry-pick high-paying consumers.[65]

Mumbai offers us several insights into the complex problem of operationalising retail choice. There needs to be clear criteria governing entry and exit of players. There should be regulatory clarity on the many complex questions that are important for implementing retail choice. Regulations will need to underpin a fair and non-discriminatory access regime to the distribution grid. Competition in distribution will also require greater clarity on aspects such as the duty to provide supply and cost-plus tariff regulation.[66]

3 Regulatory Reforms

3.1 ROLE OF STATE REGULATORY COMMISSIONS

The establishment of CERC and SERCs was an important step in reforming the governance of the power sector. It signalled the move towards regulatory independence. But true autonomy remains elusive. A study done by the World Bank found that SERCs' ability to carry out their mandate under EA 2003, with limited political interference, has a significant positive association with profit per unit of electricity. This underlines the importance of a robust regulatory framework for utility operations.[67]

The study found that many SERCs are yet to implement adequate transparency measures or create frameworks for meaningful public input to the regulatory process. Beyond these deficiencies, there are also no clear accountability mechanisms to govern the SERCs. Unless these gaps are addressed, the SERCs' ability to create an independent, transparent, and unbiased governance framework to balance the interests of consumers and discoms will remain muted.[68]

3.1.1 Tariff Setting

Low electricity tariffs are not just an Indian problem. It is commonly observed in developing countries that electricity tariffs are rarely high enough to cover the full costs of service delivery.[69] At the heart of the tariff rationalisation debate is the tension between two different outlooks: is electricity an essential public service whose provision at low rates is essential for public welfare, or is it a commodity to be bought and sold in the market like any other? States have chosen to locate themselves at different points on the policy

spectrum between these two extreme stances. While the right of the states to choose their policy stance is sacrosanct, the problem arises when discoms are unable to fulfil their obligations to their consumers and suppliers.

An aspect related to welfare is the growth in energy access. Although the Saubhagya scheme was successful in achieving 100 percent electrification by 2019, it expanded the base of low-paying customers on the grid which contributed to the rapid rise of the state-subsidy burden.

States such as Delhi and Gujarat[70] are good examples where tariff rationalisation has been carried out using the following principles:

- Adjusting the two-part tariff to accurately reflect the actual fixed and variable costs to prevent underrecovery of fixed costs.
- Quarterly tariff adjustments to ensure timely recovery of variable costs.
- Simplifying the tariff structure by minimising customer categories and tariff slabs.

Similarly, the rise in electricity volumes being generated through captive power and being traded on OA platforms, poses revenue realisation challenges for discoms still functioning in the context of cross-subsidisation.

3.1.2 Regulatory Assets

Often SERCs do not increase tariffs to match the increasing costs of discoms, in order to shield consumers from tariff shocks. The higher costs have to be absorbed by discoms. However, they are recognised by the regulator as regulatory assets, to be recovered through future tariff hikes. The appellate tribunal had earlier ruled that regulatory assets must be recovered over three years. However, the magnitude of the assets could cause a major tariff shock.[71] Therefore, the recovery was spread over a longer period, with no relief to discom finances.

Mounting regulatory assets create cash-flow problems for discoms, forcing them to borrow funds to cover the revenue deficit. The additional borrowing, coupled with the interest, adds to the burden of discoms. Post the Covid-19 lockdown, it is feared that the regulatory assets will increase to as much as ₹ 90,000 crore.[72]

Several states have dealt effectively with regulatory assets overhang. For instance, regulatory assets in Delhi have reduced by over ₹ 3,000 crore in a span of five years due to reduced AT&C losses via upgradation of transmission and distribution infrastructure and purchase of low-cost RE power.[73]

3.2 DIRECT BENEFIT TRANSFER

DBT is part of the Government of India's initiative to reform subsidy provision and dissemination to improve transparency and reduce leakages. Subsidies are transferred directly to a citizen's account instead of distorting the market prices for commodities or services. Redesigning power subsidy using DBT is a pilotable approach that can achieve welfare goals while being less distortionary (see Box 4).

Box 4: Paani Bachao Paise Kamao – Direct Benefit Transfer meets Behavioural Energy Efficiency and Smart Water Pump[74]

The Paani Bachao Paise Kamao scheme has been conceived by MIT's Abdul Latif Jameel Poverty Action Lab (J-PAL) in collaboration with the World Bank. It is being piloted in Punjab with the discom Punjab State Power Corporation Limited (PSPCL) as the implementation agency and The Energy and Resources Institute (TERI) as the nodal body. It is supported by Punjab Agricultural University (PAU) and IT Power India (ITPI).

The pilot scheme aims to address the issue of agricultural groundwater overconsumption by incentivising farmers to reduce their electricity and water use without disturbing their free electricity provision. Farmers are positively reinforced to consume less than their free allocation by giving them rebates against their bill for lower consumption. Overconsumption is not charged. Electricity is supplied only during daytime, which allows farmers to monitor their water consumption.

Enrollment is voluntary but once enrolled, an automated meter reading (AMR) system is installed at their agricultural pump connection. AMR enables the discom to monitor energy consumptions and calculate savings and incentives. Consumptions and saving data are conveyed to farmers through SMS on a bimonthly basis. Any incentive amount is credited to farmers through a DBT mechanism.

Success on the first six feeders has prompted the state to extend the pilot to 250 additional feeders.

Under DBT, subsidies are transferred directly to a citizen's bank account or discom-maintained consumer bank accounts. The electricity bill is assessed on the basis of true cost rationalised tariff or within the stated maximum of 15 percent cross-subsidy. Transitioning to DBT will improve revenue realisation and enable discoms to implement ToD and other best practices in consumer engagement. The DBT scheme holds significant benefits for discoms but requires closer coordination among the state government, the SERCs, and the discoms, for its successful deployment (see Table 4).

Table 4: Summary of DBT Scheme

Solution Option	Technical Issues Addressed	Business Issues Addressed	Managerial Issues Addressed
DBT & cost rationalisation of tariff		• Cost-reflective tariffs • Revenue realisation • High-cross subsidy	
Benefit to Discoms			
• DBT increases discom revenues realised through cost-reflective tariffs and bills that are paid on time. Further, DBT can decrease the cost of service by enabling discoms and customers to optimise demand to match lower cost supply through ToD rates and more advanced tariff programmes. • **Efficiency:** DBT allows discoms to send proper price signals to large numbers of customers that can result in more efficient use of resources and create opportunity to use time and location-based price signals to optimise operations and increase efficiency. • **Discom Finance:** DBT will eliminate large delays in discom revenue if state governments are able to deposit subsidy into accounts on a timely manner.			
How to make it work			
• **Discoms:** Installing meters and implementing billing programmes are required to capture the full set of benefits that DBT provides for discoms. • **Discoms and SERCs:** To capture the major benefits of DBT, the transition of subsidy must be implemented in a parallel manner with revised tariffs and a new paradigm of annual tariff revision to match cost and inflation. This could also include a reassessment of customer's willingness to pay. • **State Government:** The livelihood of the end customer receiving DBT will be dependent on the timeliness of the DBT being funded. If funds are deposited directly to the customer's account managed by the discom, it is necessary that considerations be made on if and when to disconnect power to the customer if the state delays DBT payment. If delays in DBT funding happen, the financial stress is moved from the discom to the customer which is not the intended outcome.			