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Power sector reforms must strive for financial efficiency and accountability: The case of India and Great Britain (Part-II)

Note: This article is in two parts. As universally known, the power sector is not known for market, payment and financial efficiency and accountability but burdened by political economy, the market reforms have been tried in various countries with different results. This article in the first part describes the reforms and their results in India and in the second part, the pro-market and privatization in the Great Britain power sector with results.

The case of Great Britain

BACKGROUND

The UK electrical system has a history of approximately 140 years. In 1881, UK operated its first community electricity generator in Godalming. In 1900, power companies were authorized by Electric Lighting (Clauses) Act 1899 to supply electricity to authorized users, which is considered as the birth of UK electricity industry. In the following decades, power stations were gradually interconnected to provide electricity supply with increased flexibility and security. The rated voltage across the transmission lines was increased from 6.6 kV to 132 kV in the 1930s. Following this development, the Electricity (Supply) Act 1919 and Electricity Acts of 1922 were published, which established Electricity Commission, appointed Electricity Commissioners, and joint electricity authorities to provide central coordination and regional organization. In 1926, the Electricity Supply Act of 1926 introduced the first significant national coordination: Central Electricity Board (CEB), which managed the generation of electricity in a limited number of power stations that were interconnected by a national grid. Electricity Act 1947 established twelve Area Electricity Boards (AEBs) for the distribution and supply of electricity to consumers, which replace 625 separate organizations in England and Wales. Besides, all generations and 132 kV National Grid were vested with newly established department, called British Electricity Authority (BEA). In 1955, BEA became the Central Electricity

Authority (CEA). In 1957, it was further changed to Central Electricity Generating Board (CEGB) to replace CEA. It owned all big generators of National Grid, managing the power generation, transmission, and distribution in England and Wales. CEGB provides electricity to twelve local electricity boards, and local boards sell electricity to consumers within their responsible areas. The Electricity Council was established accordingly to oversee industries and CEGB with responsibility for generation and transmission. In 1979, Mrs. Thatcher and the Conservative Party decided to reduce Government's direct intervention in economy, sold state-owned enterprises at a low price, and carried out a series of state-owned industry privatization reforms. In 1989, the UK issued a White Paper on the power industry by proposing the privatization of power industry and implementation of a free-market economic policy. The new structure was introduced on 31 March, 1990 under the Electricity Act 1989. The 1990 power reforms in England and Wales were designed to permit the introduction of competition at both the retail and the wholesale level. Generation was both vertically separated from transmission and horizontally separated. The sector was almost completely privatized-only the nuclear capacity was left in public hands-and regulation was applied both to promote competition and to ensure that the remaining monopolies did not exploit their advantage.

The new industry structure emerged with three generating companies: National Power (52 per cent of capacity at that time) and PowerGen (33 per cent), which were privatized, with 60 per cent of their shares sold initially, and Nuclear Electric (15 per cent), which was left under public ownership. National Power's share of capacity gave it significant market power. The national grid company-after separation from the generating companies-was transferred to joint ownership by the twelve privatized regional distribution companies. (The grid company retains control of dispatch). Each of the twelve regional distribution companies (RECs) has two separate functions-distribution

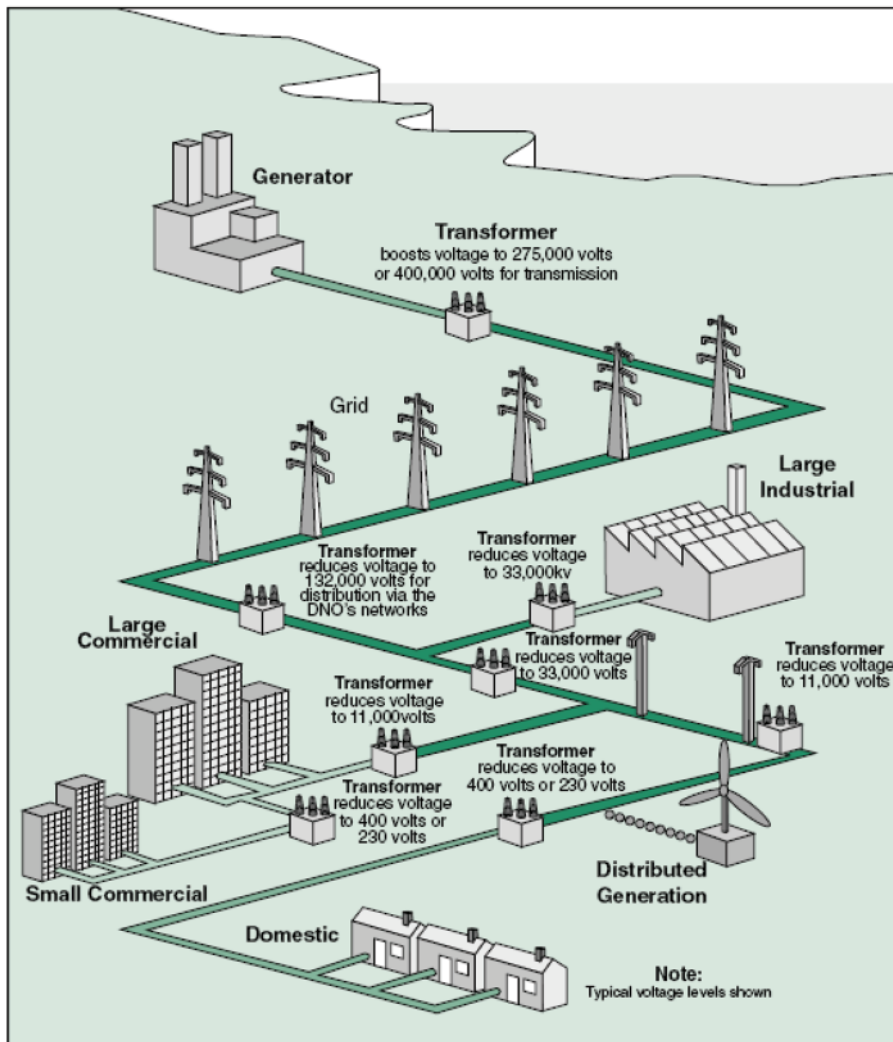


Fig.4: The British electricity network

(through low voltage wires or, more simply, grid to door) and retail supply (the sale of electricity to final customers) – and these functions must be accounted for separately. Access to the distribution operation of the RECs is regulated so that any seller of electricity has the right to “use” the associated distribution network when selling to a final customer. Until March 1995, the government retained a “golden share” in each REC, giving it the power to block any takeover or merger. The privatization activated the competition of providing electricity through a legal frame of Pooling and Settlement Agreement (PSA). The Pool is a mandatory electricity market and all large generators (with exceptions only for plants under 50 MW); the generators and customers were required to sell and purchase electricity from the Pool. Hence, the Pool provides market trading rules for electricity wholesale market and sets outbidding rules that the generator must follow. PSA legally brings capital to the generation and distribution (local suppliers) sides and becomes owners. Government still owns transmission network and manages trading and operation of the electricity market through the Pool markets.

Retail competition

Retail competition was introduced in 1990 for the large consumers (having a load in excess of 1 MW), and by 1998, it was extended to all consumers. A wholesale market was set up, and all generators were mandated to submit their bids in the wholesale market. The next major step was to fragment the generators, National Power and Powergen, further because the regulator felt that they were colluding. Not content with this, the wholesale market was replaced by NETA in 2001. This was primarily a tie-up between GENCOs and their consumers with long-term power purchase agreements. This was not all. The Energy Act, 2012, was enacted, which envisaged further changes. The notable features included the introduction of a carbon floor-price based on the EU’s energy trading system, bringing in long-term contracts for renewable generation, creation of capacity markets and mandating electricity suppliers to bring out less complicated tariff schedules.

The power pool

In England and Wales, two fossils fuel (National Power (NP) and PowerGen (PG)) and one nuclear power (Nuclear Electric (NE)) generation companies should sell electricity and compete in the Pool. Also, other sources of

electricity were allowed to trade in the Pool as long as they were certificated and allowed electricity importing from Scotland or overseas (France). In Scotland, two vertically integrated companies bundled together sell electricity. In comparison, in Northern Island, three generation companies trade with long-term power purchase agreements, as these regions are not included in the Pool. For supplying electricity to consumers at the distribution level, 14 independent Regional Electricity Companies (RECs), which replace 12 ABES, purchase electricity from electricity generators through the Pool. Each REC was obliged to supply on request all reasonable demands for electricity in its authorised area. On December 11, 1990, RECs were privatized and renamed as Public Electricity Supplier (PES).

With regards to the Pool management, National Grid Company (NGC) operates the Pool and becomes Grid Operator (GO). GO is responsible for scheduling and dispatching all power transactions. NGC also administers the Pool’s settlement system on behalf of the Pool members. Members of the Pool are wholesale buyers and sellers of

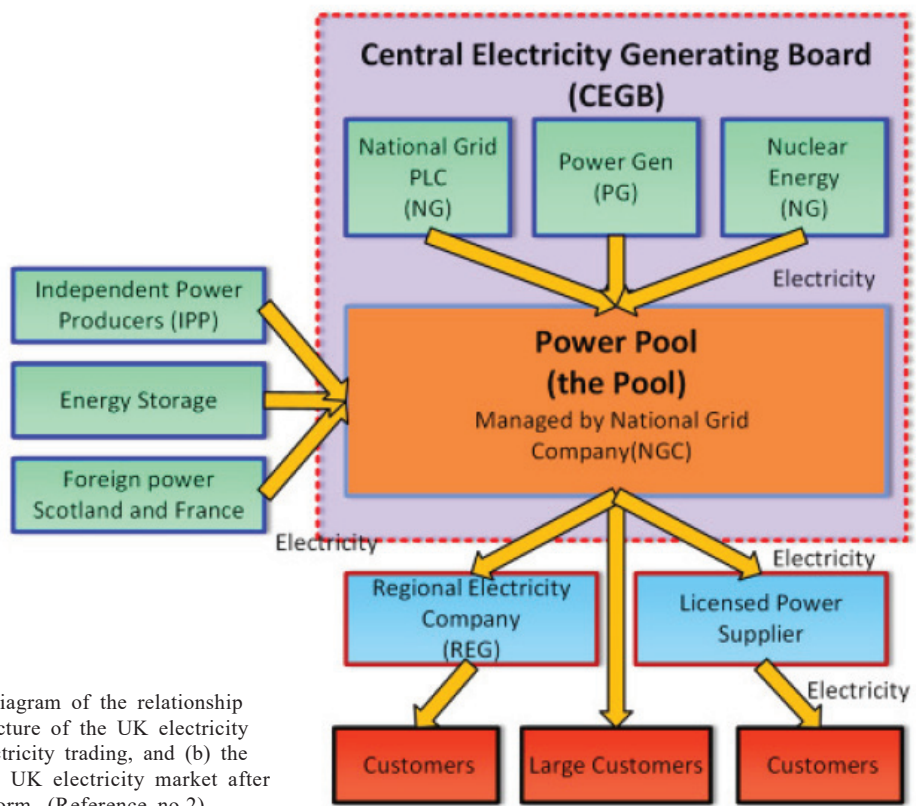
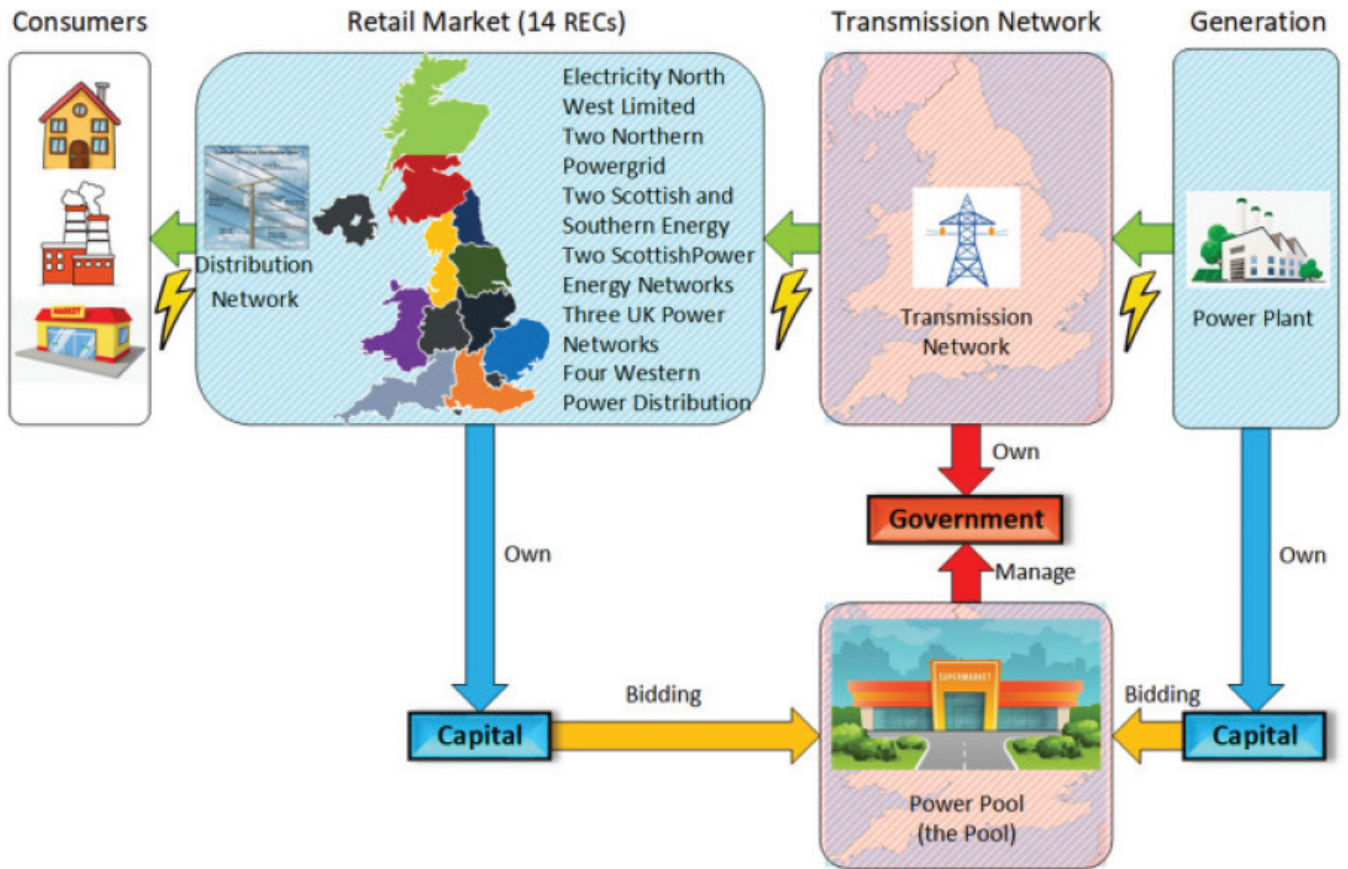


Fig.5: (a) The diagram of the relationship between the structure of the UK electricity industry and electricity trading, and (b) the organization of the UK electricity market after the first reform. (Reference no.2)

electricity who decides how the Pool was running, modified, or changed. The organizational structure of the UK electricity market during this period is shown in Fig.1(b) (in Part I).

The Pool accommodates a day-ahead wholesale market. All generation units will be queued according to the bidding price. Then, based on the load forecasting information and considering reserve demand of systems, a combination of units is selected. All costs paid to generators are shared equally by consumers, which also includes capacity payments. Capacity payments are considered as the payment to units that keep active during the period, even if work is not required during this period. Besides, an economic contract usually accompanies trading in the Pool: the most common one is Contracts for Difference (CfD) to reduce uncertainties caused by fluctuations of electricity prices. CfD works in a way that a generator receives, in addition to the usual pool price for any sales, a sum equal to specified strike price less than the pool price, multiplied by the specified number of units contracted. Moreover, there is a market for Electricity Forward Agreements (EFAs) as a supplementary mechanism, which allows primary components of electricity price uncertainty to be hedged on a short-term basis.

Contracts would be settled based on actual amount of delivered electricity, its real-time price, and contracts signed before. The settlement date begins at 0:00 every day and ends at 0:00 on the next day. Each operation day is divided into 48 equal settlement periods. Settlement System Administrator (SSR) takes charge of the process of settlement. The initial settlement is established within 4–5 business days from trading day, midterm settlement within 9–10 business days, and final settlement within 5–17 business days with consideration of reliable reading data. Since December 1993, Pool officially launched a demand side bid mechanism, and large users can submit their bid, including their capacity and expected price. Generators can also provide ancillary services for extra revenue. There are four main types of ancillary services in the UK electricity market: frequency control, reserve demand, voltage and reactive power support, and black-start. NGC acts as an Ancillary Services Provider, Settlement System Administrator, and Pool Funds Administrator.

Power pooling is used to balance electrical load over a larger network (electrical grid) than a single utility. It is a mechanism for interchange of power between two and more utilities which provide or generate electricity. For exchange of power between two utilities there is an interchange agreement which is signed by them, but signing up an interchange agreement between each pair of utilities within a system can be a difficult task where several large utilities are interconnected. Thus, it is more advantageous to form a power pool with a single agreement that all join. That agreement provides established terms and conditions for pool members and is generally more complex than a bilateral agreement. In one model, the power pool, formed by the

utilities, has a control dispatch office from where the pool is administered. All the tasks regarding interchange of power and the settlement of disputes are assigned to the pool administrator.

The formation of power pools provide the following potential advantages:

- a. Decrease in operating costs
- b. Saving in reserve capacity requirements
- c. Help from pool in unit commitment
- d. Minimization of costs of maintenance scheduling
- e. More reliable operation

The formation of a power pool is associated with a number of problems and constraints. These include:

1. Pool agreement may be very complex
2. Costs associated with establishing central dispatch office and the needed communication and computational facilities
3. The opposition of pool members to give up their rights to engage in independent transactions outside the pool.
4. The complexity towards dealing with regulatory authorities, if pool operates in more than one state.
5. The effort by each member of the pool to maximize its savings.
6. Power pooling is very important for extending energy control over a large area served by multiple utilities.

NETA, the 2nd reform

At the beginning of reform, the price of electricity decreased due to the competition introduced, which brought a great benefit to the end consumers. However, the price of electricity has increased since 1995. There are many reasons for soaring electricity prices, such as oil price, gas price, and inflation. Inadequate market mechanisms also have an inescapable responsibility. After more than ten years of operation, some of drawbacks of the Pool mechanism have gradually emerged, such as soaring electricity prices. Besides, the Pool has only been implemented in specific areas: England and Wales, indicating that the UK still does not have a unified electricity market. Hence, UK began to reform the Pool and hoped to expand the Pool to whole GB range. “New Electricity Trading Arrangement” (NETA) reforms were first proposed by Government in 1998 and implemented in 2001. In 2005, British Electricity Trading and Transmission Arrangements (BETTA) were established, and it expanded NETA from England and Wales to Scotland, establishing a united electricity market in Great Britain.

NETA is a self-dispatched energy-only market (abolishing capacity payments), which replaced the central dispatch mechanism of the Pool, aiming to encourage competition. The fundamental principle for NETA was bilateral trading. All output of generators is required to be contracted, thus removing incentives to manipulate spot market. Free bilateral

Categories	Disclosed information
Demand information	real-time demand historical demand demand incentive forecasts
Generation information	generation forecasts actual generation by fuel type generation capacity
Transmission information	availability of transmission lines congestion costs
Outcome system services	reactive energy volume contracted energy volume
Outcome energy services	STOR cost and volume frequency response volume SSP and SBP aggregated imbalanced volume aggregated bid and offer volume accepted bid and offer volume
Forecast volumes and costs	Daily BSUoS forecast monthly BSUoS report reserve requirement

Fig.6: Regulatory control over the service providers

contracts would encourage sellers to increase spot price to above marginal cost when under-contracting while reducing price below the marginal cost when over-contracting. NETA accommodates four electricity market products with different functions: Forward Market, Power Exchange (spot market), Balance Mechanism, and Imbalance Settlement. Both in Forward Market and Spot Market, bilateral contracts are signed by traders through free negotiation. Contracts are allowed to be signed several years ahead of fulfilling contract in Forward Market (also known as Futures Market), including Forward Contract, Future Contract, and other options. Forward Contract is a kind of contract-specific tariffs and delivery time, while Future Contract is similar to Forward Contract but allows to trade their contract. Options are right to buy and sell electricity during a specific period at a specified tariff, while trading in options is also permitted. Spot market is used to fine-tune contractual electricity for contracts signed in the Forward Market. At present, NORD POOL and Epexspot are the two markets to operate Spot trading. The day ahead auction, intraday trading are primary contract types in Spot Market. The day ahead auction will hold a day before delivery and intraday trading happened on delivery day. Not both Forward Market and Spot Market traders are able to sign bilateral contracts as parties to the contract, although these traders do not generate or consume electricity.

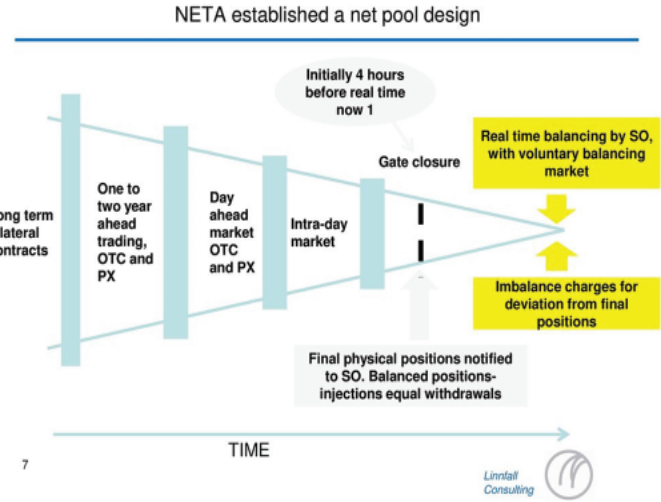


Fig.7: The electricity market in Great Britain

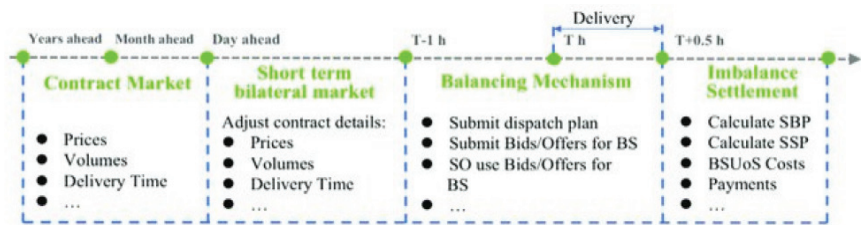


Fig.8: The transaction process of British Electricity Trading, and Transmission Agreements (BETTA)

Possible relevance of UK experience

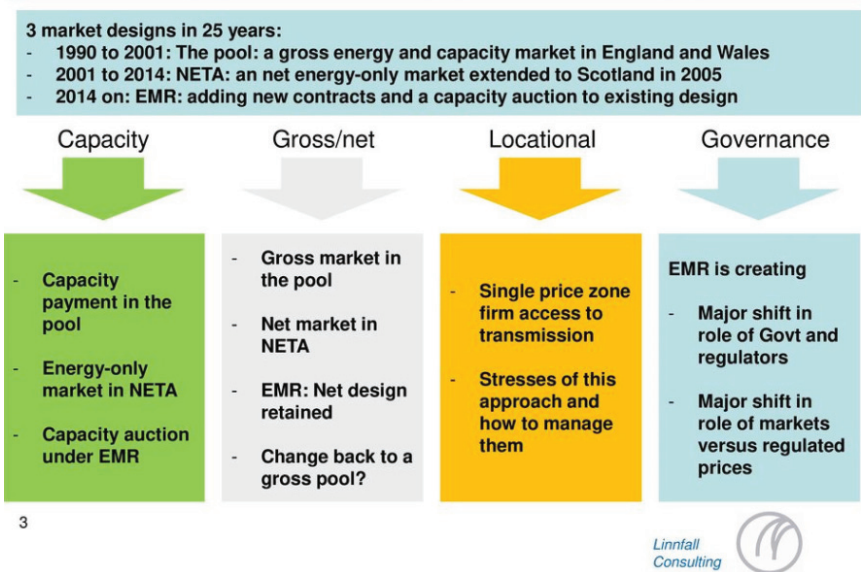


Fig.9: The reforms and results

British Electricity Trading and Transmission Arrangements (BETTA)

The electricity trading and transmission arrangements that were introduced in 2005 to integrate the operation (but not ownership) of the Scottish transmission system with the English and Welsh system. BETTA introduced refinements to the New Electricity Trading Arrangements (NETA).

Last words

The UK electricity market helps identify the critical elements required for further electricity market reform. The first reform of the Pool marks UK electricity industry privatisation and the establishment of UK Electricity Market. The second reform of NETA/BETTA uses bilateral contracts to replace complex trading mechanisms (the Pool), so capital can participate in all stages of electricity industry (generation, transmission, and supply). The third reform EMR uses CfD, CM, EPS, and CPF to encourage the growth of renewable energy and provides secure and affordable electricity to end consumers. In India, the implementation of reform goals was not really moved forward after the enactment of the Electricity Act, 2003. The Act itself is a very cautious and timid exercise compared to what has been done in the UK. Through the Act, there have been merely unbundling and ring-fencing the utilities so that there is transparency in the accounts; this itself took several years. There has been no attempt to create a wholesale market or a full-fledged retail market where the consumer chooses the supplier. Large consumers, having loads in excess of 1 MW, however, have the option of open-access where they can opt to receive supply from some other entity, instead of incumbent utility. The road to open access though has been bumpy, and discoms have opposed it tooth and nail.

Of late, there has been some thinking on introducing wholesale markets in India, and the CERC floated a discussion paper in December 2018. Whether this can be achieved is debatable since this amounts to retrofitting, and retrofitting in an existing architecture has its limitations. The moot point is whether to attempt to creating a wholesale market or for that matter a full-fledged retail market in India, especially after the experience of the UK. As mentioned before, the UK is almost back to the era of vertically integrated utilities, and consumers barely switch their retailer. Besides what was possible in the UK may not be possible in India. The UK did not have a regime of cross-subsidies (where the commercial

and industrial sectors subsidise agriculture and low-end domestic consumers) and also did not have high commercial loss levels. Moreover, in the UK, all consumers were metered, unlike India.

There is yet another factor which inhibits further reforms in the Indian power sector: 'Power' falls in the Concurrent List. The Centre and states rarely see eye-to-eye on several issues concerning the sector, especially on matters relating to distribution. Consequently, any major change does not get accepted. The subject of 'content and carriage' is one such example, though its implementation would have been a herculean task, if not impossible, given our high commercial losses, a regime of cross-subsidies and lack of consumer metering.

There is need to privatize Indian distribution sector by creating joint ventures with the government, and, of course, the government will have to undertake initial hand-holding till such time commercial losses are wiped out. This is the model which was followed in the case of Delhi and has proven successful. Commercial losses have come down from 50% to single-digit figures within a span of 10 to 12 years. Once India reaches that stage, one can think of creating a full-fledged retail market where a consumer can choose his/her supplier.

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