

## Energy Sector Reforms– Supply Led/Efficiency Led/ Green Energy Led?

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### Introduction:

The paper is an analysis of the geographical, social, political, and regulatory setup of the electricity market transition in India learning from the already existing Joint Ventures and analysis of the electricity market's status quo and prospective laws and policies. The need for the paper arises after reading the “*Revamped Distribution Sector Scheme: A reforms based and Results Scheme*”<sup>2</sup> given by the Government dated 30th June 2021 while the parallel introduction of the **private sector in the distribution sector through the franchisee model**.

The bigger question that is faced after analyzing the Electricity Act, 2003, the policies issued under the Act, the Revamped Distribution Sector Scheme, and the Electricity Amendment Bill, 2020<sup>3</sup> is whether the reforms introducing electricity distribution to private sector investment are **Supply Led or Efficiency Led or Green Energy Led?**

Do we have a plan of action rolled out to execute these reforms or will it be organized confusion in the sector?

The objective of the article is to examine whether the balance between the ambitious pledges and policies being made or proposed by the Governing Institutions with the current systems of the PSUs and corporate semantics in the Joint Ventures combined together with the level of consumer awareness and consumer involvement has critically impacted the supply chains and is continually increasing the gaps between the ambitions and the realistic expectations and results.

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<sup>2</sup>Government of India, Ministry of Power, “*Revamped Distribution Sector Scheme*”, Press Information Bureau, dated 30th June, 2021 at 16:21 PM.

<sup>3</sup>Government of India, Ministry of Power, “*The draft Electricity (Amendment) bill, 2020*”, “published vide Notification No. 42/6/2011-R&R (Vol-VIII) dated 17th April, 2020.

The Article is analyzing the aspects of corporate governance that were expected to be met and prospective aspects that are expected to increase internal and external accountability of the distribution companies and so target improving their performance. Further, an analysis of how the institutional design of state-level regulation is made before privatization and post-privatization with USO funds is introduced and how allowing distribution franchisees without the requirement of a license to distribute will be an effective measure with the recent developments and failures of the energy markets across the Asian subcontinent. The article has been written keeping in mind the extent to which independently working Regulators have been successful in implementing the key elements of the mandates of Statutes because if implemented systematically, it impacts the Discoms performance phenomenally. The work is consolidated after examining the co-relationship between the adoption of recommended corporate governance practices and utility performances (reflected through the utility profits) and between regulatory governance (including the institutional structure and functioning of different ERCs) and the Distribution companies' performance.

### **Background of the Electricity Sector**

The Indian Electricity Act, 2003<sup>4</sup> being the launchpad for creating a successfully running Indian Power Sector establishing independent and transparent Regulatory Commissions, open access being successfully implemented ensuring cooperation while promoting competition to ensure healthy supply chains. Further achievements from Delicensing Generation and inviting private investment in the generation making India the third highest nation in its power generation capacity with a total of 3,90,791 MW<sup>5</sup> in November 2021 further opening our scope to export electricity shortly to benefit from the energy economy by empowering the Central Electricity Regulatory Commission<sup>6</sup>.

The Central Electricity Regulatory Commission (Cross Border Trade of Electricity Regulations), 2019 has already been notified on 08th March 2019<sup>7</sup> by the Central Electricity Regulatory Commission. This shows the optimistic approach of the nation towards making India into an energy economy.

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<sup>4</sup>Government of India, The Electricity Act, 2003 [No. 36 of 2003] vide Notification No. 33004/2003 dated 26<sup>th</sup> May, 2003

<sup>5</sup>CEA Reports, Installed Capacity Reports, All India Installed Capacity as on 15<sup>th</sup> November, 2021 last accessed on 05.12.2021.

<sup>6</sup>Point No. 9 of "The Statement of Objects and Reasons for the "The draft Electricity (Amendment) Bill, 2020" published vide Notification No. 42/6/2011-R&R (Vol-VIII) dated 17th April, 2020.

<sup>7</sup> CERC (Cross Border Trade of Electricity), Regulations, 2019 vide Notification No. 13/2/7/2015-PM/CERC.

The power dispute resolution mechanism has been efficient, and effective and ensures Social Justice keeping in mind the fine balance between the final consumers and the companies in dispute and the impact and implications that each judgment can create, and the establishment of CGRFs and Electricity Ombudsman for consumer disputes. The Indian electricity sector has evolved over the years with the availability of continuous power supply in urban India and 99.77% national electrification<sup>8</sup> accomplished (**Graphs Below as Figure 1<sup>9</sup> and Figure 1.1**) and USO<sup>10</sup>.

Further, a transparent and demand forecast based cost-plus tariff determination process in line with the Tariff Policy<sup>11</sup> and introduction of renewable energy through subsidies from the grass-root level to set up solar parks by ensuring subsidy, fair competition introducing open access<sup>12</sup> of public infrastructure to transit electricity generation in cooperation with each other and providing trading<sup>13</sup> and exchange platforms<sup>14</sup> fair competition and the National, Regional and State Load Dispatch Centers monitor and prepares the system to maintain grid stability and continuous supply of power to avoid distribution companies from over drawal or under drawal of electricity.

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<sup>8</sup>Data Accessed from India SDG Dashboard, Government of India, Ministry of Statistics and Programme Implementation on ([mospi.gov.in](http://mospi.gov.in)) last accessed on 25<sup>th</sup> October, 2020 at 04:44 A.M.

<sup>9</sup>Data accessed from India SDG Dashboard, Government of India, Ministry of Statistics and Programme Implementation on SDGs 4 India | Itech Mission ([mospi.gov.in](http://mospi.gov.in)), last accessed on 25<sup>th</sup> October, 2020 at 04:53 A.M.

<sup>10</sup> Section 43, Duty to supply on Request, The Electricity Act, 2003 [No. 36 of 2003] vide Notification No. 33004/2003 dated 26<sup>th</sup> May, 2003

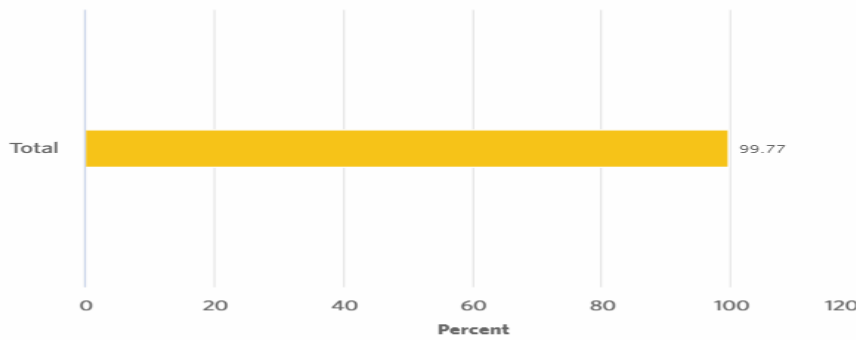
<sup>11</sup> Tariff Policy, Ministry of Power vide Notification No. 23/2/2005-R&R(Vol-IX), vide Resolution dated, 28th January, 2016.

<sup>12</sup>Section 2(15), 2(47) and 2(76) Section 42(3) and 42(4) deals with open access in The Electricity Act, 2003 [No. 36 of 2003] vide Notification No. 33004/2003 dated 26th May, 2003

<sup>13</sup>Sub-Section (23),(26), (71) of Section 2, sub-Section c of Section 14, Section 52, sub-Section 1(e) of Section 79, sub-Section (d)1 of Section 86, subsection (o)2 of Section 178 and subsection (z)2 of Section 181 of in The Electricity Act, 2003 [No. 36 of 2003] vide Notification No. 33004/2003 dated 26th May, 2003.

<sup>14</sup>Indian Energy Exchange is a publicly listed company with NSE and BSE since October, 2017

2019-2020



Source : Central Electricity Authority, Ministry of Power

**Figure 1. Percentage of households electrified**

The power supply position in the country during 2009-10 to 2021-22 :

Year	Energy				Peak			
	Requirement	Availability	Surplus(+)/Deficits(-)		Peak Demand	Peak Met	Surplus(+)/ Deficits(-)	
	(MU)	(MU)	(MU)	(%)	(MW)	(MW)	(MW)	(%)
2009-10	8,30,594	7,46,644	-83,950	-10.1	1,19,166	1,04,009	-15,157	-12.7
2010-11	8,61,591	7,88,355	-73,236	-8.5	1,22,287	1,10,256	-12,031	-9.8
2011-12	9,37,199	8,57,886	-79,313	-8.5	1,30,006	1,16,191	-13,815	-10.6
2012-13	9,95,557	9,08,652	-86,905	-8.7	1,35,453	1,23,294	-12,159	-9.0
2013-14	10,02,257	9,59,829	-42,428	-4.2	1,35,918	1,29,815	-6,103	-4.5
2014-15	10,68,923	10,30,785	-38,138	-3.6	1,48,166	1,41,160	-7,006	-4.7
2015-16	11,14,408	10,90,850	-23,558	-2.1	1,53,366	1,48,463	-4,903	-3.2
2016-17	11,42,929	11,35,334	-7,595	-0.7	1,59,542	1,56,934	-2,608	-1.6
2017-18	12,13,326	12,04,697	-8,629	-0.7	1,64,066	1,60,752	-3,314	-2.0
2018-19	12,74,595	12,67,526	-7,070	-0.6	1,77,022	1,75,528	-1,494	-0.8
2019-20	12,91,010	12,84,444	-6,566	-0.5	1,83,804	1,82,533	-1,271	-0.7
2020-21	12,75,534	12,70,663	-4,871	-0.4	1,90,198	1,89,395	-802	-0.4
2021-22*	7,08,767	7,06,329	-2,438	-0.3	2,03,014	2,00,539	-2,475	-1.2

\* Upto Sep 2021 (Provisional), Source : CEA

**Figure 1.1 Power Supply Position: 2009-10 to 2021-22**

Electricity Generation, Transmission, and Distribution sectors were unbundled from SEBs in 2002, and licenses for the distribution of electricity were given to State-owned companies disintegrated from the SEBs to distribute and supply power within their States with the Regulatory Institution laid down by the Act to be established in every state.

### **Reliance Energy as an Illustration of Initial Private Sector Reforms<sup>15</sup>**

BSES appointed J P Chalsani as chief executive officer of the southwest Delhi electricity distribution company and the central-east Delhi electricity distribution company, in which BSES has a controlling stake. Reliance Industries Ltd. increases its stake in the company to 31.54% after signing the confidentiality agreement for buying out Enron's stake in Dabhol Power Company. On the issue of Non-Convertible Debentures (NCD) for Rs 100 crore, the company's 500 MW Dahanu thermal power station achieved a **Plant Availability Factor of 100 percent** and a **Plant Load Factor (PLF) of 98.92 percent** during March.

Power Ventures increased the holding in the company to 23.88%, and it acquired a 51% stake in two of **Delhi Vidyut Board's Power Distribution Companies** (Central East Delhi Electricity Distribution Company Ltd and South West Delhi Electricity Distribution Company Ltd.) and the Delhi Government signed a share-holding agreement with **Bombay Suburban Electric Supplies (BSES)** and **Tata Power** for power distribution in Delhi. With the shareholding agreement, the names of its two power distribution companies in Delhi changed. While the South West Delhi electricity distribution company was renamed **BSES Rajdhani Power Ltd**, the Central East Delhi Electricity Distribution Company was renamed **BSES Yamuna Power Ltd**. which pulled out of the 250 MW power project in Tamil Nadu.

Reliance group increased its stake in the company from 38% to 40.29% through the acquisition route. Therefore, by the end of 2002, Reliance Power Ventures acquired 28,28,545 shares of BSES Ltd, increasing the stake to 28.30% which completed its US\$ 120 million Foreign Currency Convertible Bond issue in 2003 and the company became a part of the Reliance Group, with Mr. Anil D Ambani, Vice Chairman and Managing Director of Reliance Industries Ltd. unanimously appointed by the Board as Chairman of BSES. The name of BSES Ltd changed to Reliance Energy Ltd.

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<sup>15</sup>Reliance Infrastructure History, The Economic Times, English Edition dated 25<sup>th</sup> October, 2021 last accessed on <https://economictimes.indiatimes.com/> at 07:44 A.M.

Thereafter, BSES Andhra Power Ltd, BSES Kerala Power Ltd, BSES Rajdhani Power Ltd, BSES Yamuna Power Ltd, North Eastern Electricity Supply Company of Orissa Ltd, Southern Electricity Supply Company of Orissa Ltd, Tamil Nadu Industries Captive Power Company Ltd, and Western Electricity Supply Company of Orissa Ltd ceased to be subsidiaries of the Company with effect from March 29, 2003, when the members approved the delisting of company's shares from the following stock exchanges as Given in (Table 1) hereunder and BSES Andhra Power Limited became 100% subsidiary of Reliance Energy.

<b>.S.No.</b>	<b>Exchange Name</b>
1.	Ahmedabad Share and Stock Brokers Association
2.	Bangalore Stock Exchange Ltd.
3.	Calcutta Stock Exchange Association Ltd.
4.	Delhi Stock Exchange Association Ltd.
5.	Interconnected Stock Exchange of India Ltd.

**Table 1: Power Exchange List**

In 2002, three private companies belonging to the two of the largest conglomerates i.e., Reliance and Tata invested in Distribution through joint ventures in Delhi to give rise to BSES Rajdhani Power Limited for South and southwest zone (BRPL) and BSES Yamuna Power Limited (BYPL) for Central and East Zone and Tata Power Distribution Delhi Limited in North Delhi (TPDDL) with a monopoly over their concession zones. There was no competition between the companies, however, the competition was with its own operational and maintenance difficulties and achieving targets as were being laid down by the Regulators.

The objective of these Joint Ventures was to reduce the technical and commercial losses faced by the Discoms and achieve greater efficiency with continuous supply targets. The whole sector was regulated by the statutory regulator herein Delhi Electricity Regulatory Commission (DERC). On analysing how the proposed policies have worked in the entire power sector value chain and the Discoms being the only interface between utilities and consumers knowing that electricity falls under the essential services and the States have the responsibility for

distribution and supply of electricity with the States, the cumulative financials of distribution utilities are given hereunder, (Figure 1<sup>16</sup>).

## Financials of Distribution Utilities

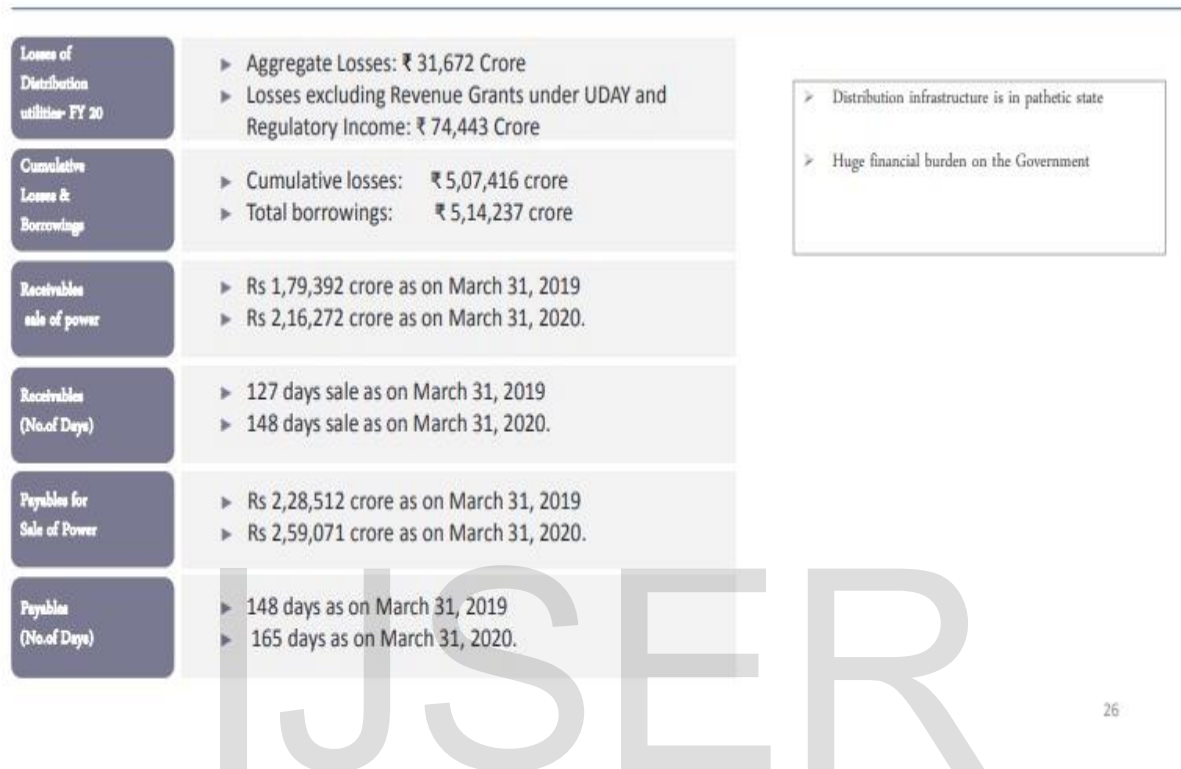


Figure 1

On analysing the Tariff Orders, it is noted that the Discoms, a joint venture of Reliance Infrastructure Limited and the Delhi Government have successfully reduced their aggregate technical and commercial (AT&C) losses from 63 percent to 8.98 percent in the case of BYPL and from 51.5 percent to 8.06 percent in the case of BRPL<sup>17</sup>. However, in the past few months, Discoms are struggling to supply power due to shortages of coal supply to thermal power plants whereas in India we were dependent on 75.3%<sup>18</sup> of thermal generation on 30th September 2021

<sup>16</sup> Huge Financial Burden on Government, Current Challenges in the Indian Power Sector, Forum of Regulators, 18 February, 2022.

<sup>17</sup> Tariff Orders issued by DERC for BSES and BRPL since 2002 to 2020

<sup>18</sup> CEA Reports, Installed Capacity Reports, All India Installed Capacity as on 30<sup>th</sup> September, 2021 last accessed on 25<sup>th</sup> October, 2021.

to 60%<sup>19</sup> of thermal generation in December, 2021 and from 21.26%<sup>20</sup> of renewable energy on 30<sup>th</sup> September to 40%<sup>21</sup> of renewable energy generation on 6<sup>th</sup> December 2021 in generation mix of power in India<sup>22,23</sup>. Therefore, the target of a complete green power economy might seem difficult but an achievable target knowing that we, as a nation have ensured a very promising start. India achieved 40% of renewable energy generation capacity based on non-fossil fuel resources on 3rd December 2021 which was a target to be achieved by 2030 at the COP 21 as part of its nationally determined contribution (NDC)<sup>24</sup> as was said by MNRE.

*The electricity act, 2003 through its Preamble and provisions have kept the Indian Constitution's preamble as its backbone.*

The Commissions and distribution companies that have implemented the Electricity Act, 2003, policies, rules, regulations, and guidelines to achieve targets that they were specified/directed with, those ERCs and Discoms are doing exemplary work and achieving targets resulting in improving their financial health and service. They are working towards achieving the targets set by their Commissions year after year for loss reduction, reduction of cross-subsidy, and achieving their financial goals while covering up the debts and liabilities and reducing the revenue gap in their ARR which is being faced by the Discoms since the disbursal of SEBs into generators, transmission and distribution companies and now with the proposed legislation to segregate the distribution and supply business.

Therefore, in my opinion, it is not the statute that failed the energy economy of a state but the institutions operating in the state that have failed and continue at failing to fulfill the intention of the Statute.

Therefore, as long as the Current Discoms do not adopt efficient and effective mechanisms, no legal reforms and policy changes will be able to improve the financial performance. However, with the technological development in the sector and reforms from the introduction of MCBs, smart metering, and microgrids to now introduction of AI and blockchain technology, effectiveness, and efficiency in the performance of Discoms can improve their financial health. Therefore, privatized Discoms are operating on a different strategy through Joint Ventures in

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<sup>19</sup> ET Energy World.com, The Economic Times, 03December, 2021

<sup>20</sup> Ibid 17

<sup>21</sup> Ibid 18

<sup>22</sup>CEA Reports, Installed Capacity Reports, All India Installed Capacity as on 30<sup>th</sup> September,2021 last accessed on 25<sup>th</sup> October, 2021.

<sup>23</sup> ET Energy World.com, The Economic Times, 03December, 2021

<sup>24</sup> ET Energy World.com, The Economic Times, 03December, 2021.



the Various States as stated with the example of Delhi and improving the energy economies of those States.

**Illustration:** The JVs in Delhi as stated above in the research paper follow uniform Regulatory Orders issued for them and similar targets to improve the continuous supply of power in their concession areas, improve service delivery, and the functioning of the three utilities is different and each emerges in the way utilities deal with their socio-political context and have engaged on a sustainable transition path. Indeed, all debates, discussions, and issues that arise are dealt with differently within each zone and managed specifically by and within each company according to their working strategy. Therefore, comparing and analyzing the approach taken by each Discom individually in tackling environmental issues with the social challenges reveal the naturally following or accompanying results but different ways of interpreting and engaging with the transition of the electricity markets.

### **Vision for Next Generation Markets: Challenges and Way Forward**

With time it is noted that a shift to more demand-oriented and environmentally friendly service provisions is being observed and the distribution utility Logics of Action on the ground sheds light on the two dimensions or two-fold prism that is currently being dealt i.e., on one hand, new policies for renewable energy and decarbonizing the energy sector while achieving energy efficiency and developing demand-side management by also distributing a certain amount of renewable energy and on the other hand distribution utilities have to extend service coverage towards the informal settlements and take preventive measures against theft of electricity which amounts to maximum technical and commercial losses and challenges. Regulatory assets and loans cover the power purchase cost. Croo subsidy surcharge and regulatory assets relationship.

Thus, analyzing why and how the already established JVs follow different corporate strategies and different transition paths and analyzing their strategies with a common grid to weigh up the various factors behind the policy choices and implementation methodologies will help us pave a smooth way for introducing private sector in distribution and supply in all states across the nation and accomplish export of power. Through studying the current systems in force in India and Brazil and analyzing the spatial, social, political, and corporate components of utilities, their networks, and clients and realizing that the coexistence of diverging interpretations of an initially uniform reform or policy can be understood and strategic

implementation can be embedded to deal with the diversity of stakes and consumers in different areas in each state.

Despite the heights achieved by the sector, there are major failures like exorbitant Distribution Losses/Commercial Losses due to inefficiencies of the Discoms in certain states. Also, few Government Policies have failed miserably at the Micro-level due to a lack of awareness at the end consumer level and no checking parameters set by the Government for the Discoms in policy implementation and impact of pandemic/ Covid on the whole sector. Another colossal issue faced for many years now is Infrastructure Development without proper planning raises major issues like Fuel security concerns or Investment Concerns destabilizing the whole financial system in the long run. Projects aimed at thermal capacity addition with various aspects like ramping up coal production by both public and private sector in a time-bound manner increased participation of private sector in coal production and easing of the regulatory framework, clearances and approvals for allocation and development of coal blocks & gas infrastructure needs to be addressed while formulating such reforms as even presently the thermal generation capacity is

on the line of risk for fuel security demand-supply gap, pending power purchase agreements with a significant gas-based capacity of more than 20,000 MW is idle due to the non-availability of gas.

While moving with global targets of **decarbonizing the energy industry and green hydrogen economy**, major issues will be faced like the trade-offs, tensions, and constraints in decarbonizing the energy industry, existing legal contracts, regulatory, and customary institutions while application of international investment law and taxation at a global level; introducing and emerging technological innovations while balancing and reregulating the legal and market landscapes in individual countries, States and regions. While we are at the junction to start the green energy transition, privatizing the distribution sector in stages and ensuring minimum chaos in implementation will ensure a healthy electricity sector while having the ability and infrastructure to be the economic backbone of the nation. Furthermore, if hydrogen is to play a key role in the global clean energy transition, its most attractive uses are in sectors for which the abatement of greenhouse gases has with time-proven to be difficult which include the industrial manufacturing such as steel fabrication, cement production, and ammonia synthesis. Also, heavy transport and fuel cells (as an evolving alternative to the battery-powered electric vehicles) and power generation (as a feedstock for hydrogen-fired turbine

power stations, and when combined with large-scale geological storage and renewable energy to produce green hydrogen) have infinite energy potential. A multi-layered or staged approach to developing the hydrogen economy is appropriate, beginning with carbon capture and storage (CCS) to enable blue hydrogen production. Similarly, there are significant synergies with hydrogen to be explored before a full transition to green hydrogen, given their existing reserves of gas, evolving CCS and CCUS (carbon capture, utilization, and storage) capabilities, together with opportunities to repurpose existing technology and facilities to accommodate blue hydrogen<sup>25</sup>.

While transitioning from non-renewable and mostly thermal power generation to green energy, complete privatization of Discoms has started by being phased out from the Union Territories as testing grounds. However, to make the transition smooth, Universal Service Obligation for certain segments of consumers should also be placed on Private Discoms in the areas they apply for operation removing the total burden from the already financially stressed Discoms. Further, to prevent the current indebted Discoms to become Non-Profitable Assets (Lessons from Past: Airlines and Telecom Sector), infrastructure sharing by current Discoms shall be allowed on sharing the assets and the liabilities of the currently operating Discoms to initiate and promote competition in the Distribution Sector while ensuring and instilling cooperation, Electricity being an essential service and the backbone of our economy.

To transition from a non-renewable to completely renewable dependent energy economy, the subsidy should be continued with a framework of reducing subsidy being provided as was provided for reduction of cross-subsidy over some time in the Electricity Act, 2003. For Reference, Section 42 aims the distribution licensee to levy the surcharge to use it for cross-subsidy within the area of supply of the distribution licensee. Section 61(g) EA03 endorses that while ascertaining the terms and conditions for the determination of tariff, the Appropriate Commission must be guided by the fact that the tariff progressively reflects the cost of supply of electricity and also, reduces cross-subsidies in the manner specified by the Appropriate Commission. Sections 38, 39, 40, 42, 178 (2) (k), (m) & (r) 181 (2) (j), (m), (p) & (zc) of the EA, 03 refer to cross-subsidies which shall be progressively reduced in the manner as may be specified by the Central Commission or State Commission.

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<sup>25</sup> ReNew L&T announce partnership agreement to jointly develop, own, execute and operate plants, "Sumant Suha, Chairman & CEO, ReNew Power, ET EnergyWorld.com from the Economic times at 02.12.2021 last accessed on 01.12.2021 at 14:09 IST.

Financial Contracts between utilities, tariff fixing processes based on demand forecast Regulatory structure, and dispute resolution mechanisms have been widely discussed in the country from political, institutional, economical, and governance points of view. However, introducing private sector investment in the distribution business would require a robust realignment of institutions and settling the queries, issues, and tensions of legality and service efficiency between the various stakeholders following the proposed reforms.

Based on the above analysis of privatization in 2002 and proposed privatization of the current Discoms, a complementary approach with phased/staged privatization, the paper is examining a wider notion of the energy transition with the focus on a more sustainable system combining Universal Service Obligation and access to achieving low carbon or no carbon energy economy with a focus on widely researched environmental and social issues. Though the reforms appear conventional like privatization in any other sector, it is to be noted that the energy transition is a socio-technical reform, and keeping in mind the reconfiguration in line with the environmental reforms, the service delivery is deeply affecting the socio-political scenario and the economic balance of the nation. Further, the geospatial and territorial energy transition needs to be minutely analyzed and first unpacked/unbundled to estimate the actual scope of success, while paving a way to maintain the socio-political economy to support the State-owned Discoms.

To reorganize the embeddedness of the network reconfiguration in the urban fabrics or rural fabrics or any category of consumers, it needs to be analyzed how the social impact and implications will follow and how the socio-technical systems will be unpacked and how their restructuring and final roll out on the ground level will be implemented. From a basic study of the Distribution companies working models, analyzing the various Discoms corporate strategies and functioning that are being followed and being proposed by the Discoms is in itself a domain that needs complete analysis as Distribution companies are the critical transition actors for the whole proposed reforms. Factually the State-owned power distribution companies remain state-dominated and lack independent decision-making authority and no performance evaluation criteria or incentives are there within the utilities resulting in increased inefficiencies. As technological advancement is exponentially increasing the scope of achieving mechanical efficiency targets, professionalizing the Utilities and empowering its Boards with independence is the key agenda for the survival and future of these companies.

The important aspects that need the ERCs and Discoms to first align are the priorities and expectations which will help the Discoms create a cognitive path dependency with dominance in various dimensions of choices of energy generators, social responsibility and accountability, economically improvising strategies, and technical defenses to overcome the financial challenges keeping in mind the environmental concerns and global awareness towards preserving the already depleting ecosystems. The Discoms are dependent on the ERCs for their tariff determination based on their annual revenue requirement based on demand forecast and their capital expenditure. Around 80% of the cost in the ARR for each Discom comes from the power purchase costs per unit proposed which are steadily increasing over the past few decades despite technological advancements, subsidized solar power, and other cheaper ways to generate because of the already existing PPAs with thermal generating stations.

Another issue that will be faced is the infrastructure of the transmission companies (franchisee and not the licensee) before wireless electricity comes to take over the industry. The transmission will face a transition challenge from managing the complete infrastructure from one or two licensed, regulated Discoms to a shift to (n) no. of

private distribution companies while ensuring grid stability in cooperation with and under the regulation of SLDCs, RLDCs, and NLDC monitoring the grid ensuring grid stability.

With the vision and mission to decarbonize the whole energy industry, ensuring sustainable future development with the least environmental impact. With the growing demand for power in all sectors of the economy, technological developments and inventions like the Kinetic tiles which are smart speed absorbers can help *reduce* our energy footprint as more and more people are slated to move into cities (66% of the world population by 2050 according to the UN). **Foot traffic** is key to using this technology effectively. With one of the biggest populations, if planned appropriately, each step of each citizen can be used to create energy from schools, hospitals, subways, offices, market areas, parks, institutions, and organizations to metropolitans all can be energized by the population the infrastructure is sustaining. Further, technologies and scope for Green Hydrogen Economy are being researched at the Government level with MNRE supporting a broad-based Research Development and Demonstration (R&D) program on Hydrogen Energy and Fuel. Support is being provided to various projects in industrial, academic, and research institutions to address and resolve challenges in the production of hydrogen from renewable energy sources, health and safety issues, and its utilization for energy in transport applications through combustion or fuel cells. *Two hydrogen*

*refueling stations have been established (one each at the Indian Oil R&D Centre, Faridabad, and the National Institute of Solar Energy, Gurugram).*

While targeting a green energy economy, a roadmap to convert the emission-generating infrastructures into zero-emission infrastructures will have to be paved out. Because the zero-emission target involves international markets and investments, 10 years for legal reforms to be implemented systematically in good faith and avoid unnecessary disputes transitioning to a zero-emission target. Further, all this needs to be planned in a manner that Prevents Discoms from being declared Non-profitable Assets being dissolved or liquidated. The need of the hour is that the Government has systematically planned the privatization of the Distribution sector while global reforms in the energy markets are being proposed and imposed and India is a signatory to most reforms.

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