

TO RESOLVE THE ENERGY CRISIS

# HOW ABOUT WHOLESALE ELECTRICITY MARKETS?

*Understanding the Root Causes of T&D Losses  
and the Role of Independent Power Producers  
in Circular Debt*



Economic Council, EFP

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Understanding the Root Causes of T&D Losses and the Role of  
Independent Power Producers in Circular Debt

Asif Aziz Zuberi  
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Economic Council, EFP

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Transmission Tower Stands Tall Amid a Cloudy Afternoon  
Source: Getty Images

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## ACRONYMS

<b>IPPs</b>	Independent Power Producers
<b>NTDC</b>	National Transmission and Dispatch Company
<b>PES</b>	Pakistan Economic Survey
<b>FERC</b>	Federal Energy Regulatory Commission
<b>EFP</b>	Employers' Federation of Pakistan
<b>ILO</b>	International Labor Organization
<b>FTA</b>	Free Trade Agreement
<b>T&amp;D</b>	Transmission and Distribution
<b>IPP</b>	Independent Power Producer
<b>AT&amp;C</b>	Aggregate Technical and Commercial
<b>FY</b>	Discal Year
<b>GENCO</b>	Generation Company
<b>DISCO</b>	Distribution Company
<b>WAPDA</b>	Water and Power Distribution Authority
<b>NEPRA</b>	National Electric and Power Regulatory Authority
<b>CPPA-G</b>	Central Power Purchasing Authority of Government
<b>CHASNUPP</b>	Chashma Nuclear Power Plant
<b>RPP</b>	Renewable Power Plant
<b>ESCO</b>	Electric Supply Company
<b>ISO</b>	Independent System Operator

## ABOUT THE ECONOMIC COUNCIL

The Economic Council of Employers' Federation of Pakistan (EFP-EC), was created in 2018 when the EFP felt the urgent need to transform itself from the voice of employers since 1950, to the voice of manufacturers and exporters. The motivation behind its existence today is the constant desire to push for a knowledge-driven economy that is business-friendly, economically sustainable, and socially inclusive with a prime focus on capacity building and strengthening of ties with trade partners.

Since its inception, the Council has successfully engaged with the business community, diplomatic missions, and the Government to further the cause of achieving rapid industrialization for Pakistan. Through EFP's growing domain of 800 stakeholders and 28 leading industrial associations, the Council has developed good relations with both Ministry of Commerce on tackling routine industrial issues and overseas investors and Pakistanis for purposes of creating market access for local manufacturers and bringing investment into the country.

Being a non-profit organization, the EFP is supported by the International Labor Organization (ILO), Dutch Employer Cooperation Program (DECP), International Organization of Employers (IOE), and its constant membership of the South-Asian Forum Employers (SAFE), International Organization of Employers (IOE), and Confederation of Asia-Pacific Employers (CAPE).

The Economic Council is in essence a Think Tank of the Federation and drives economic research. It is governed by a consortium of patriotic and genuinely committed businessmen, economists, and entrepreneurial gurus who work assiduously to highlight 'Pakistan First' in forums around the world. All activities of the Council are planned under the umbrella of the 2030 EFP Economic Vision and all publications are practical and reflective of the sentiments of the business community.

The initiatives of speculating fisheries sector as part of China-Pak Free Trade Agreement (FTA) - II, Look Africa II with the Ministry of Commerce, formation of a first electricity market in Pakistan, and processing of minerals to create value-added chemicals are some of the original ideas of the Council that have earned the EFP credibility in Pakistan.

## MESSAGE FROM PRESIDENT

It is fact little known to the masses that when Pakistan got independence in August 1947, we inherited a marginal 4 percent of the industries from Hindustan, and over time and with great fortitude by our ancestors, in 1952, Pakistan Industrial Development Corporation (PIDC) was established that powered private sector to take its first flight.

The era of industrial growth progressed steadily through the Golden Era of the 1960s, only to come to an abrupt and undesired halt in the seventies period of, 'Roti, Kapra and Makaan' from where on we drifted toward becoming a mere trading nation instead of a knowledge-driven economy, widely known for its products around the globe. To me, this was the start of the 'Great Misfortune' Era for the poor

Pakistani nation that today, has become a victim of this debacle and lunacy – the short-sighted policies creating a divide among the wealthy and the destitute.

However, what has been done, is done and since history cannot be changed, we must strive on war-footing to tap the

innumerable resources this country is innately blessed with, such as a budding young population and virgin landscapes of outstanding beauty and wonder, waiting to be romanticized with. The vast reserves of minerals, a sea rich in fish, and a hotspot location that presents itself as a trade corridor for the world beckon freedom, prosperity, pride, and peace for all races, creed, and religions.

Once, we as a nation, have united to achieve this great feat and completely cut the chains of dependability on global financial hubs to repay debts that have largely shored up as a direct result of inapt state institutions and foolhardy mentality of following dictates of other countries, we will come to realize how truly fortunate we are. Setting up a thriving industrial base takes time, and with COVID-19 wreaking havoc on economies worldwide, a greater effort is required. For income and investment to generate on the backbone of thriving industrial setups, we must change our lifestyles and focus on doing business and divert from our usual trading mindset.



**An industry is not the type of business that promises fast and instant returns. Instead, it is like a plant that requires the right nurturing to grow into a blessing for all.**

We keep hearing that Pakistan is 'blessed with a multitude of resources' - a nomenclature that regularly echoes from all quarters of the society. However, do we even know what those resources are and how to exploit and utilize them? I feel immense joy in sharing that the EFP has initiated two highly critical projects under the patronage of patriotic Pakistani bureaucrats, consultants, and honest businessmen. These are the 'Minerals to Chemicals' and 'Domestic Tourism & Hospitality Revival' projects.

While, on one hand, we are developing processes for converting 92 known minerals into valuable chemical products for export, on the other, we are working hard to fuel domestic tourism, revive the blue economy and establish

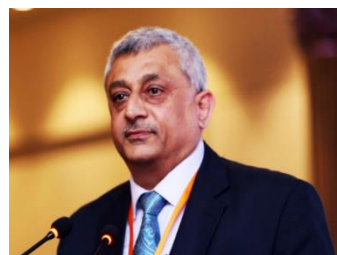
international linkages in Africa to bring new businesses into Pakistan.

The EFP stands strong with employers in these hard economic times and will continue to maintain the sanctity of its rising position as the Apex Body of Employers of Pakistan.

Best Wishes,



**ISMAIL SUTTAR**



CEO, Hub-Pak Salt Refinery  
President, Employers' Federation of Pakistan

## PREFACE

Pakistan is a country that is blessed with innumerable resources and bright minds who are capable of presenting innovative ideas to longstanding disputes, like the crisis of energy, in Pakistan. However, the negligence of past governments, and their vague contractual signing with Independent Power Producers (IPPs), has cost the nation dearly.

We applaud the efforts of the incumbent Government, in trying its best to dodge the countless mines planted by previous tenures and to renegotiate the power purchase terms with IPPs. It is also good to realize that the Administration has decided to cut gas to inefficient and idle Capacity Power Producers (CPPs), whose transparency in supplying surplus electricity to the national grid and in fulfilling their capacity payment agreements with the Government are questionable.

It is time that all these power producers undergo forensic auditing in the larger interest of Pakistan, so that money can be recovered and redirected to address the growing woes of the destitute masses.

Power and gas tariffs, especially for the export sector, should be equivalent to the average of the region, and pragmatic reforms must be brought about within distribution companies (DISCOs) to reduce the cost of doing business amid inflating prices and a weakening Rupee.

The idea of the Electricity Market is important but not new. We firmly believe that it can create an alternate source of funding through the rentier class, which can then be spent on upgrading the transmission and distribution system of Pakistan.

## ACKNOWLEDGEMENTS

Since its inception in 2018, I've had the great fortune of carrying the mantle of establishing a sound research base at the Economic Council, as well as building hearty relations with technocrats, diplomats, and the academia associated with the organization.

I feel happy to share this first edition of the report on circular debt and the energy sector that has been carefully worded and segmented to help any layman understand the energy crisis faced by Pakistan, today. The work highlights the necessity of creating an alternate channel to generate funds to upgrade the dilapidated transmission and distribution structure, through an Electricity Market System, which is common in developed countries.

I am grateful to the valuable contributions of Mr. Syed Maroof Ali and Ms. Rafaya Hassan, diligent graduates of top schools of Pakistan, who understood our mission and worked with honesty.

Sincerely,

*Abdullah A. Khan*



Coordinator, Economic Council  
Employers' Federation of Pakistan



**2010, Power Ship Owned by Turkish Company, Karkey, Arrives at Karachi**  
Source: Getty Images

## BREAKING DOWN ENERGY PROBLEM OF PAKISTAN

Pakistan has been facing a multifaceted energy crisis for over a decade. Coupled with the rising energy costs and bottlenecks in Transmission & Distribution (T&D) mechanism, the debate on cheap energy has continued to survive the last couple of years. To understand the issues embedded in the energy sector, a closer look at the sector in terms of broad indicators is warranted.

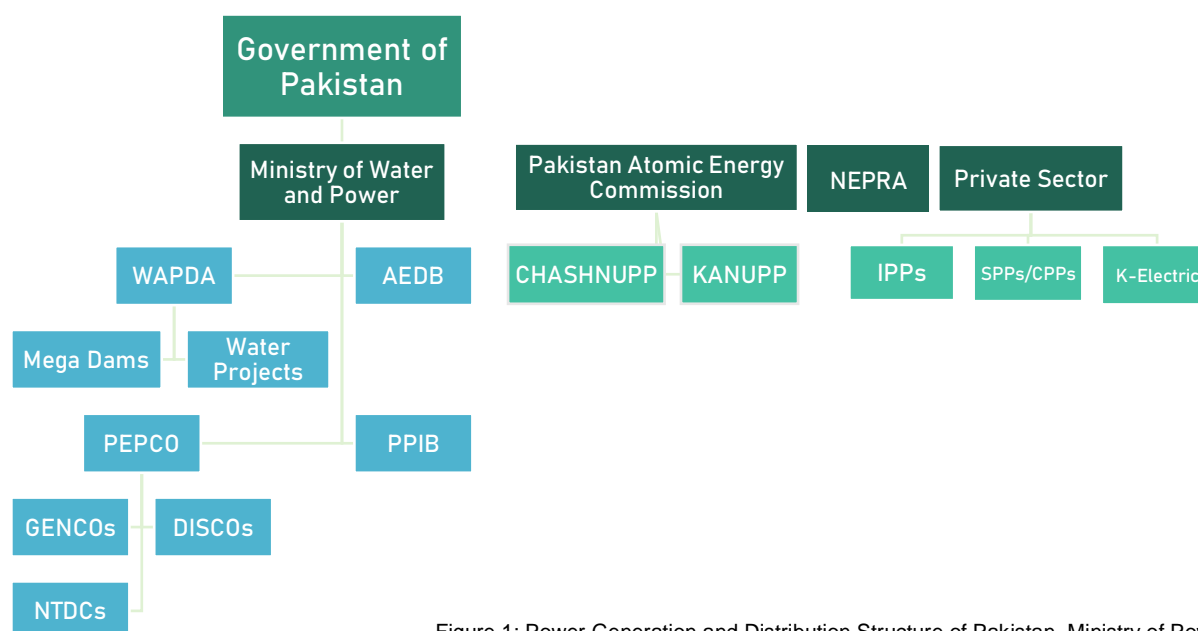


Figure 1: Power Generation and Distribution Structure of Pakistan, Ministry of Power

The following sections will touch upon the energy landscape of Pakistan.

### 1. THE ENERGY MIX OF PAKISTAN

The Energy Mix of Pakistan is dominated by thermal power through coal mainly. Although its share in electricity generation has decreased relative to 2019 (Jul-Apr), it still constitutes a significant amount in electricity generation, as Table 1 shows:

	2019 (Jul-Apr)	2020 (Jul-Apr)	% Change in Total Share
<b>Hydroelectric</b>	24,931	27,270	19.2
<b>Thermal</b>	61,003	51,629	-7.93
<b>Nuclear</b>	2,903	7,049	167
<b>Renewable</b>	7,955	2,057	-75.0
<b>Total</b>	96,792	96,382	-0.42

Table 1: Energy Mix Statistics of Pakistan, Ministry of Energy (Power Division)

A notable development can be seen in the rising share of electricity generation for Hydroelectric and Nuclear power. In July-Apr 2020, renewables were cut down by 75 percent but given the government's ambitious target of generating 30% of the total electricity by 2030 through the renewable category<sup>1</sup> the future outlook looks positive.

Thermal energy plays a dominant role in driving the oil import bill of Pakistan, as petroleum products, liquefied natural gas, and liquefied petroleum have to be outsourced.

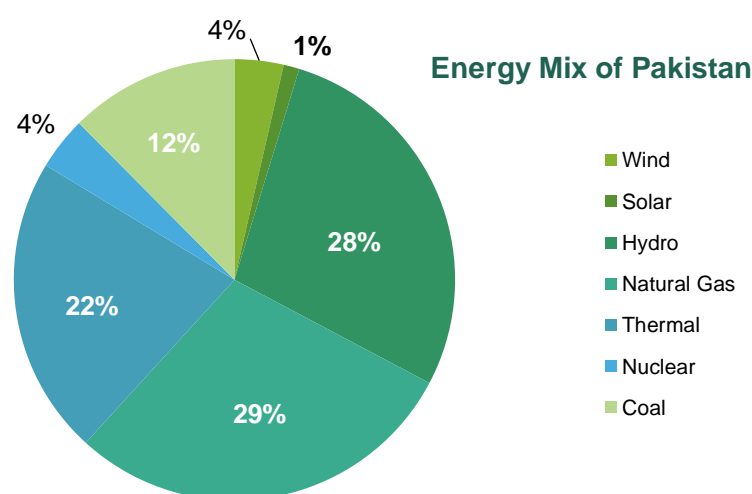


Figure 2: Distribution of energy mix, Ministry of Power

<sup>1</sup> <https://tribune.com.pk/story/2250399/1-pakistan-aims-generate-30-clean-energy-2030>

However, due to the recessionary pressure of COVID-19 and the subsequent fall in global oil prices, the import bill also fell. During the Jul-Mar 2020 period, total oil imports cut down by 25.33% to \$9.8 billion from \$13.1bn in the same period last year<sup>2</sup>.

## 2. ELECTRICITY: RELATIVE COST AND SECTORIAL CONSUMPTION

Another question pertains to the cost of electricity in Pakistan. Unfortunately, the regional comparison provides a bleak picture where Pakistan emerges as an expensive region with regards to the cost of electricity. Table 2 shows this comparison in black and white<sup>3</sup>.

Cents/KWh	Residential	Commercial	Industrial
<b>Pakistan</b>	1.3 – 15.4	12.4 – 15.9	11.8 – 12.5
<b>India</b>	4.2 – 11.2	8.4 – 11.9	10.9
<b>Bangladesh</b>	4.1 – 12.6	10.8	6.8

Table 2: Regional comparison of electricity cost, Electricity Tariff Structures of Countries

This scenario presents a factual snapshot that creates a sense of economic emergency because the expensive nature of electricity hurts domestic production, which in turn, affects international competitiveness.

MWh	Units Sold	Units Sold	% Share	% Share
	Mar-19	Mar-19	Mar-19	Mar-19
<b>Household</b>	2,180,190	2,296,190	38.07	44.90
<b>Commercial</b>	407,580	394,915	7.12	7.72
<b>Industry</b>	1,966,390	1,505,957	34.34	29.45
<b>Agriculture</b>	606,180	411,257	10.58	8.04
<b>Others</b>	566,700	505,245	9.90	9.88
<b>Grand Total</b>	5,727,040	5,113,567	100.00	100.00

Table 3: Share in Electricity Consumption, Pakistan Economic Survey 2019-20

<sup>2</sup> <https://www.dawn.com/news/1564029/oil-imports-dip-74pc-to-three-month-low>

<sup>3</sup> Report on the Power Sector: Committee for Power Sector Audit, Circular Debt Resolution and Future Roadmap (March, 2020)

Table 3 puts the industrial share of electricity consumption in second place, revealing that one-third of the total electricity consumption, in both FY2019 and FY2020 (until March) was utilized by industries.

Ironically, the country has a surplus generation capacity of 35,972 MW (as of April 2010), which grew by 7.5% compared to last year<sup>4</sup>. However, instead of presenting itself as a panacea for industrial expansion, the generation capacity has never been fully utilized due to a severely constrained T&D mechanism.

The T&D capacity is currently stagnant at 22,000 MW<sup>5</sup>, whereas the Generation capacity is to undergo planned expansion soon. This scenario is further aggravated when the Aggregate Technical & Commercial (AT&C) losses are taken into consideration. AT&C losses are the combination of energy loss (technical loss, theft, and inefficiency in billing) and commercial loss (default in payment and inefficiency in the collection). It captures the often-stated T&D loss along with the lack of billing recovery<sup>6</sup>. In Pakistan, the AT&C loss amounted to 29.7% which is stated to be the highest in the region.<sup>7</sup> This figure has two immediate implications: limited choices for import-substitution and the ineffective energy system diverting potential investors away.

It should be noted that around one-quarter<sup>8</sup> (26%) of the local populace does not have access to grid electricity. Meanwhile, 82% and 75% of the population in India and Bangladesh, respectively, have access to grid electricity. Similarly, in the areas where access to grid electricity is available, there is load shedding. This uneasy situation adds to the woes of disgruntled citizens, especially in the scorching summers of the city.

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<sup>4</sup> Ministry of Energy, (Power Division)

<sup>5</sup> <https://www.dawn.com/news/1430728/pakistans-electricity-generation-has-increased-over-time-so-why-do-we-still-not-have-uninterrupted-supply>

<sup>6</sup> <http://powerdistributionmanagement.blogspot.com/2014/12/aggregate-technical-and-commercial-loss.html>

<sup>7</sup> <https://tribune.com.pk/story/2217986/2-pakistans-power-sectors-losses-highest-region>

<sup>8</sup> <https://tribune.com.pk/story/2217986/2-pakistans-power-sectors-losses-highest-region>

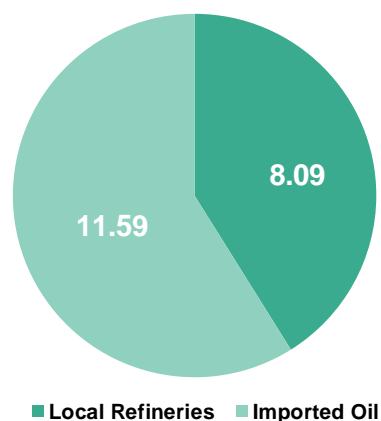


### 3. IMPACT OF PETROLEUM PRODUCTS ON THE LOCAL ECONOMY

Kiani (2011) highlighted the adverse effect of expensive crude oil on real economic growth that negatively impacts consumption patterns of households and industrial growth. Similarly, Nazir & Hameed (2015) concluded that oil consumption has a significant role in driving long-term economic growth, whereas transportation, industrial, and power sectors are major players in advancing economic development, and they should thus be safeguarded from high prices and oil shocks.

Given the rising importance of oil consumption for industries in Pakistan, it is interesting to note that the total consumption of petroleum products stands at 19.68 million tons/ annum, whereas the local production from the refineries is only limited to 11.59 million tons/ annum.

A significant portion of the import bill (29%) was attributed to Mineral Fuels, Oils, and Distillation Products in 2019<sup>9</sup>, which serves as a testament to the heightened need to plug in the T&D losses and ensure optimum usage of this expensive imported oil.



The pie chart in Figure 5, paints a dismal picture of how the limited oil production has been unfairly compensated through import of large volumes of petroleum product. This excessive reliance on foreign oil (over 41%) rains on common man in the form of inflation when transporting commodities becomes expensive<sup>1</sup>.

Figure 3: Consumption of Petroleum Products, Pakistan Economic Survey 2019-20 (Finance Division, June 2020)

<sup>9</sup> <https://tradingeconomics.com/pakistan/imports-by-category>

#### 4. ROLE OF INDEPENDENT POWER PRODUCERS:

In Pakistan, the independent power producers are 42 in number. The practice of inducting private investors into power generation started in 1994 when 'Power Policy 1994' was introduced. This initiative was taken because the country was overwhelmed by electricity shortage and there were limited funds to set up power stations. To make this policy engaging for all kinds of investors, multiple attractive incentives were provided by the Government.

These included (PPIB, 1994):

- US cents 6.5/kWh,
- Government of Pakistan's sovereign guarantees for payment and
- 18% internal rate of return.
- The Investors could use any imported fuel of their liking.

Although this was a quick fix to the power crisis of that time, the Policy was short-sighted as it ignored the long-term adverse effects that Pakistan is facing today in terms of expensive Capacity Payments to IPPs in US Dollars. This was followed by a congregation of different power policies but they did not make the situation any better for the Government of Pakistan and the mounting debt in which the economy was getting embroiled.

A little visit to the past helps explain the emergence of the current fiasco of bloated energy payment bills. Back in 1997, when the Water and Power Development Authority of Pakistan (WAPDA) was unbundled into 5 Generation Companies (GENCOs), 10 Distribution Companies (DISCOs), the generation capacity stood at 14,000 MW from 6MW in 1947. When WAPDA was privatized, it was also forced to invest millions in the dilapidated power structure to improve efficiency, as well as rationalize prices. The basic plan of establishing a competitive bilateral trading market failed to materialize and with it all the hype and buzz of planning and designing because the right technical and non-technical resources were not assigned. Part of the reason for blatant inobservance of IMF recommendations and absence of auditing systems.



**Cooling Tower at a Coal Power Station, Pakistan**  
Source: Getty Images

In 1998, when new management took up the cudgels, false reporting through the use of discretionary powers was rife and as time passed by, the demand and supply gap too rose considerably. In 2002, the generation-consumption gap registered at 26 percent amid high per unit electricity cost. When the Rupee began to slide sharply against the US Dollar in 2007 along with sky-rocketing global oil prices, public debt to GDP too expanded because 65 percent of energy dependence is based on furnace oil and high-speed diesel. The payments in dollar terms to IPPs due to Sovereign Guarantees of 2002, began haunting the government. By 2008, the reported energy shortage was 4000 MW and 45 percent population of Pakistan was deprived of power.

During 2013-17, the threshold permitted by National Electric and Power Regulatory Authority (NEPRA) which allowed for system-built losses into electricity prices, was 15.3 percent. However, it was breached and the transmission and distribution losses stood at 18.7 percent and since then have only steadily risen. With it, too did the per capita consumption of electricity from 94 Kilo Watt-hour (kWh) in 1971 to 471 kWh in 2014 and now almost 1000 kWh in 2020.

Here, it must be noted that the end price is paid by the consumer, and with every Rs. 1/kWh rise in the cost of generation, Rs. 12.53 kWh adds to the household electricity bills. When consumers do not pay back to the DISCOs like K-Electric and there is pilferage by hooking and defecting meters, the economy suffers Rs. 12 billion in loss and circular debt gets Rs. 128 billion credited. Easy to imagine the socio-economic impact.

## **5. THE IPP INQUIRY REPORT AND THE NEED FOR FORENSIC AUDITING:**

In 2019 the Prime Minister of Pakistan commissioned an inquiry report on malpractices of the IPPs. This is because the country is facing an extremely high cost of electricity and many areas are still facing a shortage of electricity supply even though there is ample power production happening in the country. The final report brought to light valuable information for decision-makers, such as misrepresentation of data that became a key factor in negotiations.

Following are the highlights of the report (Committee for Power Sector Audit, 2020):

- IPPs were earning an unimaginable 50-70 percent in annual profits versus the 15pc limit set by the National Electric Power Regulatory Authority (NEPRA)
- IPPs overstated their costs of plant installation to receive extra tariffs when the contract was being signed. NEPRA failed to check this intentional error.
- The cost of the power plant prepared by the companies was also blindly accepted by the authorities.
- The Government and power consumers kept paying billions of rupees annually even when power plants were shut or were generating less in winters
- Though the guaranteed profit should not be for more than four to five years, the Government and NEPRA granted guaranteed profit for 25 years and in US Dollars.

The aforementioned points came to light after a thorough scrutiny of the 2020 IPP Inquiry Report, as well as some more points that can be categorized as written, ‘between the lines’

### Regulatory Process for Determination of Tariff for Each Segment of Power Sector

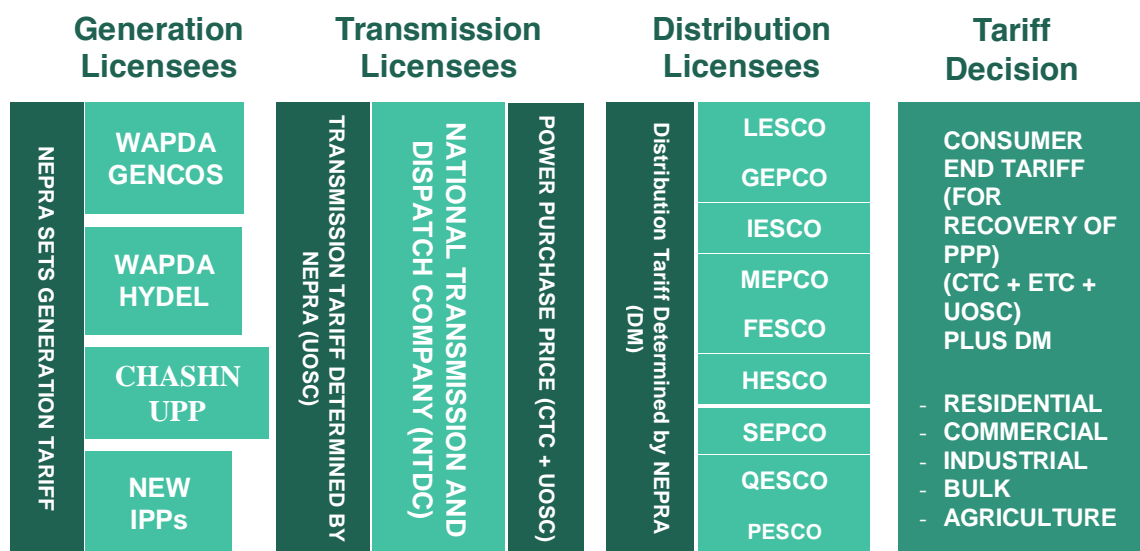


Figure 4: Tariff Determination System in Pakistan, Ministry of Power

Furthermore, it was also evident that some power plants have been idle state but due to the visibly ill-intent contractual agreement, the Government continued to pay out capacity payments and in dollars. Hence a 'Forensic Audit' is justified.

## 6. THE CARNAGE OF CIRCULAR DEBT

One of the most serious problems to befall this country is the 'Circular Debt'. It surfaced in 2007 and has today shored up to Rs. 2.3 trillion (Mushtaq Ghumman, 2020). The Senate Bill of 2018 highlights that the generation of electricity through High Sulfur Furnace Oil (HSFO) is one of the leading contributors toward circular debt (Faraz, 2018) and sadly the majority of the IPPs run on HSFO. Furthermore, the Bill also states that the country has a total dependency of 53 percent on imported fuel. Then, there is the issue of the dilapidated T&D structure that accounts for roughly 17 percent of leakage but the actual amount is 24.8 percent, as per the Senate Bill.

The largest stake of this menace is that of theft, besides the unmonitored disbursement of tariff differential subsidies to the tube wells installed in rural areas of Balochistan and the overall inefficient distribution system. With the loss of every one Rupee's worth of a unit, the quantity of electricity becomes a loss multiplier. All of this has led to a vicious circle of non-payments from end-consumers, distributors, all the way up to the suppliers.

In the past, where both global oil price hikes and currency devaluation had brutishly marred the export competitiveness, the consistently high dependence on RLNG never made sense. The imported petroleum fuel that comprises natural gas and oil is, by and large, heavily represented by the RLNG constituent at 43.5 percent. Hence, we felt the need to define the wholesale electricity market.

Another way to explain this predicament is that it is a vicious circle whereby the Government, due to insufficient funds is unable to pay the promised subsidies to the power distributors. The power distributors on their own, are not capable of paying dues to the power producers. These producers claim that since they are not being paid, they cannot further pay for the fuel, which ultimately adds to the budget deficit.



**Portrait of Muhammad Ali Jinnah on a One Thousand Pakistani Rupee Note**  
Source: Getty Images

If electricity. Like this, limited energy is procured and the consumers are not supplied with uninterrupted electricity. These consumers are also made liable to pay large amounts of electricity bills as the taxes and higher costs of fuel are passed onto them. The refusal by the consumers to pay their bills leads to low tax revenue for the Government, which adds to the budget deficit.

Since the Government is incompetent to provide subsidies to power distributors, they (NEPRA) recover this overhead amount from the consumers by raising electricity tariffs. This cascading of costs is called, Circular Debt and has become a major obstacle in way of industrialization.

To tame this monster, short-term measures would not suffice. Rather, planned and sustainable measures will need to be adopted that focus on cutting the very roots buying out IPPs, and paying capacity payments in Rupees to all remaining. Otherwise, this menace of Circular Debt will continue to plague the economy.

## **7. THE WEAK STRUCTURE OF TRANSMISSION AND DISTRIBUTION:**

T&D refers to the practice of transferring electricity from power stations to the national grid and then distributing it to end consumers - households and industries. This practice of powering up units is practiced in almost every country.

Transmission refers to the part of the Ultra High Voltage that travels over long distances from power plants to substations located near industrial and housing zones. As displayed in the above diagram, the transformer steps up the voltage and then supplies it to the national grid. Approximately, 100,000 volts are carried through.

The national grid then supplies to a secondary transformer that steps down the voltage for distribution to households and industries, as per requirement. The distribution network consists of wires along electric poles, placed 20 feet high on streets. The voltage of these distribution lines is roughly 13 kV which amounts to 13,000 volts.

The OGRA sets the price after taking into consideration international oil prices and the



IPPs, GENCOs, and WAPDA generate electricity. While, it is the job of the Government to transmit, NEPRA to set tariff rates and CPPA-G to play the role of facilitator. Finally, the NTDC receives all the power and supplies to K-Electric and other distribution companies that maintain electric lines and collect bills.

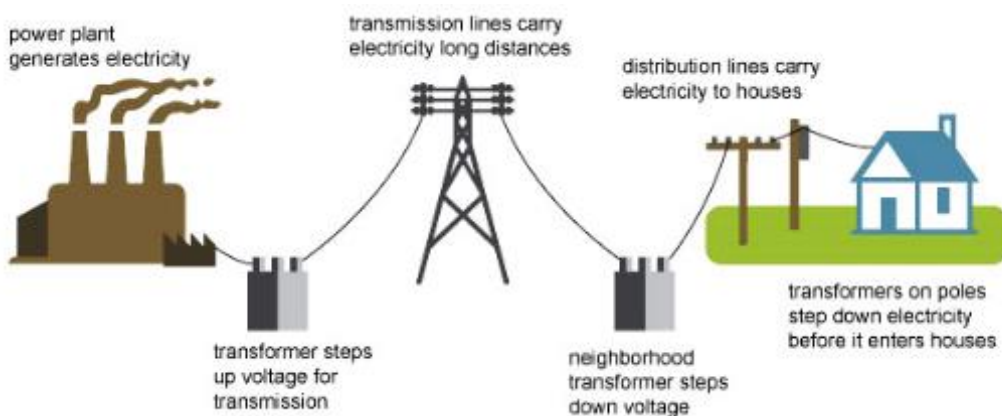


Figure 5: How Consumers Received Electricity, US Energy Information Administration

It is falsely believed by many that low generation is the root cause of load-shedding and shortfalls. Hence, past governments have instead focused on increasing the generation capacity to bridge this power shortage that has, in fact, only increased the financial burden on the entire economy. In reality, as mentioned earlier, Pakistan has more than the required electricity to supply but it is the weak transmission and distribution structure that needs attention. The current numbers state that the Aggregate Technical and Commercial losses have escalated to 29.7%, which is stated to be the highest loss compared to other neighboring countries (K-Electric Limited, 2020).

As per K-Electric, around 10,000 MW of power was generated to resolve the issue of power outages but due to the above-mentioned losses, the problem remained. The current grid network of Pakistan is capable of transmitting only approximately 22,000 MW of electricity and so any surplus leads to breakdowns. The distribution companies supply the load to the national grid but the system is such that it cannot hold a large load. Therefore, the problem is not to increase generation capacity but to upgrade the T&D mechanism after taking into account the loss at each node of power transmission.

## STRUCTURE OF POWER FLOW & TRANSFER OF COST AT A GLANCE

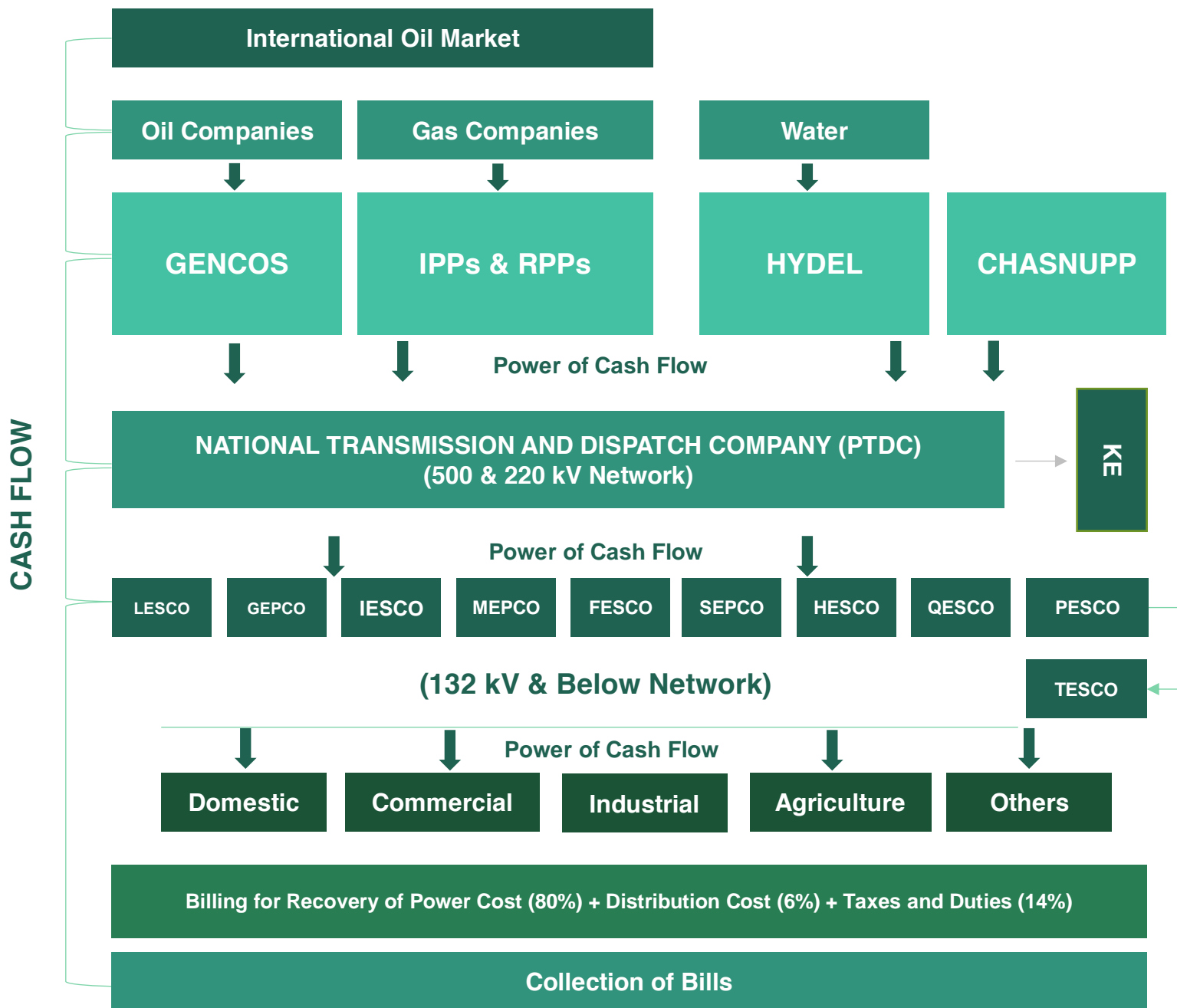


Figure 6: How Tariffs are Determined, National Transmission and Dispatch Company (NTDC)



**A Stock Market Projection for Electricity Market in Pakistan**

Source: Getty Images

## IDEA OF ELECTRICITY MARKETS

Following are few proposals to help alleviate the energy crisis in Pakistan to ensure the availability and supply of cheaper energy for industries.

A market is a venue where producers and consumers meet to exchange goods and services. This is the same concept that can be applied to the notion of Electricity Markets. This idea is not a new one rather it has been adopted by multiple countries with confident and progressive results. These markets have also proved to increase the efficiency of the power sectors of these respective countries.

The essential idea for this type of market is that it to be a trade-based market in which electricity-generating organizations exchange for the duration of the current and next day at market-driven costs. Another simpler method to describe the operations of such a market is that it will be a system where the energy that is electricity, is traded through bids in the form of swaps. Determining prices through bidding is indicative of an efficient market mechanism.

The structure and design of a market have consistently been significant. Configuration missteps can cost purchasers many billions. The inclination toward good quality is implanted in the shortage costs. An elective methodology is to legitimately arrange speculation with the spot market even though this is best done for an expansion to managerial scarcity pricing since it is the value from scarcity that propels significantly the ability to perform when it is required. For these markets to maintain a certain level of efficiency, the energy supply and demand need to offset each other and this practice has to be upheld in real-time because of spot markets and even for the forward futures market.

The initial move toward business sectors was the production of intensity pools. A few neighboring utilities are associated through the transmission grid network, permitting the exchange of vitality across locales. The wholesale market permits constant exchange and valuing of electricity. Such markets will resolve the core problem of inefficiencies in the existing system which is at the side of the producers and the distributors. Furthermore, the problem of the collection will also be addressed when there is an efficient market that

encourages low-cost procurement of electricity and timely payment of bills. These models are listed as follows:

### A. Wholesale Electricity Model

The Wholesale Market model simply refers to selling large quantities of energy to DISCOs who then act as ‘retailers’ for the consumers. The Independent System Operators (ISOs) are responsible for the regulation of such markets in the USA and Argentina, for example.

The power generating companies will place a bid on the quantity they want to supply at a certain price level. This price will include all such costs incurred to generate electricity. As the number of GENCOS increases, competition builds that will drive down the price for procurement by DISCOS and ultimately the consumers. This practice will ultimately increase the efficiency of production and lower the cost for the end-users - the households and the businesses.

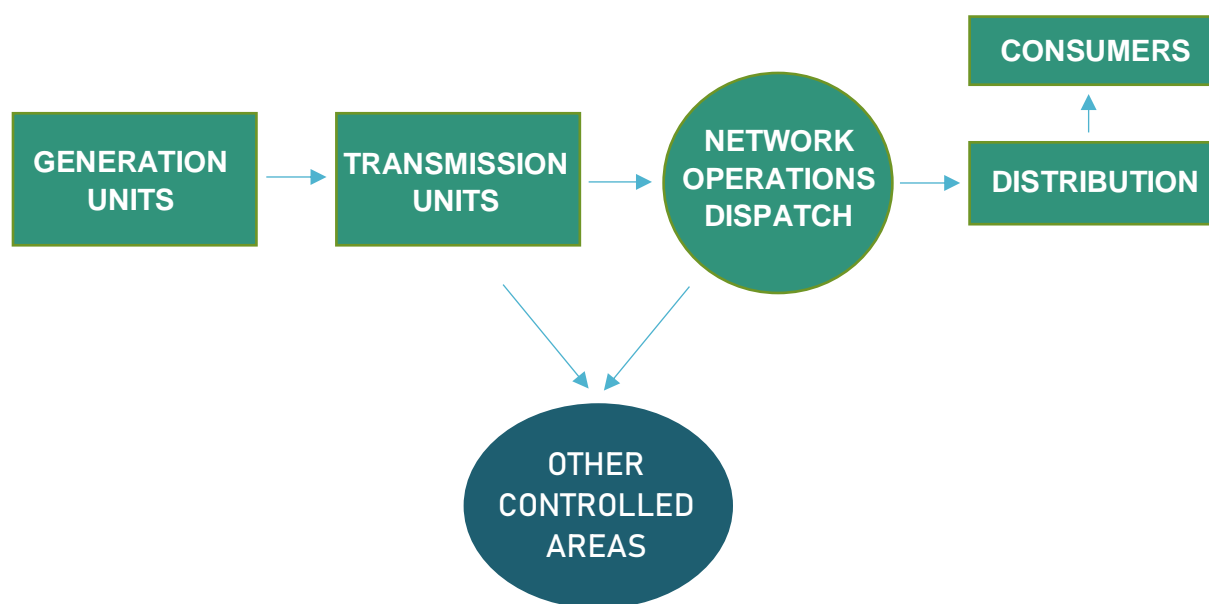


Figure 7: How Electricity Markets Work, FERC USA

However, it was the restructuring of payments done by the Argentinean Government using the wholesale electricity market model that stands out as a noted example to follow.

The idea evolved in 1980 when the Government of Chile decided to privatize the electric power system. Later, in 1990, Margaret Thatcher of the UK carried forward the same model and privatized the electricity supply industry which was then replicated by the Commonwealth countries.

## **B. Retail Market Model**

The Retail Market model is such that it features buying of energy directly from the generation companies in a wholesale setting and then selling them to consumers at a market-determined rate.

The main participants among wholesalers are the ISOs and the consumers themselves. The ISO will be the regulating party that will maintain the financial and scheduling aspects of transactions. The interaction between the wholesalers and the retailers will be a B2B one. According to the model, contracts will be in the form of 'futures'. Also, the model would include line companies and market companies.

To purchase electricity, companies will have to compete in the wholesale market. After buying energy packs, these companies will compete amongst themselves to sell to the customers – effectively, bringing down prices for end-users.

No matter which model is adopted, any well-functioning electricity market will require an optimal operational transmission network. If the power network is heavily congested and there are major losses in transmission, then the electricity markets will fail to function efficiently. These markets require that the demand and supply should balance each other out as energy is a non-tangible product and needs to be either stored or instantly transmitted. For Pakistan, regrettably, these losses are already an inherent part of the T&D and need to be fixed first.

These electricity markets were primarily designed to reduce the inflated prices of electricity by fostering competition of supplying at affordable rates.



**Windmill Stands Against the Orange Sky Afternoon in Gharo, Pakistan**

Source: Getty Images

The lax regulations, overcompensation of perks by past governments, and short-sighted power policies have cost the economy very dearly. Today, this consistently inflating price of electricity is not only adding to the circular debt but also restricting local industries from diversifying produce to adapt to the changing consumer demands of the world amid COVID.

### **C. Using Renewable Sources (alternate solution)**

Renewables - refers to the production of renewable energy that is sustainable and is more environmentally friendly than the existing system of production, which includes thermal and coal-fired power plants. These non-renewable power plants are not only detrimental to the environment but are also expensive for the government in the form of capacity payments to IPPs that are largely based on them.

The major sources of renewable energy include:

- Hydro energy
- Solar energy
- Tidal energy
- Wind energy
- Geothermal energy and
- Biomass energy

The coastal areas of Balochistan and Sindh, carry huge potential for Wind Power Generation, especially in areas like Gharo-Jhimpir (Nicholas, 2020). It is estimated that this wind corridor is capable of producing up to 11,000 MW of electricity. Then there is the potential of electricity through solar energy that will require only a one-time investment. Pakistan is a country that receives sunlight round the year. Hence, it only makes good sense to harness this natural resource and use them as a sustainable resource to power up industries.

One big advantage of using renewable energy power plants is that the tariffs do not include capacity payments.



## **ARGENTINA'S WHOLESALE ELECTRICITY POWER MODEL**

The deregulating and privatization of the vertically integrated structure of Argentina's electric power sector initiated in the early 1990s led to the creation of the wholesale electricity futures market. The focus was on revamping the generation, transmission, and distribution services. This was, by and large, done due to the mighty influence of political motives behind management as well as the 1980 hyperinflation episode. During that time, electricity theft and blackouts were rife.

The first piece of legislation was seen in the form of 'Law of State Reform' which legitimately curtailed the government's direct involvement in the operations of the power industry. Then, in 1992, the Electricity Regulation Act, which we believe was the keystone for the ambitious reform and privatization plan of the DISCOs and GENCOs, a legal framework was laid to upscale efforts to reorganize and privatize various public enterprises and of virtually all commercial activities run by the state. This led to the emergence of independent sector regulator, National Regulador de la Electricidad (ENRE), and other institutional authorities that inevitably formed part of the Wholesale Electricity Market, known as Mercado Electrico Mayorista (MEM) and its independent operator, Compañia Administradora del Mercado Mayorista Electrico S.A. (CAMMESA). In the 3 years that followed, more than 25 state-run power companies were privatized and conventional generation (thermal and hydroelectric) were sold separately, making each privatized company an independent power producer.

The 1992 Act, introduced competition in the electricity generation sector and served as the genesis for today's efficient power structure that exists in, Argentina, today. Under this act, electricity-producing companies are not allowed to own majority shares in the transmission companies. The transmission companies must provide open access to their systems for all power generators and are, hence, barred from generating or dissipating power. The distribution companies, which form part of the MEM are organized as regional monopolies and purchase electricity from the MEM in the form of contracts. The power market in Argentina has low barriers for independent power producers, supplier group

## How the Power Market Structure of Argentina Works?

The distribution and transmission networks operate under 95-year concessions and contracts which are renewed every 15 years. In the Greater Buenos Aires area, electricity distribution is regulated under 99-year contracts and strong incentives are given to the distributors to reduce high energy losses emerging from inefficiency and theft. Any third-party participation in the network is negotiated, rather than regulated. For regulated customers that include all residential, and small commercial and industrial users, the electricity tariff is adjustable at end of every quarter. Outside the capital, other provinces have Independent System Operators (ISO) which follows the principles set out in the 1992 Act.

The electricity generated by all the sources, including the IPPs, is purchased and sold in the MEM where all participants, regardless of stature, must adhere to the rules of the market laid down by the ENRE. The MEM consists of:

- Term market, with a clearly defined structure of price, quantities, and conditions which are negotiated between buyers and sellers.
- Spot market with hourly prices that take into account economic production costs.
- Balancing market. However, it must be noted that individual power generating companies are prohibited from participating.

The hourly spot prices are estimated by the CAMMESA that uses costs declared by the MEM. This 'centralized load dispatch' starts at the Ezeiza node, where CAMMESA calculates the short-run marginal price based on the variable prices of plants and hourly demand of the system. Using Locational Marginal Pricing (LMP), as done in the U.S.A., each plant of the interconnected system is assigned a specific node with a specific factor set to it which determines the final prices after taking into account the various restrictions and technical losses in the transmission system.



**Overhead Electric Bridge on a Foggy Morning**  
Source: Getty Images

## Impact on the Power Sector of Argentina?

Despite the increased market shares over the year, the concentration ratio remained lower than most European and North American markets. In the highly competitive MEM, the average capacity of an IPP is 1000 MW with the largest ones having not more than 1400 MW. Statistically, the share in total capacity per unit constitutes only 6 percent of the total installed capacity allowed.

44 percent of the representation of the MEM is in the hands of EDENOR, EDUSUR, and EDELAP. Whereas, the rest, 54 percent (or majority) is divested into the hands of the provincial governments.

The installation of increased efficient capacity and constant planning through Public-Private-Partnership (PPP) on improving operating efficiencies batted down prices of the wholesale market, MEM. The average price per MWh ranged from \$10 to \$45. The access to electricity supply, based on the 1992 Act, spans over 95 percent of the total population with 70 percent electrification in isolated areas. All those households and consumers who were consuming free (albeit illegal) electricity, were forced to pay the tariffs.

The privatization dramatically improved customer service quality and in 2004, the number of load-shedding events per customer dropped to 20 percent. The system losses, up to 2004, dropped from 25 percent in 1993 to 11 percent in 1997.

Before the unfortunate 2002 Economic Crisis and the resulting devaluation of the Argentinean Peso against the US Dollar, when the government froze the price, the electricity tariffs remained as low as 2.5 cents per kWh for a residential consumer and industries, 1.3 cents per kWh. This price drop was possible because, in comparison to Pakistan (hydel: 28 percent, other sources: 9 percent), Argentina's generation mix comprises a significantly higher 33 percent of hydel which lowered spot prices in the market and improved efficiency.

As a result of the success of the 1992 Act and the MEM, along with an increased share of renewable energy into the energy mix, carbon emission remained relatively stable, averaging around 0.3 and 0.4 tons/MWh.

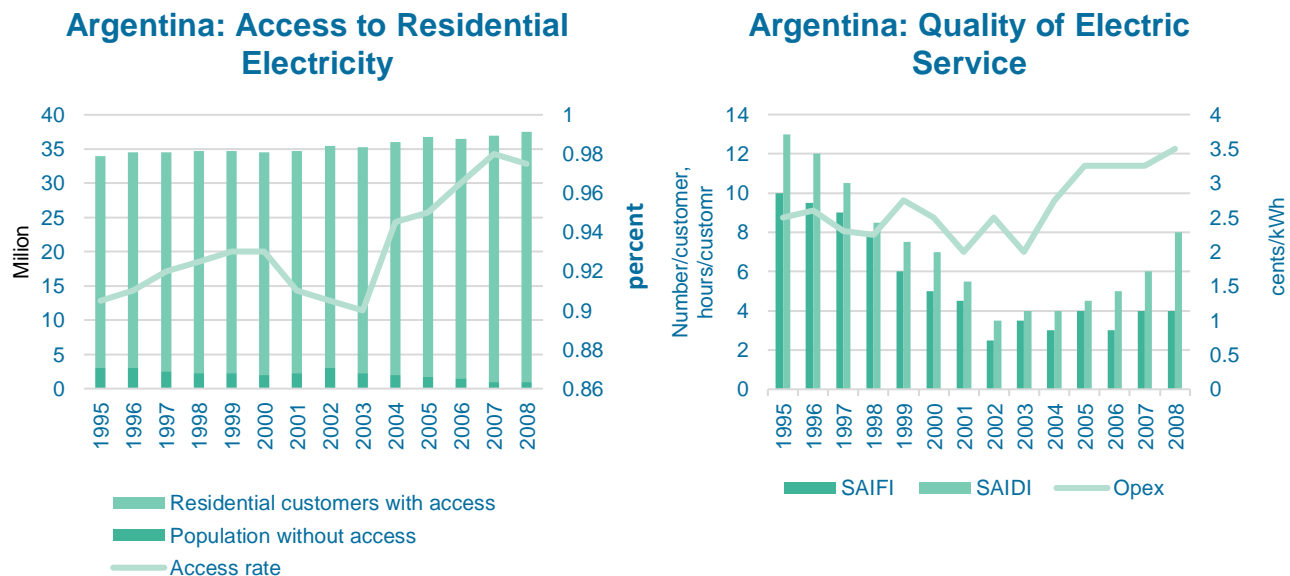


Figure 8: Power Market Structure, World Bank Report, 2013

Note: Opex = operational expenditures/costs; kWh = kilowatt-hour; SAIDI = System Average Interruption Duration Index; SAIFI = System Average Interruption Frequency Index

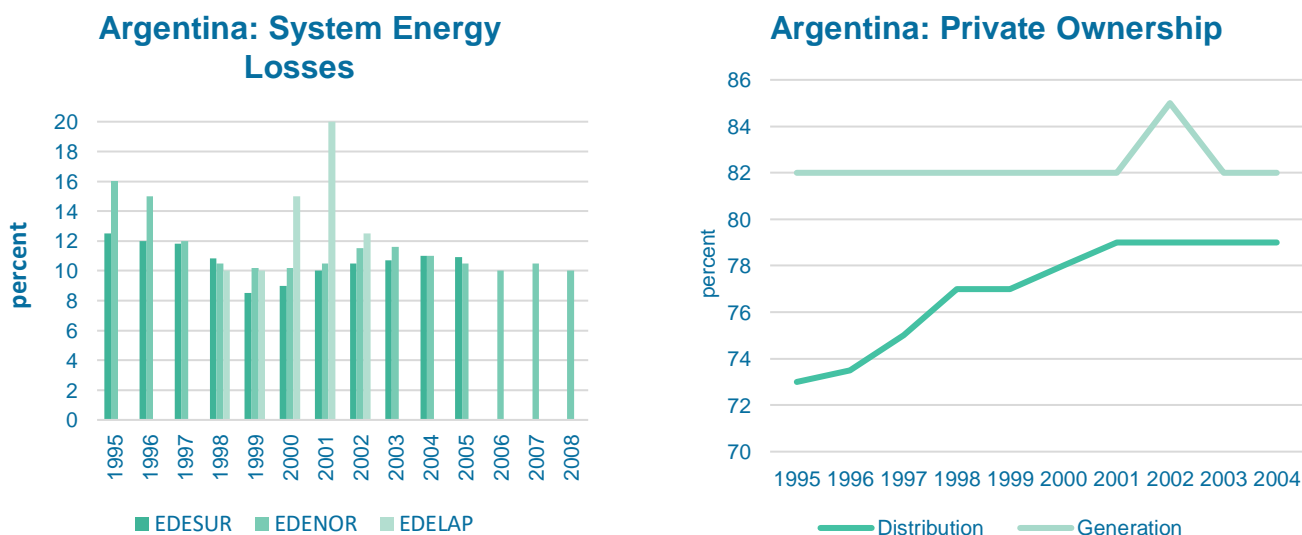


Figure 9: Power Market Structure, World Bank Report, 2013

Note: EDELAP = Empresa Distribuidora La Plata; EDENOR = Empresa Distribuidora Norte; EDESUR = Empresa Distribuidora Sur

**CAUTION CASE:**The Deregulation of Electricity Wholesale Market in California

The government must keep in mind that excessive deregulation and a dearth of audits in the energy sector, especially when it is being traded in the market, can lead to a disaster. A case in point is the deregulation of the Electricity Wholesale Market in California. According to a report published in 2001 by the Critical Mass Energy & Environment Program,

“Enron’s business model was built entirely on the premise that it could make more money speculating on electricity contracts than it could by actually producing electricity at a power plant. Central to Enron’s strategy of turning electricity into a speculative commodity was removing government oversight of its trading practices and exploiting market deficiencies to allow it to manipulate prices and supply.”

According to the consumer watchdog website, the energy suppliers were allowed to overcharge approximately \$23 billion from consumers for five years under this law.

The case for energy futures is entirely being made to help the government solve the circular debt issue and also create a source of financing for themselves. It does not in any way encourage deregulation of energy trading or energy suppliers.



**Messy Electric Lines of City of Lights, Karachi, Pakistan**

**Source:** Getty Images

## PROPOSAL

Commoditize the electricity market in the form of futures. Any electricity generated in excess can be sold in the form of futures which can be bought and traded by people and they can be used to finance investments by the government.

- These energy futures can be traded on Pakistan Stock Exchange.
- The investors will be required to hold these bonds for at least one year.
- The bonds will be issued at a 10 percent markup; this amount to be treated as dividends and the income will be subject to tax applicable on dividends.
- These bonds can be pledged with financial institutions.

Furthermore, the source of funds for buying these energy futures should not be questioned as it is helping the government, on one hand, to discharge their liability and, on the other hand, supporting the domestic industry to monetize their held-up refunds.

### **Rationale:**

The proposal is based on the principle that the current agreements will not be disturbed and the government will continue to honor all its commitments. However, the operations system is recommended to fall in line which serves the interest of the country.

By providing a market and avenue to sell the electricity generated, the overstatement of efficiency will decline because the institution can only sell what they report. The underreporting institutions who are using their own electricity in their group companies, and getting paid for it by the government will only get paid for the numbers they report and they will not get an incentive to underreport their efficiency because they will not get paid for it anymore.

The government does not have enough financing sources for augmenting the distribution system. The future will be a source for the government to earn and invest in the system. For anybody willing to sell futures, will have to get a forensic audit done which is verified by international players and this will systematically make audits mandatory.



The benefit will be that more than Rs. 500 billion will be injected into the economy and a major portion of this amount will eventually be transferred from the informal sector into the formal sector and the whole amount will be in the tax net and the economy will be documented to this extent for all times in future.

The rent-seeking class will have an opportunity to invest in this environment where the property market, stock market, and other avenues are doing very well.

## REFERENCE

Committee for Power Sector Audit. (2020). Report on the Power Sector. Private Power Infrastructure Board.

Faraz, S. (2018). Circular Debt Issues and Solutions. Islamabad: Senate of Pakistan.

K-Electric Limited. (2020). K-Electric Limited Investor Presentation. K-Electric Limited.

Mushtaq Ghumman. (2020, December 05). News. Retrieved from Business Recorder: <https://www.brecorder.com/news/40037724/circular-debt-soars-to-rs23-trillion>

Nicholas, S. (2020). Thar Coal Locking Pakistan Into Unsustainable Capacity Payments Sindh Province Illustrates the Nation's Renewable Energy Potential. Institute for Energy Economics and Financial Analysis.

PPIB. (1994). Policy Framework and Package of Incentives for Private Sector Power Generation Projects in Pakistan. Islamabad: Private Power Infrastructure Board of Pakistan/ Government of Pakistan.

World Bank. (2013). Power Market Structure.

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**A Big Eagle Flies Over the Cultural City of Lahore, Pakistan**

Source: Getty Images