

**NAME: MARYAM MAJEED**

## **ENERGY CRISIS IN PAKISTAN:**

The term energy crisis is usually defined as any significant shortage in energy supply to a country or region. More specifically, the term is used to refer to a shortage of a specific energy source at a specific time in a specific place. Like many other developing countries, Pakistan has been grappling with a severe energy crisis for several years. The demand for energy continues to surge due to population growth, urbanization, and industrialization, while the supply of conventional energy sources remains inadequate. This energy deficit has led to frequent power outages, hampering economic growth, disrupting daily life, and impeding technological progress.

The sources of energy supply are renewable and nonrenewable resources. The former comprise fossil fuels-coal, gas and oil-and are costly, limited and hazardous for the environment. The latter, however, are environmentally friendly, cost-effective and inexhaustible due to their natural restorative process. Renewable energy sources include **solar, hydro, wind, tidal, geothermal, nuclear and biofuels.**

According to the National Electric Power Regulatory Authority's 2022 annual report Pakistan's installed generation capacity adds up to 43,775 MW, of which a paltry seven percent comes from renewable energy sources.

*Making an energy transition towards a sustainable future is critical.*

Over the years, Pakistan's power sector has grappled with rising electricity costs, inefficiencies across generation, transmission, distribution, transmission limitations, underutilization of efficient plants, mounting circular debt, and governance issues. These problems have persisted during the last fiscal year and show no signs of abating as we begin the next.

According to Economic Survey 2023-24, **Pakistan's total installed electricity capacity stood at 42,131-MW as of March 2024 with percentage shares of hydel, nuclear, renewable, and thermal at 25.4 percent, 8.4 percent, 6.8 percent, and 59.4 percent, respectively.**

- On may, 2024 , The express Tribune wrote that The country's electricity demand is 24,500 MW. However, its electricity production currently stands at 18,655 MW, said official sources.
- Hydropower plants are generating 5,000 MW of electricity, while thermal power plants operated by the government are producing 975 MW.
- Private sector power plants are producing 8,350 MW; wind power plants are generating 790 MW; solar power plants are generating 200 MW; bagasse plants 140 MW; and nuclear power plants 3,200 MW.

- Minister of Petroleum and Water Resources Senator Dr Musadik Malik stated that in summer, the country's electricity demand reaches up to 35,000 MW, while in winter it drops to 10,000 MW.
- *"Due to lower electricity prices, higher capacity charges have to be paid, resulting in a circular debt of Rs2.50 trillion, which burdens the economy. Pakistan wants to import gas from Iran but faces difficulties due to sanctions and is striving to obtain concessions similar to other countries."*

### **Causes of Pakistan's Energy Crisis**

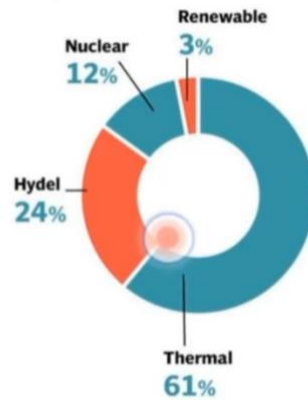
- **Lack of Investment:** One of the primary reasons for Pakistan's energy crisis is the insufficient investment in the energy sector. The country has not made substantial investments in building new power plants or upgrading existing infrastructure to meet the growing energy demand.
- **Circular Debt:** The circular debt issue in the energy sector exacerbates the crisis. This occurs when power generation companies are not paid on time by the government or consumers, leading to a shortage of funds for fuel and maintenance. As a result, the energy generation process is disrupted.
- **Over-reliance on Fossil Fuels:** Pakistan's energy mix is heavily skewed toward fossil fuels, particularly natural gas, and oil. This reliance on finite and expensive resources makes the energy sector vulnerable to price fluctuations and supply disruptions.
- **Inefficient Energy Use:** Wasteful industrial, commercial, and residential energy consumption practices contribute to the crisis. Lack of energy-efficient technologies and conservation measures result in higher energy demand.
- **Political Interference:** Frequent political interference in the energy sector has led to inefficiencies, mismanagement, and a lack of transparency, further worsening the energy crisis. Mohammad Asad, who specialises in PhotoVoltaic Solar System and Renewable Energy, told Global Voices via WhatsApp:

*The energy crisis in Pakistan stems from insufficient infrastructure, mismanagement, and heavy reliance on fossil fuels.*

- **Pakistan's Energy Mix ;**  
According to the Pakistan Bureau of Statistics (PBS) report, 'Trends in Electricity Generation 2006-07 to 2020-21', Pakistan's Energy mix has evolved over time.

Currently, according to the Economic Survey of Pakistan 2022-23, the energy mix consists of 58.8 percent thermal 25.8 percent hydel, and 8.6 percent nuclear power Additionally, alternative power sources contribute 6.8 Percent to the overall mix.

- **Share in electricity generation:**



## **PROBLEMS WITH THE ENERGY SECTOR:**

Problems in Energy sectors are majorly two,

1. first loadshedding
2. secondly expensive electricity generation.

### **Loadshedding In Pakistan:**

The energy sector of Pakistan is facing severe loadshedding.

Recently in June 2024, the energy crisis in Pakistan is made worse by issues like electricity theft and line losses, especially in Khyber Pakhtunkhwa (KP). The Peshawar Electric Supply Company (PESCO) reports that up to 60% of electricity is lost, meaning they only collect a fraction of the billed amount due to theft and inefficiencies. This has forced PESCO to impose load-shedding in areas with low bill recovery, under the idea that less electricity sold means less waste. Provincial leaders, including Chief Minister Ali Amin Gandapur, are demanding that power cuts not exceed 12 hours, to ensure fair treatment for honest citizens. However, PESCO wants Ali Amin Gandapur to use his influence to ensure people pay their bills and reduce theft.

The ongoing load-shedding disrupts economic activities and causes social unrest, highlighting the complex problems Pakistan faces in solving its energy crisis.

The Prime Minister was also briefed on a recent meeting with the Chief Minister of Khyber Pakhtunkhwa (KP), where assurances were made to curb electricity theft in the province. He appreciated this progress and expressed optimism about collaborative efforts to address these issues.

In the Summer 2023, the shortfall was well above the 7000 MW. Loadshedding in the urban centers varies from 4-5 hrs a day while in rural areas 10-12 hrs a day.

In Summer 2022, the short fall was more than 10,000 MW while loadshedding in the urban center was around 8hrs a day. In rural areas around 16-18 hrs a day.

The loadshedding in the urban centers from 2006 to 2016 was around 8hrs a day. In rural areas, more than 18hrs a day. In 2022-23, dangerous revival of energy.

## **Expensive electricity generation is the major problem of Pakistan:**

As the country generates the most expensive electricity in Asia and 3<sup>rd</sup> most expensive electricity generated in the World. (PM of Pakistan)

The National Electric Power Regulatory Authority (Nepra) announced a nearly 20% increase in the uniform national tariff to secure approximately Rs3.8 trillion for the 10 ex-Wapda electricity distribution companies (Discos) during FY 2024-25.

Effective July 1, the Rs5.72 per unit hike will generate Rs485 billion in additional revenue and support the government's IMF bailout efforts. This raises the average national base tariff, including K-Electric, to Rs35.50 per unit from Rs27.78, translating to Rs3.763 trillion in revenue for Discos, excluding taxes.

With an 18% general sales tax, the base tariff jumps to Rs42 per unit, imposing an extra Rs580 billion burden on consumers. The industrial sector will benefit from a Rs10.69 per unit cut, shifting a negative revenue impact of Rs200 billion to domestic and commercial consumers.

Nepra's determination includes a power purchase price (PPP) of Rs3,277.506 billion, with capacity charges comprising 65% of the PPP. Factoring in losses and margins, the average tariff reaches Rs35.50 per unit, driven by rupee devaluation, high inflation, interest rates, new capacities, and low sales growth. The real applicable average national tariff, including surcharges and adjustments, will range between Rs65 and 72 per unit, meeting IMF requirements for energy sector reforms.

domestic unit charges vary from 24 to 65 PKRs. The price of per unit decided on the basis of SLABS being introduced by NEPRA. Below 100 units (1-100units) the cost is almost 28Pkr including all the taxes and other charges. From 100–300-unit slab price is 44 Pkr per unit including all the taxes and other charged. From 300-600 unit slab the cost is about 56 pkr per unit. Above 600 units the minimum price per unit is 72 pkr.

In commercial (markets, industry, agriculture), it varies from 48 to 90+ PKRs per unit cost. Slabs are also vary the prices per unit. The prices got almost more than 3 times in the last two years. The cost of domestic unit of slab 300-600 unit, 18pkr in 2022, now the price rises more than 56 Pkr.

## **REASONS OF EXPENSIVE ELECTRICITY IN PAKISTAN:**

- Pakistan produces expensive electricity due to a combination of factors including
- high reliance on imported fossil fuels
- inefficient energy mix, substantial transmission
- distribution losses
- chronic issues like circular debt and regulatory inefficiencies.
- The outdated infrastructure and inefficient power plants further exacerbate costs,
- while underutilization of domestic resources such as hydropower and coal add to the problem.
- Additionally, fluctuations in foreign exchange rates and complex tariff structures contribute to higher electricity prices.

- High power cost is one of the key factors that leads to spiraling inflation.

According to the Pakistan Bureau of Statistics, the electricity charges had increased by 58.8 percent until May this year/2024

Laveet Kumar, who holds a PhD in Renewable energy, told Global Voices via WhatsApp:

*Pakistan is currently grappling with a severe energy crisis marked by frequent power outages, gas shortages, and an overall imbalance between energy supply and demand. This crisis, driven by outdated infrastructure, poor energy management, financial constraints, and a heavy reliance on conventional energy sources which not only impacts the industrial productivity but also affects the daily lives of millions.*

### **1. Pakistan generates more than 60% electricity through Hydrocarbons (HC).**

12000 MW electricity units are installed capacity of diesels, more than 7000 MW of LNG, around 6500 MW of coal. Diesels is most expensive; LNG is the second most and 3<sup>rd</sup> the Coal. Almost all the HC being consumed for production of electricity are imported. All the diesels, LNG, petrol and majority of Coal is being imported. The prices of HC jumped up in international market after the war in Ukraine and Sanctions on Russia. All the HC has been purchased in Dollars while Rupee has been devalued against dollars. In 2021, if 1-billion-dollar oil is import had a cost of 178 billion Pkr, today it has more than 275 billion Pkr.

It also effects our environment as refineries lead to the carbon emission which eventually cause the climate change. In recent years, Pakistan has experienced significant fluctuations in its per capita CO<sub>2</sub> emissions, with an average annual growth rate exceeding 3.4%. The primary sources of these emissions include cement plants, transportation, agriculture, gas processing, power plants, and refineries. In terms of geographical contributions, Sindh accounts for over 22 million tons of CO<sub>2</sub> emissions. It is followed closely by Punjab, which exceeds 20 million tons. With the use of coal, this is likely to rise sharply.

In relative terms, while Pakistan is the least contributor to global carbon footprints (roughly around 0.7% globally), it is one of the ten most affected countries by global warming and climate crisis. But it doesn't mean Pakistan and its industrial sector absolved of decarbonisation responsibilities. The country's steady transition from an agriculture-led economy to an industry-led economy is increasing its energy consumption as well as carbon emissions.

The National Energy Efficiency and Conservation Authority (NEECA) has made certain commitments to reduce carbon emissions by 2030. Table below, in this regard, shows the energy demand. The primary energy source in Pakistan is hydrocarbons – reflecting that by properly regulating the existing supply system, about 5.3 MtCO<sub>2</sub>-e of GHG emissions can be slashed.

**Table 1: Industrial climate mitigation in industrial sector by 2030**

| Sector                     | Energy demand reduction (Ktoe) | GHG emission reduction (MtCO <sub>2</sub> -e)* |
|----------------------------|--------------------------------|--|
| Textile                    | 359.3                          | 1.45   |
| Food and beverage industry | 136.1                          | 0.32   |
| Brick/Kiln                 | 404.4                          | 0.94   |
| Cement                     | 250.1                          | 0.91   |
| Wood and paper             | 63.6                           | 0.15   |
| Fertilizer                 | 665.1                          | 1.56   |
| <b>Total</b>               | <b>1,878.6</b>                 | <b>5.33</b>                                    |

**Challenges faced by industry in transforming from fossil fuel to clean energy**

## **2. Expensive agreements with IPP (Independent power producers)**

In september 2023, President of Hyderabad Chamber of Small Traders & Small Industry *Muhammad Farooq Shaikhani* has said that the main reason for the electricity crisis in Pakistan is the contracts made with Independent Power Producers (IPPs) along with electricity stealing and the consequences are always borne by the traders and the people in the form of non-availability of electricity and expensive electricity.

He said that the total number of independent power producers in Pakistan is 49, out of which 41 are thermal plants and 8 are hydro plants, which together generate about 19,000 MW of electricity, while Pakistan's electricity consumption has never exceeded from 31,000 MW.

This means that if the government of Pakistan wants, it can review the contracts with these Independent Power Producers (IPPs) and reduce the production of electricity by up to 10,000 MW from these Independent Power Producers, which will not only affect positively Pakistan's dollars reserves but it will also have great effects on the country's economy.

Independent power producers or the private sector producers produces electricity from HC. These IPP were installed in 1994, 2005 (1994 and 2005 were installed because the generation capacity was less and the demand was more)

While in 2011 and 2014 (2011 and 2014 IPPS were installed in order to minimize dependency on oil and shift to LNG and coal).

- The more the increase in demand, the more the IPPs got installed. First and the major reasons for expensive electricity is the capacity payments made to IPPs. In Summers, the demand is on the peak as in July 2023 it was around 28,000 MW while in winters it reduces by more than 50% as in January 2023 it was less than 14000 MW.
- The agreement with IPP is being signed on the basis of maximum demand. In Summers the state has to purchase the maximum demand while in winter it reduces (normally it reduces to 40%). The state has to purchase this much electricity the minimum.

- But if the state does not purchase, the required volume of electricity yet again it has to pay the price. whether state purchases or not purchases electricity at all from an IPP yet again the govt has pay off atleast 33% of the total payment 33 to 40 %. Unprecedented increase in the capacity payment which is currently **2.8 Trillion Pkr.**
- Electricity consumers are set to pay capacity payments amounting to Rs2. 8 trillion during the upcoming financial year 2024-25. These payments account for 70% of the electricity tariff for consumers, with the remaining 30% attributed to energy costs.
- All the IPPs Payment are being paid in Dollars. As far the external IPPs has send they. Must have to pay in dollars, but locally owned IPPs has being paid in Pkr. Unfortunately, we have paid the local IPPs in dollars that results into decline in the dollar reserves.

Problem statement ---installed capacity is more and the requirement is less which reflects Pakistan's mismatch between its electricity generation capabilities and actual demand.

### **3. The conditionalities of IMF results in making electricity more expensive:**

In 2024, The International Monetary Fund (IMF) has imposed additional conditions on Pakistan, which significantly impact the energy sector and exacerbate the ongoing energy crisis. Among these conditions is the requirement to increase power tariffs, further burdening consumers already struggling with high electricity costs.

*Sajid Amin* on July 2024, a senior economist and deputy executive director at the Sustainable Development Policy Institute (SDPI), said the government had **“no option but to secure the IMF loan program.”** Amin warned the upcoming IMF program would be the **“toughest”** one for the government as it would not be easy for it to complete it. The IMF has urged Pakistan to overhaul its SOEs and introduce tax, energy and power reforms. Pakistan has had to take painful measures in line with the IMF’s demands since 2022, which included hiking fuel and food prices.

In 2022 The IMF criticized Finance Minister Shaukat Tarin's budget for fiscal year 2022 for increasing macroeconomic vulnerabilities, particularly due to significant fiscal relaxation and the reversal of tax revenue commitments. The IMF report highlights the need for new personal income tax legislation and the reduction of tax credits and allowances, which will likely double the tax burden on the salaried class.

Additionally, the government must implement the second step of energy subsidy reform for residential consumers, including withdrawing previous slab benefits and raising tariffs by at least 50 paisas per unit. These measures, coupled with the ongoing load-shedding and inefficiencies in the energy sector, underscore the complex challenges Pakistan faces in achieving energy sector viability and economic stability amidst stringent IMF conditions.

In oct 2022, the Agreement with IMF renegotiate. In March 2023, it renegotiated again. IMF conditioned the provision of loan to Pakistan with the increase in per unit price of electricity. To do that subsidies should be waved off. Secondly The fuel prices would be increased in Pakistan more than 60% of electricity is produced by fuel. Thirdly, make rupee devalue. The devaluation of Pkr resulted in further in the prices of electricity. Hydrocarbon is purchased in dollars, furthermore IPP are also paid in dollars whereas the rupee devalued against dollars. Resultantly the unprecedentedly price hike of electricity in Pakistan.

#### **4. Problems with the electricity distribution and transmission system results in loadshedding and expensive electricity.**

Theft/losses of electricity and less recoveries of bills are the main contributors of circular debt accumulation.

Pakistan's electricity distributors, including K-Electric, underperformed significantly in 2022-23 due to poor governance, resulting in a Rs 1 trillion annual financial shortfall and increasing the country's energy sector circular debt by an extra Rs 350 billion.

The total loss in the transmission and distribution system is aprox. 33%. Out of which, in transmission it is 17%. As the transmission line of Pakistan is seriously outdated. Majority of them has got expired either before 2000 or 2010. Resultantly the line lost in Pakistan is highest in Asia which is 17%. This line lost in China is 3%. Approx. 9% in India and Bangladesh. Around 12% in Afghanistan. This means out of 100 MW being produced and 17 MW being lost in lines. The cost of it to be afforded by the state and consumer.

Secondly, there are numerous problem in distribution system, that result in 16% loss in eelectricity sector. One of the major reasons for the increase in electricity prices is electricity theft. In South Asia, Pakistan is on the top of the list. The common pahern of electricity theft is the Konda system, temper the meter reading etc. This electricity theft in urban centers, Karachi is the top most city, while there is no single city where electricity theft is not reported. In urban centers it is mostly done by industrialist and builders while in rural areas it is by agriculturist who use to thief. This electricity theft in common areas where the writ of the state. Moreover, there are a series of areas in Pakistan specially the ex- tribal areas, there is no concept of electricity bills. Pending of bills on the Government departments, free and subsidies electricity in certain departments in Pakistan which results in 16% loss.

### **IMPACTS**

#### **1) Impact on Pakistan's Industries and Economy**

The price of the product is decided on the basis of the purchase of raw material, transportation cost, labor rates and the price of electricity. On one hand the state has not be able to ensure the non-stop supply of electricity. On the other hand, the generation cost of electricity has been increased three times that has resulted in higher production cost of industrial products. Therefore, the products of Pakistan not been able to compete in international market those



which are produced in Bangladesh and India, resultantly decline in exports especially in textile, leather, sports products etc. Industry is the worst hit. More than 200 industries closed in Pakistan since last 3 years.

Multiple factors are responsible, unprecedented rise in electricity is the major reason.

- The production, economic, industrial and trade activities of Pakistan are badly affected due to the current industrial, financial and energy crisis. As industries continue shutting down the workers will get unemployed and will take on streets.
- In other countries of the world, government helps industries by providing numerous incentives along inputs at cheaper rate which in turn increase productivity, exports, and competitiveness in the global market and thus ultimately boost their economy.
- But in Pakistan most industries are not self capable of generating power and also distressed with heavy taxes and costly energy supply with continuous disruption which results in loss of output production especially textile industry whose exports are restricted to a very low level and are shutting down or either shifting to the neighbor countries.
- For short-run Pakistan is implementing various strategies such as payment of circular debt, coal based 600MW electricity plant at Port Qasim with the help of China, 10,000 acre solar park in Punjab with Chinese support and importing electricity from Iran but for long-run government promptly needs to take some serious steps on priority basis to completely end energy crisis

2) **Setback for the agriculture sector:**

More than 30% of Pakistan's agriculture relies on tube wells and digwells, most of which are powered by electricity. Frequent load-shedding severely disrupts agricultural operations, leading to reduced productivity and higher operational costs. As electricity prices increase, the cost of running tube wells rises, which in turn raises the cost of agricultural products. This not only affects the livelihoods of farmers but also contributes to overall inflation in the country.

3) **Economic Impact on Exports and Imports**

As the cost of agricultural products in Pakistan increases due to higher electricity prices and frequent load-shedding, these products become less competitive in the international market. This leads to a decrease in exports and an increase in imports, placing additional pressure on the country's dollar reserves. To improve dollar reserves, the government is compelled to acquire loans from the IMF and other sources, further entangling Pakistan in a cycle of debt and economic instability.

4) **Implications on domestic life:**

More than the 40% of the earning of lower middle class is being consumed by the electricity bills because there has been unprecedented increase in per unit price of electricity. This has negatively impacted disturbed the routine domestic budget of every house hold. Repeated load shedding effected the domestic life.

The crisis in Pakistan has serious socioeconomic, developmental, psychological and political impacts. These include, but are not limited to, economic instability and industrial downfall; high unemployment and abject poverty; skyrocketing inflation and the exorbitant cost of living; social

alienation and suicide; rampant corruption and political instability; lawlessness and a high crime rate; frustrations and psychological ailments.

### **5) Impacts on Commercial market:**

The commercial markets in Pakistan have been severely affected by the rising cost of electricity, which has nearly tripled in recent years. Shopkeepers are forced to incorporate the increased electricity costs into the prices of their products, passing the burden onto consumers. Additionally, frequent load-shedding during peak shopping hours compels businesses to rely on generators, further increasing operational costs. These additional expenses are ultimately transferred to buyers, making goods more expensive and reducing overall consumer spending. This situation exacerbates the economic strain on both businesses and consumers, contributing to the broader energy crisis.

### **6) Public life:**

Because of loadshedding, deindustrialization is under process. Results in increase in unemployment. The price of commercial unit has increased. Therefore, the shopkeeper is bound to add the cost of electricity to the final cost of the product. On one hand purchasing capacity of people decline on the other the earning of the businessman is tremendously curtailed. Therefore, electricity tariffs have become the major socio-economic problem of the country that has been far reaching negative implication on the national life of the country.

## **SOLUTIONS:**

### **1. Renegotiate the agreements of IPPs.**

The agreement signed in 1986, 1991, 1994, 2002, and 2005 should have been negotiated long time ago but unfortunately decades long delay was made by the successive governments. Until 2020, when these agreements were renegotiated no more capacity payments, local IPPs would pay off in Pkr. It was a positive development but it has solved the problem maximum by 40%. As majority of IPPs being installed in 2011 and 2014, which cannot be renegotiated till 2028.

Key Points for Renegotiating Agreements with IPPs

#### **1. Currency Mismatch:**

- IPPs earn in dollars but receive payments in rupees, causing financial strain.

#### **2. Generous Contract Terms:**

- IPPs have agreements with 15% returns in dollars and full tax exemptions, making it hard for the government to meet obligations.

#### **3. Circular Debt Issue:**

- Structural problems, like these favorable terms, contribute to the circular debt, harming the economy and hindering growth.

#### **4. Overcapacity and Idle Plants:**

- Pakistan has more generation capacity than needed, leading to high capacity payments, especially for idle plants (Rs. 1.3 trillion for idle plants alone).

#### 5. 1994 Policy Contracts:

- Investors from the 1994 policy should be asked to accept payments in rupees and only if their rates are competitive and affordable.

#### 6. 2002 Policy Contracts:

- Investors, mostly Pakistanis, should accept a significant percentage of capacity-related obligations upfront and renegotiate their contracts afterward.

#### 7. Public Sector GENCOs:

- Approach should be similar to the 1994 policy IPPs, including renegotiating terms with banks and addressing invoicing currency issues.

#### 8. Chinese IPPs (2016/17):

- These projects have a 20% return rate in dollars, higher than earlier projects. They might resist changes, so alternative strategies like allowing market trading of some capacity should be considered.

#### 9. 2022 Policy IPPs:

- As cheaper hydro and renewable projects come online, consider stopping purchases from more expensive thermal power generators by using the 'pay' option in the 'take or pay policy'.

#### 10. Complementary Reforms:

- Simplify the tariff structure to increase electricity consumption and reduce capacity payment obligations.

- End free/concessional electricity for certain groups, including WAPDA and DISCO employees, which costs over Rs. 25 billion annually.

- Force government defaulters to pay their electricity dues.

- Outsource DISCO management and install smart meters to tackle technical and distribution losses, reduce corruption, and improve recovery of dues.

- Right-size the workforce in the sector, addressing overstaffing and improving skill levels.

## **2. Install local and cheaper electricity projects.**

Energy policy 2030, focuses on indigenization of electricity generation. 15000 MW of electricity would be produced from hydel projects, in which diambasha dam would add 4500 MW by 2029, Dasu would add 4300 MW by 2027, Mumand dam 800 MW by 2025, Karot has already started generation of 730 MW, Sukhi kinari would 883 MW

etc. Secondly increasing focus on electricity from local coal of Thar, as one project of 1320 MW, and 4 projects of 320 MW each are already completed. Thirdly, 4500 MW would be produced by wind turbines and 3000 MW from solar projects. The objective of Pakistan is to achieve zero percent of dependency on important hydrocarbons for electricity generation by 2030.

### **3. update the transmission lines**

Though it is an expensive phenomenon but the country is in dire need of changing the outdated transmission lines. The local transmission and the broader network NTDC (National transmission dispatch) needs to be changed. The line lose and the electricity thel would be greatly reduced.

### **4. Improving State Governance and Enforcement**

The state must strengthen its authority to curb electricity theft and ensure timely bill payments. Additionally, the state should enforce policies to ensure that no department receives free electricity. This will improve revenue collection, reduce losses, and create a fair and sustainable energy sector.

### **5. Privatization of Electricity System with State as Regulator**

Privatizing the electricity system entails transferring ownership and management to private entities, while the state retains its role as regulator. This approach aims to introduce efficiency, competition, and innovation into the sector, potentially improving service delivery and reducing operational inefficiencies. By acting as a regulator, the state can ensure adherence to standards, protect consumer rights, and promote fair market practices. This model seeks to enhance accountability and transparency while fostering a more sustainable and reliable electricity infrastructure.

## **The Way Forward**

- Power sector need swift Governance policy reforms
- Business model to boost Renewable energy
- Liberalization of energy Market
- Renegotiation of tariff Packages
- Deregulation of Administrative and Operational activities of The distribution companies
- Public private partnership
- Implementation of Accelerated reforms for Modernization

## **THE PROMISE OF ALTERNATIVE ENERGY**

Alternative energy sources, such as solar, wind, hydroelectric, and biomass, offer a way out of this energy predicament as envisioned under ARE Policy. These sources provide a range of benefits that align with Pakistan's unique geographical and climatic conditions. Solar Energy: Pakistan boasts abundant sunlight throughout the year, making solar energy a viable option. Large-scale solar farms and rooftop solar installations can significantly augment the energy supply. By harnessing solar power, Pakistan can reduce its dependence on imported fossil fuels and minimize carbon emissions.

**Wind Energy:** The coastal areas of Pakistan, particularly in Sindh and Baluchistan, have substantial wind energy potential. Installing wind turbines can provide a steady source of clean electricity. Wind power can diversify the energy mix, reducing the strain on conventional sources and promoting sustainability.

**Hydroelectric Energy:** Pakistan's geography is characterized by rivers and water bodies. Developing hydroelectric power plants can not only generate substantial electricity but also regulate water flow for irrigation and flood control. This approach addresses both energy and water management challenges.

**Biomass Energy:** Agricultural residues and organic waste can be converted into biofuels and biogas. This not only helps manage waste but also generates renewable energy. Promoting biomass energy can provide additional benefits to rural communities by creating local employment opportunities.

**Geothermal Energy:** Although largely untapped, Pakistan has significant geothermal potential, particularly in regions with active tectonic activity. Geothermal energy can provide a stable and continuous source of power, reducing the reliance on intermittent renewable sources.

## **Benefits and Challenges of Alternative Energy Adoption**

### **Benefits:**

- **Sustainability:** Alternative energy sources are renewable and do not deplete over time, ensuring a long-term and sustainable energy supply.
- **Reduced Environmental Impact:** Unlike fossil fuels, alternative energy sources produce little to no greenhouse gas emissions, mitigating climate change and improving air quality.
- **Energy Independence:** Relying on domestic renewable resources can decrease dependence on imported fossil fuels, enhancing energy security and reducing the impact of global oil price fluctuations.
- **Employment Opportunities:** The transition to alternative energy requires skilled labour for installation, operation, and maintenance, potentially creating jobs and stimulating economic growth.

### **Challenges:**

- **Initial Costs:** The upfront investment required for infrastructure and technology can be substantial, deterring immediate adoption.
- **Intermittency:** Some alternative sources, such as solar and wind, are intermittent, requiring efficient energy storage solutions to ensure continuous supply.
- **Infrastructure Development:** Establishing the necessary infrastructure, such as power grids and transmission lines, is essential but can be challenging, especially in remote areas.

- Policy and Regulatory Framework: A supportive policy environment, including incentives and regulations, is crucial to encourage private investment and innovation in the alternative energy sector.

**Conclusion:**

Above steps mentioned steps will be taken, not only loadshedding would be over with that would help to decrease the overall price per unit.