Energy, POL, Gas/LNG, Policies, Strategies and Practices in relation with the Industrial Development in Pakistan

Sami Ullah[1], Muhammad Tufail [2], Hafiz Laeeq-ur-Rehman[3], Muhammad Anadil Khan[4]

Jehanzeb Khan Orakzai [5], Dr. Muqeem ul Islam [6]

Citation:
Ullah, S., Tufail, M., Laeeq-ur-Rehman, H., Khan, M. A., & Orakzai, J. K. & Islam, M. U Energy, POL, Gas/LNG, policies, strategies, and practices in relation to the industrial development in Pakistan. Khyber Journal of Public Policy, Summer 2023, 2(2)

Article Info:
Received: 31/03/2023
Revised: 07/04/2023
Accepted: 10/04/2023
Published: 24/04/2023

Abstract:

Energy plays a critical role in the social and economic development of a nation, serving as the backbone of its economy. However, energy crises can lead to negative impacts, including reduced agricultural yields, decreased industrial output, higher inflation, and rising poverty levels. Pakistan, experiencing severe energy shortages, faces escalating demand coupled with insufficient supply, leading to significant disruptions in key sectors such as agriculture and industry. The fertilizer industry has been particularly affected, with gas shortages causing production interruptions. Additionally, the energy sector's reliance on expensive thermal power generation has exacerbated financial strains, contributing to a circular debt crisis. This paper analyzes the existing energy policies, strategies, and practices in Pakistan and identifies key challenges such as unclear policies, overemphasis on large-scale projects, and limited private sector involvement. It concludes with recommendations for short-term, medium-term, and long-term actions, including enhancing private sector participation, improving energy conservation, and investing in renewable energy solutions to ensure sustainable energy management.

Key words: *Energy crisis, industrial development, Pakistan, energy policies, circular debt*

[1] *Provincial Management Service-Khyber Pakhtunkhwa, Email: gulwareenbaz@gmail.com*
[2]*Provincial Management Service-Khyber Pakhtunkhwa , Email:tufailkhattak007@gmail.com*
[3]*Office Management Group , Email: laeeqrehman1975@gmail.com*
[4]*Inland Revenue Service , Email: anadilkhan.irs@gmail.com*
[5] *Faculty Advisor, national Institute of Management, Peshawar, Email: janzeb@gmail.com*
[6] *Chief Instructor, National Institute of Management Peshawar, Peshawar, Email: muqeemci@nipapeshawar.gov.pk*

Introduction

Energy is the backbone of an economy, playing an important role in improving the social structure and building a strong economic foundation. However, when a nation undergoes an energy crisis, it experiences a negative impact on its social and economic spheres, especially. What we see today are lower agricultural yields, decreased industrial output, lower Gross Domestic Product (GDP), higher inflation, unemployment, and poverty. Unfortunately, Pakistan is on the list of countries experiencing the worst form of the energy crisis. Energy demand has increased and is expected to reach higher levels in the years to come. Load-shedding has disrupted economic activities in Pakistan, with capacity utilization in some key industries falling to almost 50 percent. The fertilizer industry is the worst affected, as it has faced interruptions to its gas supplies, forcing closures in various areas.

As far as the fertilizer industry is concerned, Pakistan has the capacity to produce more than one million tons of exportable surplus urea, but the energy crisis has decreased this annual production level, and Pakistan now has to import urea. As a result, the decrease in urea exports has eroded the country's foreign exchange and led to the payment of millions of dollars in subsidies. In the absence of electricity, oil, and gas, most industrial units remain closed. Those that are still functioning are gradually moving toward closure or relocation to neighboring and other countries. Similarly, unscheduled shutdowns and termination of electricity have severely affected agricultural productivity. Load-shedding has also hindered the production of insecticides, pesticides, and fertilizers, pushing the sector into decline.

Specifically, the emergence of circular debt in the energy sector is due to the increased dependence on expensive thermal oil power generation. The slippages in bill payments, particularly by public institutions, trigger a chain of delayed payments for imported furnace oil, natural gas, and other inputs for thermal production. The world is facing an energy shortage, which has sent shockwaves from Europe to Asia, and Pakistan is no exception. The energy industry in Pakistan is in crisis due to a lack of energy output to meet the country's rising demand over the past few decades. Pakistan is now reliant on imported energy resources such as gas and oil. According to Cheema (2022), Pakistan may face an extremely challenging and disastrous winter as a result of the lack of long-term energy management strategies by policymakers.

The conflict between Ukraine and Russia has caused fuel prices to soar, endangering the supply chain and making it difficult for Pakistan to maintain the effective operation of its power plants. Many LNG companies have broken their agreements with Pakistan. Long-term LNG suppliers have canceled several shipments scheduled for delivery in recent months, further tightening supplies, which has directly resulted in complications for Pakistan. As a result, Pakistan is now forced to buy costly LNG. Moreover, the circular debt, currently at a staggering 2.5 trillion Pakistani rupees, is 10% higher than it was in the previous fiscal year. By 2025, it is anticipated to reach 4 trillion Pakistani rupees, according to studies. Due to the severe financial burden this is placing on our meager foreign exchange reserves, OGDCL and PPL are unable to expand into new markets, as their revenue is trapped in a vicious cycle of debt. The lack of new investment in exploratory initiatives, following declining oil and gas reserves, is concerning and does not bode well for the nation.

Apart from the aforementioned reasons, other contributing factors include decreasing gas supply and dependence on oil, unrealistic power tariffs (leading to low investments), poor payment recovery, inefficient revenue collection, overpopulation, and overuse.

Problem Statement

Energy is undoubtedly the backbone of any economy and plays a pivotal role in the economic development of a country. In Pakistan, the high cost of electricity and gas, coupled with frequent power outages and dependence on imported oil/LNG, has led to a decline in industrial productivity and competitiveness. Pakistan has recently been hit by a severe energy crisis, which has adversely affected the performance of all sectors, with industry being the worst affected due to the increased demand for energy. Pakistan has not been able to keep pace even with the developing countries of the world and has thus failed to achieve the desired economic growth. Consequently, several industries have been compelled to shut down or relocate outside the country due to increased production costs and low profit margins. This is a critical situation that warrants immediate attention and a thorough understanding of the bottlenecks in policies and strategies, along with practicable recommendations for moving forward in the current situation.

Scope

The scope of this public policy document is to critically analyze the capacity, preparedness, output, policies and processes of energy sector in Pakistan and its impacts on industrial development. This research will also cover role

of the energy sector in industrial development in Pakistan in comparison with best practices around the world.

After investigating issues and challenges, the paper will dilate upon the policy recommendations.

Research Methodology

Qualitative research method has been used for this research. Primary data has been collected from Power Division and Petroleum Division, whereas, secondary data has been collected from Economic Survey of Pakistan 2021-22, Newspapers, Journals and case studies. Data has been analyzed in the context of the energy, POL, Gas/LNG, policies, strategies and practices in relation with the Industrial development of Pakistan. Situational analysis of the capacity, preparedness, output, policies and processes of energy sector in Pakistan was carried out. In addition, its impact on national economic development of Pakistan and analysis of legal and institutional framework of energy sector in Pakistan were conducted. Comparative analysis of the role of energy sector of Pakistan in industrial development with the best practices around the world was carried out. SWOT-EETH analysis of energy sector in order to promote industry in Pakistan for each related policy, legal and institutional framework separately and GAP analysis was also carried out.

Literature Review

Energy is the backbone of an economy and plays an important role in improving the social structure and establishing a strong economic foundation (Economic Survey, 2021-22). However, when a nation undergoes an energy crisis, it experiences a negative impact on its social and economic spheres, especially. Unfortunately, Pakistan is among the countries experiencing the worst form of the energy crisis. Consequently, some key industries have shut down their operations, and their output has fallen to almost 50 percent.

The fertilizer industry is the worst affected, as it has faced interruptions to its gas supplies, forcing closures in various areas. Pakistan has the capacity to produce more than one million tons of exportable surplus urea, but due to the energy crisis, Pakistan has to import urea. As a result, the decrease in urea exports has eroded the country's foreign exchange.

Industrial growth has a positive and significant impact on the overall GDP (Gross Domestic Product) of Pakistan, with the industrial sector contributing 18% to GDP. Many countries, including Taiwan, China, and Korea, are prime examples of the positive relationship between industrial growth and GDP. The industrial sector has also shown an impact on exports and imports with respect to the balance of payments. According to the World Bank (2005), electricity serves as an important input for the industrial sector, especially for developing countries like Pakistan. For the regulation of electricity, the National Electric Power Regulatory Authority (NEPRA) has played an important role. Since 2005, Pakistan has experienced serious electricity crises due to peak demand from both domestic and industrial consumption. The Economic Survey of Pakistan (2008) clearly indicated that to meet current demand, the concerned authorities must enhance generation capacity by 50%.

To promote the effective and sustainable development of renewable energy, the Chinese government has formulated a series of policies on renewable energy development, including laws, regulations, economic incentives, research and development, industrial support, and government renewable energy model projects. Denmark has converted its energy systems into a 100% renewable energy system. It is concluded that such large-scale renewable energy development is possible if the government develops strategies for integrating renewable energy into coherent energy systems influenced by energy savings and energy efficiency measures (Lund, 2007). According to Cheema (2022), Pakistan might face an extremely challenging and disastrous winter as a result of the lack of long-term energy management strategies by policymakers.

ANALYSIS OF LEGAL FRAMEWORK OF ENERGY SECTOR IN PAKISTAN

Article 157(1) of the 1973 Constitution of the Islamic Republic of Pakistan provides for electricity as follows: "The Federal Government may, in any Province, construct or cause to be constructed hydro-electric or thermal power installations or grid stations for the generation of electricity and lay or cause to be laid inter-Provincial transmission lines." Article 158 provides: "The Province in which a well-head of natural gas is situated shall have precedence over other parts of Pakistan in meeting the requirements from that well-head, subject to the commitments and obligations as on the

commencing day." Nuclear energy is included in the federal legislative list of the 1973 Constitution of Pakistan.

The WAPDA Act of 1958 provides for the regulation of water and power from hydro resources in Pakistan. Regulation of nuclear energy is addressed through the Pakistan Atomic Energy Commission Ordinance, 1965.

The Pakistan Council of Renewable Energy Technologies Act, 2018 provides for the acquisition, development, and dissemination of techniques and processes for the promotion and propagation of photovoltaic, solar, thermal, hydrogen, biogas or biomass, mini or micro hydro, wind, and other alternative and renewable energy techniques; (b) establishing facilities and expertise for developing suitable technologies to produce materials, devices, and appliances in the fields of alternative and renewable energy sources; and (c) organizing, coordinating, promoting, and executing research and development in the fields of alternative, new, and renewable energy technologies.

The National Electricity Policy 2021 was issued by NEPRA. Other policies include the Alternative and Renewable Energy Policy, 2019; Power Generation Policy, 2015; Transmission Line Policy, 2015; Power Policy, 2002; Hydro Policy, 1995; Framework Guidelines (Fast Track); Solar PV Initiative 2022; Petroleum Act, 1948; Petroleum Policy, 2012; Marginal Field Guidelines; Fare Gas Guidelines; Low BTV Gas Policy; Model Petroleum Concession Agreement, 2013; Pakistan Petroleum Exploration and Production Rules, 2013; Petroleum Act, 1934; Mines Act, 1923; Regulations of Mines and Oil Fields Minerals Development Government Act, 1948; Minerals Policy, 2013; LPG Policy, 2016; LNG Policy, 2011; Fertilizer Policy, 2001; SME Policy, 2021; and the Auto Industry Development Export Policy (2021-26).

Analysis of Institutional Framework of Energy Sector in Pakistan

Under the institutional framework, Ministry of Energy and Power Division and Petroleum Division as well as Ministry of Industries and Production. Regulatory authorities include ODGCL, SNGPL, SSGPL, NEPRA and WAPDA and DISCOS.

Situational Analysis of Capacity, Preparedness, Output, Policies and Processes

Pakistan's energy sector remains one of the main obstacles to economic growth. Although Pakistan has managed to increase power generation since 2013 and mitigate power blackouts that plagued the country over the past decade, expensive fuel sources, a reliance on imported energy products, chronic natural gas shortages, major debt in the power sector, and aging and insufficient transmission and distribution systems have prevented the sector from growing and modernizing.

This policy document presents the Energy Outlook in relation to the industrial development of Pakistan, with an analysis of the country's energy mix in oil, petroleum oil lubricants (POL) products, gas including liquefied natural gas (LNG), coal, liquefied petroleum gas (LPG), and electricity. To forecast future energy demand, an accurate contemporary energy demand model, historical consumption trends of the energy sector, and its linkage with industrial development and macroeconomic parameters such as gross domestic product (GDP), population, energy prices, and other key indicators have been considered. The data for these variables has been obtained from relevant sources. The research primarily focuses on supply and consumption side analysis, forecasting primary energy demand for the future, an energy balance for different sectors, and a set of recommendations for supply/demand.

Oil & Petroleum Products: Historically, imported and local POL products were the major energy sources for the economic sector and power generation in the country. Presently, their use has been reduced to 22 percent of the energy mix, mainly due to the government's policy to phase out furnace oil (FO)-based power generation in the country.

Forecast results show an increase in POL consumption from 17.03 million tons in 2020 to 24.15 million tons by 2030. On the supply side, due to limited upstream exploration of oil, oil production will decrease with an annual compound growth rate (ACGR) of negative 4 percent. For future sustainability in oil and POL, upgradation/expansion of refineries is necessary to reduce oil and POL imports. A national oil logistics and infrastructure study should be conducted to identify long-term solutions for refining plans and demand growth.

Natural Gas including LNG: For decades, natural gas has been the leading energy source to serve sectoral and power generation needs. Currently, natural gas accounts for 40 percent of the energy mix. Due to the continuous depletion of local gas reserves, the supply gap is filled with imported LNG to meet rising demand.

Forecast results show that sectoral consumption will reach 1,337 billion cubic feet (CFt), while the share of natural gas in power generation will reduce to half by 2030. On the supply side, upstream gas production in the country has depleted by an ACGR of negative 5 percent. To bridge the gap between demand and supply of gas, the expansion of LNG import infrastructure will be needed to accommodate the import requirement of 1,900 million cubic feet per day (MCFD) by 2030. Moreover, recommendations such as shifting captive power plants (CPPs) from gas to the national grid, LNG cost optimization and terminal management, importing natural gas from neighboring countries, and constructing a North-South pipeline to transfer imported LNG from the port to the northern regions of the country have been suggested.

LPG: Compared to historical trends, an increase in the primary supply of LPG in the country has been observed. Significant investment in LPG supply has helped the domestic and commercial sectors substitute natural gas. LPG has covered energy needs in areas where natural gas supply disruption exists or where a distribution network is absent. Forecast results predict a 50 percent increase in LPG demand within the domestic, commercial, and transport sectors. The energy balance for LPG shows that the supply side should improve to cater to the growing LPG demand in the country. To serve this purpose, the private sector should enhance its investments in the import and improvement of supply, logistics, and marketing of LPG, particularly in remote areas of the country.

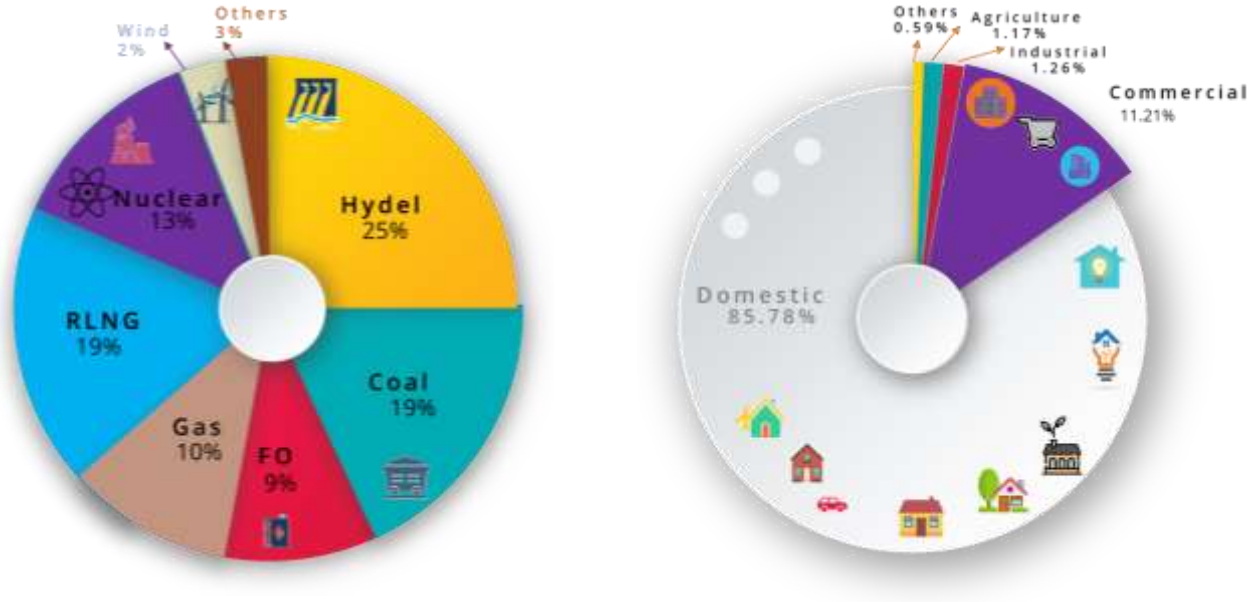
Coal: Coal has historically been used in power generation and industries, including brick kiln and cement industries. Currently, Pakistan has abundant coal reserves to meet the future coal needs of the country. Advancements in coal-use technologies have replaced a fair share of oil and gas in the industrial sector. Forecast results show that coal-based power generation will double coal consumption in the country by 2030.

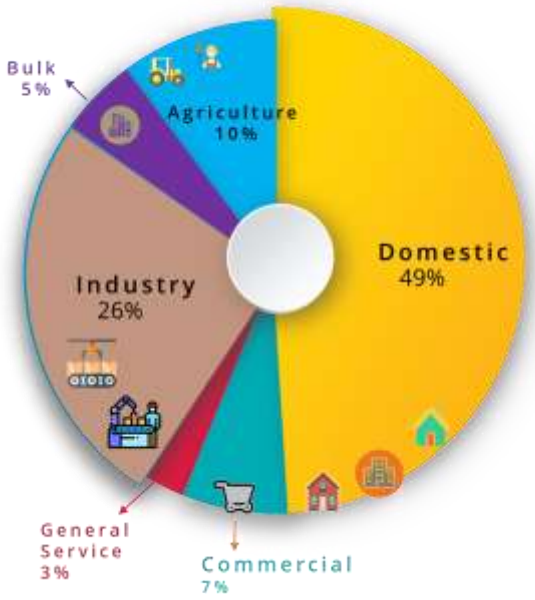
Moreover, the boom in the construction sector will directly increase industrial coal consumption, as cement industries consume coal as a primary energy source. To meet the growing coal demand locally in a sustainable way, Thar coal can be used as a substitute for imported coal in the future, as mining expansion is already underway to reach 30 million tons per annum (mtpa). Substitution of coal will have a positive impact on coal prices and foreign exchange savings. For smooth and uninterrupted supply,

railway tracks can be developed to adopt rail as the primary mode of coal transportation.

Electricity: The rising electricity demand in the country is met by expensive and unsustainable thermal power generation. Over the years, electricity demand has increased due to the expansion of the national grid, advancements in domestic heating/cooling technologies, and the development of the industrial sector. Forecast results show that demand will continue to increase by 2030 in all sectors, including transportation, due to the National Electric Vehicle Policy supporting more electric vehicles (EVs) on the roads in Pakistan. The need for a better energy mix, replacing thermal power with hydro and renewable energy, is also suggested. The Indicative Generation Capacity Expansion Plan (IGCEP) is an informative document for generation expansion planning and has improved supply-side planning. However, the demand side must be improved in consultation with sectoral experts, academia, and relevant stakeholders (Pakistan Energy Outlook Report 2021-2030, 2022).

Pie Charts 1&2 show generation mix & consumer mix of energy





Source: NEPRA

Capacity, preparedness, output, policies and processes of Energy Sector in Pakistan

Wind Energy

Pakistan has considerable potential for using wind energy along the coastal belt of Sindh and Balochistan (in southern Pakistan). The Government of Pakistan (GOP) has developed a wind power energy corridor along the southern coastal regions of Sindh and Balochistan. Wind data, provided by Pakistan's Meteorological Department, measures Pakistan's coastal belt at 60 km (Gharo-Keti Bandar) and 180 km long, with an exploitable potential of 50,000 MW of electricity generation through wind turbines. Currently, there are 26 private wind projects operating, producing approximately 1,335 MW. In addition, 10 wind projects with a cumulative capacity of 510 MW have achieved financial closure and are under construction. As the Government of Pakistan has developed the RE Policy, which envisages generating 60 percent of energy from renewable resources by 2030, this ambitious target provides several opportunities for the wind energy market in Pakistan.

Small/Mini/Micro Hydroelectric

In addition to large hydro, there are prospects for the development of small, mini, and micro hydro power under the revised RE Policy. The GOP considers small hydropower projects as clean and inexpensive sources of energy. Small hydropower projects are mainly located in the remote areas of Pakistan, particularly in the northern regions. Recently, the GOP has identified new generation requirements by capacity, fuel technology, and utilizing indigenous resources for power generation by announcing the Indicative Generation Capacity Expansion Plan (IGCEP). This plan envisages developing hydropower projects by adding an additional 13,000 MW of hydropower capacity by 2030, from an existing capacity of 9,000 MW, which would account for a 25 percent share in the total energy mix.

Solar

Pakistan receives an average of nine and a half hours of sunlight daily. Solar power entered Pakistan's energy mix in 2013 after the government introduced a set of support policies to foster renewable energy development. According to the Pakistan Economic Survey, over the last five years, six solar power projects totaling 430 MW have initiated commercial operations and are now providing electricity to the grid. With the rising costs of electricity in Pakistan and an unreliable grid supply, more industries and commercial organizations are turning to captive solar solutions. There has been a strong surge in domestic installation of rooftop photovoltaic panels in larger cities. For projects under 1 MW, net metering regulations came into effect in September 2015. This sector is trending toward significant growth, as the GOP is targeting at least 1 million customers and adding approximately 3,000 MW of solar power through net metering.

To expand renewable energy in Pakistan's energy mix, the World Bank has provided $100 million in financing to the Sind Solar Energy Project to support independent power producers in developing 400 MW of new solar power projects and provide partial grants to private sector firms for the commercial provision of Solar Home Systems to 200,000 households.

U.S. and international assistance have helped Pakistan make some major strides in addressing these problems, but without major reforms, Pakistan's energy future remains challenging. According to the National Electric Power Regulatory Authority's (NEPRA) 2021 annual report, Pakistan's total installed power generation capacity is 39,772 MW, of which 63% of energy comes from thermal (fossil fuels), 25% from hydro, 5.4% from renewables (wind, solar, and biomass), and 6.5% from nuclear.

In the current scenario, renewable energy (RE) resources can play an important role in closing the deficit. With the current government's focus on renewable energy, the Ministry of Energy recently revised the Renewable Energy (RE) Policy of 2019. According to the revised RE policy, the Government of Pakistan aims to derive 60 percent of energy from renewable sources, including hydro, by 2030, which would reduce Pakistan's dependence on imported fuel products.

Situational Analysis of Electricity, Petroleum and LNG Policies

Electricity Policy

The National Electricity Policy 2021 was issued by the Power Division of the Federal Government. The supply of reliable, secure, efficient, and affordable electricity is one of the primary drivers for the sustainable growth of a nation's economy. In the past, electricity shortfalls have adversely impacted the socio-economic balance of the country. The Government has framed various policies, from time to time, to address such issues, including but not limited to policies for the generation and transmission sectors. The National Power Policy 2013 encompassed all three sub-sectors—generation, transmission, and distribution—and provided policy goals, targets, and guidelines for the sector. However, due to multifarious reasons, the implementation of policy initiatives has primarily focused on the generation sub-sector. As a result, the goals and targets set for the power sector have not been fully met.

Recently, the NEPRA Amendment Act has been promulgated to lay the foundation for the development of an integrated, sustainable, and competitive power market. Accordingly, as envisaged in Section 14A of the NEPRA Amendment Act, the Government has prepared the National Electricity Policy for the development, reform, improvement, and sustainability of the power market and power sector.

The National Electricity Policy identifies the major goals to be achieved for the power sector and, in this respect, provides policy directions. It also outlines the key guiding principles to develop subservient frameworks that will steer decision-making in the power sector to achieve the identified goals. However, plans for implementation or specific operational instructions have not been prescribed, and these will be prepared by the Government in the form of periodic National Electricity Plans.

The vision of the policy is to ensure universal access to electricity through a self-sustainable power sector, developed and premised on: optimal utilization of indigenous resources; an integrated planning approach; an efficient, liquid, and competitive market design; and an affordable and environmentally friendly outcome for consumers.

As per the Policy, the goals for the power sector are to ensure access to affordable, secure, and sustainable energy. These broad and overarching goals, once attained, will realize the vision of the Government for the power sector. None of these goals is subservient to any other; all actions taken pursuant to this National Electricity Policy will ensure balanced implementation that does not prejudice any one goal for the achievement of others, while ensuring alignment with the SDGs. In discharging their respective functions, the Government, the Regulator, and all sector entities, including provincial entities, will be guided by these goals to overcome the challenges and impediments faced by the power sector and to devise future plans of action.

Accessibility of electricity to all areas, including rural areas, at affordable rates is the cornerstone of socio-economic development. Making power available, when it is not affordable, has limited value. The Government shall strive to ensure that electricity is accessible to all consumers at rates that are commensurate with their ability to pay, coupled with the development of an efficient and liquid market design.

Energy security, including uninterrupted availability of energy sources, is an essential goal for the power sector. The Government shall endeavor to diversify the fuel mix of the generation capacity in the country through optimal utilization of energy resources such as hydro, renewable sources, coal, natural gas, and nuclear.

The sustainability of the power sector is of paramount importance, and all sector entities shall strive to take the necessary steps to ensure such sustainability. This shall include measures to minimize environmental degradation, ensure technical and operational sustainability, promote integrated development of the power sector, and achieve financial self-sustainability, including the progressive elimination of circular debt.

Key Guiding Principles of the Policy

Six principles shall inform the actions and plans for the power sector to enable it to achieve the goals identified above:

Efficiency will be progressively increased across the entire value chain of the sector. This will be done, broadly, by gradually improving efficiency in the generation fleet and system operations, optimum utilization of the fuel base, reduction in Transmission and Distribution (T&D) losses, improvement in collections, demand-side management, conservation, sound governance practices, including decentralization, etc.

Transparency is one of the core values of the power sector and is a sine qua non to attract investment. Transparency also enhances consumer confidence, and, as a result, improves the liquidity of the sector. Transparency will be ensured through a predictable policy framework, uniform application of the regulatory framework, elimination of institutional conflicts of interest, automation and digitization of processes, and adopting best practices for the dissemination of authentic and timely information to all stakeholders.

Competition contributes to improving quality, increasing efficiency, and reducing costs. Enhancement of competition in the sector will provide stepping stones for the transition into a competitive wholesale market. Competition shall be the cornerstone for the development and operations of the entire value chain of the power sector.

The **sustainability** of the entire power sector pivots around the financial and commercial viability of its individual sub-sectors. This will be done by: a. Promoting investments on a least-cost basis balanced with development in underserved areas; b. Having cost-reflective tariffs in transmission and distribution, to the extent feasible; c. Timely passing of costs to consumers, while netting off any subsidies funded by the Government; and d. Recovery of costs arising from open access, distributed generation, etc.

A **multi-pronged approach for indigenization** will be adopted, which shall include promoting local content, transfer of technology, and R&D across the value chain of the power sector.

This may also include Government-to-Government and Business-to-Business agreements, through which the Government or private entities/parties in Pakistan shall promote the transfer of technology. Further, steps will be taken to facilitate the creation of development funds to support domestic R&D as well as resources needed for the augmentation of indigenous capacity.

Environmental responsibility is recognized worldwide as a vital pillar to ensure the overall sustainability of a power sector. Therefore, all aspects of the sector shall be guided by environmental targets benchmarked with international commitments, including carbon footprints (decarbonization) and emission targets for the sector, in line with Pakistan's commitment to reduce and limit greenhouse gas emissions.

Policy Areas

The National Electricity Policy identifies nine (9) policy areas of the power sector, in which all actions shall individually and collectively be aimed at attaining the above-mentioned goals by applying the key guiding principles, thereby achieving the vision for the power sector. These areas are as follows:

i. Sustainable development of the power sector requires that, despite varying seasonal energy requirements, sufficient generation capacity be made available to cater to the peak demand of the country.

ii. The transmission network serves as the backbone for a sustainable and secure sector, which enables the delivery of affordable electricity. Efforts shall be made to develop a robust transmission network that complements generation plans for smooth dispersal of power between generating stations and load centers. Such integration will ensure smooth operations of the power sector, while avoiding congestion and blackouts/brownouts.

iii. The distribution segment is the interface of the entire sector with the consumers of electricity. The financial viability of the entire sector is premised on the efficient operations of the distribution system and timely recoveries from consumers.

iv. Effective and efficient performance of system operations is crucial for the power sector, as it enables safe, reliable, non-discriminatory, and economic dispatch of electric power from generation companies. Per key guiding principles, actions shall be taken to ensure the integrity of system operations.

v. The efficient and liquid power market design, as approved by the Regulator, will contribute to attaining the policy goals.

vi. Financial sustainability of the sector is premised on the recovery of the full cost of service, to the extent feasible, through an efficient tariff structure, which ensures sufficient liquidity in the sector.

vii. Energy conservation and efficient use of energy are effective tools to manage the demand/supply of electricity and can lead to an improved energy intensity index. The cost of one megawatt-hour saved through energy efficiency and conservation is much lower than the corresponding cost of generating one megawatt-hour. Accordingly, concerted efforts shall be made to promote efficiency and conservation measures, which shall serve as a first fuel for the above purpose. To meet the existing and future energy needs of the country, power sector planning will be integrated with the energy value chain. Accordingly, the Ministry of Energy shall, henceforth, develop the future integrated energy plan on a sustainable basis.

viii. Good governance is a prerequisite for efficient and sustainable performance of any entity and eventually contributes to the sustainability of the entire power sector. All sector entities and stakeholders shall adopt principles of transparency, fair play, and good governance in their decisions and operations.

The Challenges and Issues in the National Electric Policy, 2021

Implementation

The policy faces challenges in implementation due to a lack of coordination between various stakeholders, lack of financial resources, and infrastructure constraints.

Political interference

Electricity policies are affected by political interference, which can hinder the implementation of the policy and delay its progress.

Lack of investment

Lack of investment in the power sector may limit the implementation of the policy and delay the achievement of its objectives.

High transmission and distribution losses

High transmission and distribution losses are a major issue in many countries, and Pakistan is no exception. Addressing this issue is crucial for the success of the policy.

Technical challenges

The policy faces technical challenges, such as integrating renewable energy sources into the grid, maintaining grid stability, and managing the demand and supply of electricity.

Public opposition

The policy is facing opposition from the public, particularly as it involves the construction of new power plants or transmission lines in densely populated areas.

Inadequate regulatory framework

The policy is challenged by inadequate regulatory frameworks, which may fail to provide a level playing field for different players in the power sector.

Environmental concerns

The policy has to address environmental concerns, particularly as it involves the construction of new power plants or transmission lines in environmentally sensitive areas.

Critical Analysis of National Electricity Policy 2021

The National Electricity Policy 2021 of Pakistan is a policy document that aims to reform and improve the country's electricity sector. While the policy has several positive aspects, there are some shortcomings as well. Some of the shortcomings are:

Lack of Clarity

The policy lacks clarity in some areas, which may lead to confusion and inconsistency in its implementation. For example, the policy does not provide clear guidelines on how the government plans to increase the share of renewable energy in the country's energy mix.

Overemphasis on Large-Scale Projects

The policy places a strong emphasis on large-scale projects such as coal-fired power plants, which may not be the most efficient or sustainable solution for the country's electricity needs. This approach may lead to an over-reliance on fossil fuels and delay the transition to cleaner and more sustainable energy sources.

Limited Focus on Demand-Side Management

The policy focuses primarily on supply-side solutions such as increasing generation capacity and improving transmission and distribution infrastructure. However, it does not give adequate attention to demand-side management measures such as energy efficiency and conservation, which can reduce electricity consumption and lower costs.

Limited Role for the Private Sector

The policy does not adequately facilitate private sector involvement in the power sector, which could help increase the capacity of the electricity grid and reduce the burden on the government.

Insufficient Funding

The policy has not outlined a clear plan for financing the development of the power sector, which could hinder the implementation of the policy.

Lack of Accountability

The policy does not provide a clear mechanism for ensuring accountability and transparency in the electricity sector. This may lead to inefficiencies and corruption in the sector, which can undermine the effectiveness of the policy.

As a result of the critical evaluation carried out, the gap analysis is provided below.

GAP ANALYSIS OF ELECTRICITY SECTOR

Target	Current State	Desired State	Action Plan
Power	Current Supply 26,083 MW	Current demand 49,435 MW	Power Generation Energy Conservation Energy Efficiency Rationalization consumption patterns
	68.4% thermal based production	Shift to Sustainable and economically efficient energy production	Incentives for Alternate and renewable energy production
	Inaccurate demand and supply estimate	Systematic collection of data	Coordination among Producers and Suppliers

Petroleum Sector

In 2019, Pakistan had the capacity to refine 19 million tons of crude oil, but only 4.3 million tons of oil was produced during the year, meeting only 20% of the country's petroleum needs. Pakistan heavily relies on crude oil imports to meet its petroleum needs.

Petroleum Exploration & Production Policy 2012

Transportation, energy, and industry are the three main sectors that rely on petroleum products. Transportation consumes 59% of petroleum products; electricity consumes 32%, and industry consumes 8%.

The salient features of the policy are to accelerate E&P activities in Pakistan with a view to achieving maximum self-sufficiency in energy by increasing oil and gas production, promoting direct foreign investment in Pakistan by increasing the competitiveness of its terms of investment in the upstream sector, promoting the involvement of Pakistani oil and gas companies in the country's upstream investment opportunities, training Pakistani professionals in the E&P sector to international standards, and creating favorable conditions for their retention within the country. The policy also aims to promote increased E&P activity in the onshore frontier areas by providing globally competitive incentives, enable more proactive management of resources through the establishment of a reorganized Directorate General of Petroleum Concessions (DGPC) comprising both Federal and Provincial representatives, with the Federal Director serving as ex-officio Director General, and providing the necessary control and procedures to enhance the effective management of Pakistan's petroleum reserves. Additionally, it aims to ensure the energy security of the country by enhancing domestic exploration, decrease reliance on imported energy by providing additional incentives to exploration and production companies for increasing indigenous production, and to undertake the exploitation of oil and gas resources in a socially, economically, and environmentally sustainable and responsible manner.

GAP ANALYSIS OF PETROLEUM SECTOR

India and China are importing more than 90% of crude oil, while Japan and Thailand are importing more than 80% of crude oil. Pakistan, Sri Lanka, and Indonesia are importing around 35% of crude oil, while Nepal and Cambodia are using almost 100% refined oil. Indonesia is rapidly relying on internal reserves, reducing its petroleum imports by almost 10% annually.

The mandatory storage capacity of Pakistan is 20 days, compared to Bangladesh, which has a capacity of 45-50 days. As the demand for oil is continuously rising, the storage capacity needs to be enhanced. As a result of the critical evaluation carried out, the gap analysis is provided below.

As a result of the critical evaluation carried out, the gap analysis is given as under.

Target	Current State	Desired State	Action Plan
POL	Domestic Oil production declined to 73,000 barrels per day from 98,000 barrels per day from 2017 to 2021	High Domestic E&P	Tax incentives for E&P
	Domestic Oil Refinery Industry caters to 20% of the consumption need	High domestic Oil Refinery output	Tax Incentives for Refinery Industry
	Imported Oil mix: 65% of Refined Oil and 35% of Crude Oil	Import of Crude Oil up to 90% regional practices	Tax Incentives for Refinery Industry
	Oil Storage Capacity up to 20 days	Oil Storage capacity up to 45 – 50 days	Regulatory framework and oil levies for the development of storage capacities

GAS AND LNG POLICY

LNG Policy of 2011 of the Government of Pakistan

Pakistan's policy for the sustainable development of the energy sector, including the provision of reliable and competitively-priced LNG, is based on the following objectives: (a) Optimization of the primary energy mix, based on economic and strategic considerations; (b) Maximizing the utilization of indigenous energy resources; (c) Enhancing private sector participation in the energy sector by strengthening the regulatory framework and institutional capacity; (d) Developing energy infrastructure; and (e) Developing human resources with emphasis on energy sector-specific technical skills and expertise.

Natural gas plays a key role in Pakistan's energy balance, currently accounting for around 50% of the country's primary energy supplies. With accelerating economic growth, the demand for gas is projected to increase sharply, and the country's recoverable indigenous gas reserves will be insufficient to meet this demand. Gas shortages have already emerged and will increase substantially in the following years if indigenous supply is not supplemented through imports. To address the shortage, strong emphasis is being placed on importing gas from neighboring gas-producing countries through cross-border gas pipelines and also in the form of liquefied natural gas ("LNG"). Necessary measures are being taken for the installation of LNG receiving, storage, and re-gasification facilities and the expansion of gas transmission infrastructure for the distribution and sale of regasified LNG ("RLNG") in the domestic market.

The LNG Policy of 2006 has been modified in 2011 to facilitate the expeditious implementation of LNG projects.

LNG IMPORT PROJECT STRUCTURE

An LNG import project may be structured under one of the following alternatives:

Integrated project structure, under which a private or public sector party, joint venture, or consortium (hereinafter referred to as the "LNG Developer") is responsible for purchasing LNG supplies, transporting them to its LNG import terminal (comprising receiving, storage, and re-gasification facilities), and supplying RLNG to the domestic market and/or for its own use.

The LNG Developer would enter into a Gas Sales and Purchase Agreement (GSPA) directly with a Government-designated buyer, gas utility, or any customers (hereinafter referred to as "RLNG Buyer(s)"); or

Unbundled project structure:

i. A Government-designated buyer, gas utility, any consumer, or any LNG supplier (hereinafter referred to as "LNG Buyer(s)") would directly import the LNG under an LNG Sale and Purchase Agreement ("SPA") either on a delivered ex-ship (DES) basis, free-on-board (FOB) basis, or C&F basis.

ii. For FOB purchases, the LNG Buyer would additionally enter into an agreement with a shipping company to transport LNG to the receiving terminal.

iii. The LNG Buyer(s) would enter into an agreement with the LNG Terminal Owner and/or Operator (hereinafter referred to as the "LNG").

ISSUES IN LNG POLICY 2011

1. **Pricing:** One of the major issues in the LNG policy of 2011 was the pricing of LNG. The policy did not provide a clear mechanism for determining the price of LNG. This created uncertainty and made it difficult for investors to make decisions about LNG projects.
2. **Regulatory Framework:** The LNG policy in 2011 did not have a comprehensive regulatory framework to govern the import, storage, transportation, and distribution of LNG. This lack of regulation made it difficult for companies to make investments in the sector.
3. **Infrastructure Development:** While the policy aimed to promote the development of LNG infrastructure, it did not address the challenges in infrastructure development, such as the lack of port facilities, pipeline networks, and storage facilities.
4. **Competition:** The policy did not create a level playing field for competition in the LNG sector, as the government continued to regulate the pricing of natural gas, which gave an unfair advantage to state-owned companies.
5. **Contractual Issues:** There were several contractual issues that arose in the LNG sector, such as disputes between buyers and sellers over pricing and the supply of LNG.
6. **Environmental concerns:** The policy did not adequately address the environmental concerns associated with LNG.

There were concerns about the impact of LNG on the environment, including air and water pollution, as well as the potential for accidents.

7. **Security of supply:** The policy did not provide a clear plan for ensuring the security of LNG supply. This created uncertainty for investors and raised concerns about the reliability of LNG as a source of energy.
8. Overall, while the LNG policy in 2011 aimed to promote the development of LNG infrastructure in Pakistan, there were several issues that needed to be addressed to achieve the objectives of the policy

As a result of the critical evaluation carried out, the gap analysis is given as under.

GAP ANALYSIS OF LNG SECTOR

Target	Current State	Desired State	Action Plan
RLNG	Domestic production 4 BCFD	Demand of 6 BCFD	Incentives to gas exploration Gas pipeline completion (TAPI)
	Delays in procurement and supply	Robust Supply Chain Management	Contract Management LNG Terminal Management Inventory Management
	Dependence upon Qatar for supply of LNG	Diversification of Suppliers	Russian as supplier of Oil & Gas

ENERGY SECTOR IMPACTS ON INDUSTRIAL DEVELOPMENT OF PAKISTAN

The industrial growth has positive and significant impact on overall GDP (Gross domestic product) of Pakistan whereby industrial sector contributes 18 % to GDP. Many countries including, Taiwan, China and Korea are the best examples of positive relationship between industrial growth and GDP. Industrial sector has also studied impact on export and import with respect to balance of payment. According to World Bank (2005) electricity serves as important input for industrial sector especially for developing countries like Pakistan. For regulation of electricity National Electric Power Regulatory Authority (NEPRA) has been playing an important role. Since 2005 in Pakistan serious electricity crisis are experienced due to peak demand from both domestic consumption and industrial consumption. Economic Survey of Pakistan (2008) clearly indicated that in order to meet current demand concerned authorities must have to enhance generation capacity by 50%.

The use of energy has increased significantly due to various inventions and innovations of common use made in last century. Thus almost all human activities have become more dependent on energy. For developing nations in particular, there is fundamental need for reliable and affordable energy. In these countries, energy demand has been increased due to expansion in industry, modernized agriculture, increased trade and improved transportation. Pakistan is dependent on energy imports because there is lack of investment in indigenous resources of hydro, natural gas and lignite. Biomass is the largest energy source. The government has decided to stop building new coal-fired power plants because of environmental issues. The public oil and gas companies are planned to be privatized for various concerns. Due to significant increase in electricity demand, both state-owned companies and IPPs are actively engaged in producing electricity. However, fiscal sustainability has become a challenge due to increase in energy payments. This energy deficiency began from a fuel mix transformation which was initiated two decades ago, when power generation used to rely more on imported furnace oil than hydropower. The current energy crisis began to manifest itself by late 2007.

Pakistan imports nearly a third of its energy resources in the form of oil, coal, and liquefied natural gas (LNG). An import-driven energy policy is not sustainable for Pakistan, making it energy insecure in the long term. Besides being a drain on its foreign exchange reserves, it exposes the economy to international energy price shocks, putting the entire economy at risk through inflation. Inflationary pressures reduce the competitiveness of the country's exports, further constraining the economy's capacity to pay for energy imports. This paper analyzes Pakistan's energy security under the 4As framework over the 6-year period of 2011–2017.

The 4A methodology attempts to measure and illustrate graphically the change in the energy security of a region by mapping it onto four dimensions: availability, applicability, acceptability, and affordability. The analysis indicates that Pakistan's energy security improved initially over the first 3 years but then deteriorated over the next 3 years. Despite significant investments in the energy infrastructure over the last 5 years, Pakistan continues to be energy insecure. This paper recommends the immediate and rapid adoption of green energy solutions, like distributed solar and smart metering, and increased conservation efforts, like developing and implementing building insulation standards to mitigate energy insecurity.

Relying heavily on imported energy is not sustainable for Pakistan's economy, which has been running a current account deficit for over 2 decades (with the exception of 1 or 2 years). Borrowing (from friendly nations, international sovereign bonds, and multilateral banks) funds these deficits almost by default, as bureaucratic inertia and the absence of an enabling political and regulatory environment typically limit the foreign direct investments flowing into the country. As Pakistan's external liabilities build up and it diverts an increasing share of its foreign exchange earnings toward external debt servicing, it is simply not left with the financial means to import energy continuously. It is important for the country to rethink its energy design to achieve not just energy sufficiency but also energy security. Energy security is a multidimensional concept and is a measure of a unique nexus that encompasses economic, political, geopolitical, and institutional, legal, and regulatory aspects of a country or region. The first dimension is the economics of energy security, which covers the consequences of import dependence in relation to instable energy markets, the diversification of the primary energy mix and the use of indigenous resources, and the circular flow of energy. The second dimension is the political economy of energy security, which examines the interrelations between crude and natural gas exporting and importing countries. The third dimension is the geopolitics of international relations, which explores how geopolitics influences and shapes coalition, cooperation, or unilateral action for energy security. The fourth dimension consists of the aspects of energy security in institutional, legal, and regulatory frameworks in the local, regional, and international context (Energy Security in Pakistan: A Quantitative Approach to a Sustainable Energy Policy, 2019)

COMPARATIVE ANALYSIS OF THE ROLE OF ENERGY SECTOR OF PAKISTAN IN INDUSTRIAL DEVELOPMENT WITH THE BEST PRACTICES AROUND THE WORLD

Many people in Pakistan are wondering what the situation is in the region in terms of energy supplies and prices. We will try to provide a rough comparative sketch of the energy scene in South Asia, involving Pakistan, India, and Bangladesh. India is comparatively rich in terms of energy resources – coal, hydro, and solar – and has been mostly self-sufficient in these resources. However, lately, there have been local coal supply issues compared to demand, and India has had to import coal from abroad. Imported coal is being mixed with local coal, with a cost penalty of 30% in the cost of generation.

India imports gas in the form of liquefied natural gas (LNG), which is expensive these days. However, there is hardly any electricity generation based on gas. Inefficiency and transmission and distribution (T&D) losses in India are comparable to those in Pakistan, or even higher, which affects the cost of supplies. There are huge DISCOM losses, which have accumulated to levels almost comparable to those in Pakistan. In Pakistan, these losses show up in the form of a unique term called circular debt.

Bangladesh and Pakistan seem to have an identical syndrome – high installed capacity and low fuel availability due to higher prices. Bangladesh had to approach the IMF as well due to the current account deficit created by heavy and expensive energy imports. Installed electricity capacity in Bangladesh is 25,566 MW against peak demand of 14,782 MW. Approximately 7.89% of electricity is generated from coal, 50.84% from gas, including LNG, 28% from furnace oil, and 6% from diesel.

Various electricity conservation measures have been enforced in Bangladesh. It faces almost the same problems as Pakistan: excess capacity, high capacity charges, and dependence on expensive imported gas and furnace oil.

Tariff Variances:

Although averages may be deceptive, the Indian average tariff for large customers is Rs 23.38 per kWh, and for small consumers, the average is Rs 10.70 per kWh in Pakistan. These figures appear comparable with Bangladesh's corresponding figures – maximum Rs 25.33 per kWh and minimum Rs 12.64 per kWh.

Pakistan's maximum tariff is 40% higher than the Indian average. Compared with the corresponding Pakistani tariff of Rs 32.77 per kWh, Pakistan's tariff is 31% higher than that of India. However, they are able to supply free electricity to small consumers up to 200 units. It is anyone's guess how they finance such a subsidy.

Pakistan's maximum tariff is 16-29% higher than the corresponding Bangladesh tariff. The minimum tariff of the two countries is almost identical – Rs 12.64 per kWh for Bangladesh vs Rs 13.45 per kWh for Pakistan. Bangladesh's power infrastructure is similar to that of Pakistan and suffers from the same difficulties of expensive imported fuel. Lower T&D losses and subsidies enable it to maintain a lower tariff than Pakistan. It is obvious that the Bangladesh government is subsidizing electricity.

India is the least-cost country due to mostly local coal-based electricity and hydro. There are subsidies and accumulated DISCOM losses, which have enabled India to keep a low tariff. India has practically no significant problems with electricity tariffs compared to Pakistan and Bangladesh.

Pakistan's circular debt is a form of unpaid subsidy and may continue to remain on the books, in one form or another, for a long time. The induction of cheaper renewables and local Thar coal, along with higher capacity utilization, appears to be the near-term solution to alleviate the high tariff issue. Pakistan's electricity tariff problems are becoming increasingly intractable, particularly due to the floods and political instability (Ali, 2022).

Comparative Analysis of Energy Sector Mix of Pakistan with India and Bangladesh in relation to Industrial Sector

Country	Pakistan	India	Bangladesh
Contribution to GDP	19%	26%	36 %
Unit Cost Rs.	28 & 34	11 & 23	13 & 25
Industrial Sector Consumption	28%	41%	28%

Energy Production Mix

Country	Hydel	Gas & Coal ,Oil	Solar & other RE	Nuclear & Other Sources	Subsidy
Pakistan	21 %	68 %	3 %	8 %	Yes
India	**11** %	57 %	29 %	3%	Yes
Bangladesh	1 %	85 %	4 %	10 %	Yes

SWOT-EETH Analysis of the Energy Sector in Order to Promote Industry in Pakistan for Each Related Policy, Legal, and Institutional Framework Separately

Policy Framework:

Strengths:

- The government has implemented several policies to promote the industrial sector in Pakistan.
- The industrial policy aims to enhance the competitiveness of local industry, increase exports, and attract foreign investment.
- The policy also focuses on increasing the contribution of the industrial sector to the country's GDP and generating employment opportunities.

Weaknesses:

- The policy lacks a clear roadmap for the development of different industrial sub-sectors, resulting in uneven growth rates.
- The lack of effective implementation mechanisms and monitoring systems has hindered the policy's success.
- The policy has not adequately addressed the environmental impact of industrialization, leading to pollution and other environmental concerns.

Opportunities:

- The government can introduce policies to promote innovation and technology in the industrial sector, leading to more efficient and sustainable production methods.
- There is an opportunity to increase investment in Special Economic Zones (SEZs) to attract more foreign investment and increase the country's export potential.
- The government can incentivize the establishment of small and medium-sized enterprises (SMEs) in the industrial sector to enhance employment opportunities.

Threats:

- Political instability in the country can impact the policy's continuity, leading to a lack of clarity and consistency in the government's approach to the industrial sector.
- The global economic slowdown can affect the export potential of the industrial sector, leading to reduced revenues and profitability.
- The lack of infrastructure development, including roads, transport, and energy, can limit the growth potential of the industrial sector.

Legal Framework:

Strengths:

- Pakistan has established several laws and regulations to govern the industrial sector, including the Factories Act and the Environmental Protection Act.
- The legal framework aims to promote workplace safety, protect workers' rights, and prevent environmental degradation caused by industrial activities.

Weaknesses:

- The implementation of the legal framework is weak, leading to violations and non-compliance by industries.
- The legal framework lacks clarity and consistency, leading to confusion among industries and government agencies.
- The legal framework has not kept up with the changing needs of the industrial sector, leading to outdated and inadequate regulations.

Opportunities:

- The government can revise the legal framework to address emerging challenges facing the industrial sector, including environmental concerns and new technologies.
- The government can enforce strict penalties for violations and non-compliance, leading to better adherence to ethical and legal standards.
- The government can establish specialized courts to deal with industrial disputes and ensure timely resolution of legal issues.

Threats:

- The lack of resources and capacity of government agencies to enforce the legal framework can hinder its effectiveness.
- The political influence of industries can impact the implementation of the legal framework, leading to violations and non-compliance.
- The legal framework can be misused to stifle competition and promote monopolies in the industrial sector.

Institutional Framework:

Strengths:

- The government has established several institutions to promote and regulate the industrial sector, including the Ministry of Industries and Production and the Pakistan Industrial Development Corporation.
- These institutions aim to provide support and guidance to industries and promote their growth and development.
- The institutional framework includes specialized agencies to address specific issues, such as the Environmental Protection Agency.

GAP Analysis

Current Status:

Energy: Pakistan faces significant challenges in meeting its energy demands. The country has a limited capacity to generate electricity, leading to frequent power outages, load shedding, and high energy costs. The majority of the country's energy comes from non-renewable sources such as oil, natural gas, and coal.

POL (Petroleum, Oil, and Lubricants): Pakistan is heavily dependent on imported petroleum products, which puts a significant strain on the country's economy. The government heavily subsidizes these products, leading to a significant fiscal burden.

Gas: Pakistan has significant natural gas reserves, which are mainly used for domestic consumption. However, the country is facing a gas shortage due to a lack of investment in infrastructure and exploration.

Policies, Strategies, and Practices: Pakistan has implemented several policies and strategies to promote industrial development, including the Industrial Policy 2011 and the Automotive Development Policy 2016-21. However, the implementation of these policies has been hindered by bureaucratic hurdles, corruption, and a lack of investment in infrastructure.

Desired Status:

Energy: The desired status for Pakistan's energy sector is to transition to renewable sources of energy, such as wind and solar, to reduce the country's dependence on non-renewable sources. This would require significant investment in infrastructure and a shift away from traditional fossil fuel-based power generation.

POL (Petroleum, Oil, and Lubricants): The desired status for Pakistan's petroleum industry is to reduce the country's dependence on imported petroleum products and promote domestic production. This could be achieved through increased investment in exploration and development of domestic reserves and reducing subsidies on petroleum products.

Gas: The desired status for Pakistan's gas industry is to increase investment in exploration and infrastructure to fully utilize the country's natural gas reserves. This would require significant investment in infrastructure and exploration.

Policies, Strategies, and Practices: The desired status for Pakistan's policies, strategies, and practices related to industrial development is to promote a more business-friendly environment with reduced bureaucratic hurdles and corruption. This would require significant reforms in the government and a focus on improving the ease of doing business. Additionally, the government should focus on developing infrastructure and promoting investment in key sectors to foster industrial growth.

Conclusion

On the basis of the foregoing analysis of the policies, strategies, and practices related to industrial development in Pakistan, the following conclusions are made:

Lack of Clarity:

The policies lack clarity in some areas, which may lead to confusion and inconsistency in their implementation. For example, the policies do not provide clear guidelines on how the government plans to increase the share of renewable energy resources in the country's energy mix.

Overemphasis on Large-Scale Projects:

The policies place a strong emphasis on large-scale projects, which may not be the most efficient or sustainable solution for the country's energy needs. This approach may lead to an over-reliance on traditional fuels and delay the transition to cleaner and more sustainable energy sources.

Limited Focus on Demand-Side Management:

The policies focus primarily on supply-side solutions, such as increasing generation capacity and improving transmission and distribution infrastructure. However, they do not give adequate attention to demand-side management measures, such as energy efficiency and conservation, which can reduce energy consumption and lower costs.

Limited Role for the Private Sector:

The policies do not adequately facilitate private sector involvement in the energy sector, which could help increase the capacity of the energy mix and reduce the burden on the government.

Insufficient Funding:

The policies have not outlined a clear plan for financing the development of the energy sector, which could hinder the implementation of the policies.

Lack of Accountability:

The policies do not provide a clear mechanism for ensuring accountability and transparency in the energy sector. This may lead to inefficiencies and corruption in the sector, which can undermine the effectiveness of the policies.

Procurement:

The procurement component is missing in the LNG Policy, which led to a debacle during high demand.

Supply Chain Management:

The policies do not provide a roadmap for supply chain management.

Recommendations

Short-Term Recommendations

Private Sector Participation

The government should encourage private sector participation in national growth and the development of the energy sector. The government may tax a fraction of top companies' profits to create a fund for off-grid solutions. In India, the top 500 companies are required to contribute 2% of their profits to CSR funds for off-grid solutions.

Clean Energy Cess

The government should regulate or impose a cess upon certain consumption patterns to generate funds for investing in renewable energy projects. India charges a cess of INR 400 per tonne of coal consumed.

Joint Liability Group (JLG) for Off-grid Installations

The government may extend small loans to a group of 4-10 local entrepreneurs, known as a JLG, for non-farming activities that may be applicable for micro-grid installations. Currently, India benefits from this model of micro-financing for off-grid solutions.

Energy Conservation

Pakistan, as an energy-scarce country, must carefully examine its patterns of energy consumption and rationalize its effective use. Making good use of daylight, closing marketplaces early at night, and adopting work-from-home mechanisms may all help reduce energy consumption and give the government more room to divert energy to industrial units.

Medium-Term Recommendations

Development of Refinery Industry and Import of Crude Oil

To encourage investment in the refinery industry, the government should implement tax breaks. The government must also import crude oil rather than refined oil. This could result in a $1 billion annual profit.

In order to deal with unexpected supply disruptions or price fluctuations, the country's storage capacity must be increased from 20 days to 60 days.

Efficient Supply Chain Management of LNG

Efficient procurement of LNG and effective terminal operations may help the country avoid delays and price shocks.

Long-Term Recommendations

Incentives for Oil & Gas Exploration

The country requires investment in oil and gas exploration. This may help reduce reliance on imported oil and bridge the trade deficit.

Incentives for the Development of the Alternate Renewable Energy Industry

The country needs to introduce incentives for the domestic industry to develop solar panels, electric vehicles, a net metering mechanism, and industrial efficient equipment for the effective use of energy.

Bibliography

1. Petroleum Consumption Pattern (TDAP-PETROLEUM-series 01-2021 - Petroleum Sector of Pakistan and its Trade Dynamics)
2. Economic Survey of Pakistan, 2021-22
3. Ikramullah Junejo, Jawad Raza Khoso: "Impact of Electricity Crises on Industrial Growth in Pakistan: A Multiple Regression Analysis Approach"
4. Dr Imran Naseem and Jawad Khan: "Impact of Energy Crises on Economic Growth of Pakistan"
5. Pakistan Energy Outlook Report 2021-2030
6. National Power Policy 2013
7. Power Policy, Alternative and Renewable Energy Resources