

Energy is an integral component of the economy and is considered necessary for nearly all human activities. Recent decades have witnessed a rapid increase in the global energy demand that is primarily derived from the expansion of economic activities, population growth, and rapid technological change. However, energy supply bottlenecks become a chronic problem for a country's economy. Pakistan also suffered from such a situation in the past. Therefore, several large-scale projects were initiated between 2013 and 2018 to eliminate the demand-supply electricity gap and address the challenge of ensuring the smooth delivery of energy services. To this end, the government played a significant role in abridging severe energy demand imbalance by importing Liquefied Natural Gas (LNG).

The government envisions focusing on indigenous energy sources, primarily hydel, solar, wind, and Thar coal. In this regard, it is paramount to note that the share of alternative and renewable energy sources (AREs) has also increased from zero percent in FY2014 to 6.8 percent of the electricity's installed capacity in the current fiscal year due to the right direction of policies. However, there is still potential for AREs to contribute more to the national energy supply and ensure affordable and universal access to electricity. The government is also committed to protecting the national interest by producing low-cost indigenous power.

The government has approved the Framework Guidelines for Fast Track Solar Initiatives 2022 to promote and develop cost-effective local renewable energy sources and reduce the impact of high prices of imported fossil fuels in the global markets, resulting in high electricity tariffs and drainage of precious foreign exchange. The framework covers Solar PV Energy Substitution for Expensive Imported

Fossil Fuels, Solar PV Generation on 11 kV Feeders, and Public Buildings Solarization.

The government aims to achieve a 60 percent share of electricity's generation capacity through indigenous clean energy technologies (ARE and hydro) by 2030, based on the Indicative Generation Capacity Expansion Plan (IGCEP). The draft of IGCEP 2022, prepared by the National Transmission and Despatch Company (NTDC) and currently under approval with the National Electric Power Regulatory Authority (NEPRA), projects the country's demand at 41,338 MW and an installed capacity of 69,372 MW by 2031 as the base case.

Nuclear power plants (NPPs) are a reliable source of electricity, as they can run for up to 18 months without refueling and store enough fuel for another 18 months on site. It makes them immune to short-term changes in fuel prices or availability and allows them to achieve very high-capacity factors. The nuclear fleet, comprising six NPPs with a total capacity of 3,530 MW, contributed about 27 percent of the total electricity generation in the national grid in December 2022.

In 2016, the government had imposed a moratorium on new imported fuel-based power projects. Moreover, the government plans to convert all commissioned imported coal independent power producers (IPPs) to Thar coal. As such, Thar has the country's largest coal reserves, which have been actively developed in recent years. With the addition of three power projects during the current fiscal year, the total installed capacity from five Thar coal-based power generation plants has reached 3,300 MW.

In Pakistan, the main consumers of petroleum products are the transport and power sectors, which account for 78.5 percent and 10.8 percent of the total consumption, respectively. However,

during the current fiscal year, the demand for Motor Spirit (MS) and High Speed Diesel (HSD) has decreased mainly due to the high prices of these products, while the demand for Furnace Oil (FO) has declined due to the shift of power generation to Re-gasified Liquefied Natural Gas (RLNG) or coal and other alternative sources. Thus, the total demand for petroleum products (16.72 million tonnes in July-March FY2022) has reduced by 21.9 percent during July-March FY2023. On the other hand, the natural gas consumption amounted to around 3,258 MMCFD from July-March FY2023, which included 631 MMCFD of RLNG volume.

### **Global And Regional Perspective**

The global and regional perspective on energy is complex and dynamic, requiring a comprehensive analysis of various factors, such as supply chain, prices, demand, policy, technology, infrastructure, regulations, environment, and geopolitics. The energy supply chain is a network of interdependent actors and processes that produce, transport, and distribute energy resources to meet market demand. It is also vulnerable to various risks, such as natural disasters, accidents, sabotage, cyber-attacks, and conflicts.

The Russia-Ukraine war is a significant geopolitical factor that affected not only the global supply chain but also the energy demand, particularly in Europe and other energy-importing countries. The war has reduced the economic growth and income of both countries involved in the conflict, as well as their neighbours and trading partners. Furthermore, the resultant rise in energy prices also negatively influenced the developing economies. However, the war has increased the awareness and urgency of diversifying the energy sources and routes of energy supply and enhancing the efficiency and resilience of energy systems.

It is also critical to note that economies around the globe are facing high demand for energy to achieve sustainable economic growth. However, the challenge is how to meet the rising demand and reduce reliance on depleting fossil fuels because their frequent use exerts adverse environmental impacts on socioeconomic progress. Besides, the volatile price dynamics of fossil fuels and the widening demand-supply gap of electricity calls for an urgent search for cost-effective, environment-friendly, and reliable energy resources. These factors result in an increasing interest of economies to develop renewable resources. At the global level, policymakers have largely recognized the significance of the relationship between energy and economic progress. That being the case, it is generally proved that economic development and energy reinforce each other. Thus, affordable and sustainable energy supplies not only bring prosperity to the population at large but also helps to eradicate poverty through various direct and indirect channels. Pakistan as a country is not an exception.

### **Power Sector**

#### **Installed Capacity and Generation of Electricity**

The country’s total installed electricity capacity stands at 41,000 MW; the percentage share of hydel, thermal, nuclear, and renewable is 25.8 percent, 58.8 percent, 8.6 percent, and 6.8 percent, respectively (Table 14.1). The share of thermal as a dominant source of electricity supply has declined over the past few years, showing the increased reliance on indigenous sources. On the other hand, against total electricity generation of 94,121 GWh, the share of hydel, nuclear, and renewable is combined as 53.8 percent, which is a good sign for the economy and the environment.

**Table 14.1: Installed Capacity and Generation of Electricity (July-March FY2023)**

Source	Installed Capacity		Generation	
	MW	Share (%)	GWh	Share (%)
Hydel	10,592	25.8	26,937	28.6
Thermal	24,095	58.8	43,526	46.2
Nuclear	3,530	8.6	19,739	21.0
Renewable	2,783	6.8	3,919	4.2
<b>Total</b>	<b>41,000</b>		<b>94,121</b>	

Source: Hydrocarbon Development Institute of Pakistan

### Electricity Consumption

During FY2023 (July-March), total electricity consumption is 84,034 GWh (Table 14.2). The household sector is the largest consumer of electricity, consuming 39,200 GWh (46.6 percent), followed by the industrial sector with 23,687 GWh (28.2 percent). Moreover, agriculture and commercial sectors consume 6,906 GWh (8.2 percent) and 6,576 GWh (7.8 percent), respectively, whereas the electricity consumption in other sectors (streetlights, general services, and other government) is 7,664 GWh (9.1 percent).

**Table 14.2: Sectoral Share in Electricity Consumption**  
(July-March) FY2023

Sector	Consumption (GWh)	Share (%)
Household	39,200	46.6
Commercial	6,576	7.8
Industry	23,687	28.2
Agriculture	6,906	8.2
Others	7,664	9.1
<b>Total</b>	<b>84,034</b>	

Source: Hydrocarbon Development Institute of Pakistan

### Private Power and Infrastructure Board

In 1994, the GoP established Private Power and Infrastructure Board (PPIB) as a “One-Window Facilitator” to attract private power sector

**Table 14.3: PPIB’s Facilitated Installed Capacity**

Total	Commissioned Projects: Fuel/Technologies					
	Hydro	Thar Coal	Natural/Low BTU Gas	RLNG	Imported Coal	Oil
<b>20,911 MW</b>	1,053 MW	3,300 MW	5,372 MW	3,633 MW	3,960 MW	3,593 MW

Source: Private Power and Infrastructure Board

Private investments in power generation (particularly in coal (both imported and local), RLNG, and hydel, based on state-of-the-art technologies and a recently installed HVDC transmission line) have expanded and diversified the country’s power generation and transmission line infrastructure in recent years. So far, two robust policy frameworks (Power Generation Policy 2015 and Policy Framework for Private Sector Transmission Line Projects 2015) have received an overwhelming market response and attracted many renowned local and foreign investors to the Pakistan power sector.

investments. In 2012, the PPIB was granted a statutory status through the PPIB Act 2012 (Act VI of 12). Subsequently, the PPIB Amendment Act 2016 authorized PPIB to facilitate certain public sector power and related infrastructure projects in independent power project (IPP) mode. PPIB approves IPPs, issues LOIs and LOSs (including Tripartite LOSs), approves feasibility studies, executes Implementation Agreements (IAs), provides GoP guarantees, and formulates regulations related to power generation and transmission lines.

So far, PPIB has successfully managed to develop 45 IPPs of about 20,911 MW, more than half of the country’s installed capacity, attracting FDI of over US\$ 25 billion. These initiatives boost economic development, employment, and livelihoods by generating much-needed electricity. PPIB also facilitated the country’s massive transmission line project (Lahore-Matiari), the first HVDC Transmission line project created by the private sector. This project, worth US\$ 1.65 billion of FDI, shows PPIB’s crucial role in private sector resource mobilization for power transmission infrastructure projects. Table 14.3 presented information associated with PPIBs facilitated installed generation capacity.

PPIB promotes indigenous Thar-coal and hydel resources to generate cheaper electricity and accelerates hydel and Thar coal-based power generation projects. PPIB is processing 16 power generation projects of over 8,300 MW, 13 hydroelectric projects of 5,455 MW, 1 Thar coal-based project of 1,320 MW, 1 RLNG-based project of 1,263 MW, and an imported coal-based project of 300 MW (Table 14.4). The government understands the adverse impacts of climate change; thus, all the projects—including coal—meet World Bank/International Finance Corporation’s environmental standards.

**Table 14.4: Power Projects under Facilitation by PPIB**

Year/Description	No. of IPPs	Fuels	Power Generation (MW)
2023	1	RLNG	1,263.00
2024	2	Hydel (884+7.08)	891.08
2025	1	Imported Coal	300
2026	1	Hydel	8.00
2028	1	Hydel	82.00
2030	3	Hydel (700.7+450+132)	1282.7
2031	3	Hydel (1124+640+300)	2,064
Other Projects in Process)	4	Hydel and Thar Coal (80+548+500+1320)	2,448
<b>Total</b>	<b>16</b>		<b>8,338.78</b>

Source: Private Power and Infrastructure Board

In 2016, the government had placed a moratorium on further processing new imported fuel-based power generation projects except those the board had already approved to reduce dependence on imported fuels. Apart from opening new vistas of investment in Thar-coal and hydel power generation, following the power demand-supply scenario under the IGCEP and policies in vogue, PPIB is endeavoring to complete three IPPs of 2,154 MW during 2023-24.

Power production requires tariff determination, land purchase, generation license, environmental clearance, coal price, IAs, PPA, WUA, CSA, TSA, FSA, and other interdependent processes. Any disputed activity impacts the overall project implementation process, thus disturbing the project timelines. PPIB promoted and implemented upcoming IPPs, although outside factors hampered project companies/sponsors. These factors include but may not be limited to COVID-19, Sinasure, and land purchase. In such situations, PPIB played an important role in handling these problems with all stakeholders. Thus, 4 Thar coal and 1 hydropower projects of 3,600 MW were built in one year. Other projects also resumed development in July–March FY 2023.

The total installed capacity from 5 Thar coal-based power production plants is 3,300 MW after 3 projects reached Commercial Operations Date (COD) during FY2023. Thar Energy Limited (330 MW), ThalNova Power Thar Private Limited (330 MW), and Shanghai Electric (1320 MW) reached COD on 1<sup>st</sup> October

2022, 17<sup>th</sup> February 2023, and 5<sup>th</sup> February 2023, respectively. The US\$ 2,908 million investment will supply 13 billion electricity units and save Rs 360 billion annually. In addition, 660 MW Engro and 660 MW Lucky Thar coal-based projects were also commissioned by PPIB. It is worth mentioning that all Thar coal-based power projects are at the top of the NPCCs merit order list.

RLNG-based Punjab Thermal Power (Pvt) Limited (PTPL) is near Trimmu Barrage in District Jhang. It is the largest RLNG-based power generation facility of 1,263 MW. The Government of Punjab is developing this project at the cost of US\$ 708 million, arranged from its own resources, and the project is in the commissioning phase. The project features cutting-edge machinery with above 60 percent efficiency. The project is crucial for system stability, especially in the FESCO area, and will solve technical concerns such as transmission constraints, overloading at Gatti, and load management issues, especially in summer.

The US\$ 1,707.7 million 884 MW Suki Kinari project on river Kunhar in Mansehra is being developed under CPEC with a debt-to-equity ratio of 75:25. About 88.5 percent of construction work is completed. The 7.08 MW Riali-II Hydropower Project is a run-of-river project on Ghori Nullah, a right bank tributary of Neelam River in District Muzaffarabad. It will contribute 38 million units annually with a US\$ 20 million investment and approximately 75 percent of civil work finished. 700 MW Azad Pattan hydropower is a run-of-river project on

river Jhelum at the border of AJK (District Bagh) and Punjab (District Rawalpindi). PPIB is implementing it with an investment of US\$ 1,350 million in the CPEC framework. These projects should finish by December 2024. Another energy project under CPEC is the 1,124 MW Kohala Hydropower project. It is the country's largest private investment in an IPP. The US\$ 2,355 million worth of project will be developed on river Jhelum, which flows into AJK in the northeast. However, early Sinosure/land acquisition resolution is needed to reach a financial close by September 2024.

The government is also planning to convert all commissioned imported coal IPPs to Thar coal. A feasibility study was conducted under the direction of the Ministry of Energy (Power Division), which suggested starting on-site testing of 10 percent Thar coal blending with the imported coal. Accordingly, efforts have been started to blend Thar coal with imported coal for Sahiwal, Port Qasim, and Hub coal projects, having a total capacity of 3,960 MW.

The government has planned to merge AEDB into PPIB to extend one window by PPIB for all technologies. The proposed merger will dovetail with the Competitive Trading Bilateral Contract Market (CTBCM), which envisions an Independent Auction Agent (IAA) to assign the task of conducting the auctions/biddings on behalf of DISCOs. Accordingly, the PPIB (Amendment) Bill 2022 was referred to the National Assembly Standing Committee on Power for consideration and report recommending the Bill to pass by the National Assembly on 3rd August 2022. Currently, the report of the Committee on the Bill is ready for consideration in the National Assembly.

### **Alternative Energy Development Board**

The government is working to bring transformational change in the power system to ensure affordability, sustainability, energy security, and universal energy access. Accordingly, the government prioritizes utilizing indigenous, clean energy generation resources and encouraging alternative and renewable technology.

The Alternative Energy Development Board (AEDB) promotes and facilitates alternative and renewable energy technology throughout the country. The GoP is committed to encouraging private sector investments in renewable energy power generation projects. Currently, 36 wind power projects of 1,835 MW, 7 solar projects of 530 MW, and 8 sugar mill-based bagasse co-generation plants of 259.1 MW are operating ARE-based projects. Among several ARE projects, 3 solar projects of 150 MW, started under the RE Policy 2006, are expected to complete within the outgoing fiscal year. Besides, 1 bagasse project of 32 MW is expected to complete in January 2024.

AREs account for 6.8 percent of electricity's installed capacity due to concentrated efforts. However, ARE can increase the national energy supply mix and assure universal and inexpensive power access nationwide. Based on IGCEP findings, the government aims to generate 60 percent of its generation capacity using indigenous clean energy technologies (ARE and hydro) by 2030. The base case of NTDC's plan IGCEP 2022, currently pending approval by NEPRA, estimates the country's demand at 41,338 MW and installed capacity at 69,372 MW by 2031. It also adds 13,278 MW of solar (8,350 MW) and wind (4,928 MW) capacity by 2031, increasing their power mix shares to 20 percent and 10 percent, respectively. AEDB prepared the Request for Proposal (RFP) packages for competitive bidding for wind and solar projects and made NEPRA-required amendments. NEPRA will determine the benchmark tariff for the competitive bidding.

### **Fast Track Solar Initiatives 2022**

For promotion and development of indigenous renewable energy resources in the country on the least cost principle and in the realization of the need to reduce the impact of prevailing high prices of imported fossil fuels in international markets resulting in high electricity tariffs and drain of precious foreign exchange, the Federal Cabinet (GoP) in its meeting held on 18<sup>th</sup> October 2022, approved the Framework Guidelines for Fast Track Solar Initiatives 2022. This framework is based on the following three key pillars.

### **Substitution of Expensive Imported Fossil Fuels with Solar PV Energy**

Under the initiative, Solar PV-based power generation capacity shall be solicited to substitute expensive imported fossil fuels used for power generation that will lower the average basket cost of generation for the system. The government plans to add approximately 6,000 MW of solar PV capacity under this initiative. In the first phase, for a solar PV project of 600 MW capacity at Kot Addu, District Muzaffargarh, NEPRA has approved the RFP and Security Package Documents (SPDs), including the Energy Purchase Agreement (EPA) and the IA on 1<sup>st</sup> February 2023. The benchmark tariff is also determined for the competitive bidding of this project.

### **Solar PV Generation on 11 kV Feeders**

Decentralized, medium-scale Solar PV power can contribute cost-efficiency to alleviate some of these problems by feeding directly into the medium-voltage (MV) network, thereby improving the local losses, power outages, and voltage situation. Furthermore, the injection of Solar PV power into the MV network would provide cheap electricity to the national grid without any augmentation or significant upgrade of the grid infrastructure. Accordingly, solar PV projects of suitable capacity up to a maximum of 4 MW will be procured through competitive bidding at an 11 kV feeder level. The standard RFP and EPA are already prepared for developing small solar projects of up to 4 MW capacity at feeder level across the country. Furthermore, these documents have been shared with all DISCOs for approval from their Boards. Then, it will be processed for competitive bidding on identified feeders upon approval of RFPs and determination of benchmark tariff by NEPRA.

### **Solarization of Public Buildings**

Solarization of public buildings will help meet a specific portion of the electricity load through clean energy technology, reduce electricity bills of public offices, and relieve electricity utilities/distribution companies from long-term dues. Under this initiative, building-specific

Solar PV net-metering-based systems will be installed through bidding on Lease (10-year BOOT basis) and the Own-cost models. AEDB has been tasked to carry out the solarization of public buildings through competitive bidding on behalf of public sector entities.

### **Distributed Generation (Net Metering)**

The government encourages consumers to utilize renewable energy technologies in household, commercial, and industrial sectors in addition to large-scale RE projects. Under the NEPRA (Alternative and Renewable Energy) Distributed Generation and Net Metering Regulations, 2015, AEDB promotes renewable energy-based net-metering.

Under AEDB (Certification) Regulations, 2018, AEDB certifies solar system service providers, vendors, and installers to help consumers and DISCOs and ensure quality. However, the government's Ease of Doing Business vision simplified the restrictions in August 2021. As such, in July–March FY2023, 145 new installers received certifications, bringing the total number of active AEDB-certified installers to 307. Furthermore, net metering-based systems of 355.3 MW total capacity were installed by different consumer segments during the same period, while 50,656 installations totaled 863.4 MW as of March 2023.

AEDB has also supported ARE technology promotion and private-sector investment. First, AEDB facilitated RE power projects to meet milestones and resolve challenges faced by the project sponsors by public sector entities. Second, AEDB and World Bank conducted the Balochistan Renewable Energy Development Study on renewable energy development in Balochistan. It seeks to strategically develop utility-scale solar and wind power in Balochistan to meet Pakistan's ambitious renewable energy targets for the power industry and promote the transition to affordable, reliable, sustainable, and modern energy for all. Third, IESCO and LESCO redesigned and deployed ONMAP, an online net-metering portal for consumer applications. Fourth, AEDB held an Investors Conference in Islamabad on 14<sup>th</sup> September

2022 to present and get feedback from prospective consumer investors on the Framework Guidelines for Fast-Track Solar PV Initiative 2022. Fifth, with GIZ support, 500 solar technicians at relevant Pakistani training institutions will receive customized Competence-Based Training and Assessment (CBT&A) training on the National Vocational Qualification Framework (NVQF).

### Nuclear Energy

Pakistan became a nuclear power producer in 1972 when KANUPP, a 137 MW nuclear power plant in Karachi, began operations. The Pakistan Atomic Energy Commission (PAEC), the only institution in Pakistan authorized to exploit the vast atomic energy generated by splitting nuclei, developed and ran it. After fifty years, KANUPP was shut down in August 2021, but its infrastructure and understanding helped Pakistan build a reliable nuclear power program.

The rejuvenation of nuclear power in Pakistan began at the end of the last century, when KANUPP was almost three decades old, due to Pakistan's inclusion in the list of countries denied nuclear technology transfer. Now the nuclear fleet consisting of 6 NPPs is worth 3,530 MW. Four units (C-1 and C-2, each of 325 MW,

and C-3 and C-4, each of 340 MW) are currently operational in Chashma, Mianwali, while two plants (K-2 and K-3), each with a capacity of 1100 MW are operational in Karachi. The Prime Minister formally inaugurated K-3 on 2<sup>nd</sup> February 2023. While KANUPP was a Pressurized Heavy Water Reactor (PHWR) constructed with the help of Canada, the new generation of nuclear plants is all Pressurized Water Reactor (PWR), designed and constructed with the assistance of China. One more plant of 1,100 MW capacity, destined to be installed at Chashma, is in its planning phase.

Nuclear Power plants (NPPs) have the unique characteristic of operating for about 18 months with no additional fuel. Moreover, fuel for another 18 months can be stored on the plant site without additional infrastructure costs. Therefore, it makes them invulnerable to short-term price fluctuations or supply chain disruption resulting in very high-capacity factors. The 6 NPPs supplied about 18,739 million units of electricity to the national grid from July-March FY2023. In December 2022, the uninterrupted electricity supply from NPPs was about 27 percent of the total electricity supplied in the national grid. Some performance parameters of NPPs are presented in Table 14.5.

**Table 14.5: Performance of Nuclear Power Plants**

Plants	Capacity (MW)		Electricity sent to Grid (million kWh)	
	Gross	Net	July-March FY2023	Lifetime up to 31st March 2023
C-1	325	300	1,654	46,225
C-2	325	300	1,927	27,294
C-3	340	315	1,956	15,311
C-4	340	315	1,794	13,013
K-2	1,100	1,017	5,522	14,052
K-3	1,100	1,017	5,886	7,853

Source: Pakistan Atomic Energy Commission

Avoiding environmental damages in the shape of global warming caused by the CO<sub>2</sub> produced by burning fossil fuels is one of the incentives that nuclear power offers. From July-March FY2023, nuclear power generation avoided about 10 million tonnes of CO<sub>2</sub> entering the environment, whereas the lifetime avoidance of CO<sub>2</sub> emissions is estimated at around 85 million tonnes.

### Oil Sector

The total demand for petroleum products remained at 23.1 million tonnes during FY2022. However, this year witnessed a decline in demand to 13.1 million tonnes during July-March FY2023 from 16.7 tonnes in July-March FY2022. The declining trend may be attributed to a decrease in demand for FO, HSD, MS, and

High Octane Blended Component (HOBC), which comprises more than 95 percent of the total demand. Furthermore, the transport and power sectors are major petroleum consumers, covering around 90 percent of total demand. On the other hand, the only increase is in Jet Fuel's

(JP-1 and JP-8) demand, which has grown 18 percent this year. As such, the demand for petroleum products decreased in all sectors ranging from 5.3 percent to 45.4 percent, except the overseas demand (Table 14.6).

**Table 14.6: Sectoral Consumption of Petroleum Products (000 MT)**

Sector	FY2022	July-March FY2022	July-March FY2023	Change (%)
Domestic	29.522	24.792	13.547	-45.36
Industry	1,332.899	1,025.826	889.741	-13.27
Agriculture	11.822	9.738	7.400	-24.01
Transport	17,409.035	12,789.549	10,254.475	-19.82
Power	3,683.322	2,423.462	1,413.780	-41.66
Government	373.489	276.316	261.668	-5.30
Overseas	250.121	175.660	229.930	30.89
<b>Total</b>	<b>23,090.210</b>	<b>16,725.343</b>	<b>13,070.541</b>	<b>-21.85</b>

Source: Petroleum Division, Ministry of Energy

The decrease in MS and HSD demand may be attributed to the high prices and the decline in FO demand due to shifting power generation from FO/HSD to RLNG/Coal and other alternative sources. Overall, the total demand for petroleum products decreased by 21.9 percent during July-March FY2023 compared to FY2022.

Pakistan is an importer of petroleum products and crude oil. Imports of petroleum products during July-March FY2023 are around 6.1 million tonnes, valued at more than US\$ 5.7 billion (Table 14.7). The major imported products are MS, HSD, and FO, with import quantities of 3,853.9 thousand tonnes, 1,645.6 thousand tonnes, and 530.6 thousand tonnes, respectively. As such, this year witnessed a significant decrease in imports of all five petroleum products.

Furthermore, due to efforts of the government, the country's reliance on FO for power generation declined that leading to 530.6 thousand tonnes of imports during July-March FY2023 against 1,318.2 thousand tonnes for the comparative period of FY2022, whereas the total imports of FO were 2,258.2 thousand tonnes in FY2022. Furthermore, it is expected that with a better fuel mix for electricity generation, the import of FO will further diminish. Furthermore, with the addition of refining capacity in the country, in consequence of more value addition domestically, the import of petroleum products would decline. The crude oil import requirement of refineries during July-March FY2023 remained at 5,858.4 thousand tonnes, which was 6,802.3 thousand tonnes during the same period of FY2022. Furthermore, the total import requirement for crude oil was 9,284.6 thousand tonnes for FY2022.

**Table 14.7: Import of Petroleum Products** (Quantity in thousand MT; Value in million US\$)

Period/ Product	FY2022		July-March FY2022		July-March FY2023	
	Quantity	Value (C&F)	Quantity	Value (C&F)	Quantity	Value (C&F)
MS	6,502.07	6,070.38	4,987.25	4,248.57	3,853.99	3,704.34
HOBC	125.62	115.94	101.98	87.94	18.05	18.54
HSD	3,949.97	3,462.71	2,615.92	1,877.62	1,645.59	1,646.31
FO	2,258.20	1,414.40	1,318.16	688.35	530.59	307.20
JP-1	53.87	47.42	43.37	32.14	70.06	65.65
<b>Total</b>	<b>12,889.730</b>	<b>11,110.852</b>	<b>9,066.687</b>	<b>6,934.610</b>	<b>6,118.289</b>	<b>5,742.040</b>

Source: Petroleum Division, Ministry of Energy; C& F = Cost and Freight



## Gas Sector

Natural Gas's indigenous supplies contribute about 29.3 percent (FY2021) of the country's total primary energy supply mix. Pakistan has an extensive gas network of over 13,775 Km Transmission, 157,395 Km Mains, and 41,352 Km Services gas pipelines to cater to the requirement of more than 10.7 million consumers across the country. The government has been pursuing its policies for enhancing indigenous gas production and imported gas to meet the increasing energy demand in the country. Currently, the capacity of two FRSUs to RLNG is 1,200 MMCFD. Accordingly,

RLNG is being imported to mitigate the gas demand-supply shortfall.

During July-March FY2023, the average natural gas consumption was about 3,258 MMCFD, including 631 MMCFD volume of RLNG. During the same period, the two Gas utility companies (SNGPL and SSGCL) laid a 225 Km gas transmission network, 1,170 Km Mains, and 63 Km service lines and connected 92 villages/towns to the gas network. Furthermore, 7,102 additional gas connections (including 5,068 domestic, 1,948 Commercial, and 86 Industrial) were provided nationwide. Table 14.8 depicts sector-wise natural gas consumption.

**Table 14.8: Sector-wise Natural Gas Consumption (July-March FY2023, MMCFD)**

Sector	Gas Consumption	RLNG	Total
Power	600	399	999
Domestic	906	1	907
Commercial	54	6	60
Transport (CNG)	60	2	62
Cement	3	0	3
Fertilizer	635	52	687
General Industry	369	171	540
<b>Total</b>	<b>2,627</b>	<b>631</b>	<b>3,258</b>

Sources: Ministry of Energy (Petroleum Division)

Natural gas is expected to supply approximately 520,801 new consumers (this target is subject to approval/revision by OGRA) during FY2024. In addition, gas utility companies have planned to invest Rs 38,674 million in transmission projects, Rs 47,700 million in distribution projects, and Rs 9,416 million in other projects bringing the total investment to Rs 95,790 million during FY2024.

Currently, the two LNG terminals are operational with OGRA licenses granted in 2016 and 2018 to M/s Engro Elengy Terminal Limited (EETL) and M/s Pakistan GasPort Consortium Limited (PGPCL), respectively. Further, OGRA granted construction licenses to M/s Tabeer Energy Private Limited and M/s Energas Terminal Private Limited (ETPL) in April 2021 to develop LNG terminals at Port Qasim Karachi. The extension in the validity of these licenses has been granted by OGRA for further two years (i.e., till April 2025) upon the

licensees' request and completion of the requisite formalities.

OGRA is empowered to regulate the LPG sector under the OGRA Ordinance, 2002, and LPG (Production & Distribution) Rules, 2001 w.e.f. 15<sup>th</sup> March 2003. LPG plays an important role in the energy mix of Pakistan as it provides a cleaner alternative to biomass-based sources, especially in locations where natural gas is unavailable. During July-January FY2023, the total supply of LPG stood at 843,878 tonnes, wherein 79.6 percent was met through imports. Currently, 11 LPG producers and 273 LPG marketing companies operate in the country with more than 7,000 authorized distributors. Furthermore, an investment of approximately Rs 2.75 billion is made during July-March FY2023.

## Mineral Sector

Coal is an important energy source, and the power sector uses a significant share of coal for electricity generation. Indigenous coal resources

are reasonably significant (over 186 billion tons) and sufficient to meet the country’s requirements on a long-term sustainable basis. Domestic coal production is expected to increase in the coming years on the start of mining activity at Thar Coalfield Block-I and expansion of existing mine at Block-II. Indigenous coal production is mainly consumed by power generation plants situated at Thar Coalfield, whereas production from other coalfields is utilized in brick kilns. Furthermore, imported coal was consumed by power plants, cement manufacturing units, and other steel-making industries. During July-March FY2023, domestic coal production figured around 9,402.6 thousand tonnes, and about 6,576.6 thousand tonnes of coal were imported.

During July-March FY2023, coal consumption by the power sector is about 47.3 percent (7,295.3 thousand tonnes), whereas, in cement and other industries, it stands at 31.1 percent (4,800.0 thousand tonnes). On the other hand, the brick Kilns sector consumes 21.5 percent (3,321.2 thousand tonnes).

**Table 14.9: Consumption of Coal by Sector**  
(000 metric tonnes)

Sector	FY2023 (July-March)	Share (%)
Power	7,295.3	47.32
Brick Kilns	3,321.2	21.54
Cement/Others	4,800.0	31.14
Household	1.5	0.01
<b>Total</b>	<b>15,418.0</b>	

Source: Hydrocarbon Development Institute of Pakistan

### Outlook

Pakistan is in the transition phase to utilize indigenous and renewable energy sources (hydel, Thar coal, solar, wind) to meet the existing and growing energy needs. It can be supported by certain facts. First, Pakistan decided not to allow more imported coal-based power plants in 2016 after it was on track to meet the demand-supply electricity gap. Second, blending local coal with imported coal has been initiated, which is expected to reduce coal imports. Third, Thar coal is being utilized to generate 3,300 MW of electricity. Fourth, the share of AREs in the fuel mix of electricity generation has been increased to more than 6 percent. Fifth, many hydel power plants have been initiated. Sixth, Nuclear Power generation capacity is increased to 3,530 MW, whereas one more power plant is planned at Chashma. Sixth, the reliance on FO for power production is significantly decreased during the last few years.

Furthermore, the government has approved the Framework Guidelines for Fast Track Solar Initiatives 2022 to promote and develop cost-effective local renewable energy sources. It is expected to reduce domestic price volatility due to less reliance on the global market and ease the foreign exchange requirements. This framework covers three major aspects: Solar PV Energy Substitution for Expensive Imported Fossil Fuels, Solar PV Generation on 11 kV Feeders, and Public Buildings Solarization. To achieve a 60 percent electricity generation, share of indigenous clean energy technologies, IGCEP is prepared, whereas PPIB and AEDB are facilitating the execution of power projects in the right direction.