

Table 14.1: Installed Capacity of Electricity

Source	FY2023		July-March FY2023		July-March FY2024	
	MW	Share (%)	MW	Share (%)	MW	Share (%)
Hydel	10,681	25.44	10,681	25.44	10,681	25.35
Thermal	25,046	59.66	25,046	59.66	25,046	59.45
Nuclear	3,545	8.44	3,545	8.44	3,545	8.41
Renewable	2,709	6.45	2,709	6.45	2,859	6.79
Total	41,981		41,981		42,131	

Source: National Electric Power Regulatory Authority

Table 14.2: Generation of Electricity

Source	FY2023		July-March FY2023		July-March FY2024	
	GWh	Share (%)	GWh	Share (%)	GWh	Share (%)
Hydel	36,254.80	28.11	26,936.90	28.93	29,167.10	31.67
Thermal	62,639.00	48.57	43,525.60	46.75	42,249.20	45.88
Nuclear	24,054.60	18.65	18,738.80	20.13	16,753.70	18.19
Renewable	6,014.30	4.66	3,909.90	4.20	3,921.00	4.26
Total	128,962.70		93,111.20		92,091.00	

Source: National Electric Power Regulatory Authority

Electricity Consumption

During FY2024 (July-March), total electricity consumption was reported at 68,559 GWh (Table 14.3). The household sector is the largest consumer of electricity, consuming 33,737 GWh (49.2 percent), followed by the industrial sector

with 18,022 GWh (26.3 percent). Moreover, agriculture and commercial sectors consume 6,905 GWh (10.1 percent) and 5,365 GWh (7.8 percent), respectively, whereas the electricity consumption in other sectors (streetlights, general services, and other government) is 4,530 GWh (6.6 percent).

Table 14.3: Sectoral Share in Electricity Consumption

Source	FY2023		July-March FY2023		July-March FY2024	
	GWh	Share (%)	GWh	Share (%)	GWh	Share (%)
Household	53,522.91	47.41	33,319	48.12	33,737	49.21
Commercial	8,891.62	7.88	5,174	7.47	5,365	7.83
Industry	31,088	27.54	19,626	28.34	18,022	26.29
Agriculture	9,639.68	8.54	6,854	9.90	6,905	10.07
Others	9,748.99	8.64	4,274	6.17	4,530	6.61
Total	112,891.20		69,247		68,559	

Source: National Electric Power Regulatory Authority

Private Power and Infrastructure Board

The Private Power and Infrastructure Board (PPIB) was created in 1994 as a One Window Facilitator on behalf of the GoP to promote private investment in the power sector. It was given statutory status in 2012 through an Act of the Parliament, PPIB Act, 2012, that empowered PPIB to facilitate certain public sector power and related infrastructure projects in Independent Power Project (IPP) mode. PPIB approves IPPs, issues Letters of Intent (LOIs) and Letters of Support (LOSs) (including Tripartite LOSs), approves feasibility studies, executes Implementation Agreements (IAs), provides GoP guarantees, and formulates regulations

related to power generation and transmission lines. To create synergy in the power sector, the Alternative Energy Development Board (AEDB), with a similar mandate, has also been merged into PPIB in June 2023.

So far, PPIB has successfully managed the development of 100 IPPs with a capacity of about 24,958 MW, more than half of the country's total installed capacity, attracting FDI of over US\$33 billion. In addition to the commissioning of 100 IPPs, another five multiple fuel-based IPPs of 1,066 MW are at the advanced stage of construction and are expected to be completed during 2024-25. These initiatives help boost economic development,

employment, and livelihoods by generating much-needed electricity. Table 14.4 presents

information associated with PPIBs-facilitated installed generation capacity.

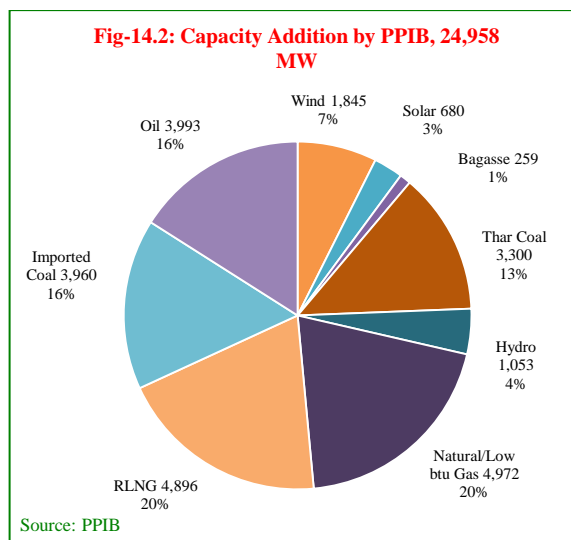
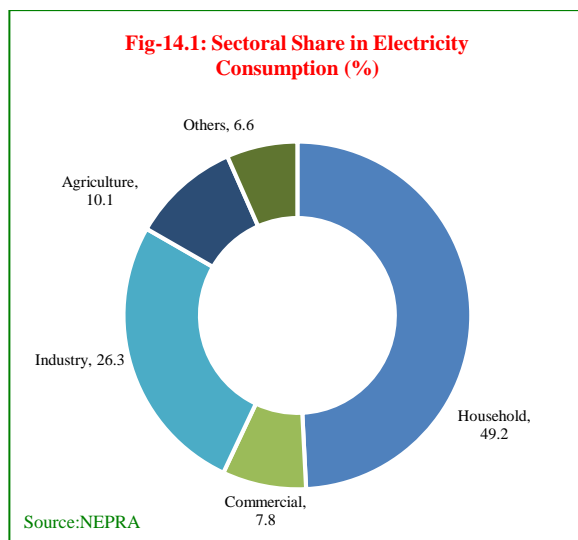


Table 14.4: PPIB's Facilitated Installed Capacity

Total 24,958 MW	Commissioned Projects: Fuel/Technologies								
	Wind	Solar	Bagasse	Thar Coal	Hydro	Natural/Low BTU Gas	RLNG	Imported Coal	Oil
	1,845 MW	680 MW	259 MW	3,300 MW	1,053 MW	4,972 MW	4,896 MW	3,960 MW	3,993 MW

Source: Private Power and Infrastructure Board

PPIB promotes indigenous Thar-coal and hydel resources to generate cheaper electricity and accelerates hydel and Thar coal-based power generation projects. The Portfolio of upcoming power generation projects, currently being processed by PPIB, comprises 24 projects of

7,460 MW at different completion stages (Table 14.5). The government understands the adverse impacts of climate change; thus, all the projects, including coal, meet the World Bank/International Finance Corporation's environmental standards.

Table 14.5: Power Projects under Facilitation by PPIB

Year/Description	No. of IPPs	Fuels	Power Generation (MW)
2024	3	Bagasse, Solar, Hydel (32+100+884)	1,016
2025	6	Solar, Hydel, Imp Coal (132+7+300)	439
2026	3	Wind, Hydel (100+8)	108
2028	1	Thar Coal (1,320)	1,320
2029	1	Hydel (82)	82
2030	1	Hydel (701)	701
2031	3	Hydel (1,556)	1,556
2032	1	Hydel (640)	640
Other Projects in Process	5	Hydel, Gas (1578+20)	1,598
Total	24		7,460

Source: Private Power and Infrastructure Board

Under the short-term targets, apart from opening new investment landscapes in Thar Coal and Hydel power generation in accordance with the power demand-supply scenario under the

Integrated Generation Capacity Expansion Plan (IGCEP) 2022 and policies in vogue, PPIB is striving to complete 12 ongoing IPPs of 1,563 MW during 2024-26 (Table 14.6).

Table 14.6: Ongoing IPPs (MW)

Year	Wind	Solar	Bagasse	Hydro	Imported Coal	Total
2024	-	100	32	884	-	1,016
2025	-	132	-	7.0	300	439
2026	100	-	-	8.0	-	108
Total	100	232	32	899	300	1,563

Source: Private Power and Infrastructure Board

PPIB is actively processing a diversified portfolio of IPPs (Wind/ Solar/ hydel/Bagasse/ Coal and Gas) under the provisions of Power Generation Policy 2015, Alternative and Renewable Energy (ARE) Policy 2019, and National Electricity Policy 2021. PPIB has achieved Significant accomplishment for the implementation of various advanced staged IPPs during the July-March FY 2024:

Successful Completion of 3 solar projects by Scatec, Norway: Scates ASA is establishing three solar power projects (each 50 MW) in Sukkur. Due to the expeditious processing & Facilitation of PPIB, these projects have successfully achieved commercial Operation Dates (COD).

Suki Kinari Hydropower Project: The largest hydro IPP of 884 MW, the Suki Kinari project achieved completion of over 96 percent of the work by March 2024. The Project is well on Track to be operational in November 2024.

Bagasse-Based Shah Taj Sugar Mills Project: Thanks to PPIB's swift processing and facilitation services, the 32 MW Bagasse-based project by Shah Taj Sugar Mills, located in Mandi Bahauddin, has accomplished a significant proportion of construction work and is progressing satisfactorily toward commissioning by June 2024.

Net-Metering: As of March 2024, net metering-based solar installations stand at 117,807 with a cumulative capacity of 1,822 MW. The number of active certified installers has surpassed 400.

To prioritize indigenous and renewable resource-based power generation, IGCEP has targeted increasing the share of RE, including hydropower, from 33 percent to 62 percent by

2031. In this regard, the following measures have been taken in the ongoing fiscal year:

- Development of solar PV Project under Fast Track Solar Initiatives 2022 (600 MWp and 50 MWp Projects at Kot Addu/ Muzaffargarh and Manjhand)
- Development of RE projects under G2G mode (600 MWp and 1200 MWp projects at Jhang & Layyah)
- Small-scale Solar PV project at 11 KV level through competitive bidding by DISCOs
- Constraints in power evaluation capacity and transmission line development are among the power sector's top priorities, and PPIB plans to carry out competitive bidding for private sector investment in transmission lines.

For the promotion of local resources for power generation, PPIB has already imposed a moratorium on the processing of new imported fuels-based power projects since 2016. Further, due to the increased price of imported coal in the international market, GoP took the initiative to substitute imported coal-based IPPs with Thar coal which is abundantly available. In this regard, a feasibility study has been conducted to convert imported coal-based IPPs to Thar coal. Efforts are underway to start the blending of Thar Coal by three imported coal IPPs with a cumulative capacity of 3,960 MW, including 1,320 MW Sahiwal Coal Power Project, 1,320 MW Port Qasim Coal Power Project, and 1,320 MW Hub Coal Power Project.

These initiatives will reduce electricity generation costs, lower tariffs, and save valuable foreign exchange.

Fast Track Solar Initiatives

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 government has approved the Framework Guidelines for Fast-Track Solar PV Initiatives 2022 for fast-track deployment of solar PV. This framework is based on the following three key pillars.

Substitution of Expensive Imported Fossil Fuels with Solar PV Energy

Under this initiative, solar-based power generation capacity shall be solicited to substitute expensive imported fossil fuels used for power generation. This will lower the average basket cost of generation for the system by utilizing solar energy during the daytime in substitution of the imported fossil fuels-based thermal generation at that time while utilizing the same thermal power generation capacity at night to meet the peak demand at that time. The government plans to add around 6,000 MW of solar PV capacity under this initiative primarily through competitive bidding. The following three (03) solar PV projects of 2,400 MW cumulative power generation capacity will be implemented shortly. These are the 600 Megawatt peak (MW_p) solar project at Kot Addu / Muzaffargarh, the 600 MW_p Solar Project at Jhang, and the 1200 MW_p Solar Project at Layyah.

Solar PV Generation on 11 kV Feeders

Many electricity consumers in Pakistan suffer from poor power quality (scheduled & unscheduled outages, low voltage, etc.). Decentralized, medium-scale Solar PV power can contribute cost-efficiently to alleviate some of these problems by feeding directly into the medium-voltage (MV) network, thereby improving the local losses 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 with a suitable capacity of up to a maximum of 4 MW will be procured through a competitive bidding process at the 11 kV feeder level. It is envisaged that approximately 2000 MW of solar PV capacity will be added under this initiative.

Solarization of Public Buildings

Solarization of public sector buildings will help meet particular portion of the electricity load through clean solar 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 are being installed through bidding. This initiative is expected to result in the installation of 1000 MW rooftop-based solar PV capacity.

Other Initiatives During FY 2024 for Promoting Renewable Energy

PPIB undertook many supportive measures to promote RE technologies and attract private sector investments. Some of the supportive measures taken by PPIB are as follows:

- i. PPIB proactively facilitated the RE power projects' achievement of project milestones and resolution of issues and impediments faced by the project sponsors from different public sector entities.
- ii. PPIB engaged with the World Bank to carry out an initial study on RE development in Balochistan titled "Balochistan Renewable Energy Development Study" with the objective of strategic development of utility-scale solar and wind power in Balochistan to help meet Pakistan's ambitious renewable energy targets for the power sector and support the broader transition that is needed to achieve "affordable, reliable, sustainable and modern energy for all."
- iii. An online net-metering portal (ONMAP) was redesigned and reactivated in IESCO and LESCO for the online processing of consumer applications for net-metering-

based systems. PPIB is currently working on the expansion of ONMAP with improved features such as solar PV equipment verification & tracking and a rooftop solar monitoring program.

- iv. With the support of GIZ, a program for the training of solar technicians has been initiated. Under this program, customized training for 500 technicians at relevant Pakistani training institutions will be provided using a Competency-Based Training and assessment approach, following the National Vocational Qualification Framework.
- v. PPIB is also engaged in international initiatives such as the Danish Energy Transition Initiative (DETI) and RELP. Under the DETI initiative, the Danish Government is providing capacity building to Pakistan's power sector. RELP, an international NGO, is assisting PPIB in designing a competitive bidding framework and preparing a broader roadmap for Pakistan's renewable energy sector, along with de-risking guarantees/tools.

Nuclear Energy

Pakistan was the 15th country worldwide to install an NPP when the 137 MW Karachi Nuclear Power Plant (KANUPP) became operational in 1972. The plant's economic life assessment was 30 years; however, it operated for around 50 years under the supervision of the Pakistan Atomic Energy Commission (PAEC) and finally shut down in August 2021.

For almost three decades after the start of the KANUPP, international embargoes on transferring civil nuclear technology to Pakistan restrained the expansion of nuclear energy generation capacity in the country. Steady efforts regarding technology and manpower development have resulted in the addition of six NPPs with 3530 MW capacity in Pakistan's power system. Units (C1 and C2, each of 325 MW, and C3 and C4, each of 340 MW) are currently operational in Chashma, Mianwali, while two plants, each with a capacity of 1100 MW, are operational in Karachi. While KANUPP was a Pressurized Heavy Water Reactor (PHWR) constructed with the help of Canada, the new generation of nuclear plants are all Pressurized Water Reactor (PWR) designed and built with the assistance of China. One more PWR plant of 1200MW capacity is in the initial phase of its development at the Chashma site, called C-5.

A unique characteristic of a PWR NPP is that once fueled, it can produce electricity at total capacity for around 14 to 18 months. This is called one cycle of electricity production. Fuel is only added during break time between these cycles. This not only makes them invulnerable to short-term energy price fluctuations but also a source of secure energy supply to the grid. These attributes of nuclear power technology ensure a high availability of NPP. The six NPPs supplied about 16,753 million units of electricity to the national grid during July-March FY 2024 (Table 14.7). During this period, the monthly share of nuclear in the generation mix remained between 12.8 percent to 25.8 percent.

Table 14.7: Performance of Nuclear Power Plants

Plants	Capacity (MW)		Electricity sent to Grid (million kWh)	
	Gross	Net	July-March FY2024	Lifetime up to 31st March 2024
C-1	325	300	1,317	48,187
C-2	325	300	1,976	29,781
C-3	340	315	1,666	17,522
C-4	340	315	1,984	15,676
K-2	1,100	1,017	3,900	19,991
K-3	1,100	1,017	5,911	14,661

Source: Pakistan Atomic Energy Commission

Nuclear energy is clean, so it avoids the emission of greenhouse gases (GHG) in the environment. During July-March FY 2024, nuclear generation in Pakistan avoided about 10 million tonnes of GHG entering the environment. The lifetime avoidance of GHG emissions by Pakistan-operating NPPs is estimated at around 103 million tonnes.

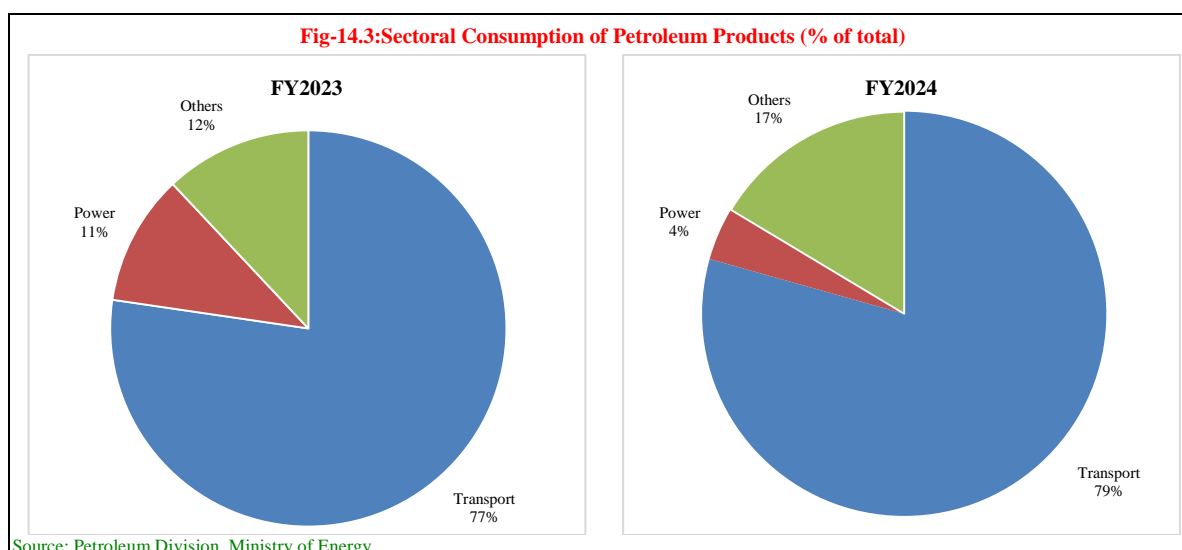
14.2 OIL SECTOR

A decline in demand for oil to 12.3 million tonnes was observed during July-March FY 2024, from 13.3 million tonnes during the same

period last year. The declining trend may be attributed to a decrease in demand for HSD, MS, and Furnace Oil (FO), which comprises more than 95 percent of the total demand. The total demand for petroleum products remained at 17.5 million tonnes during FY 2023. Furthermore, the transport and power sectors are major petroleum consumers, covering 77.3 percent and 10.7 percent of total demand, respectively. Overall, the total demand for petroleum products decreased by 7.23 percent during July-March FY 2024 compared to last year. Sector-wise consumption of petroleum products is depicted in Table 14.8.

Sector	FY2023	July-March FY2023	July-March FY2024	Change (%)
Domestic	17.95	13.55	18.80	38.80
Industry	1,126.85	889.71	815.32	-8.36
Agriculture	9.21	7.40	10.16	37.31
Transport	13,606.63	10,254.53	9,764.55	-4.78
Power	1,668.15	1,417.08	520.70	-63.26
Government	365.09	262.26	224.70	-14.32
Overseas	696.85	416.63	948.03	127.55
Total	17,490.73	13,261.15	12,302.25	-7.23

Source: Petroleum Division, Ministry of Energy



Pakistan is a net importer of petroleum products and crude oil. Imports of petroleum products and crude oil during July-March FY 2024 are around 11.0 million tonnes, valued at around US\$ 8.4 billion. The major imported products are Motor Spirit (MS), High-Speed Diesel (HSD), and

crude oil, with import quantities of 3,528.1 thousand tonnes, 1,233.5 thousand tonnes, and 6,169.3 thousand tonnes, respectively. During the period under review, the import value of petroleum products declined by 16.7 percent compared to the same period last fiscal year.

Furthermore, due to the government's efforts, the country's reliance on FO for power generation declined, leading to zero imports for

furnace oil, which was US\$ 307.7 million in FY 2023 (Table 14.9).

Table 14.9: Import of Petroleum Products Quantity in thousand MT; Value in million US\$

Period/ Product	FY2023		July-March FY2023		July-March FY2024	
	Quantity	Value (C&F)	Quantity	Value (C&F)	Quantity	Value (C&F)
MS	5,181.04	4,829.87	3,853.99	3,704.34	3,528.13	3,156.31
Crude Oil	7,595.47	5,334.17	5,858.44	4287.35	6,169.27	4,051.07
HOBC	31.57	30.57	18.05	18.54	17.83	16.25
HSD	2,367.03	2,219.08	1,645.59	1,646.31	1,233.53	1,050.27
FO	530.59	307.66	530.59	307.20	-	-
JP-1	113.94	100.68	70.06	65.65	98.24	85.51
Total	15,819.63	12,822.03	11,976.73	10,029.39	11,047.00	8,359.41

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

14.3 GAS SECTOR

Natural Gas is a clean, safe, efficient, and environmentally friendly fuel. Its indigenous supplies contribute about 28.9 percent (FY 2023) of the country's total primary energy supply mix. Pakistan has an extensive gas network of over 13,989 KM Transmission, 161,806 KM Mains, and 41,463 KM Services gas pipelines to cater to the requirements of more than 10.77 million consumers nationwide. The government is pursuing its policies to enhance indigenous gas production and import gas to meet the increasing energy demand in the country. Currently, the capacity of two FRSUs to Re-gasified Liquefied Natural Gas (RLNG) is 1,200 MMCFD and accordingly, RLNG is being imported to mitigate the gas demand-supply shortfall.

The total natural gas consumption was about 3,207 million Cubic Feet per day (MMCFD), including 695 MMCFD volume of RLNG from July-March FY 2024. The maximum gas consumption is from the power sector, domestic, and fertilizers, with 894 MMCFD, 864 MMCFD, and 764 MMCFD, respectively. During the same period, two gas utility companies (SNGPL & SSGCL) have laid 156 Km Gas Transmission network, 3,614 Km Mains, and 76 Km service lines and connected 56 villages/towns to the gas network. Moreover, 11,554 additional gas connections, including 9,871 domestic, 1,621 commercials, and 62 industrial, were provided across the country. Table 14.10 depicts sector-wise natural gas consumption.

Table 14.10: Sector-wise Gas Consumption MMCFD

Sector	July-March FY2023			July-March FY2024		
	Gas Consumption	RLNG	Total	Gas Consumption	RLNG	Total
Power	600	399	999	461	433	894
Domestic	906	1	907	863	1	864
Commercial	54	6	60	43	6	49
Transport (CNG)	60	2	62	58	3	61
Fertilizer	635	52	687	721	43	764
General Industry	369	171	540	366	209	575
Total	2,627	631	3,258	2,512	695	3,207

Sources: Ministry of Energy (Petroleum Division)

In pursuance of OGRA Ordinance 2002 and LNG policy 2011, OGRA notified LNG rules 2007 to bring the anticipated LNG activities

under the regulatory regime. The licensing process related to the regulated activities of the LNG sector is governed under OGRA (LNG)

rules 2007.

For the period July-March FY 2024, the progress/status of the project and steps undertaken by OGRA in the LNG sector is mentioned below:

- To date, 02 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.
- OGRA granted construction licenses in April 2021 to M/s Tabeer Energy Private Limited (TEPL) and M/s Energas Terminal Private Limited (ETPL) to develop LNG terminals in Port Qasim Karachi. Moreover, an extension in the validity of these licenses has been granted by OGRA for a further two years.

Gas companies plan to provide new connections during FY 2025 subject to OGRA approval. In addition, gas utility companies plan to invest Rs 45,483 million in transmission projects, Rs 39,610 million in distribution projects, and Rs 5,878 million in other projects, bringing the total investment to Rs 90,971 million during FY 2025.

OGRA is empowered to regulate the LPG sector under the OGRA Ordinance, 2002, and LPG (Production & Distribution) Rules, 2001 w.e.f. 15th March 2003. LPG is essential in Pakistan's energy mix as it provides a cleaner alternative to biomass-based sources, especially in locations where natural gas is unavailable. During July-February FY 2024, the total supply of LPG stood at 935,574 M. tonnes. Currently, 11 LPG producers and 313 LPG marketing companies operate in the country with over 6,000 authorized distributors.

OGRA has simplified the procedure for granting LPG licenses, and the same is granted on a fast-track basis once the requirements are met. During July-March FY 2024, 36 permits for the operation of LPG storage & filling plants, 33 licenses for the construction of LPG storage & filling plants, 02 operational licenses for LPG air

mix plant, and 08 licenses for road bowsers for transportation of LPG were issued. In addition, OGRA has also issued 04 permits for the construction of LPG auto refueling stations during the same period.

Due to augmented investment and future expansion plans of the LPG marketing companies, significant investment in LPG supply and distribution infrastructure has been witnessed. OGRA has made a noteworthy contribution to national economic progress and created an environment for additional investment, which will not only result in the creation of infrastructure in the LPG sector all over the country but also provide jobs to hundreds of unemployed people. OGRA is playing a role in increasing private investment in the midstream and downstream petroleum industry. During July-March FY 2024, an investment of around Rs 6.57 billion has been made in LPG infrastructure.

COAL

Coal is an important energy source, and the power sector uses a significant share of coal for electricity generation. Indigenous coal resources are reasonably substantial 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, starting with mining activity at Thar Coalfield Block-I and expanding the 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, power plants and the industrial sector consumed imported coal.

During July-March FY 2024, the power sector's coal consumption remained at about 68.9 percent (11,906.7 thousand tonnes), whereas, in the brick Kilns sector, it stands at 14.9 percent (2,572.3 thousand tonnes). On the other hand, the cement and other industries sector consumes 16.2 percent (2,800.0 thousand tonnes). Sector-wise consumption of coal is depicted in Table 14.11.

Table 14.11: Sector-wise Consumption of Coal 000 metric tonnes

Sector	FY2024(July-March)	Share (%)
Power	11,906.70	68.91
Brick Kilns	2,572.26	14.89
Cement/Others	2,800.00	16.20
Household	-	-
Total	17,278.96	

Source: Hydrocarbon Development Institute of Pakistan (HDIP)

Concluding Remarks

Achieving self-reliance in energy production is crucial to reducing economic vulnerabilities, lowering production costs, and enhancing global competitiveness. As such, Pakistan’s energy sector is paving the way towards transitioning from imported fossil fuel to renewable energy sources, as demonstrated by substantial investments in wind and solar power. Furthermore, the government has approved the Framework Guidelines for Fast Track Solar Initiatives 2022 to promote and develop cost-effective, climate-friendly, and local renewable energy sources.

According to IGCEP-2022, no new power plants

based on imported fossil fuels will be inducted. By 2030, the share of electricity from hydel, wind, and solar sources is projected to rise from 28 percent, 4 percent, and 1 percent, respectively, to 39 percent, 10 percent, and 10 percent, increasing the total share of green electricity in the generation mix to approximately 59 percent. Accordingly, the government has been focusing on strengthening the regulatory framework and incentivizing the private sector investment in renewable energy that will help ensure energy security and climate change mitigation. The Private Power Infrastructure Board is facilitating twenty-four (24) power generation projects (including 22 renewable projects), having an installed capacity of 7,460 MW, which will be completed by 2032.