Chapter 14

ENERGY

Pakistan is successfully overcoming energy crisis, which has direct and indirect impact on all sectors of the economy, through increase in generation as well as in transmission capacity of the system. Presently, Energy Sector is confronted with demand supply gap, which needs to be filled up along with improvement in energy-mix for its supply at lower cost. In terms of energy-mix, Pakistan's reliance on thermal which includes imported coal, local coal, RLNG and natural gas has been decreasing over last few years. Pakistan's dependence on natural gas in the overall energy mix is on decline and the reduction of its share in the energy mix may be attributed to declining natural gas reserves as well as to the introduction of LNG since 2015. The share of renewable has steadily increased over the years (% share, however, in July-April 2020 has declined as compared to same period in 2019). The shares of Hydro and nuclear in energy-mix have also increased in FY2020 as compared to FY 2019. Such historical variability for each energy source in the energy mix of the country has been used to formulate the Integrated Energy Plan. The Integrated Energy Plan will not only help in envisioning the energy demands and respective supply paths of the future but also to formulate evidence based long term policy options.

Global and Regional Perspective

Energy systems around the world are going through rapid transitions that will bring important changes to the way we fuel our cars, heat our homes and power our industries. These trends will have widespread implications for businesses, governments and individuals in the coming decades. A competition is underway among coal, natural gas and renewable to provide economic power and heat to Asia's fast-growing economies. Coal is the incumbent in most developing Asian countries. Renewable, led by China and India are the main competitors to coal in Asia's power sector. Developing Countries in Asia account for over half of the global growth in generation from renewable. Demand for natural gas has also been growing fast as clean fuel of choice for industry. An increase of over 70 percent in Asia's natural gas consumption comes from imports, largely from LNG; however, the competitiveness of this gas in price-sensitive markets remains a key uncertainty. Regionally, primary energy demand in the Asia Pacific region is expected to grow by over 40 percent by 2040, based on the International Energy Agency's central scenario, accounting for two-thirds of the global growth.

Electricity

Pakistan's Generation Capacity and Energy Mix

Share in Electricity Generation

The hydro share in total electricity generation has increased in FY2020 as compared to its

share in FY2019. Currently, thermal has the largest share in electricity generation. Gas and RLNG are other cheaper sources. Significant growth of RLNG usage in energy mix has helped in improved supply to various power plants like Bhikki, Haveli Bahadur Shah, Balloki, Halmore, Orient, Rousch, KAPCO, Saif and Sapphire. Moreover, RLNG is also being supplied to fertilizer plants, industrial and transport sectors. The comparison of share of different sources of electricity generation is given below:

Table 14.1: Share in Electricity Generation (GWH)

	2019 (Jul-Apr)	2020 (Jul-Apr)	% Share 2019 (Jul-Apr)	% Share 2020 (Jul-Apr)
Hydroelectric	24931	27270	25.8	30.9
Thermal	61003	51629	63.0	58.4
Nuclear	2903	7049	3.0	8.2
Renewable	7955	2057	8.2	2.4
Total	96792	96382	100	100

Source: Ministry of Energy, (Power Division)

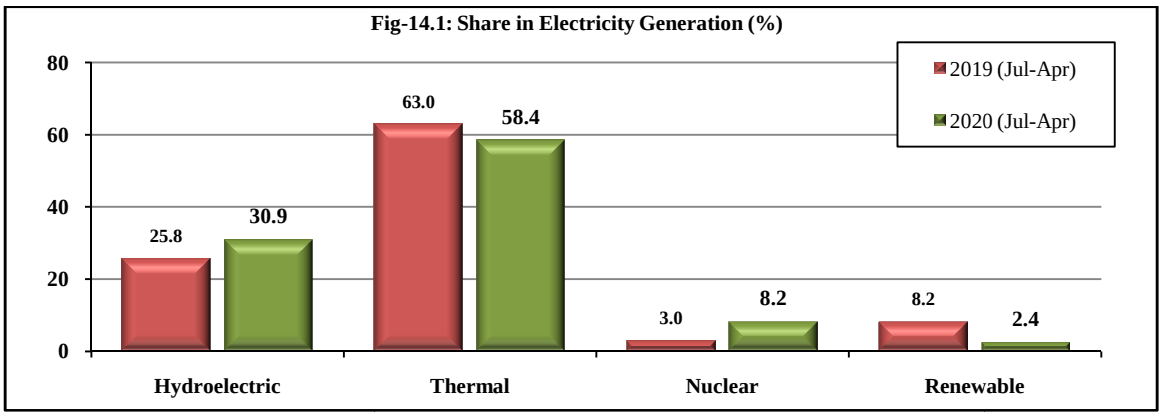
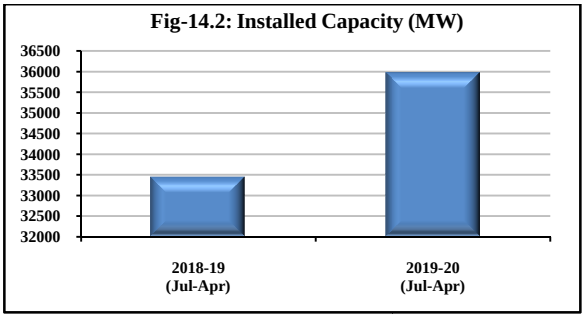


Table 14.2: Installed Capacity

Installed Capacity (MW)	2018-19 (Jul-Apr)	2019-20 (Jul-Apr)
	33,452	35,972

Source: Ministry of Energy, (Power Division)

Till April, FY2020, installed capacity of electricity has reached to 35,972 MW, which was 33,452 MW in April 2019, posting a growth of 7.5 percent



Electricity Consumption

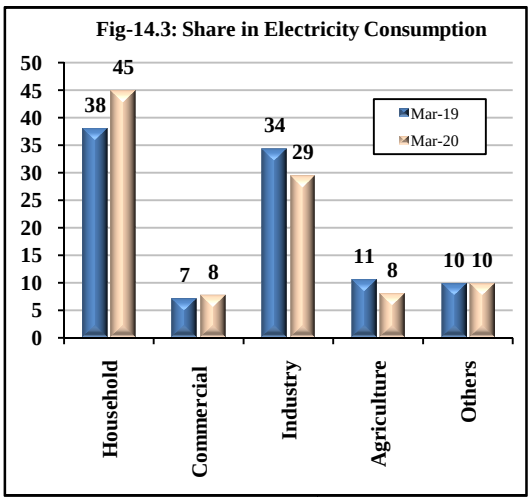
Regarding consumption pattern, there is no significant change in the consumption pattern of electricity. However, during July-April FY2020, the share of agriculture in electricity consumption has been decreasing which may be attributed to improved rain pattern for major crops. The share of Household in electricity consumption has increased. The comparison between consumption patterns of electricity during March 2020 with corresponding period last year is shown below:

Table 14.3: Share in Electricity Consumption

Description/ Sectors	UNITS SOLD (MWH) Mar-19	UNITS SOLD (MWH) Mar-20	% Share Mar-19	% Share Mar-20
Household	2,180,190	2,296,190	38.07	44.90
Commercial	407,580	394,915	7.12	7.72
Industry	1,966,390	1,505,957	34.34	29.45
Agriculture	606,180	411,257	10.58	8.04
Others	566,700	505,245	9.90	9.88
Grand Total	5,727,040	5,113,567	100.00	100.00

Oil Sector

The consumption of petroleum products (energy products) in Pakistan is 19.68 million tonnes/annum against the supply of 11.59 million tonnes per annum from local refineries, while rest of the 8.09 million tonnes/annum is being imported.



Oil prices have crashed and lost over 60 percent of its values in last few months owing largely to non-agreement between OPEC and non-OPEC major crude producers on cutting world production and the sharp decline in demand due to closing down on industries, tourism and service sectors across the world due to COVID-19 pandemic. For the first time in history, the settlement price for WTI crude on 20-04-2020 was negative $40.0; however international bench mark i.e. Brent crude plunged to 22 $/barrel and recovered to 30 $/barrel during 2nd week of May 2020.

The Government of Pakistan has shared the benefits of lower petroleum with the population by reducing petroleum prices frequently in the recent past; the government has reduced the prices of various petroleum products ranging from Rs 15 to Rs 30 on May 1, 2020. Earlier, the petroleum products prices were decreased by Rs 7 per liter for the month of March and subsequently, Rs 15 per liter in April. Pakistan imports $15-$16 billion worth of oil annually and in the current scenario, the Government can save up to $8-$9 billion. If the government passes 50 to 60 percent of the benefit of the drop in oil rates to the public, it may generate sizable economic stimulus.

The total refining capacity of the country is 19.37 million tonnes; however, the same is not being fully utilized on account of financial as well as technical problems. On financial side, the present Government after taking over, made concerted efforts to clear the circular debt, however, the same continued to rise. The government is engaged with IMF and World Bank to address it appropriately, to ease down the liquidity problem.

On the other side, most of the refineries in Pakistan are old version except PARCO. Such refineries produce more than 40 percent of Furnace Oil (FO), which is the lowest price value product. A refinery producing large quantities of FO is generally a money loser or has squeezed margins based on the pure crude/product price differential.

The Petrol consumption in the country is 7.6 million tonnes/annum, out of which 30 percent is being catered from local refineries and rest is being imported to meet the National Demand. Similarly, the consumption of Diesel is around 7.3 million tonnes/annum. The local production can meet 65 percent of the total demand, while rest is being imported.

At refining side, five refineries namely; PARCO, NRL, PRL, APL and Byco are operating in the country. Byco leads with major share in installed capacity by 38 percent followed by PARCO and NRL by 23 percent, 15 percent respectively. Whereas, APL and PRL possess 13 percent and 11 percent share respectively in domestic installed capacity.

Table 14.4: Detail of Oil Refineries

S. No.	Name of Refinery	Capacity	Area
1.	Pak Arab Refinery Limited (MCR)	100,000 bbl/d	Multan
2.	Attock Refinery Limited (ARL)	53,400bbl/d	Rawalpindi
3.	Byco Petroleum Pakistan Ltd (Byco)	150,000bbl/d	Hub Balochistan
4.	National Refinery Limited (NRL)	64,000bbl/d	Karachi
5.	Pakistan Refinery Limited (PRL)	50,000bbl/d	Karachi

There are thirty Oil Marketing Companies (OMCs), in the Country, major are; Pakistan State Oil Company Limited (PSOCL), Shell Pakistan Limited (SPL), Total Parco Pakistan Limited (TPPL), Attock Petroleum Limited (APL), Gas & Oil Pakistan Private Limited (GOPPL) and Hascol Storage Limited (HPL, Among these OMCs, PSO leads with an overall market share of 42.5 percent, followed by APL with 10.9 percent, TPPL 10.3 percent, HPL 9.8 percent and SPL 8.3 percent.

OMCs receive, store, distribute / market the petroleum products in the Country by utilizing their supply arrangements and infrastructure, comprising of OMC's Installations, Storage Depots, Oil Pipelines and Retail Outlets, etc. The bulk of 19.68 million tonnes of petroleum products required by the Pakistan's market is transported by Road (around 74 percent), Oil pipelines (24.4 percent) and Railways (1.5 percent). The OMCs (i.e. PSO, SPL and TPPL) hold equity partnerships in the White Oil Pipeline (WOP), which provides the strategic infrastructure to transport petroleum products from Karachi to the Up-Country locations. WOP has a transportation capacity of 12 million tonnes / annum.

There are around 8567 OMC's Retail Outlets in the Country. PSO has the largest share of around 3,487 Retail Outlets, Moreover, the OMCs are managing a fleet of more than 12,000 tank lorries for the movement / supply of the petroleum products.

Gas Sector

Natural Gas is a clean, safe, efficient and environment friendly fuel. Its indigenous supplies contribute about 38 percent in total primary energy supply mix of the country. Pakistan produces around four (4) Billion Cubic Feet Per Day (Bcfd) of indigenous natural gas against an unconstrained demand of over six (6) Bcfd. To meet the shortfall, the GoP has initiated the import of LNG. Pakistan has an extensive gas network of over 12,971 Km Transmission 139,827 KM Distribution and 37,058 Services gas pipelines to cater the requirement of more than 9.6 million consumers across the country. Government of

Pakistan is pursuing its policies for enhancing indigenous gas production as well as imported gas to meet the increasing demand of energy in the country. At present, the capacity of two Floating Storage and Re-gasification Unit (FRSU) to Re-gasified Liquefied Natural Gas (RLNG) is 1200 MMCFD and accordingly RLNG is being imported to mitigate gas demand-supply shortfall.

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 not available. It an emerging sector of energy in Pakistan and 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. The total supply of LPG during July-March 2019-20 was 739,785 Metric Ton. Currently, there are 11 LPG producers and 200 LPG marketing companies operating in the country having more than 7,000 authorized LPG distributors.

OGRA has simplified the procedure for grant of LPG license and the same is granted on fast track basis once the requirements are met / complied. During July-March 2019-20, one (01) operational license of LPG Storage Terminal, three (03) licenses for construction of LPG Air-Mix plant, thirty-five (35) licenses for construction of LPG Storage & Filling plants and eighteen (18) licenses for operation of LPG Storage & Filling plants were issued. In addition, OGRA has also issued three (03) licenses for construction of LPG Auto Refueling stations and three (03) operational licenses for 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. LPG sector has also provided jobs to hundreds of unemployed people. During July-March 2019-20, an investment of Rs 3.72 billion approximately has been made in LPG infrastructure.

Around 76 percent of the LPG consumed is met with Local Production in Pakistan, whereas the rest is imported. Refineries, Gas Producing Fields and Imports are three main sources of LPG supply in the Country. LPG is gradually becoming popular domestic fuel among people who live in far-flung areas and where natural gas infrastructure does not exist. Currently, LPG accounts for about 1.2 percent of the total primary energy supply in the country. This low share of LPG in the total energy mix is mainly due to supply constraints and the higher price of LPG in relation to competing fuels like natural gas, wood etc.

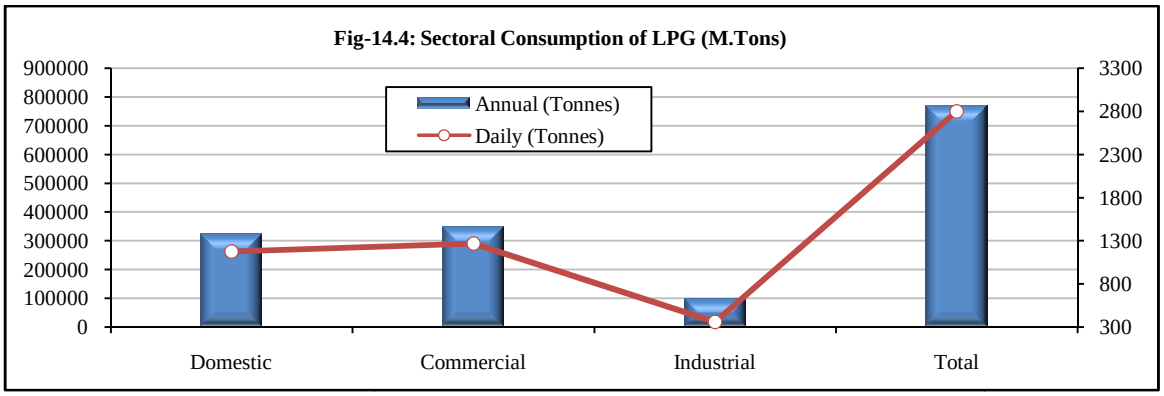
The current size of LPG market is around 1,061,447 MT/Annum. It is primarily meant to supply for the domestic fuel requirement especially in natural gas starved areas and in peak times in the urban territories. The use of LPG as domestic fuel shall deter deforestation in hilly areas and shall provide a comparatively healthier and hygienically safe alternative to the common citizens. GoP has taken a policy decision to allow use of LPG in the automotive sector to share the burden with conventional auto fuels. Subsequently, OGRA has laid down an elaborated regulatory framework for supply of LPG to the vehicles.

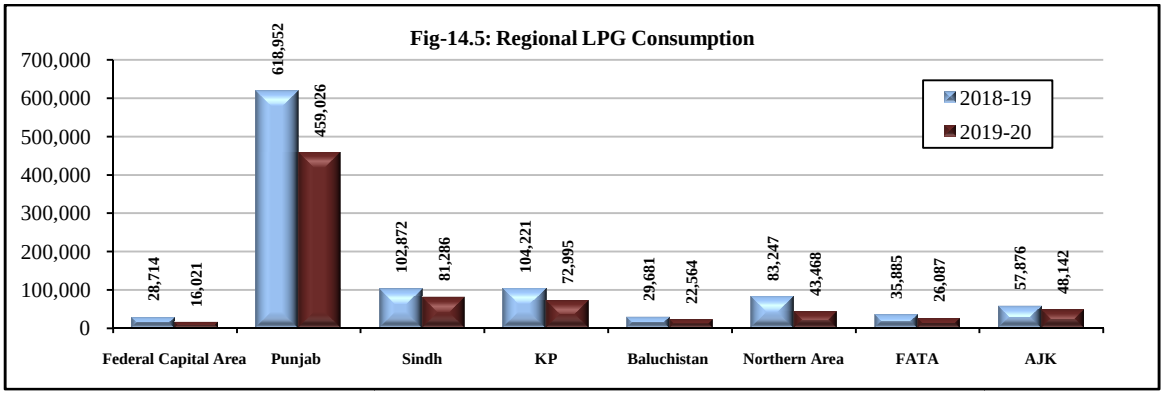
From 2008 onwards, OGRA started registration of LPG equipment manufacturing companies for the purpose to eradicate substandard manufacturing, sale and use of LPG equipments. Till March 2020, OGRA has pre-qualified 52 LPG equipment manufacturing companies as authorized manufacturer of LPG equipment.

Table 14.5: LPG Regional/Sectoral Consumption during FY2019 &FY2020

Sectors/ Regions	2018-19				2019-20			
	Domestic	Commercial	Industrial	Total	Domestic	Commercial	Industrial	Total
Federal Capital Area	10,712	9,469	8,533	28,714	6,289	7,181	2,551	16,021
Punjab	212,360	257,090	149,502	618,952	158,421	234,523	66,082	459,026
Sindh	25,607	47,148	30,117	102,872	18,749	41,601	20,936	81,286
Khyber Pakhtunkhwa	72,874	24,220	7,127	104,221	46,944	24,286	1,764	72,995
Balochistan	12,047	13,200	4,434	29,681	5,738	10,520	6,306	22,564
Northern Area	45,449	37,798	0	83,247	34,088	9,380	0	43,468
FATA	26,195	9,690	0	35,885	19,055	6,939	93	26,087
AJK	40,253	16,753	870	57,876	33,494	14,088	560	48,142
Annual (Ton)	**445,496**	**415,368**	**200,583**	**1,061,447**	**322,779**	**348,518**	**98,292**	**769,589**
Daily (Ton)	**1,221**	**1,138**	**550**	**2,908**	**1,174**	**1,267**	**357**	**2,799**

(Source: LPG Marketing Companies Reports)





Currently, LPG supplies are being met through three sources: refineries, gas producing fields and imports. The actual supply from refineries/producing fields is presented in following table and the respective share of each supply source in the total country-wide supply is shown in figure below.

Table 14.6: LPG Supply during FY2019 & FY2020

Sectors	2018-19		2019-20	
	Annual (Ton)	Daily (Ton)	Annual (Ton)	Daily (Ton)
Attock Refinery Limited	2,846	8	3,118	11
Pakistan Refinery Limited	16,065	44	10,355	38
National Refinery Limited	8,613	24	5,113	19

Table 14.6: LPG Supply during FY2019 & FY2020

Sectors	2018-19		2019-20	
	Annual (Ton)	Daily (Ton)	Annual (Ton)	Daily (Ton)
Pak Arab Refinery Company	120,773	331	74,579	271
Byco Petroleum	53,025	145	31,347	114
Refineries Sub Total	**201,322**	**552**	**124,512**	**453**
OGDCL	267,181	732	171,778	625
UEPL (Naimat Basal) formerly BP	24,400	67	9,185	33
OPI (Ratna, Ex-Meyal)	2,168	6		
JJVL	26,609	73	39,670	144
POL (Mayal-Pindhori)	15,920	44	10,462	38
PPL	94,324	258	64,629	235
MOL Pakistan	176,507	484	137,049	498
Fields Sub Total	607,108	1,663	432,773	1,574
Total Production (M.T)	808,431	2,215	557,285	2,026
LPG Import (M.T)	252,467	692	197,842	719
Total Production + Import (M.T)	**1,060,897**	**2,907**	**755,127**	**2,746**

Source: LPG monthly production reports of producers

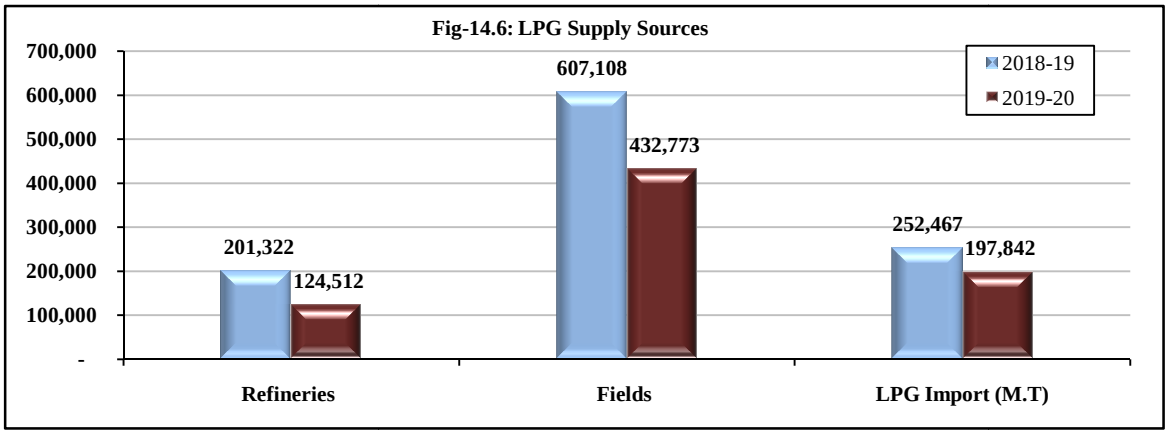


Table 14.7 Status of all LNG projects

Tabeer Energy (Private) Limited **TEPL**	• Provisional License timelines extended till August 2020. • With respect to the application for Construction License by TEPL, in house review has been done by OGRA. TEPL has submitted response to the shortcomings identified by OGRA and Pre-qualified consultants have been asked to submit financial bids for evaluation of construction license application.
Energas Terminal (Pvt.) Limited	• Company has been granted extension in Provisional License to file application for Construction License during last quarter of FY2020.
PGP Consortium Limited **PGPCL**	• The LNG terminal is operational and no application is pending w.r.t instant project. Compliance of License Conditions is regularly sought from the company.

Source: OGRA

Table 14.8: LNG Terminals in Pakistan:

S #	Company Name	Company Location	Terminal Location
1	SSGC LPG(Pvt.) Limited	SSGC GTI Building, Karachi, Terminal, Opposite Safari Park, Main University Road, Karachi.	Port Qasim
2	ENGRO Vopak Limited	4th Floor, Office Number 05, Dolmen City, HC# 03, Block 04, Scheme 05, Clifton, Karachi.	Port Qasim
3	Al-Qasim Gas (Pvt.) Limited	Office No. 04, 1st Floor, Safdar Mansion, Fazl-e-Haq Road, Blue Area, Islamabad.	Gwadar Port

Source: OGRA

Nuclear Energy

Pakistan Atomic Energy Commission (PAEC) is the sole department in Pakistan engaged in electricity generation using nuclear technology. There are five nuclear power plants operating on two sites in the country, one unit namely, Karachi Nuclear Power Plant (KANUPP) at Karachi and four units of Chashma Nuclear Power Plants (C-I, C-2, C-3 & C-4) at Chashma (Mianwali District of Punjab Province). The gross capacity of these five nuclear power plants is 1430 MW that supplied about 7,143 million units of electricity to the national grid during 1st July 2019 to 31st March 2020.

KANUPP, the oldest of the lot has surpassed its design life of 30 years and has, in fact, completed 48 years of safe and successful operation. The four units of Chashma are amongst the best performing electricity generating plants in the country, in terms of endurance and availability. Some performance parameters of these plants are presented in following table:

Table 14.9: PAEC's Performance Parameters

Plant	Capacity (MW)		Electricity sent to Grid (Million KWH)	
	Gross	Net	1st July 2019 to 31st March 2020	Lifetime upto 31st March 2020
KANUPP	100	90	119	14,649
C-1	325	300	1,391	39,160
C-2	325	300	1,966	20,192
C-3	340	315	1,643	7,951
C-4	340	315	2,024	5,907
Total	**1430**	**1320**	**7,143**	**87,859**

Source: PAEC

Two more units with a total output of 2200 MW are currently under construction near the KANUPP site in Karachi, the Karachi Nuclear Power Plants (K-2 and K-3). First concrete of K-2 was poured on the 20th of August 2015 and that of K-3 on the 31st of May 2016. Construction of K-2/K-3 is on full swing and is in its final stages with more than half of civil work already in place. Functional tests of different modules of K-2 are expected to start from March 2020 and the plant is likely to connect to the grid by the end of year. PAEC has undertaken construction of another nuclear power plant at Chashma near Mianwali. The site already is home to four operating nuclear plants. This unit will be called C-5 and it will replicate the design characteristics of K-2 and K-3. A contract for its construction has been

signed with China and extensive studies for site evaluation are currently underway.

PAEC has intensified its activities to meet the nuclear electricity generation target of 8,800 MW by the year 2030 set through government's Energy Security Plan formulated in 2005. Completion of K-2/K-3 project will be a big step that will bring PAEC 2200 MW closer to achieving this target. PAEC is planning to develop additional sites to house more nuclear power plants in the future and sites identified throughout the country. These sites are being investigated and acquired for development.

Ample technical and engineering infrastructure is already in place to support both the existing and the under construction nuclear power plants. Skilled manpower is being produced regularly by Indigenous institutes, imparting state of the art training and education in all relevant disciplines and at all levels, from technical trainings to academic programs. These instruments are enough to successfully support the foreseeable future ambitions envisioned by PAEC for the future nuclear power program of Pakistan.

Coal

Massive energy resource in shape of coal exists in the country and further exploration in different areas is in progress but only a fraction of it is being utilized. In coming years, local coal use should be promoted to achieve larger contribution. Many coal mining and power generation projects are in process of development in Thar coal field. Imported coal power plants may also be required to consider mixing with Thar Coal. Spontaneous combustion is a potential problem for long distance transportation and long-term storage, and thus restricts Thar coal usage. A number of plants on imported coal have now started functioning like one in Sahiwal, two in port Qasim and one plant on indigenous coal has also started operations in Thar.

The volume of import cargo during July-December 2019 stood at 21.878 million tonnes, as against the 20.125 million tonnes handled during corresponding period last year, showing an increase of 8.7 percent. The major non-containerized imports were Coal, LNG, POL, Chemicals, Palm oil and Grain. The Coal imports were the largest imported cargo which represented over 34 percent of total import cargo.

Renewable/ Clean Energy

The Government of Pakistan is emphasizing on utilization of indigenous and environmentally clean energy generation resources. In this regard, the promotion of alternative and renewable technologies is amongst the top priorities of the Government. Several initiatives have been taken to create a conducive environment for the sustainable growth of the clean energy sector in Pakistan in order to harness the potential of indigenous renewable energy resources.

Renewable Sector
Alternative Energy Development Board

The development of Alternative and Renewable Energy (ARE) Sector was initiated under a phased, evolutionary approach constituting a strategic policy implementation roadmap under Policy for Development of Renewable Energy for Power Generation, 2006 (RE Policy 2006). The aim was to increase the deployment of alternate renewable energy ARE

technologies (ARETs) in Pakistan. The Government of Pakistan is proactively pursuing the exploitation and utilization of its indigenous power generation resources as a part of its vision in order to achieve strategic objectives of energy security, decreasing dependence on imported fuels and providing sustainable energy supplies for economic growth. The development of renewable energy based power generation projects is being pursued on IPP mode through private sector investors. ARE promises a higher proportion of the national energy supply mix and helps ensure universal and affordable access to electricity in all regions of the country.

Several ARE projects, initiated under the RE Policy 2006, were not able to proceed with their development due to restrictions imposed vide decisions taken by CCOE dated 12th December, 2017. Under the vision of the current Government to exploit clean energy resources and increase the share of ARE in the energy mix, the CCOE vide its decisions in case No. CCE-12/04/2019(V) dated February 27, 2019 allowed implementation of projects that had already achieved significant milestones of project development by placing them into following three categories;

- Category-1: 19 projects of 531 MW that have already been issued Letter of Support (LOS) subject to revision of tariff in case tariff determination has been done since more than one year or if the tariff validity period has lapsed
- Category-II: 22 projects of 1199.3 MW that have acquired tariff and generation license subject to revision of tariff in case tariff determination has been done since more than one year or if the tariff validity period has lapsed
- Category-III: 104 projects of more than 6000 MW cumulative capacity holding LOIs to be allowed to proceed ahead after becoming successful in a competitive bidding to be undertaken as per demand communicated by NTDC.

In compliance of the CCOE's decision, AEDB has actively been facilitating the said projects as per the criterion set by the CCOE. Twelve (12) wind power projects with a cumulative capacity of 610 MW have been facilitated to successfully achieve Financial Closing in November, 2019.

AEDB is also in process of formulation of RFP package for carrying out competitive bidding for projects falling under category-III. AEDB carried out consultative workshops on 27th and 29th November, 2019 on the draft RFP package for seeking inputs from all relevant stakeholders. The RFP package is under submission to NEPRA for approval.

New Alternative & Renewable Energy Policy

A new Alternative & Renewable Energy Policy (ARE Policy 2019) has been formulated consequent to expiry of RE Policy 2006 in March, 2018. The policy aims at creating a conducive environment supported by a robust framework for the sustainable growth of ARE Sector in Pakistan. The GOP's strategic objectives of affordability of electricity, energy security, availability for all, environmental protection, sustainable development, social equity and mitigation of climate change will further be harnessed under the ARE Policy 2019. Salient features of the new ARE Policy 2019 are as follows:

- The policy has an expanded scope encompassing all alternative and renewable energy sources, competitive procurement and addresses areas like distributed generation systems, off-grid solutions, B2B methodologies and rural energy services.
- ARE Policy 2019 envisages development of large scale ARE projects in all parts of the country through active participation of the provinces.
- Provinces are also part of the Steering Committee envisaged in the policy that will be carrying out the planning of ARE induction. Provincial energy departments will be carrying out competitive bidding process as per the annual ARE procurement plan approved by the AEDB Board on recommendations of the Steering Committee.
- The most significant feature of the policy is that it makes a transition from the traditional methods of procurement based on cost plus and upfront tariffs to competitive bidding. All new RE projects specifically wind and solar power projects will be developed through competitive bidding.

ARE Utilization & Distribution

Apart from large scale RE projects, the Government of Pakistan is also encouraging utilization of renewable energy technology at consumer ends across domestic, commercial and industrial sectors. Moreover, off-grid RE applications for village electrification requirements are also being promoted. Different activities under the following initiatives were carried out during the FY2020;

i. Net-Metering

In order to maximize the utilization of ARE technologies, NEPRA had announced NEPRA (Alternative & Renewable Energy) Distributed Generation and Net Metering Regulations, 2015 on September 1, 2015. These regulations provide the framework for implementing net-metering installations using solar and wind generation of up to 1 MW capacity. The first net-metering system of 1 MW capacity was installed at the Parliament House, Islamabad which has opened the door for net-metering based systems in all parts of the country.

During the period of July 2019 to March, 2020 more than 2300 new licenses were issued by NEPRA for net-metering based installation of approx. 34 MW. As of March, 2020 more than 4125 solar installations with a cumulative capacity exceeding 75 MW have been approved by NEPRA for net-metering.

ii. IFC Lighting Pakistan

AEDB with the support of IFC completed a four year program for creating awareness and bringing private sector investment in remote villages in Pakistan. The program successfully introduced IFC Global Standard products in off-grid villages in Sind Gilgit-Baltistan and Punjab. The program was aimed to address the lighting needs of consumers and give access to low-cost, high-quality, safe, reliable, and cleaner lighting products.

iii. RBF Off-Grid Electrification Pilot Project

AEDB undertook a pilot Result Based Financing (RBF) off-grid electrification initiative.

The project was executed in remote areas of Sindh and Punjab. The project resulted in inviting private sector companies to develop their businesses-cum-supply chain for off-grid solar solutions in the remote villages. The pilot project was completed in December 2019, which is expected to lead to full fledge programme in next year.

Initiatives Taken by AEDB for Development of ARE Sector

AEDB undertook a number of supportive measures in order to promote ARE technologies and to attract private sector investments. Some of the supportive measures taken by AEDB are as follows:

i. AEDB assisted State Bank of Pakistan in revision of SBP's Financing Scheme for Renewable Energy in order to make financing available for broader consumer categories and swift implementation. The facility has been extended till June, 2022. So far, six commercial banks namely JS Bank, Bank of Khyber, Habib Bank, Faysal Bank, Meezan Bank and Bank Alfalah already have announced their products under the SBP facility.

ii. Assisted World Bank in study for analyzing the integration of variable renewable energy in the national grid with the objective of increasing the share of renewable energy in the energy mix of the country.

iii. AEDB assisted Ministry of Science & Technology and Ministry of Commerce on development of mechanism for enforcement of the solar quality standards through announcement of SRO 604(I)/2019 requiring pre-shipment inspection (PSI) of solar panels and related equipment consignments imported into the country.

iv. AEDB engaged World Bank for developing strategy for implementation of new ARE Policy 2019 and undertaking competitive bidding for renewable power generation including localization of the manufacturing technology and advanced R&D.

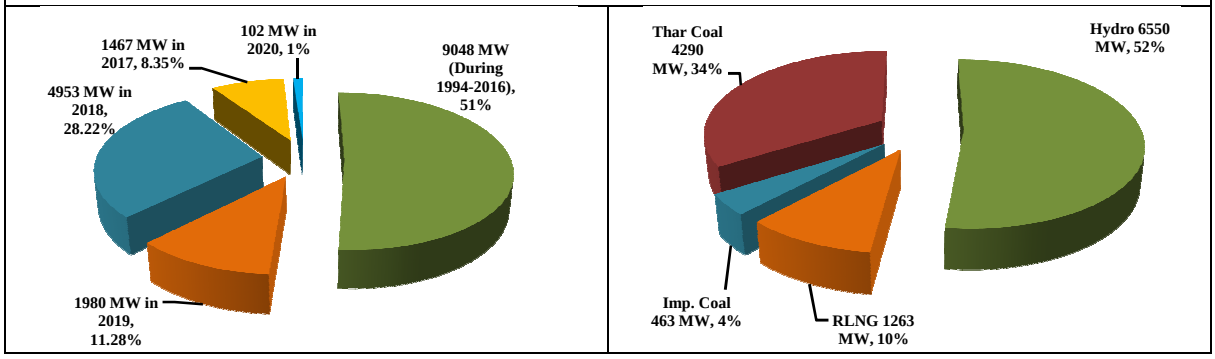
v. Continued collaboration with UNIDO in promoting biomass technologies, cluster development for promotion of biomass in industries, energy management practices in industries, mapping potential for utilizing renewable energy applications in major export oriented industries and imparting trainings to energy managers.

vi. AEDB collaborated with World Wind Energy Association (WWEA) in organizing a two-day Pakistan Renewable Energy Summit in September, 2019. AEDB invited policy makers, national and international experts, investors, developers, manufacturers and other stakeholders to enlighten them with global renewable power developments and potential for future growth in Pakistan.

Private Power and Infrastructure Board (PPIB)

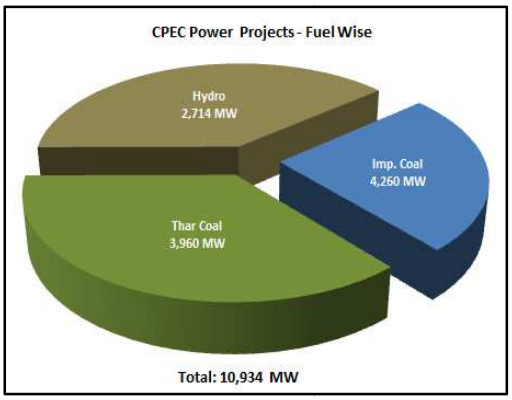
PPIB acts as a one-window facilitator/one- stop organization on behalf of GoP to promote, encourage, facilitate and safeguard private investment in power sector. PPIB was able to attract leading national as well as international investors and lenders to invest in country's power sector and has successfully managed to induct 40 independent power projects (IPPs) totaling 17,550 MW with cumulative investment outlay of around $ 20 billion.

Fig-14.7: Capacity Additions by PPIB 17,550 MW



During 2017-20, nine IPPs of more than 8,500 MW have already been commissioned out of the target of 16,600 MW by 2022. Overall all, eleven IPPs of 9,000 MW have been commissioned through PPIB since 2013 till-date of which around 7,000 MW have been added during 2018-19. Additionally, Matiari-Lahore Transmission Line Project is also being processed by PPIB which is set to come online by March 2021.

In addition to commissioned IPPs, PPIB is handling a diversified portfolio of twenty- six (26) hydro, coal & R-LNG based power generation projects of more than 12,500 MW and an HVDC Transmission Line Project covering the distance of around 900 kilometers between Matiari (Sindh) and Lahore (Punjab).



PPIB as frontline institution of the GoP in implementing majority chunk of energy portfolio under the flagship CPEC program has so far delivered significant results. The portfolio of CPEC based projects comprises of three (3) hydropower projects of 2,714, nine (9) coal based project of 8,220 MW, of which (4) coal based projects of 4,620 MW have been commissioned which include Pakistan's first Thar coal based 660 MW Engro Power generation project. Similarly, another three Thar coal based projects of 1,980 MW and two hydropower projects of 1,590 MW are at advance stages of development and lined-up to be completed during 2020-2022. From the overall portfolio of 12 power generation projects of 10,934 MW under CPEC, so far, four projects of 4,620 MW have already been commissioned which signifies that 42 percent of the CPEC energy program has successfully been implemented by PPIB.

Conclusion

The supply side bottlenecks in energy sector have adversely affected the economy of the country in the last decade and half. To ensure smooth delivery of energy services, efficient projects are being incorporated to the supply side. Although the added capacity in recent years has helped in easing the bottlenecks at generation side, yet the transmission and distribution side inefficiencies have hampered the sustained delivery of energy services. Moreover, the higher energy prices have also increased the cost of doing business.