Refineries

Sector Study

November 2021

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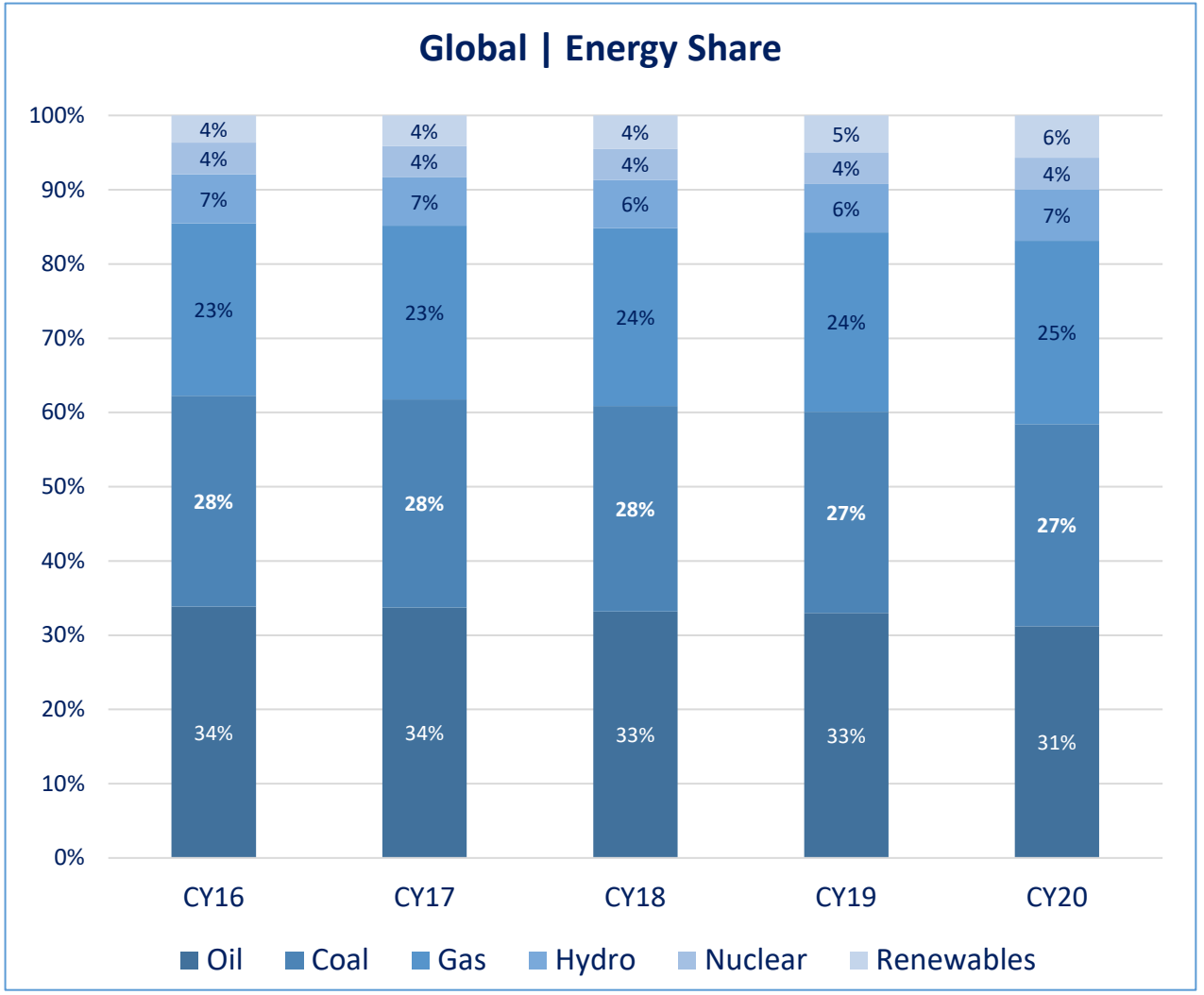
Global | Overview

- The global energy mix is historically dominated by fossil fuels, with oil taking the lead among all fuels followed by coal and gas. Despite the growing demand for renewables and environment friendly energy, renewable energy still holds a very nominal portion in the global energy mix.

- In CY20, the world consumed energy of ~91bln barrels of oil equivalent from a variety of sources. Although there is a positive trend in the development of renewables; fossil fuels (Oil, Gas and Coal) comprised the lion's share in the global energy mix at ~83.1% of total (CY19: ~84.3%) with oil being the most dominant source of energy at ~31.2%.

- A gradual decrease in demand for fossil fuels is expected in the longer term following advances in renewable technology, improved efficiency of internal combustion engines, a more widespread use of EVs and international efforts for environmental sustainability.

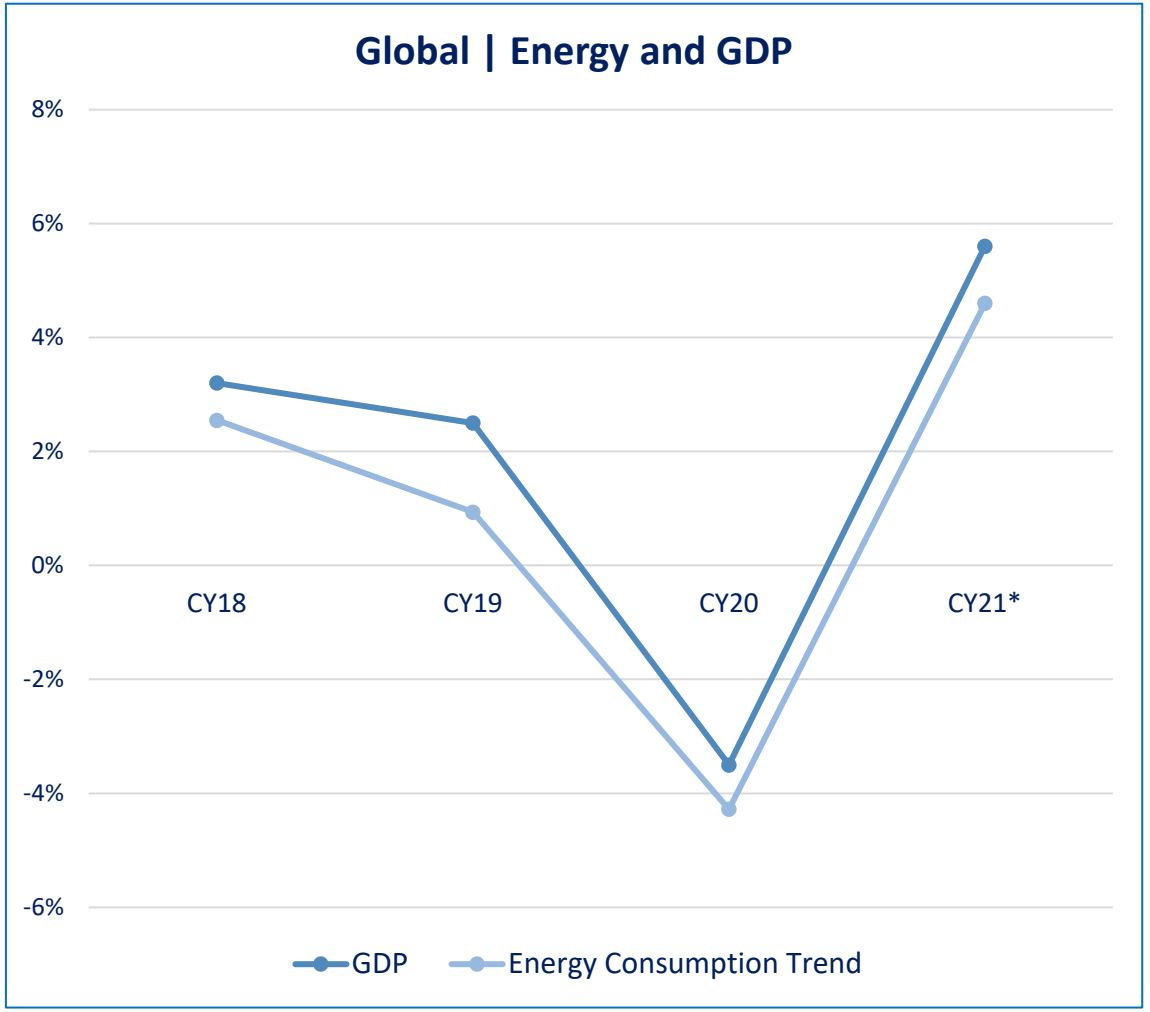


Source: BP Stats, Yale School of the Environment, McKinsey & Company

Refineries

Global | Energy Consumption| Outlook

- COVID-19 caused a global slowdown in CY20. The world economy shrank by ~3.6%; reduced economic activity also caused world energy consumption to shrink by ~4.3%.
- The biggest downslide was witnessed in oil as its consumption declined by ~8.4%, followed by coal and gas, which fell by ~4.2% and ~2.3% respectively.
- In CY20, global consumption of energy from renewable sources increased by ~9.7%, while global carbon emissions fell by 6%. This seems encouraging but the carbon cut came at an opportunity cost of USD~1,485/ton.
- As CY21 began, vaccines started to rollout and countries launched their immunization programs, the global economic activity rebounded strongly. The global GDP growth rate is expected to reach ~5.6% and global energy demand is expected to increase by ~4.6%.
- By CY21 end, oil consumption is expected to increase by ~5.2% but would still remain below pre-COVID levels by ~4%. Gas demand is expected to increase by ~3.2% and will cross pre-COVID levels by ~1%. Demand for coal is expected to rise by ~4.5% but will remain below pre-COVID levels.



*Forecasted**

Source: BP Stats, World Bank, IEA, EIA

Refineries

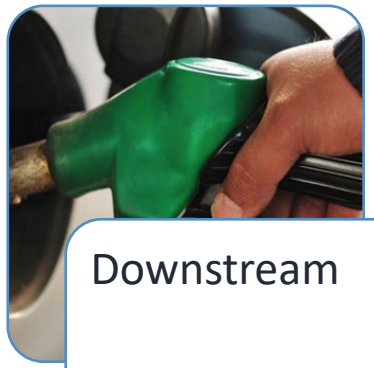
Oil Market Segments

Upstream

- Exploration
- Field Development
- Production Operations

Midstream

- Transportation
- Processing & Refining
- Storage & Distribution



Downstream

- Wholesale & Marketing

- Oil sector is divided into **Upstream**, **Midstream** and **Downstream** segments.
- Upstream Sector encompasses Exploration and Production of oil.
- Midstream includes transporting oil from production sites to refineries via pipelines, trains, tankers, and trucks and production of refined products.
- Downstream comprises marketing & distribution of refined petroleum products.
- In the medium term global investments of USD~250bln are expected to be made in the midstream and downstream sectors.

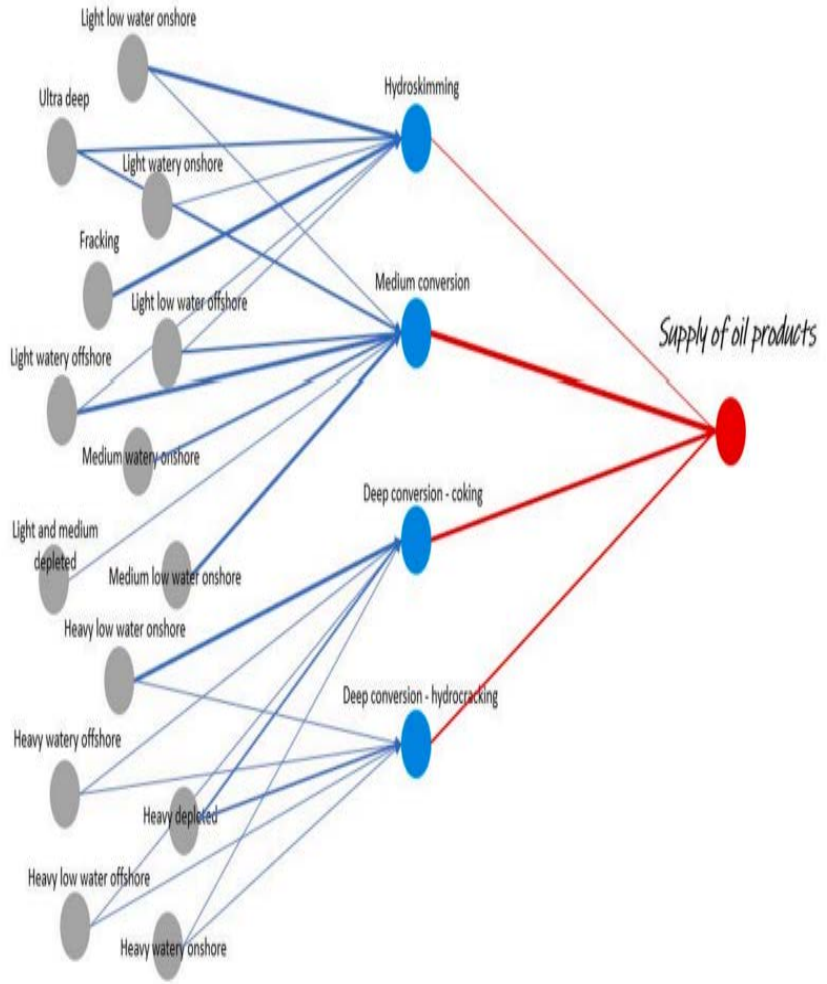
Source: EIA, OPEC

Refineries

Refinery configurations

There are 4 major classifications of refineries based on the degree of complexity and the type of crude oil they can effectively refine

- **Topping**
  These consist of a simple distillery that primarily separates crude oil into distillates (i.e. diesel, kerosene, Jet fuel and heating oil), naphtha (feedstock for motor gasoline blend), light gas, residual/heavy fuel oil. They lack the capacity to drive economically viable yields from low API gravity and high Sulphur crude oil (Heavy sour).
- **Hydro skimming**
  In addition to the distilleries, these include hydrotreating, catalytic reforming and blending infrastructure. These can handle crude oil with low to medium API gravity and Sulphur content (Light sweet to Medium Sour). With additional infrastructure they can reform naphtha to motor gasoline up to specific octanes and desulphurize light products such as motor gasoline and diesel to meet regulatory requirements.
- **Conversion/cracking**
  In addition to all the Hydro skimming infrastructure, these include facilities for hydro and/or catalytic cracking. These processes allow heavy fractions such as gas oil to be converted into lighter refinery streams, yielding motor gasoline, jet fuel and other petrochemical feedstocks.
- **Deep Conversion/cocking**
  These are a special class of refineries that can convert the heaviest fraction i.e. residual oil into lighter streams which can then further be processed lighter petroleum products. These refineries can handle with economic viability; all classes of crude oil (Light sweet to Heavy sour).



Source: Journal of Energy Economics, Journal of Applied Energy

Refineries

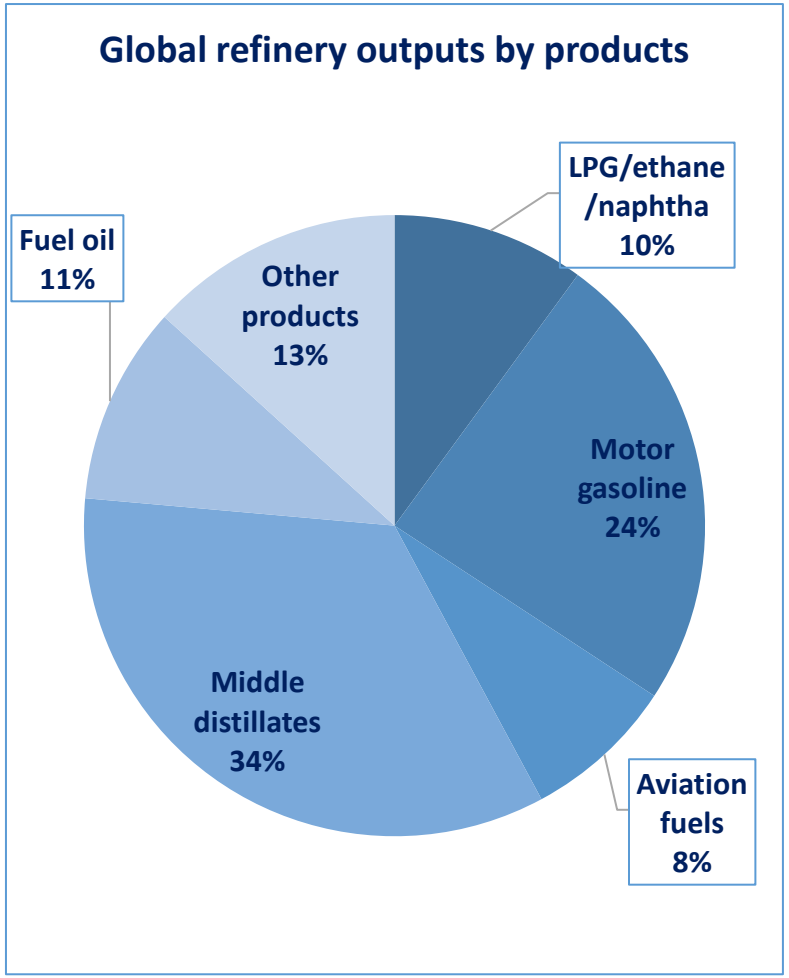
Oil Value Chain

Crude oil is a mixture of hydrocarbons that exists in liquid phase in natural underground reservoirs and remains liquid at atmospheric pressure after passing through surface separating facilities.

Crude oil is transported to refineries to convert it into its derivatives.

Refining breaks crude oil down into its various components, which are then selectively reconfigured into new products. All refineries have three basic steps: Separation, Conversion, Treatment

Petroleum products include gasoline, distillates such as diesel fuel and heating oil, jet fuel, petrochemical feed stocks, waxes, lubricating oils, and asphalt.



Source: EIA

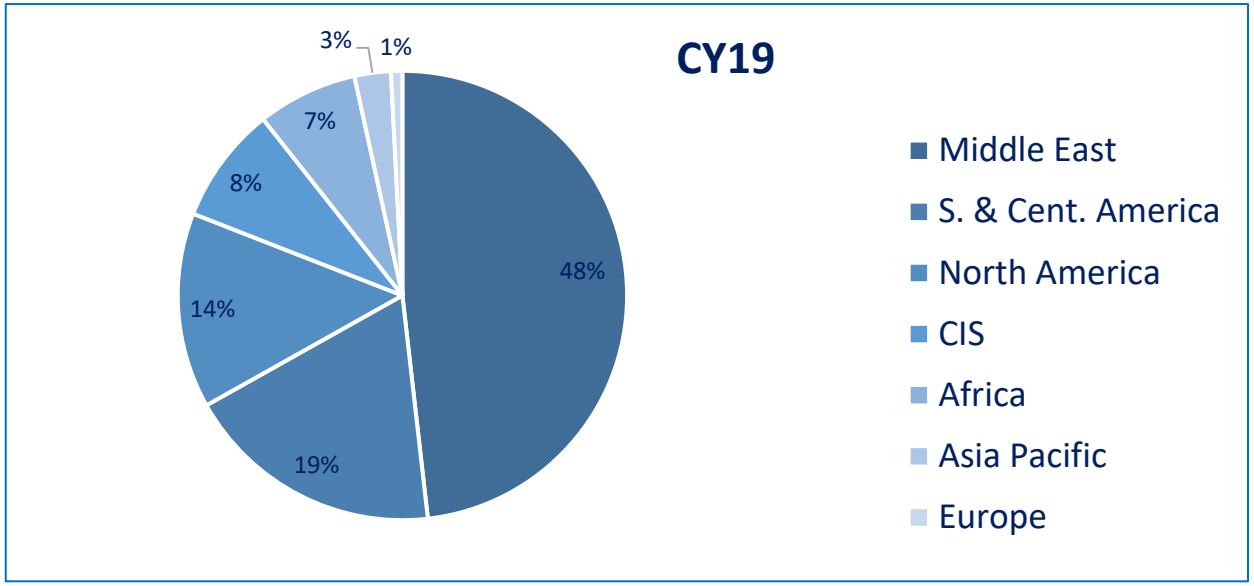
Refineries

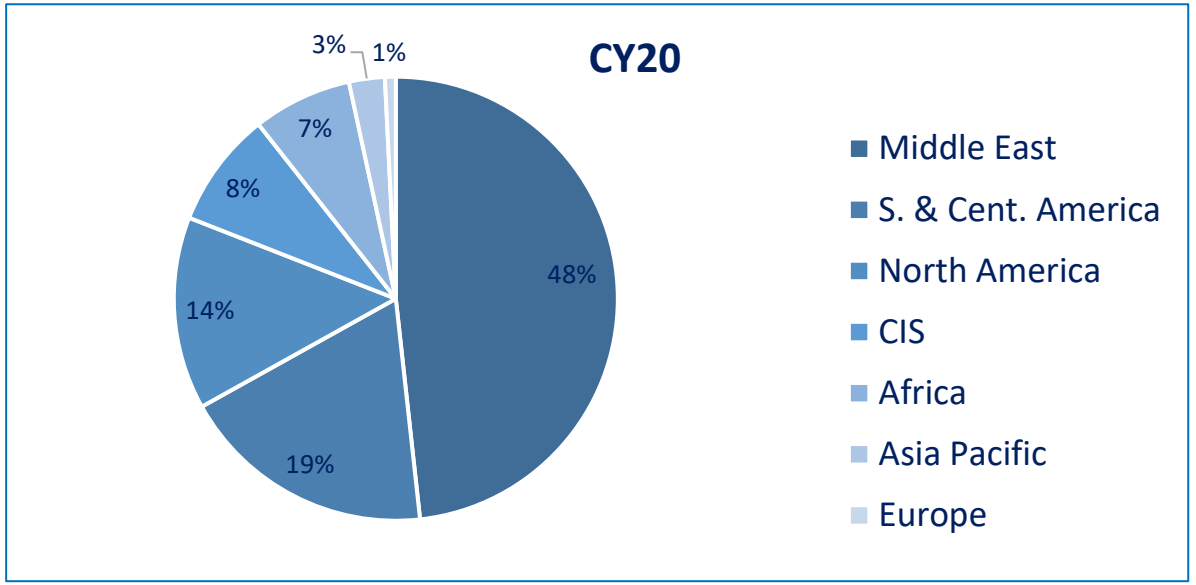
Global | Crude Oil Reserves Position

- World crude reserves stood around ~ 1,732bln barrels as at end Dec-2020.
- Reserves have been growing at a meagre CAGR of ~0.5% from CY16-CY20.
- OPEC countries account for ~70% of the world's proven crude oil reserves.

Global Crude Oil Reserves (bln barrels)

Period	CY15	CY16	CY17	CY18	CY19	CY20
Total World	1,684	1,690	1,728	1,736	1,735	1,732





1 Barrel =0.1364 MT

Source: BP Stats, EIA

Refineries

Global | Crude Oil Production & Consumption Levels

- During CY20, global crude oil extraction as a percentage of total global reserves was ~2%.
- Total world crude oil extraction fell by ~6% in CY20 due to COVID-19, bringing down a five year growth rate (CY16-CY20) to a negative 0.8%. However, the later revived economic activity and increased demand of energy products resulted in the cumulative growth rates from CY17-CY21* and CY18-CY22* to recover at -0.46% and ~0.12% respectively.
- In CY21, global crude oil extraction is expected to grow at ~1.5%, recovering up to ~95% of pre-COVID levels and exceed the pre-COVID levels by CY22 with an expected growth rate of ~5.7%.
- Crude oil consumption declined by ~8.4% in CY20 due to COVID-19 pandemic and is expected to rebound at ~5.2% in CY21.
- CAGR of crude oil consumption from CY16-CY20 was recorded at -1.3%; CY17-21* CAGR is expected to be -0.3%.

Global | Crude Oil Extraction-mln MT					
Period	CY17	CY18	CY19	CY20	CY21*
World Production	**4,386**	**4,484**	**4,478**	**4,165**	**4,267**
Middle East	1,475	1,489	1,414	1,297	1,382
North America	921	1,030	1,106	1,060	1,004
CIS	702	715	719	660	681
Asia Pacific	369	361	361	353	352
Africa	386	394	402	327	367
S. & Cent. America	367	333	318	300	321
Europe	165	163	158	167	160

Global | Crude Oil Consumption-mln MT					
Period	CY17	CY18	CY19	CY20	CY21*
World Consumption	**4,372**	**4,409**	**4,423**	**4,007**	**4,362**
Asia Pacific	1,601	1,625	1,640	1,549	1,627
North America	1,013	1,034	1,029	894	1,005
Europe	705	704	700	603	687
Middle East	391	384	391	361	387
S. & Cent. America	286	279	274	246	275
CIS	191	196	198	188	196
Africa	185	188	190	165	184

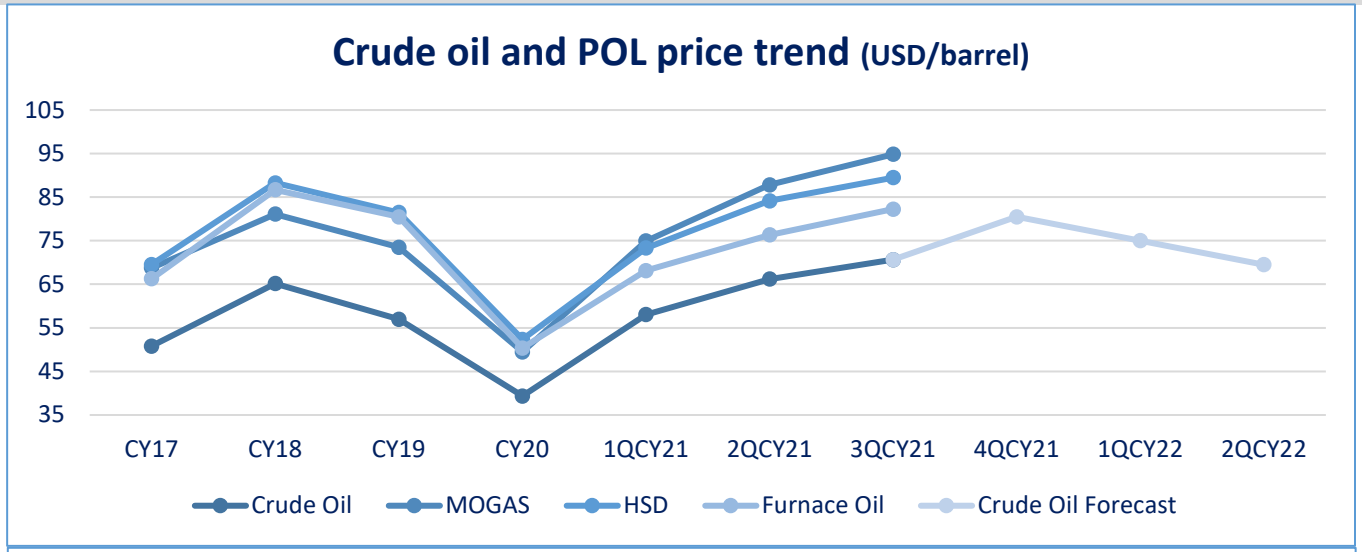
*Estimated

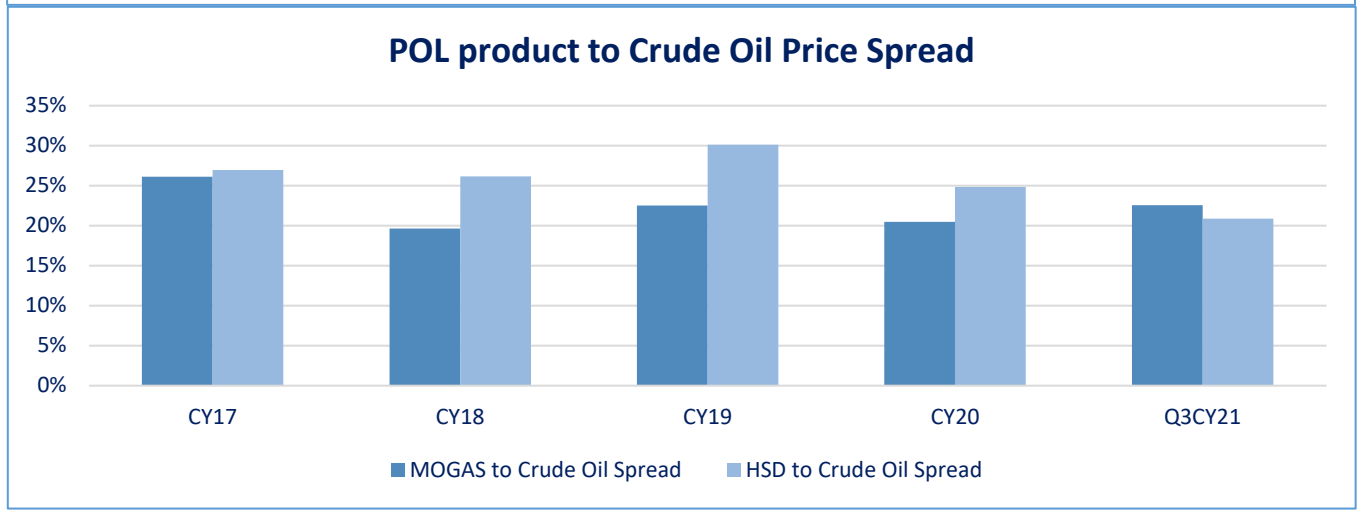
Source: BP Stats, EIA

Refineries

Crude Oil & POL Products Price Volatility

- As POL products are derived from crude oil, they trade at a premium in comparison to it; This premium is known as the crack spread and it has a major impact on refinery margins.
- The global oil prices have witnessed a V-shaped recovery following the pandemic and have gained significant traction since then. Average 3QCY21 crude oil prices stood at USD~70.6/barrel, a multi-year high.
- Gasoline made the biggest recovery as its average global price crossed all POL products by 3QCY20. During 3QCY21, gasoline's price stood at a high of USD~94.9/barrel (3QCY20: USD~51.7/barrel).
- HSD, during 3QCY21 stood at USD~89.5/barrel (3QCY20: USD~50.3/barrel); as the second most premium POL product.
- Furnace Oil's price was recorded at USD~82.2/barrel in 3QCY21 (3QCY20: USD~48.1/barrel).
- The average five year crack spread between MOGAS and crude oil has been ~22% (3QCY21 spread: ~23%), while between HSD and crude oil, it has been ~26% (3QCY21 spread: ~21%).
- As per international estimates, crude oil prices are expected to settle around USD ~70/barrel by 2QCY22; from the 4QCY21 prices of USD ~81/barrel.



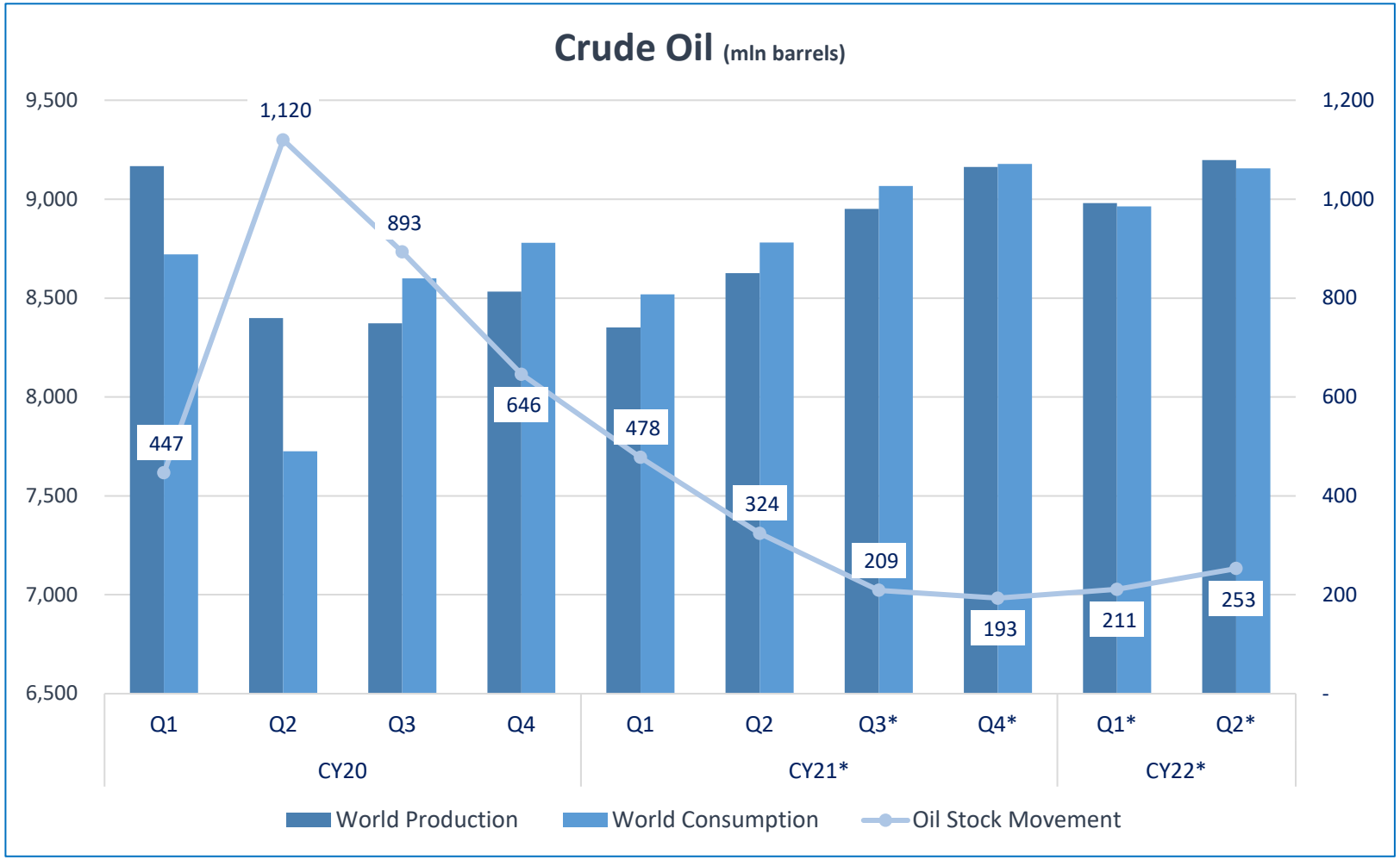


Source: EIA

Refineries

Oil Stock Analysis

- In Q1 and Q2 of CY20, global oil production overshot consumption, due to slumped demand as the COVID-19 pandemic was setting in; causing massive stock buildups, i.e. ~1,120mln barrels.
- Since the beginning of 3QCY20 global oil consumption has outpace production by an average of ~199mln barrels per quarter. This trend is expected to taper off by CY21 end, as high surplus of oil stocks decreases.
- Oil production is expected to overtake demand by 1QCY22 by ~40mln barrels per quarter, as the oil global market is expected to normalize and reach pre-COVID numbers by CY22 end.



*Forecasted**

Source: EIA

Refineries

Trade | Crude & Products

- In CY20, Saudi Arabia had the highest share of world crude exports (~17%), followed by Russia (~12%) and Canada (~9%). In products market, USA emerged as the largest exporter (~22%), followed by Russia(~10%).
- A major portion of world crude and products import was dominated by Europe (~23%) and China(~26%). India is emerging as a net crude importer and product exporter on the globe with a share of ~10% in crude imports and ~1% in products export.
- Whereas in terms of export of total petroleum liquids, USA cemented itself as the global leader in CY20, outpacing Saudi Arabia by ~90mln tons and capturing ~12% of the global market share.

Imports Share

No	Region/Country	CY19 Crude & Product	CY20 Crude & Product
1	China	17%	20%
2	Europe	21%	19%
3	Other Asia Pacific	14%	15%
4	USA	13%	12%
5	India	8%	8%
6	Japan	5%	5%
7	Singapore	5%	5%
8	S. & Cent. America	4%	4%
9	Canada	2%	2%
10	Mexico	2%	2%
11	ROW	9%	10%
	Total	100%	100%

Exports Share

No	Region/Country	CY19 Crude & Product	CY20 Crude & Product
1	USA	11%	12%
2	Saudi Arabia	12%	12%
3	Russia	12%	11%
4	Canada	7%	7%
5	UAE	6%	7%
6	West Africa	7%	7%
7	Iraq	6%	6%
8	S. & Cent. America	5%	5%
9	Other Middle East	5%	5%
10	Other Asia Pacific	4%	5%
11	ROW	24%	23%
	Total	100%	100%

Source: BP Stats

Refineries

POL Product Mix | Consumption

- Global POL mix has been stable up till CY19. However, due to COVID-19 lockdowns and travel restrictions, variations were observed in CY20.
- Among POL products, HSD is the highest consumed product with a share of ~30%, followed by MOGAS with a share of ~25%. HSD is mainly used as a fuel in engines operating above 750rpm in commercial vehicles, stationery diesel engines, locomotives, pumps, etc.
- As global POL consumption fell amid COVID-19 pandemic, the fall was not proportionate among fuel types. Jet fuel took the biggest hit, as its share in global POL mix is estimated to have dropped from ~7% to ~4% in CY20. MOGAS global share also dropped by ~1% in CY20. The decline in both MOGAS and Jet fuel global share was picked up by HSD and other petroleum liquids as their share increased by ~1% and ~2% respectively

Global | POL Consumption Mix					
Period	**CY16**	**CY17**	**CY18**	**CY19**	**CY20**
White Oils	**63%**	**62%**	**63%**	**63%**	**60%**
HSD	29%	28%	29%	29%	30%
MOGAS	26%	26%	26%	26%	25%
Jet fuel	7%	7%	7%	7%	4%
Kerosene	1%	1%	1%	1%	1%
Black Oils	**28%**	**29%**	**28%**	**28%**	**30%**
Other petroleum liquids	21%	22%	21%	21%	23%
Residual fuel oil	7%	7%	7%	7%	7%
Gases	**9%**	**9%**	**9%**	**9%**	**9%**
Liquefied Petroleum Gases	9%	9%	9%	9%	9%
Total	**100%**	**100%**	**100%**	**100%**	**100%**

Source: EIA

Refineries

Global | Top players

- World's Top 10 Refineries generated annual revenue of USD~1,444bln in CY20 (USD~2,126bln in CY19).
- Top 10 Refineries contributed ~1.76% to world's GDP in CY20 (~2.5% in CY19).
- Top 10 Refineries serve in all three streams of oil industry.
- Most oil refineries are run by giant multinational corporations which are either state-owned or public/private limited
- As of CY20:
  - Top 10 oil refining companies held a ~35.2% share in global refining capacity of 101mmbbl/d.
  - Top 3 oil refining capacity holding countries i.e. USA, China and Russia hold ~ 40.8% of the global refining capacity.
  - The top consumers followed a similar trend. USA, China and India had ~40.8% share of global consumption.
- The industry has high barriers to entry and requires extensive capital investment

Global | Refining Capacity

S.No	Company	Origin	Capacity (mln MT)
1	**Sinopec**	China	280
2	**CNPC**	China	235
3	**Exxon Mobil**	USA	233
4	**Saudi Aramco**	KSA	174
5	**Marathon**	USA	159
6	**Rosneft**	Russia	156
7	**Shell**	Netherlands	148
8	**Valero Energy**	USA	138
9	**Phillips 66**	USA	113
10	**Petrobars**	Brazil	108
	Total		**1,745**

Source: Financial Statements, Mckinsey Energy Insights

Refineries

Local | Industry Snapshot

- Pakistan relies significantly on imports to meet the demand of its energy products. During FY21, the country consumed ~19.8mln MT of petroleum products (FY20:~17.1mln MT) up ~15.8% YOY. Owing to declining local oil reserves amid low new discoveries, the dependence on imported POL products is increasing with each passing year.
- Currently, there are ~5 refineries operating in the country namely (i) Attock Refinery Limited (ATRL) (ii) Pakistan Refinery Limited (PRL) (iii) National Refinery Limited (NRL) (iv) Pak Arab Refinery Limited (PARCO) and (v) Byco Petroleum Pakistan Limited (BYCO).
- The Sector is highly regulated with the prices of two major products, i.e, MOGAS and Diesel being determined by the Oil & Gas Regulatory Authority (OGRA) on fortnightly basis.
- Refineries generated an aggregate revenue of PKR~1,062bln in FY21 (FY20: PKR~1,042bln) with an annual GDP contribution of ~2.2% (FY20: 2.5%). The sector's revenue during FY21 registered a YOY growth of ~1.9% on account of increased consumption and rising petroleum products prices.

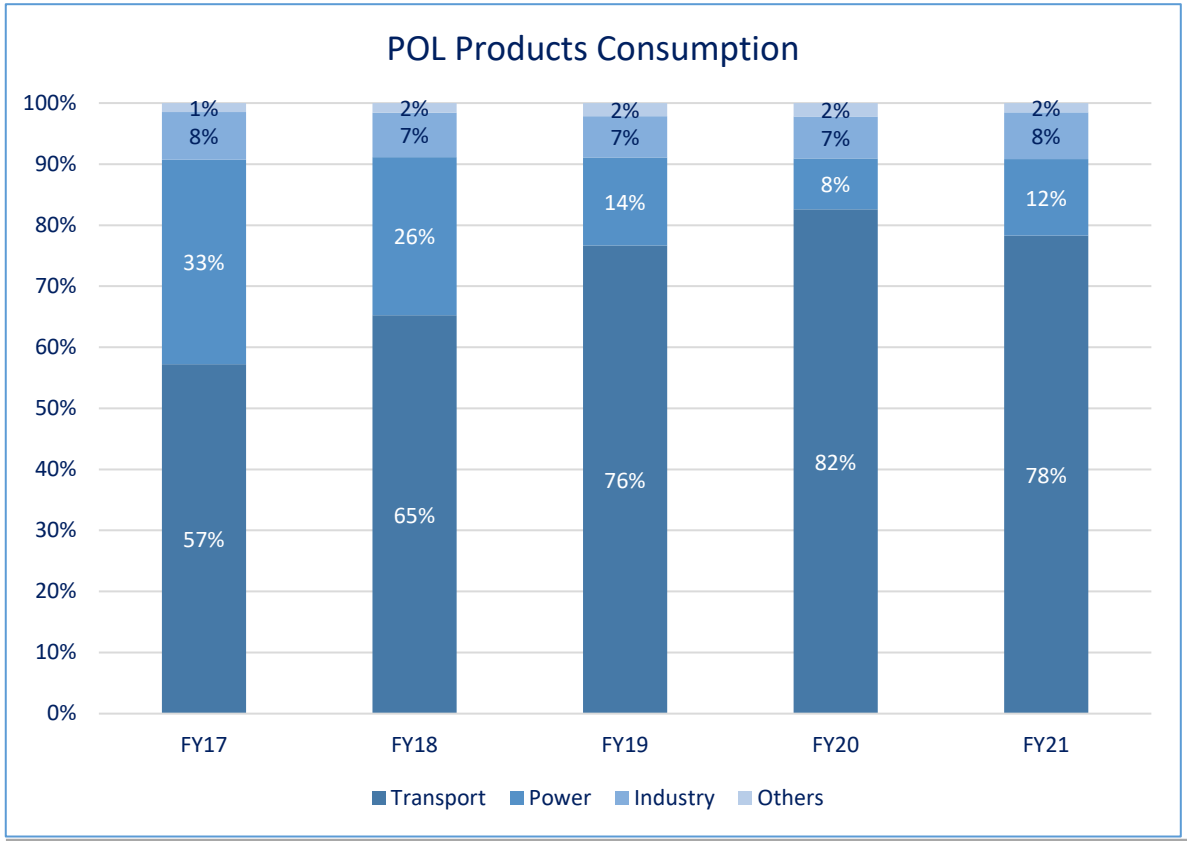
Overview	FY20	FY21
Gross Revenue (PKR bln)	1,042	1,062
Contribution to GDP	2.5%	2.2%
Sector Players	5	5
Oil/Petroleum Consumption (mln MT)	17.9	19.4
Local Crude Oil Production (mln MT)	3.7	3.7
Crude Oil Import (mln MT)	6.8	8.4
Petroleum Product Import (mln MT)	7.5	9.8
Total Oil Refining Capacity (mln MT)	19.6	19.8
Structure	Regulated & Listed	
Regulator	OGRA	
Associations	OCAC	

*PARCO revenues have been pro-rated on the basis of 9MFY20

Refineries

Demand | Sector Wise

- Transport sector is the highest consumer of petroleum products, as it constitutes ~78% of total POL products consumed in FY21 (~78% in FY20).
- POL consumption by industries is largely driven by LSM growth. The industrial consumption share increased to ~8% during FY21 (FY20:~7%). Since FY15, power sector's oil consumption has reduced at a CAGR of ~18% due to shift from RFO to cheaper and environment friendly sources.



POL Products | Sector Wise Consumption (mln MT)

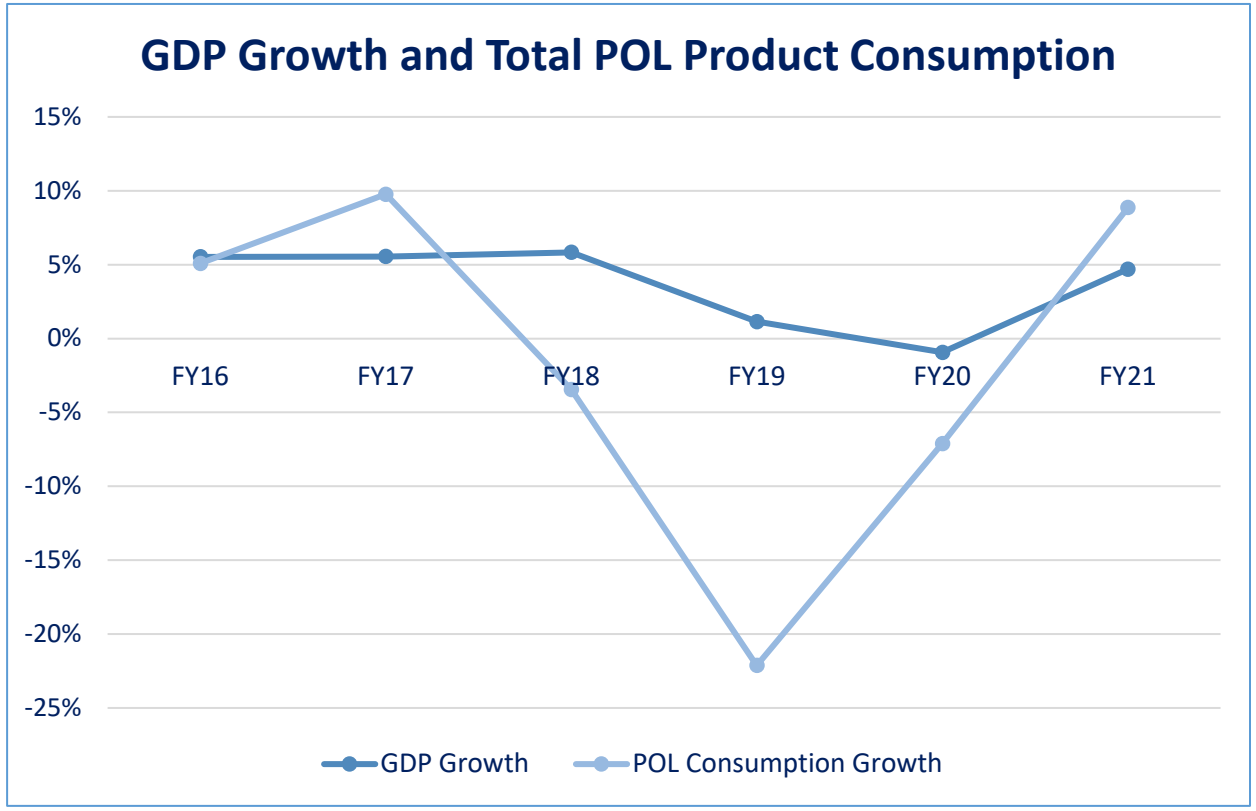
	Transport	Power	Industry	Other Govt.	Households	Agriculture	Total
FY17	14.6	8.5	2.0	0.37	0.08	0.01	**25.6**
FY18	16.0	6.4	1.8	0.39	0.07	0.01	**24.7**
FY19	14.7	2.8	1.3	0.41	0.06	0.02	**19.2**
FY20	14.7	1.5	1.2	0.39	0.05	0.01	**17.9**
FY21	15.2	2.4	1.5	0.30	0.03	0.01	**19.4**

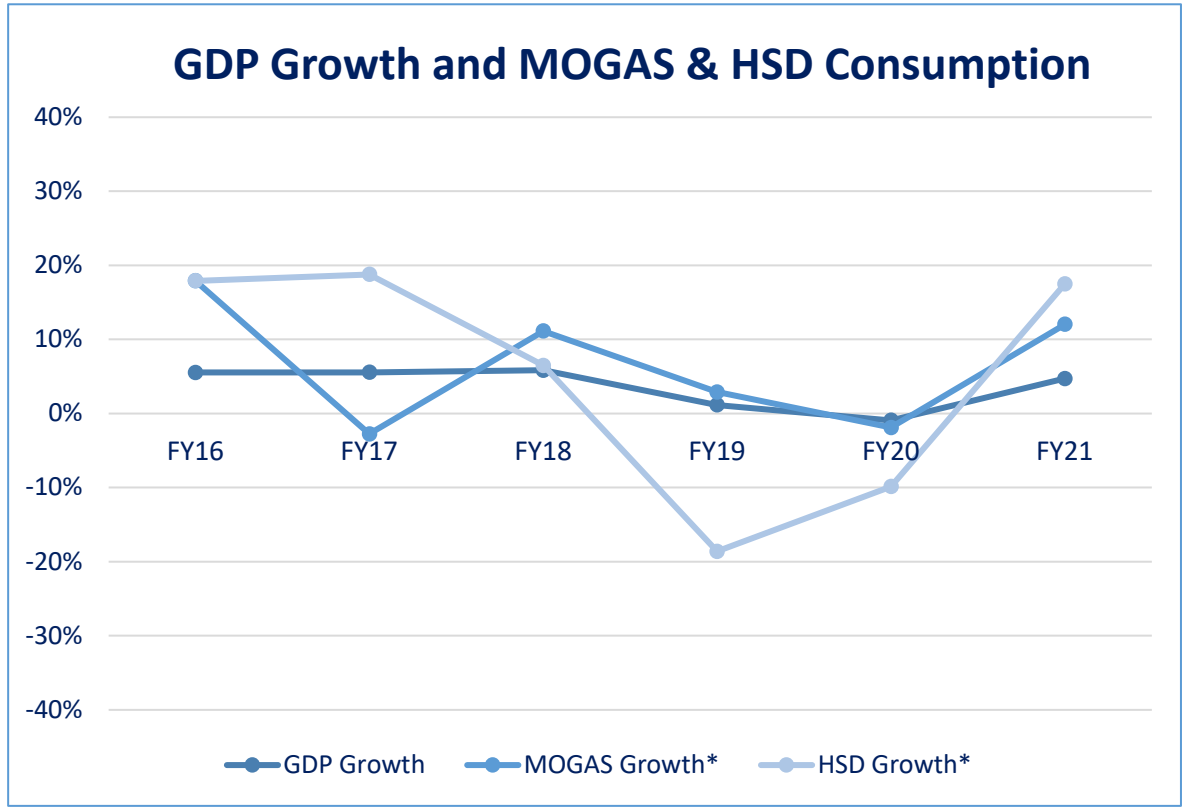
Source: Pakistan Economic Survey

Refineries

POL consumption and Economic Activity

- Local POL products consumption is highly correlated to GDP growth. As discussed earlier, the decrease in overall POL products in recent years was on the backdrop of a dip in RFO consumption.
- MOGAS consumption growth had a coefficient of ~0.96 with GDP growth, indicating cyclical dependency of demand, while HSD consumption growth has a lower coefficient of correlation with GDP growth at ~0.79 indicating a lower cyclical dependency of demand.





Source: PBS, OCAC, IMF, BP

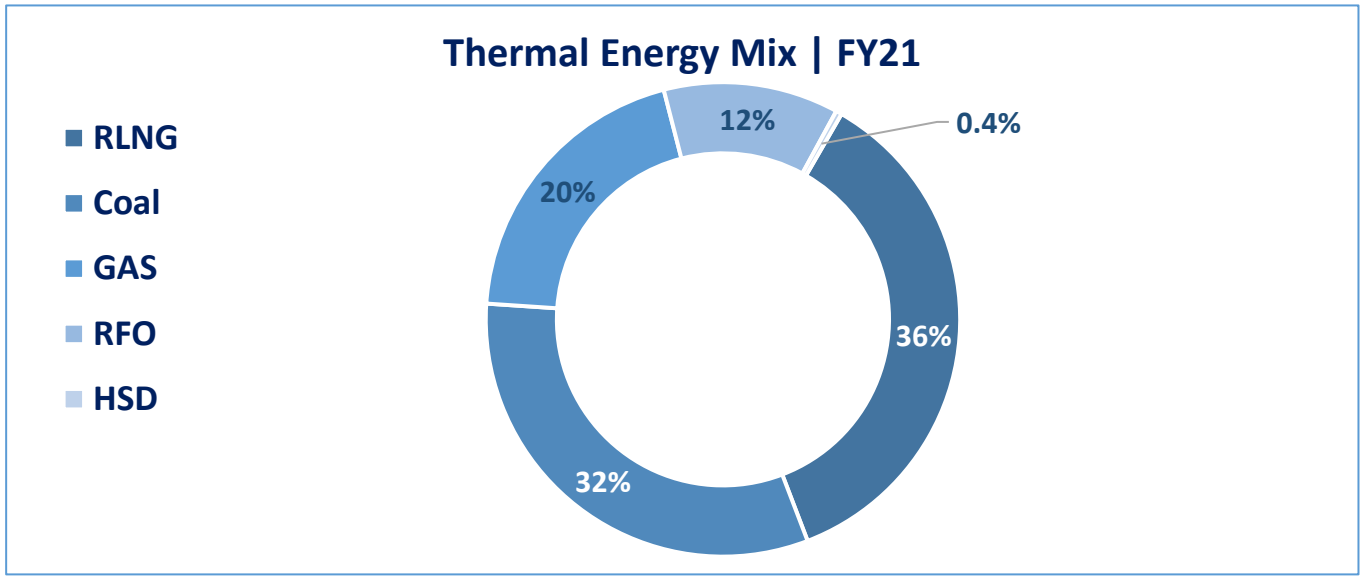
Refineries

Demand | Energy Mix

- Thermal and hydro-energy are two major sources of electricity generation in Pakistan. During FY21, thermal electricity generation had a share of ~58% (FY20:~60%) in total power generation mix followed by hydroelectric, which contributed ~31% to total electricity generation in FY21 (FY20:~29%).
- RFO based power plants generated ~10,590 GWH electricity during FY21 (FY20: ~7,909 GWH) with a YoY increase of ~34%. The share of RFO based power plants in total thermal energy generation increased to ~12% during FY21 (FY20: ~10%). This is due to the continuous depletion of local gas reserves and favorable rates of RFO during FY21.
- The uptick in RFO offtake also bodes well for the refineries. RFO sales continue its upward trend in FY22 as well and was recorded at ~878,000 tons during 2MFY22 (2MFY21: ~563,000 tons) with a YoY increase of ~56%.
- Going forward, the government is committed to increase the share of renewable energy sources in total power generation mix through Integrated Generation Capacity Expansion Plan (2021-2030).

Power Generation | Commercial Mix

Period	FY17	FY18	FY19	FY20	FY21
Thermal	66%	68%	67%	60%	58%
Hydroelectric	26%	21%	21%	29%	31%
Nuclear	6%	7%	8%	7%	7%
Renewable	2%	3%	4%	3%	3%
Imported	0.4%	0.4%	0.4%	0.4%	0.4%



Refineries

Demand | Product Wise POL Consumption

- Pakistan's POL products demand is significantly driven by transportation sector and the level of Industrial activities in the country. A major drop is witnessed in the overall consumption from FY19 onwards when consumption drastically dropped due to substitution of FO by imported LNG in the power sector, and the emergence of COVID-19 in 2HFY20 adversely impacting the MOGAS consumption.
- However, with the uptick in economic activity, as the GDP registered ~4% growth during FY21, the consumption of petroleum products also increased significantly. Total consumption of petroleum products during FY21 was recorded at ~19.8mln MT (FY20: ~17.2mln MT) with YOY growth of ~16%.
- The three major products, HSD, MOGAS and RFO account for ~98% of the total POL products consumption in the country. Historically, RFO was the highest consumed product with a share of ~37% in FY17. Its consumption has drastically declined at a CAGR of ~24% from CY17-CY21 mainly due to government's decision to reduce its use as a fuel for power plants.

Energy | Refined POL Product Consumption (mln MT)					
Period	FY17	FY18	FY19	FY20	FY21
White Oils	16.1	17.5	15.9	14.7	16.6
MOGAS	6.6	7.4	7.6	7.5	8.4
HSD	8.5	9.0	7.4	6.6	7.8
JP-1	0.8	0.9	0.8	0.6	0.4
Kerosene	0.1	0.1	0.1	0.1	0.1
Black Oils	9.6	7.4	3.5	2.4	3.2
RFO	9.6	7.4	3.5	2.4	3.2
Total	25.7	24.9	19.4	17.1	19.8

Energy | Refined POL Product Consumption Mix					
Period	FY17	FY18	FY19	FY20	FY21
White Oils	63%	70%	82%	86%	84%
MOGAS	26%	30%	39%	44%	42%
HSD	33%	36%	38%	38%	39%
JP-1	0%	0%	1%	1%	1%
Kerosene	3%	4%	4%	3%	2%
Black Oils	37%	30%	18%	14%	16%
RFO	37%	30%	18%	14%	16%
Total	100%	100%	100%	100%	100%

Source: PBS, OCAC

Refineries

SUPPLY

- **Crude Oil:** Pakistan majorly relies on imports to meet its crude oil demand. Total crude oil consumption was recorded at ~93.9mln barrels in FY21 (FY20: ~78.4mln barrels) of which ~27.7mln barrels were locally produced ***(upstream oil sector)*** and ~66.2mln barrels was imported.

- **Petroleum Products:** Pakistan's consumption of Petroleum Products clocked in at ~147.7mln barrels in FY21 (FY20: ~125.2mln barrels), of which ~72.2mln barrels was produced locally and ~75.6mln barrels of finished products being imported. Locally, refined POL products are produced by the following refineries in the country:

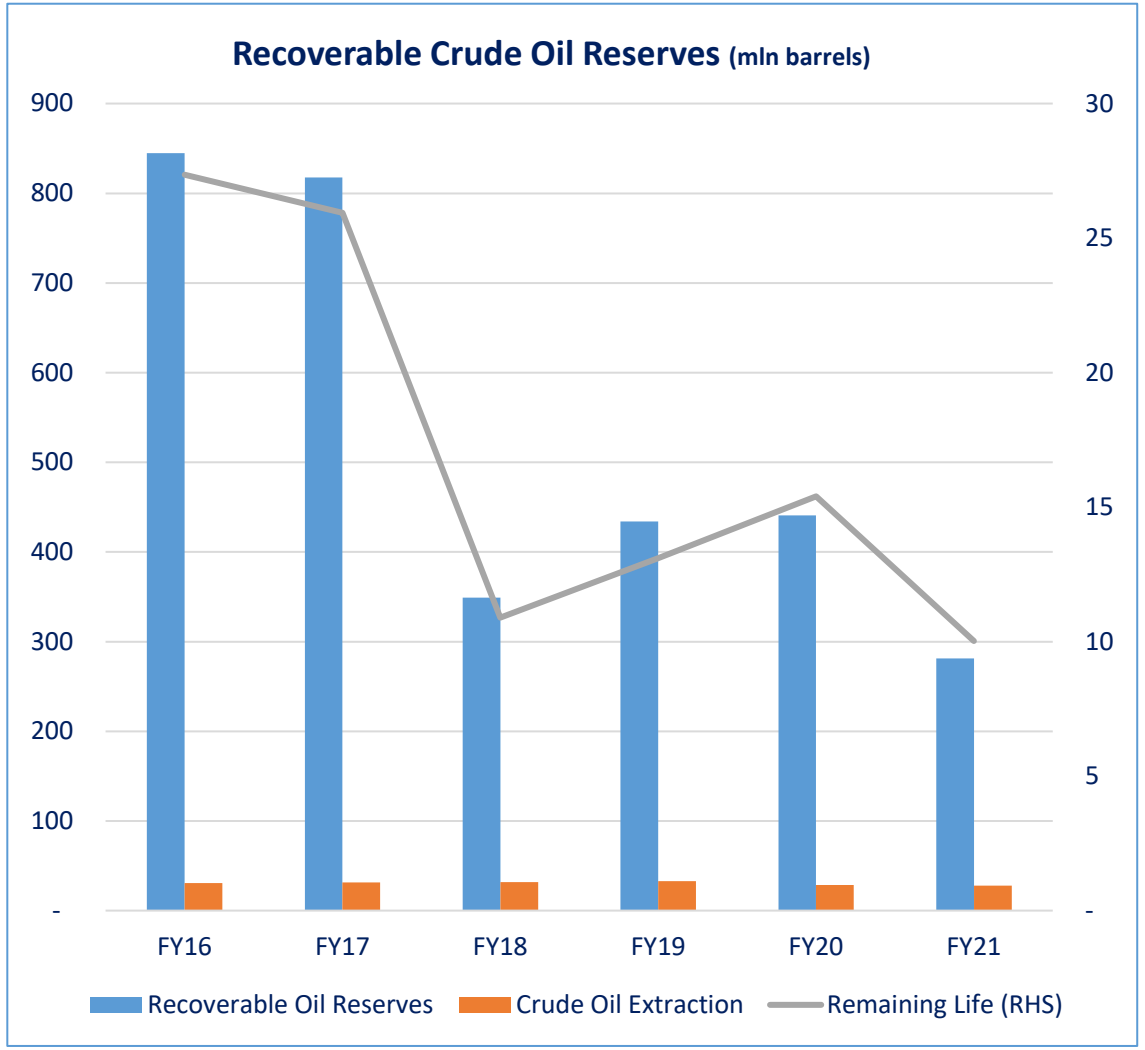
byco	PARCO	National Refinery Limited	ARL	PRL
Incorporated in 1995	Incorporated in 1974	Incorporated in 1963	Incorporated in 1978	Incorporated in 1960

Refineries

Crude Oil Reserves

Recoverable Crude Oil Reserves & Extraction						
Period	**FY16**	**FY17**	**FY18**	**FY19**	**FY20**	**FY21**
Crude Oil Reserves (mln barrels)	845	818	349	434	441	281
Extraction of Crude Oil (mln barrels)	31	32	32	33	29	28
Remaining Life (Years)	27	26	11	13	15	10

- Pakistan's recoverable crude oil reserves are estimated at ~281mln barrels as at end June-2021 (June-2020: ~441mln barrels).
- Total recoverable crude oil reserves showed a significant decline in recent Reserves Evaluation Study, 2020 being carried out by a USA based consultant.
- Total crude oil consumption was recorded at ~28mln barrels during FY21 (FY20: ~29mln barrels) with a YOY decrease of ~3.5%.
- Declining reserve life will significantly increase the reliance on imported fuel to meet local demand. Exploration of new wells and major discoveries are imperative to improve local supply of crude oil.

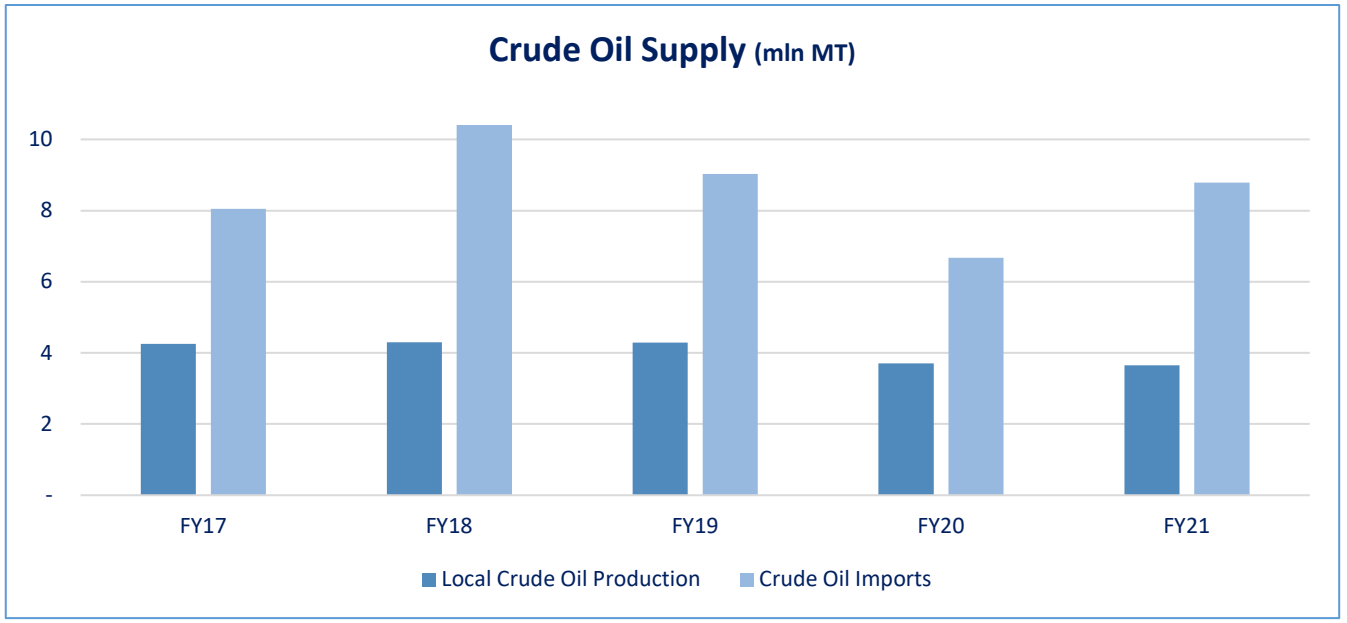


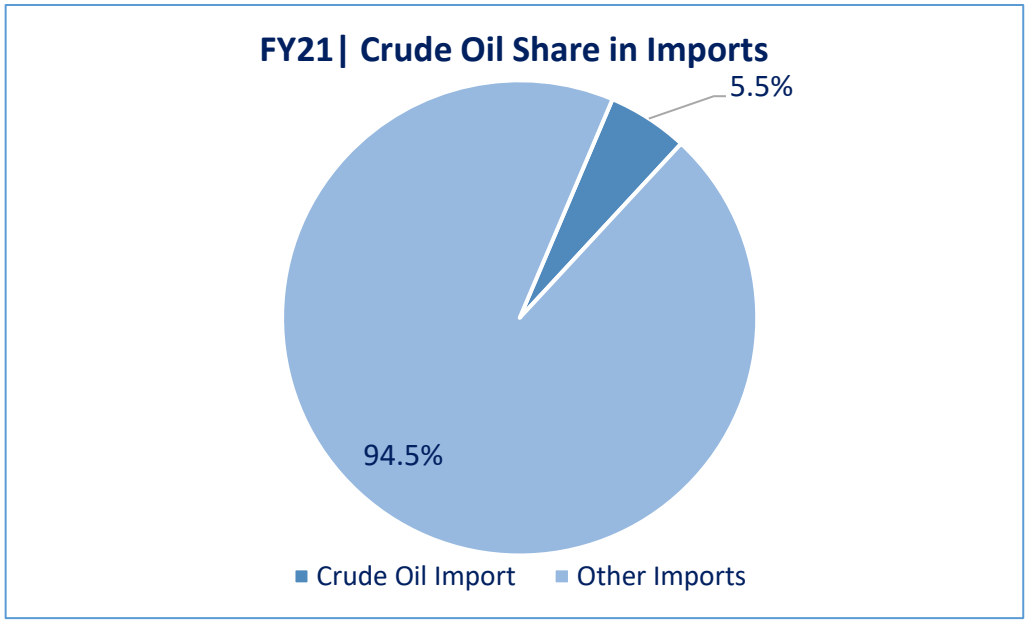
Source: OGDC

Refineries

Supply | Crude Oil

- Pakistani local crude oil is light and sweet, i.e. it has an average API gravity of ~39.06 and has on average ~0.24% Sulphur content by weight.
- In FY21, Pakistan extracted ~3.7mln MT crude oil (FY20: 3.7mln MT).
- Pakistan significantly relies on imports to meet its demand of petroleum products. On average around ~8.6mln MT of crude oil is imported every year.
- In FY21 ~8.8mln MT (FY20: ~6.7mln MT) crude oil was imported marking a growth of ~29.4% YoY.
- Total crude oil imports in FY21 amounted to PKR ~495bln (FY20: PKR ~427bln) representing 5.5% (FY:20 6.1%) of total import bill.



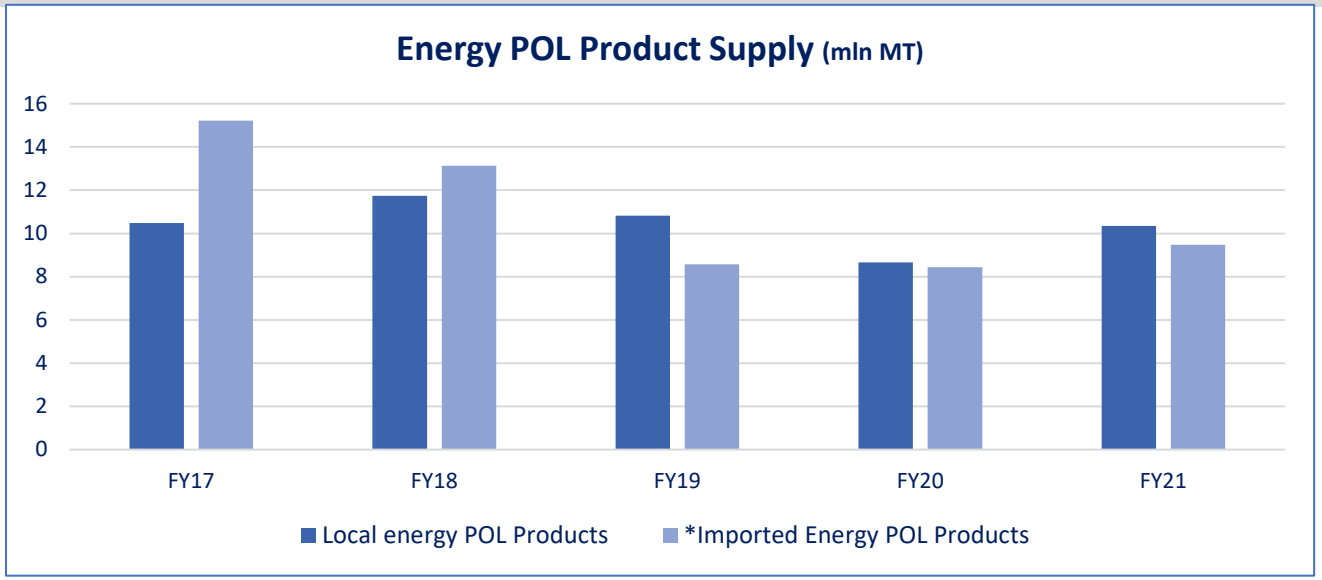


Source: Economic Survey, PBS, Journal of Petroleum Technology and Alternative Fuels

Refineries

Supply | POL Products

- In FY21 Pakistan locally produced ~11.6mln MT (FY20: ~9.4mln MT) POL products, of which ~10.3mln MT (FY20: ~8.3mln MT) were energy POL products and ~1.3mln MT (FY20: 1.2mln MT) were non-energy POL products.
- As local refineries lack cracking and cocking capabilities, therefore in FY21 RFO comprised ~25% (FY20: ~27%) of total locally produced energy POL products, while MOGAS share was ~25% (FY20: ~24%) and HSD share was ~47% (FY20: ~46%).
- POL product imports for FY21 were ~9.5mln MT (FY20: ~8.4 mln MT), marking a growth 28.7% YoY.
- In FY21 POL product import bill amounted to PKR ~822bln (FY20: PKR ~745bln) representing ~9.1% (FY20: 10.6%) share in total imports.



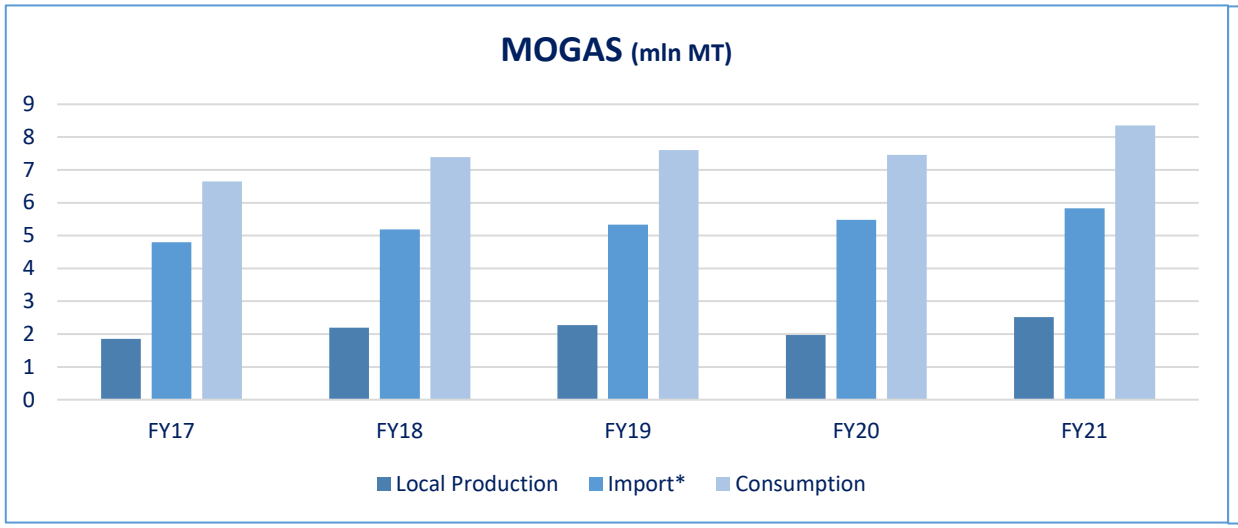
Locally Produced POL Products (mln MT)					
Period	FY17	FY18	FY19	FY20	FY21
White Oils	6.7	7.7	7.3	6.0	7.5
MOGAS	1.9	2.2	2.3	2.0	2.5
HSD	4.6	5.3	4.7	3.8	4.7
JP-1	0.2	0.2	0.2	0.2	0.2
Kerosene	0.1	0.1	0.1	0.1	0.1
Black Oils	4.6	5.2	4.4	3.4	3.8
RFO	3.0	3.3	2.9	2.2	2.5
Non-Energy Products	1.6	1.9	1.6	1.2	1.3
Total	11.3	12.9	11.8	9.4	11.3

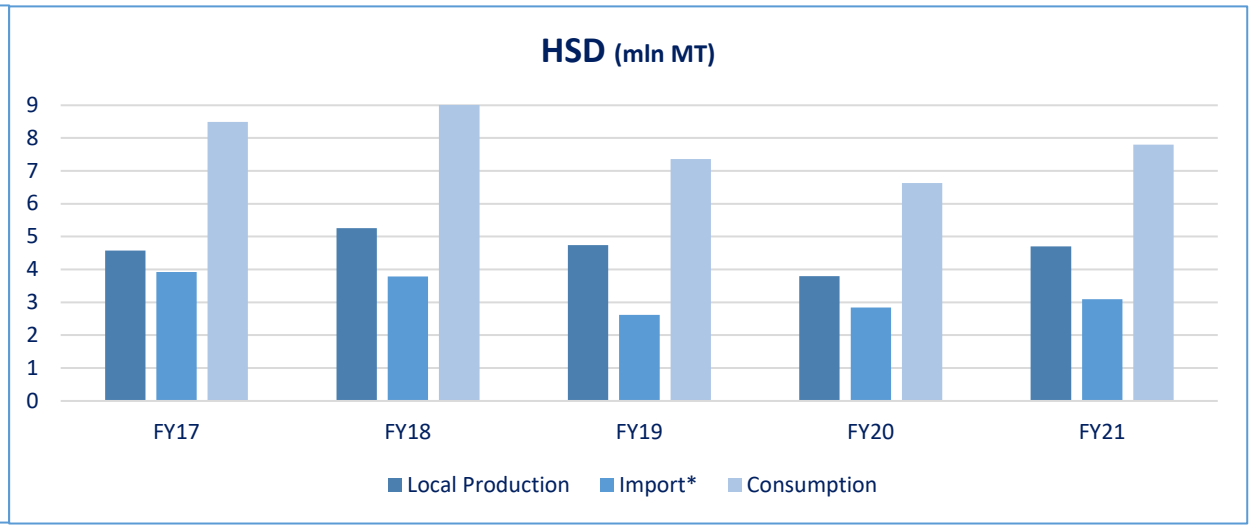
*Estimated

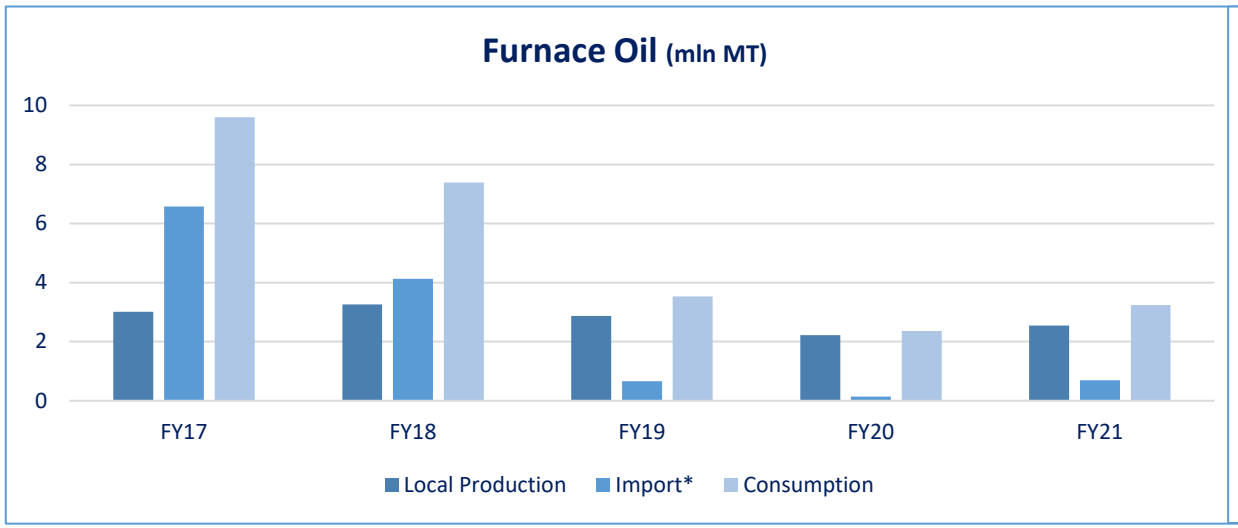
Source: Economic Survey, PBS, Cabinet Division, OCAC

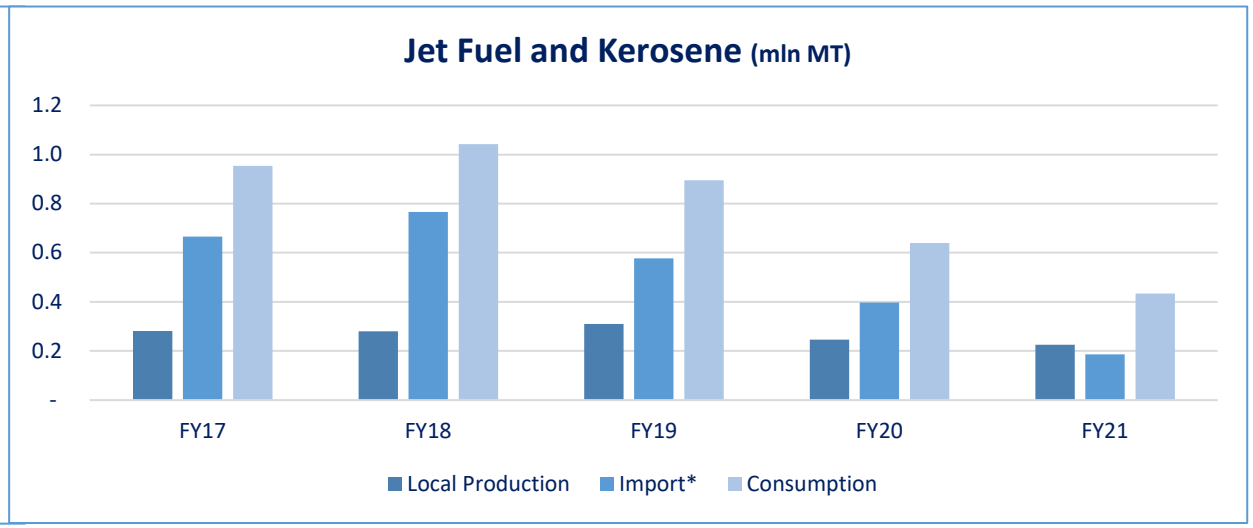
Refineries

Supply









*Estimated

Source: OCAC

Refineries

Supply | Capacity Utilization

- Pakistan's total refining capacity was recorded at ~19.8mln MT per annum during FY21, (FY20: ~19.6mln MT) with an increase of ~0.2mln MT in FY21 owing to upgradation to Euro V diesel generation by NRL during the years.

- All refineries are committed to upgradation of their refinery facilities. However, timing of its announcement is largely dependent on the approval of the new refining policy that is under consideration.

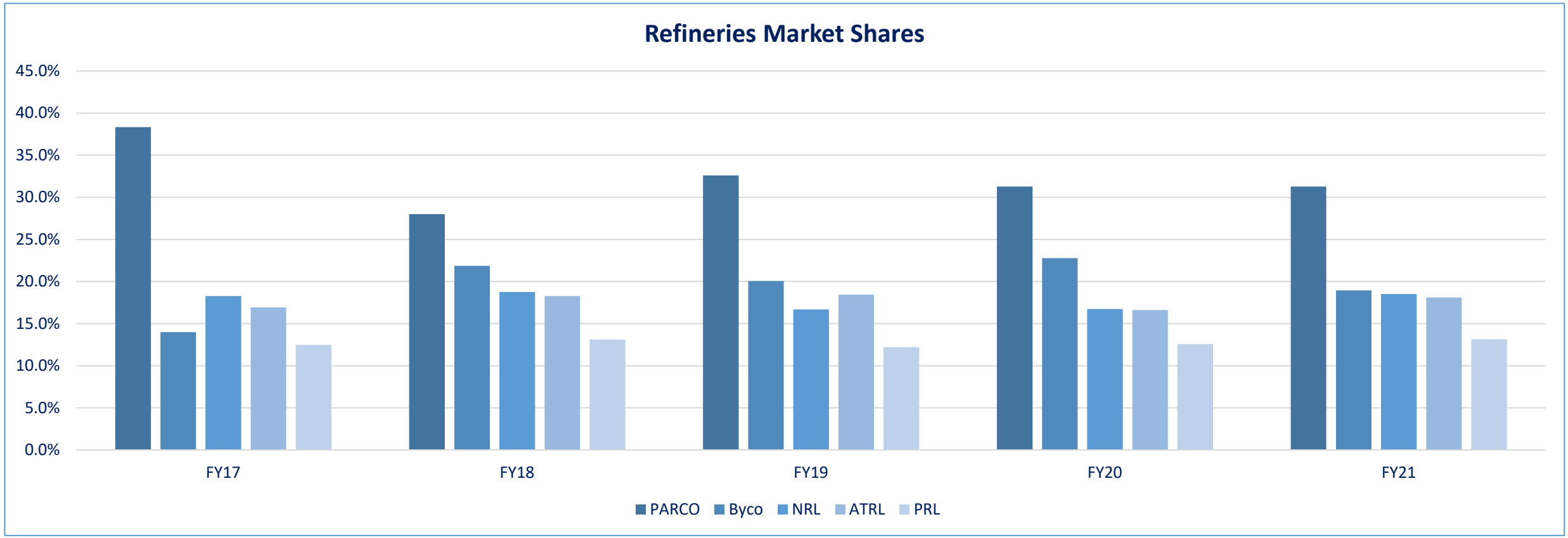
	FY17		FY18		FY19		FY20		FY21	
(Figures in mln MT)	Capacity	Utilization	Capacity	Utilization	Capacity	Utilization	Capacity	Utilization	Capacity	Utilization
Byco	6.9	16.4%	7.6	35.6%	7.6	32.5%	7.6	26.4%	7.6	30.8%
PARCO	4.5	104.5%	4.5	101.2%	4.5	87.9%	4.5	66.5%	4.5	83.6%
NRL	2.9	82.9%	2.9	84.8%	2.9	76.9%	2.9	58.7%	3.1	63.3%
ATRL	2.5	91.5%	2.5	93.9%	2.5	93.5%	2.5	69.5%	2.5	77.0%
PRL	2.1	77.0%	2.1	79.4%	2.1	76.3%	2.1	59.3%	2.1	61.0%
Total	**18.9**	**64.2%**	**19.6**	**70.0%**	**19.6**	**64.2%**	**19.6**	**49.4%**	**19.8**	**56.9%**

Source: Financial Statements

Refineries

Supply | Market Shares (Volume Based)

- PARCO carries the highest market share but it has been gradually reducing, as other refineries are catching up. Among all refineries, ATRL and PARCO are based in North, while all other refineries are based in South, i.e., Karachi near port.
- ATRL mostly consumes local crude oil to meet its demand. Whereas, all other refineries are largely dependent on imported crude to meet their demand.



Source: Financial Statements

Refineries

Pricing Mechanism| How it Works

- The pricing structure of POL products (MOGAS & HSD) is a computation of six different price components (discussed in previous slide) embedded in a price formula.
- While OMC Margins and Dealer Commission are fixed, the Petroleum Levy, Sales Tax and IFEM are variable components, the former two depending on the GoP's discretion, and the latter computed through a freight pool mechanism.
- The start-up point for pricing mechanism is the **'Ex-Refinery Price'.** This price is determined by OGRA and was earlier determined based on PSO's weighted average costs of POL products in the preceding monthly and ~30 days International prices published in the Platt's Oilgram.
- Since 1st Sep'20, the pricing mechanism has been shifted from monthly basis to fortnightly basis and the price benchmark based on PSO's oil imports has been shifted to Platt's Index. This development is expected to shield the Industry from Inventory losses.
- As per OGRA Rules, OMCs are required to build storage/depots at different areas of the country in order to maintain a stock of at least 20 days so as not to end up with dry petrol stations. Ex-Refinery Price, PL, IFEM and OMC margin add up to Ex-Depot Price, while Dealer Commission is added on the next step. Sales Tax is applied to an aggregate of Ex-Depot Price and Dealer Commission.

Source: OCAC, OGRA

Refineries

Fuel Retail Price

- Local POL product prices are a function of international POL product prices, OMC & Dealers' margin and government taxes (including petroleum levy and Sales Tax).
- In FY20 and 1HFY21, lower base price effect provided room to the GoP to increase taxes on POL products while still keeping the product prices low. Like in 1QFY21 the government took off PKR~43.57/liter tax on MOGAS which was ~42% of per liter petrol price.
- However, with a sharp rise in international prices of POL products and partially due to PKR depreciation against USD, the per liter POL product prices in Pakistan is at its all time high of PKR~145.82/liter for MOGAS. Whereas, the government is charging only PKR~11.68/liter of tax which is ~8% of per liter price.
- This sets an alarm for the GoP to meet its budgeted petroleum levy collection target of FY22, since it requires to charge at least PKR~32/liter levy, which seems highly unlikely considering the current international POL prices.

MOGAS-Retail Price Per Liter Composition

Price Components	FY19	FY20	FY21				FY22			
			1QFY21	2QFY21	3QFY21	4QFY21	1QFY22	Oct'21	1-Nov-21	5-Nov-21
Ex-Refinery Price	71.89	61.48	50.39	49.57	66.29	75.83	93.29	107.67	112.39	123.18
IFEM Margin	3.31	3.42	3.5	3.49	3.74	3.75	3.78	3.89	4.08	4.08
OMC Margin	**2.64**	**2.77**	**2.81**	**2.81**	**2.81**	**2.97**	**2.97**	**2.97**	**2.97**	**2.97**
Dealer Commission	3.47	3.64	3.7	3.70	3.70	3.75	3.91	3.91	3.91	3.91
Petroleum Levy	15	19.84	28.46	28.10	17.88	6.89	1.93	5.62	5.62	9.62
Sales Tax	16.37	15.49	15.11	14.91	16.05	15.87	12.64	8.49	8.82	2.06
Max Ex-Depot Sales Price	112.68	106.63	103.97	102.57	110.47	109.21	118.52	132.55	137.79	145.82

HSD - Retail Price Per Liter Composition

Price Components	FY19	FY20	FY21				FY22			
			1QFY21	2QFY21	3QFY21	4QFY21	1QFY22	Oct'21	1-Nov-21	5-Nov-21
Ex-Refinery Price	85.67	66.32	56.11	53.64	72.22	78.01	89.63	103.70	109.38	117.08
IFEM Margin	1.12	1.18	0.97	0.91	0.95	0.99	1.12	1.16	1.11	1.11
OMC Margin	**2.64**	**2.77**	**2.81**	**2.81**	**2.81**	**2.97**	**2.97**	**2.97**	**2.97**	**2.97**
Dealer Commission	2.93	3.07	3.12	3.12	3.12	3.30	3.30	3.30	3.30	3.30
Petroleum Levy by Fed.Govt	16.03	21.06	26.89	28.78	18.87	9.99	3.33	5.14	5.14	9.14
Sales Tax	18.43	16.05	15.31	15.18	16.66	16.19	16.10	12.00	12.58	9.02
Max Ex-Depot Sales Price	126.82	110.44	105.21	104.44	114.63	111.45	116.44	128.26	134.48	142.62

Source: OGRA, PSO

Refineries

New Refinery Policy

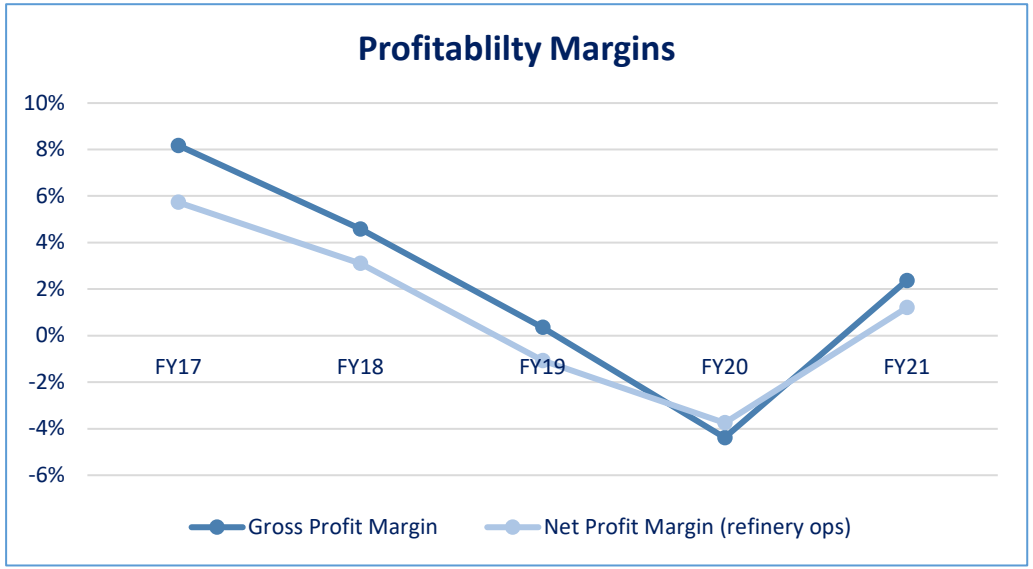
- There have been numerous developments towards the proverbial “New Refinery Policy”, aimed at resolving the prevailing shortcomings in the refining capabilities (cracking and cocking) of the sector.
- As per the latest development, the government is more inclined to give incentive to greenfield refineries rather than existing refineries.
- Following are the main features of the upcoming refinery policy;
  - Duty protection in the form of 10% import duty on MS and diesel of all grades as well as imports of any other white product used for fuel of any kind of motor or engine. The protection will be effective from Jan’22 to Dec’27.
  - Government to limit its contribution in total investment to ~30% whereas ~70% to be fund by refineries.
  - A special reserve account for upgradation/ modernization/ expansion will be maintained by each refinery in a separate bank account to be opened in National Bank of Pakistan. The refineries will transfer any incremental revenue (net of taxes) based on the revised tariff structure to the special reserve account.
  - The refineries will be entitled to withdraw from the reserve account once the EPC contract has been awarded for the relevant project. The withdrawal from the reserve account will be on a proportionate basis
  - To be eligible for the incentives, the existing refineries would have to commit before 31st December 2021 and provide an undertaking to the PD with a proposed timeline along with potential size, configuration, product slate and all relevant information, ensuring production of Euro 5 MS and HSD. The refineries that do not provide such an understanding and do not have a waiver, will not be allowed to sell their products in Pakistan after 30th June 2022.

Source: Taurus Securities

Refineries

Business Risk

- Following the economic recovery post COVID-19 restrictions, the sector also recorded an uptick in FY21 as it's net revenues grew by ~1.7% (FY20: ~-30.6%), gross margins were up at ~2.4% (FY20: ~-4.4%) and net margins were up at ~1.2% (FY20: ~-3.8%).
- The 5 year CAGR (FY17-FY21) for gross profits and net profits stood at ~-18.1% and ~-23.2% respectively, which are indicative of structural issues prevalent in the sector.
- On average (FY17-FY21), crude oil imports make up to ~68% of total national supply, which exposes the sector to both exchange rate risk and international price volatility. Both have had tumultuous movements as the average 4MFY22 exchange rate stood at PKR ~167.5 compared to FY17 average of PKR ~104.6, while average 4MFY22 Brent price stood at USD ~78.1/barrel compared to average USD ~50.7/barrel in FY17. However, recent increase in MOGAS and crude oil crack spread will bode well for refineries' profitability.
- As Pakistani refineries lack cracking and cocking capabilities, FY21 RFO share in local POL production stood at ~25.4% (FY20: 27%), while its share in national POL consumption has been reducing with CAGR of -~19.5%. Significant investments are imperative for sustenance of refineries operations and hence profitability in coming periods.



MOGAS to Crude Oil Spread (USD/barrel)

Period	FY17	FY18	FY19	FY20	FY21	4MFY22
Crack Spread	13.2	14.2	7.3	6.8	12.0	20.3
MOGAS (RBOB)	63.8	80.2	75.8	57.5	67.3	98.3
Crude Oil (Brent)	50.7	66.0	68.5	50.7	55.3	78.1
PKR/USD Rate	104.6	110.5	137.6	158.3	159.1	167.5

Source: Financial Statements, investing.com

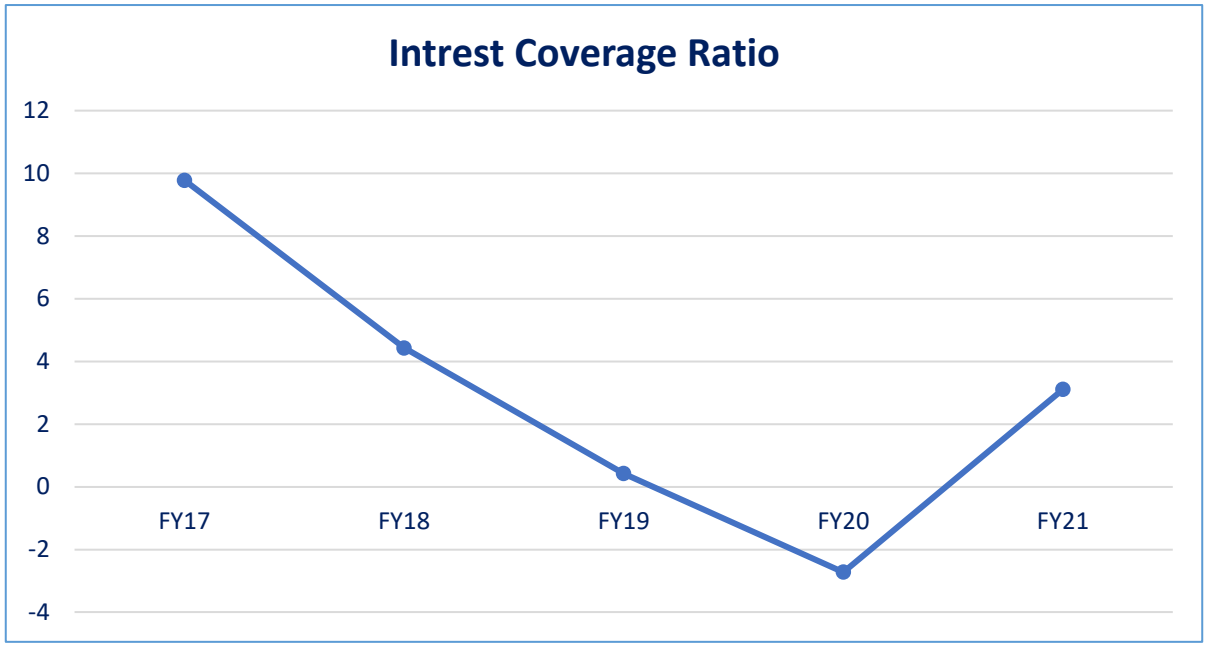
Refineries

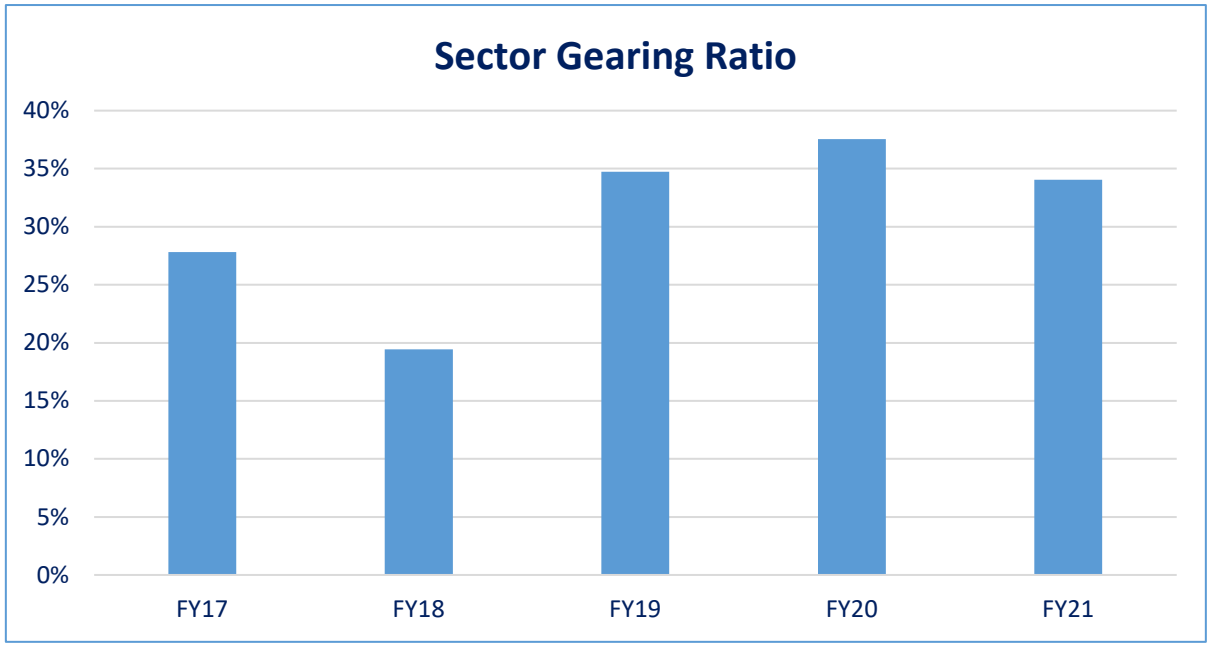
Financial Risk | Capacity to Pay and Borrowings

- With historically low interest rates for the most part of FY21 and improved profitability, interest coverage of the sector enhanced significantly in FY21 to ~3.1x (FY20:~-2.7x).

- The sector is moderately leveraged with gearing ratio of ~34% in FY21 (FY20:~38%). The borrowing needs of the sector arise from working capital financing and continuous investment in plant & machinery, for which the sector relies on a mix of short term and long term borrowings.

- According to SBP, as of Sep'21, loans to refineries stood at PKR ~130bln (Sep'20: PKR ~94bln) of which PKR ~89bln (Sep'20: PKR ~49.4bln) was short term reflecting ~68.7% (Sep'20: ~52.6%) share in the borrowing mix, this amounted to a ~38.1% YoY growth in 1QFY22.





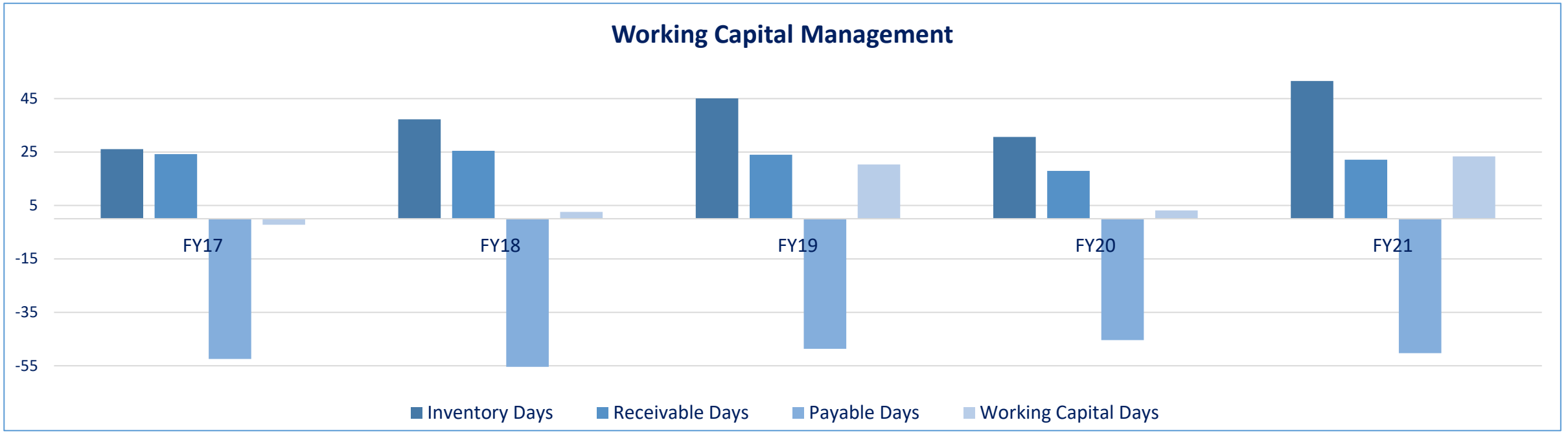
Source: Financial Statements, SBP

Refineries

Financial Risk | Working Capital

- In FY21 Pakistan imported ~86.1% (FY20: ~97.2%) of its crude oil from UAE and KSA. Given the recent signing of trade finance agreement of USD~1.1bln and Murabaha of USD~762mln with International Islamic Trade Finance Corporation (ITFC); enhancement of liquidity is expected in the sector.

- In FY21, the sector's average inventory days stood at ~52 days (FY20: ~31 days) with a YoY increase of ~19 days. Average receivable days of the sector during FY21 were recorded at ~22 days (FY20: ~18 days). Moreover, payable days in FY21 stood at ~50 days (FY20: ~45 days).

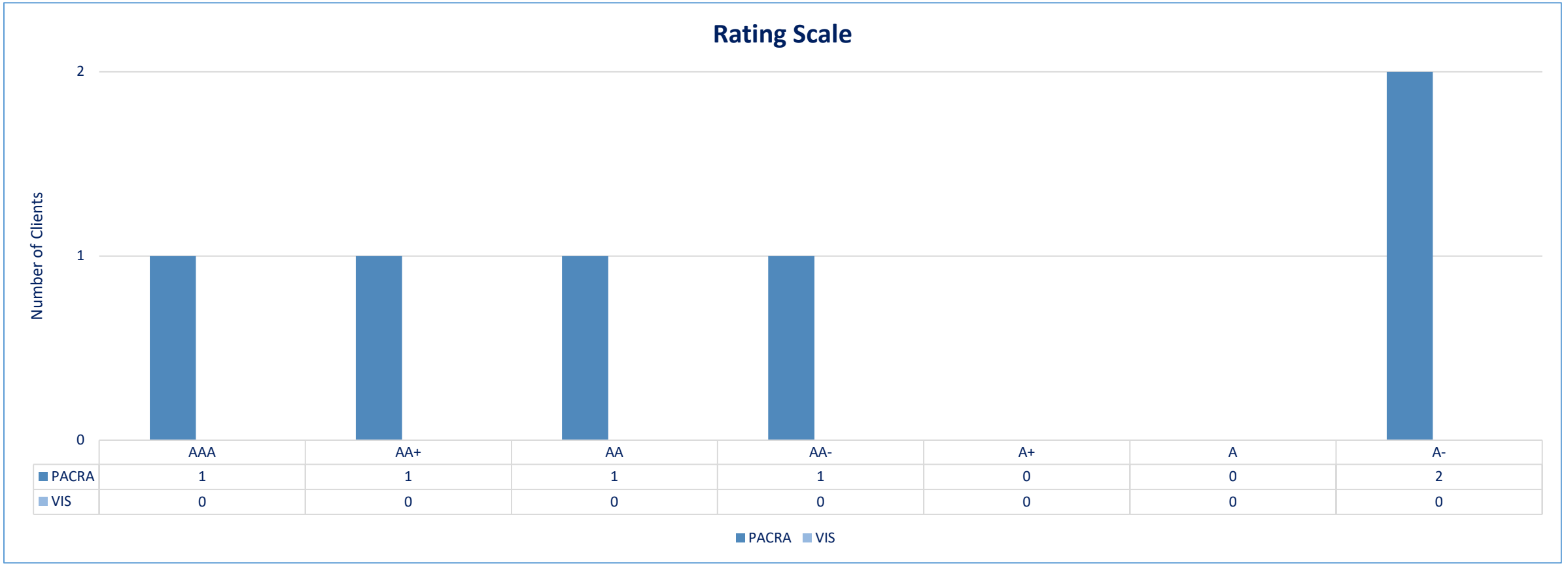


Source: Financial Statements

Refineries

Rating Curve

- PACRA rates all five refineries in Pakistan.



Refineries

SWOT Analysis

Strengths

- Highly capital intensive business
- Government relations
- Strategic importance
- Robust local demand
- Moderately competitive (HHI score: 2,181)

Weaknesses

- The total refining capacity is not being fully utilized due to financial and technical problems
- High proportion of low value product (FO) in total product mix
- Exposure to exchange rate and international oil price movement

Opportunity

- Attention/focus of government towards solving issues of refineries
- Upcoming refinery policy
- All companies are moving towards upgradtion of Bottom-of-Barrel (BOB) to produce value added products
- Improving crack spread

Threats

- Non-approval of refinery policy
- Outdated technology
- Abrupt reduction in petrol prices
- Depleting local oil reserves

Refineries

Outlook: Watch

- Economic activity picked up pace during FY21 after easing of COVID-19 restrictions during the period. The country's GDP registered an impressive growth of ~3.94% during FY21 (FY20:(0.5%)), which resulted in increased demand of petroleum products as well.

- Local consumption of petroleum products registered an impressive growth of ~15.9% during FY21 (FY20:(~11.8%)). Although the demand of petroleum products from industries is expected to remain strong but record high prices of petroleum products will impact the demand from transport sector negatively.

- Overall demand of petroleum products is expected to increase during FY22. Moreover, due to significant increase in international RLNG prices, RFO based thermal generation would become relatively cheaper which is expected to stimulate FO demand during the period.

- Profitability of the sector improved during FY21 on the back of increased offtake. Moreover, profitability will improve further with significant increase in crack spreads. On the contrary, the negative impact of rising interest rates will be apparent on sector's profitability sooner or later owing to significant proportion of short term borrowing in total liability mix.

- Approval of under consideration Oil Refinery policy is imperative for the sector's growth. All refineries are required to submit there expansion plans by Dec-2021 in order to become eligible for incentives being offered in draft policy and to continue their operations without any government restrictions. This is a major development awaited for the sector's future prospects.

- Any downward revision in oil prices, going forward, can result in inventory losses for the sector. However, the revisions are expected to be gradual and mild, particularly in comparison to the recent past.

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