



March
2018

Policy & Economic Report - Oil & Gas Market



Federation of Indian Petroleum Industry (FIPI)

3rd Floor, PHD House, 4/2, Siri Institutional Area,
August Kranti Marg, New Delhi - 110 016

Table of Contents

| | |
|---|----|
| Economy in Focus | 2 |
| Crude oil price | 8 |
| Indian Basket Crude oil price | 10 |
| Oil demand & supply | 10 |
| Global petroleum product prices | 11 |
| Petroleum products consumption in India | 12 |
| Natural Gas Price | 12 |
| Natural gas production, consumption and import | 14 |
| Key policy announcements in oil & gas sector during the month | 15 |

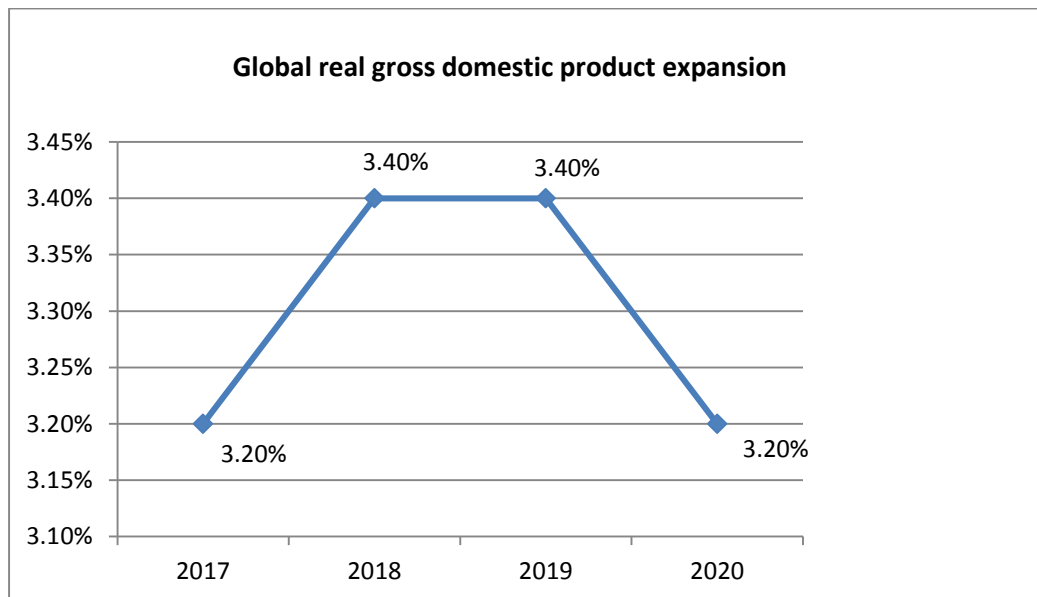
Policy & Economic report – Oil & Gas market

Economy in Focus

New economic numbers suggest moderation in global growth rate

Recent global Purchasing Managers' Index™ (PMI) data and earnings growth estimates from analysts suggest bit of moderation. The US show more such signs with a decline in consumer spending. With weaker retail sales growth and moderation in housing market activity, the popular opinion states that this could potentially lead to a downward revision in U.S. growth estimates.

The global economy's upswing showed signs of strains in March as a drop in momentum at businesses from Japan to the euro region underscored the world's vulnerability to confidence shocks from a trade war. With the U.S. Federal Reserve raising interest rates and boosting growth forecasts for this year and next, survey data from elsewhere provided a reminder of how the international economic outlook could turn. The euro area's private sector grew at the slowest pace in 14 months, Japanese manufacturing lost steam and German business confidence fell to the weakest level in almost a year.



Source: World Forecast Flash, IHS Markit

The global economy is going strong and the general outlook is bright, but global risks like protectionist measures are also on the rise and threaten to curb momentum.

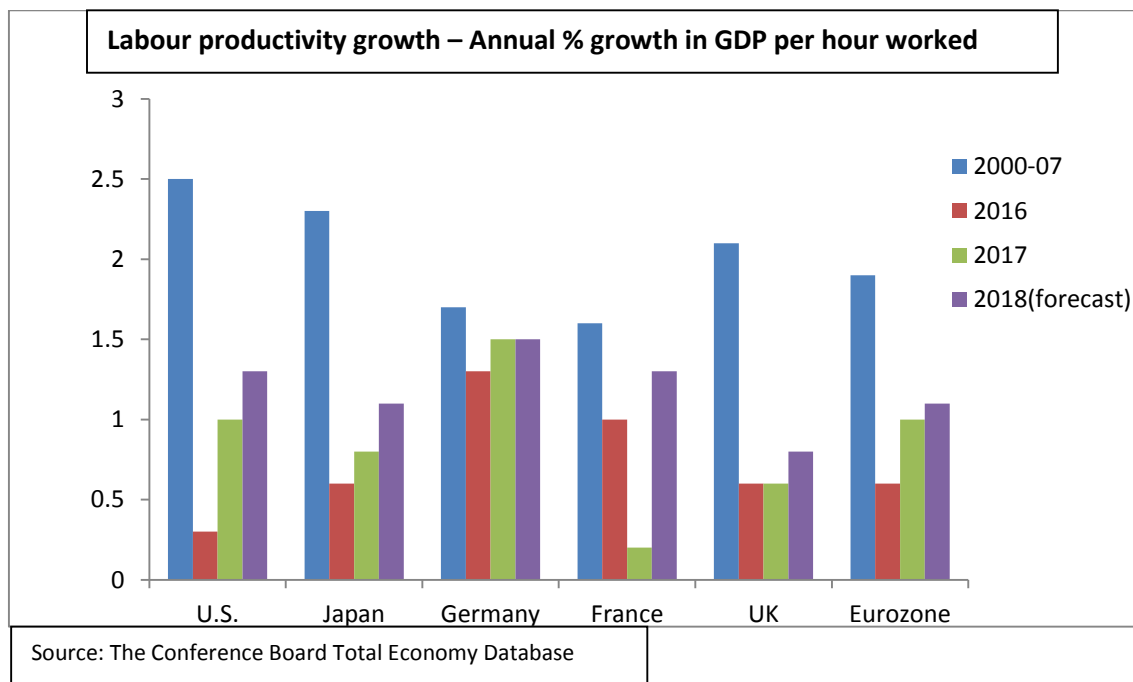
WTO's concerns with trade barriers

Post Washington slapping steep tariffs on Chinese imports, heightening fears of a trade war, the World Trade Organization chief warned states that creating barriers to international trade would "jeopardize the global economy," especially at a time when economic recovery, though fragile, has been increasingly evident around the world. Analysts state that if this stance is pursued upon by Trump administration, it can clearly make more waves in financial markets. If trade tensions escalate, two possible outcomes are likely - one where Europe cooperates with the US and one where Europe alienates from the US. These two scenarios could have significant negative implications for world trade and the global economy and cooperation between US-EU towards China would seem more realistic than the other way around.

Another possible outcome of this could be that import tariffs imposed on certain products from China could benefit exporters of similar products from other countries. The trade flows could be "diverted" from China to other competing suppliers such as Taiwan, Korea, Vietnam, Thailand, Malaysia etc.

Indian equity markets reacted negatively in-line with global markets. US's imposition of fresh tariff on China has resulted in an increasing fear of a trade war which could impact economic growth. If global trade volume shrinks on account of this trade war, our exports are bound to be buffeted. The expected double-digit growth in exports in FY19 may not happen. Global growth can be affected as a trade war will mean higher prices and lower growth in these two main geographies. This will impact our exports. Global GDP was valued at \$ 75.3 trillion with USA and China contributing to \$19.4 trillion and \$11.9 trillion respectively. Presently we have a surplus with the USA. In 2016-17, exports were \$42.3 billion and import \$22 billion leading to a surplus of \$20.3 billion, which may not be significant from USA point of view. In case of China, we have a deficit of \$51.1 billion with exports of \$10.2 billion and imports of \$61.3 billion and these ensuing fears of trade battles can make currencies volatile as well.

Decline in Britain's performance since Brexit referendum



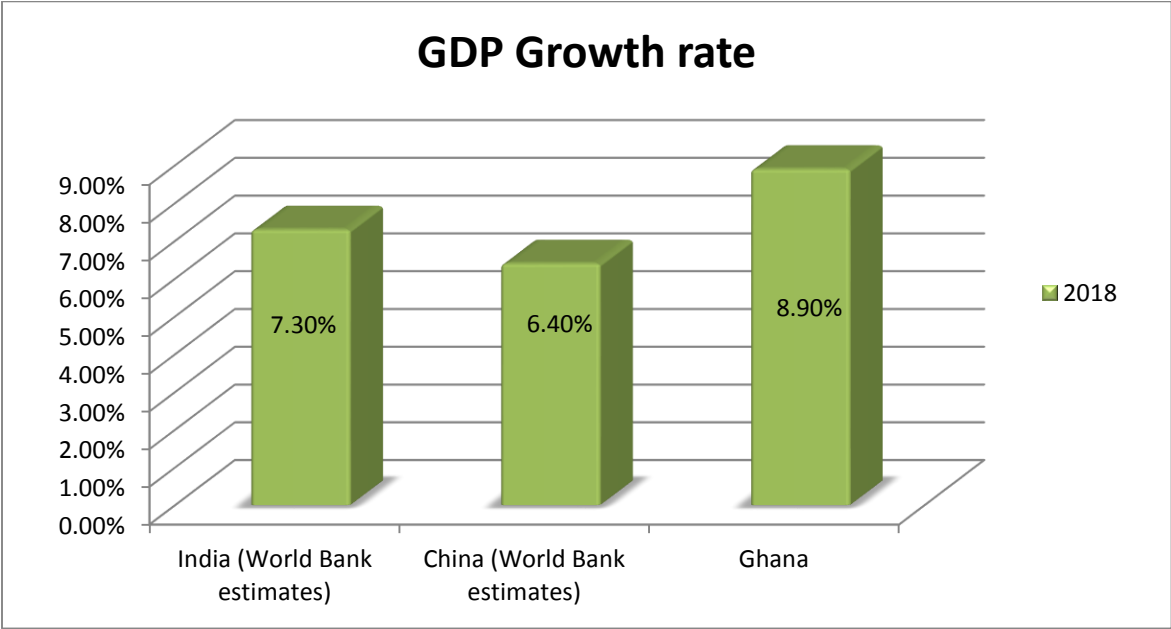
The Eurozone labour productivity growth which is the core building block of economic success rose 1 per cent in 2017 and is forecast to increase 1.1 per cent this year, quite within reach of the 1.4 per cent annual rate seen before years before the crisis. While Britain’s productivity growth rate has improved from 0.6 per cent last year to a projected 0.8 per cent in 2018, it is still far behind the 2.1 per cent Britain sustained before the financial crisis.

Italian economy one of EU's most at risk

The European Commission stated that the Italian economy is one of the most at risk in the European Union because of its large debt and weak banking sector. Italy’s giant public debt, one of the largest in the world, is set to stabilize but is not expected to decrease, as required under EU rules. The high amount of bad loans on the balance sheets of Italian banks remains a major vulnerability, as well as high unemployment.

Ghana contends for the crown of the fastest growing economy, ahead of India, China.

While India registered a GDP growth of 7.2 percent in December quarter and World Bank predicting a 7.3 percent growth in 2018-19 and 7.5 percent growth in 2019-20, Ghana is projected to register a growth between 8.3 and 8.9 per cent in 2018. Analysts attribute stellar growth prospects to the country's oil production and cocoa production, which has been inadvertently fueling its economy.

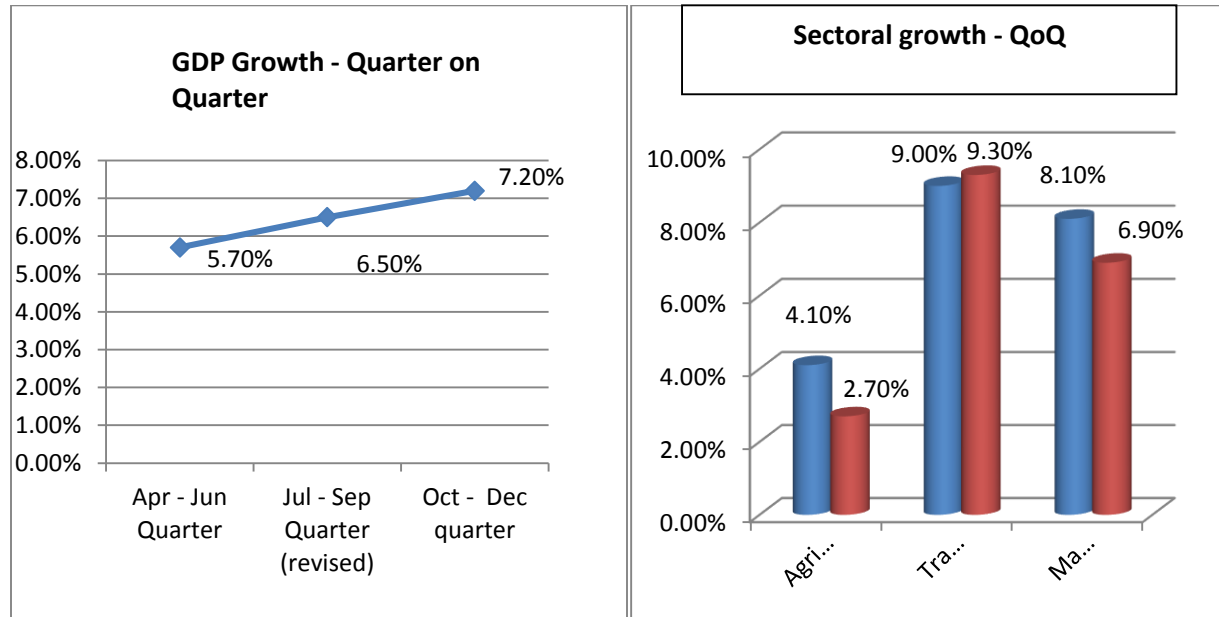


Source: World Bank

Indian economy to double to \$5 trillion by 2025

India's GDP in value terms currently stands at USD 2.5 trillion — making it the sixth largest economy in the world. The trajectory of inflation growth has been within the RBI's target of 4 per cent, plus/minus 2 per cent. The wholesale price index based inflation fell to a 7 month low of 2.48 per cent. The consumer price based retail inflation was also at 4 month low of 4.44 per cent in February.

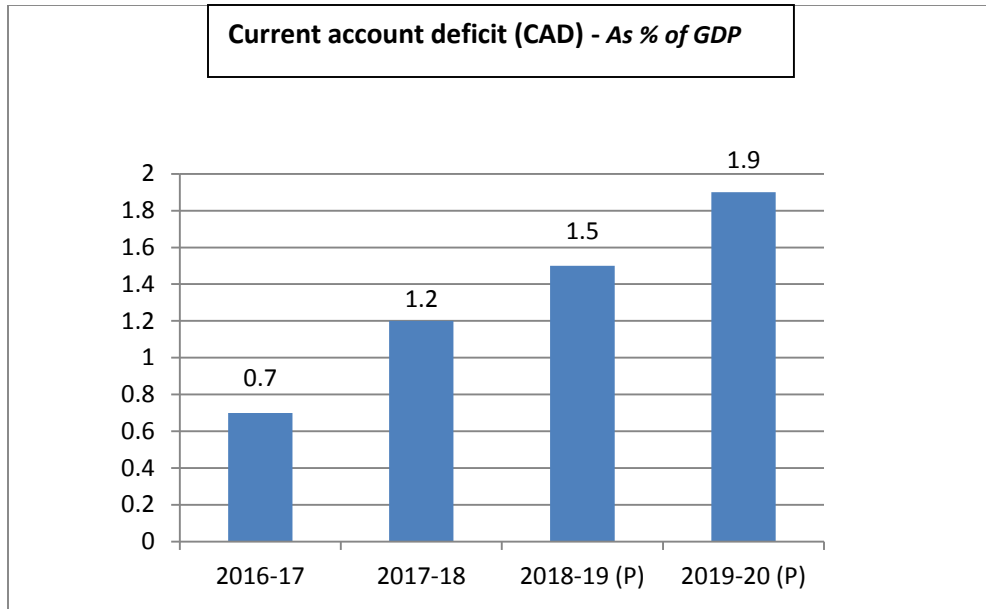
India's dominant services sector which accounts for about 55.2 percent of gross value added is likely to lead growth in gross fixed capital formation.



Source: Central Statistics Office

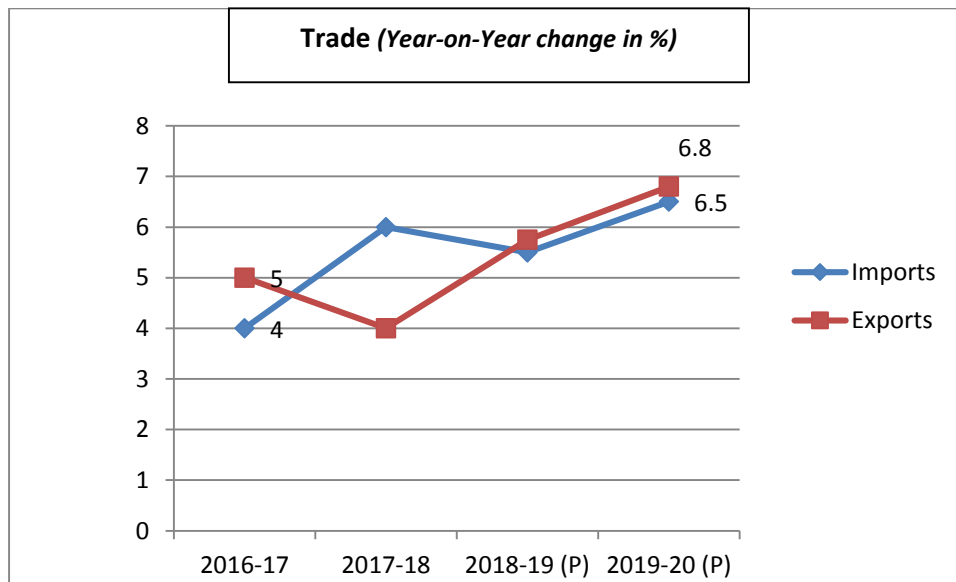
The full FY17-18 GDP growth has been pegged at 6.6% versus 6.5% with GVA FY17-18 being recorded at 6.7%.

The Indian economy seems to have regained its momentum in the December quarter recovering from disruptions caused by demonetization and implementation of the goods and services tax (GST), to expand at 7.2%, the fastest in five quarters. The World Bank has projected economic growth to accelerate to 7.3% in 2018-19 and 7.5% in 2019-20 and stated that India needs a decisive structural reform momentum that succeeds in stimulating investment and export growth while maintaining macroeconomic stability to achieve these growth figures.



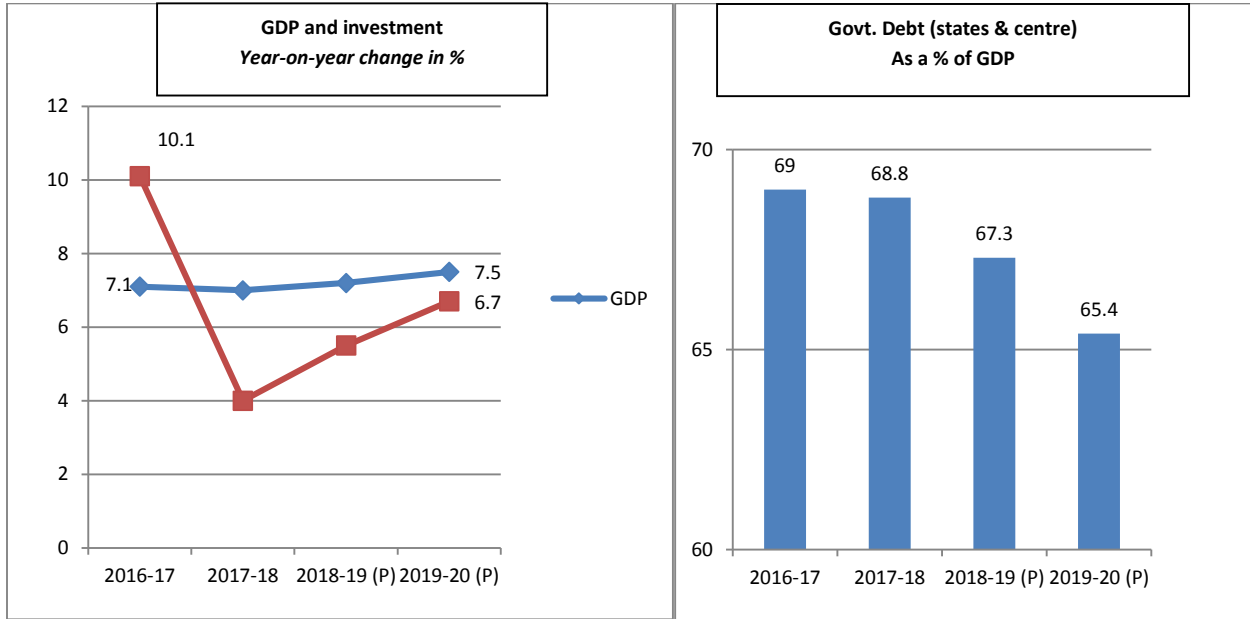
Source: India Development Update, World Bank

The India Development Update stated as to how tightening liquidity in financial markets or increased risk aversion can adversely impact India's growth outlook. It also mentioned as to how instability due to fluctuating oil prices were less of a risk concern now since oil prices are expected to remain range-bound and average \$58 per barrel in 2018.



Source: India Development Update, World Bank

The report highlighted as to how maintaining the macroeconomic stability, a definite and durable solution to the banking sector issues, realization of the expected growth and fiscal dividend from the GST, and regaining the momentum on an unfinished structural reform agenda were key components of sustaining a growth rate higher than 7.5%, and reaching an aspirational growth rate of 8% or higher.



Source: India Development Update, World Bank

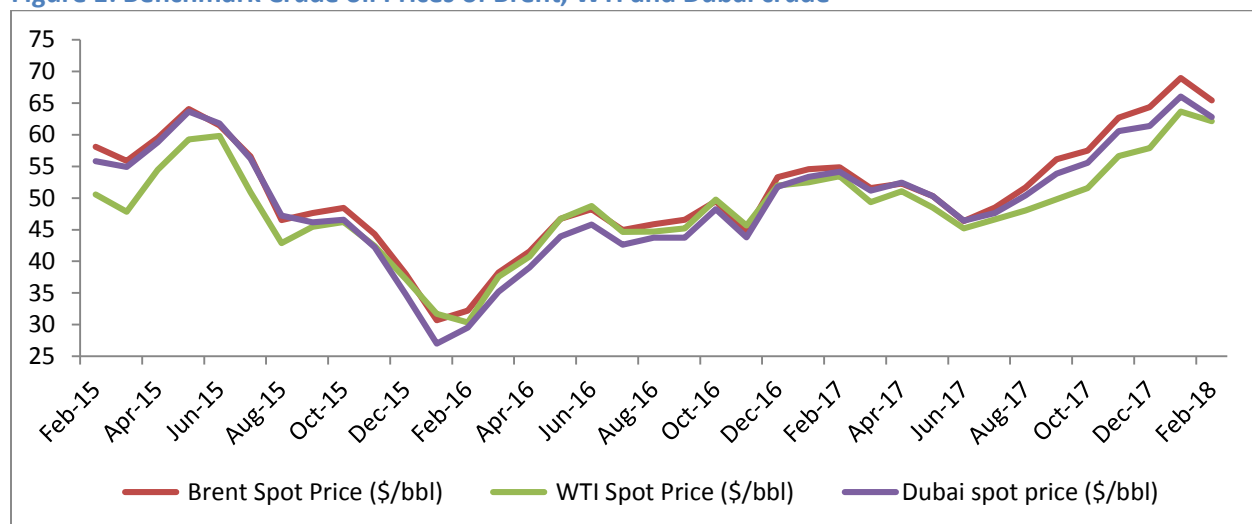
It is deemed essential that besides recapitalization, a consolidation of public sector banks, revising their incentive structure to align it more closely with their commercial performance be undertaken so as to ensure a level playing field for private banks. This would open the space for greater competition which would enhance the stability and efficiency of the banking sector.

Oil & Gas Market

Crude oil price

Crude oil prices showed a decreasing trend in the month of February 2018. Global benchmark crudes such as Brent, WTI and Dubai declined in the range of 2% - 5% from their three year high in January 2018 due to record US production which raised crude inventories.

Figure 1: Benchmark Crude oil Prices of Brent, WTI and Dubai crude



Source: EIA, World Bank,

- Brent crude price averaged \$65.4.0 per bbl in February 2018, and was down 5.2% and up 19.2% on a month on month (MoM) and year on year (YoY) basis, respectively.
- WTI crude price averaged \$62.2 per bbl in February 2018, and was down 2.4% and up 16.3% on a month on month (MoM) and year on year (YoY) basis, respectively.
- Dubai crude price averaged \$62.8 per bbl in February 2018, and was down 4.9% and 15.9% on a month on month (MoM) and year on year (YoY) basis, respectively.

Table 1: Crude oil price in February, 2018

| Crude oil | Price (\$/bbl) in Feb 2018 | MoM (%) change | YoY (%) change |
|--------------|----------------------------|----------------|----------------|
| Brent | 65.4 | -5.2% | 19.2% |
| WTI | 62.2 | -2.4% | 16.3% |
| Dubai | 62.8 | -4.9% | 15.9% |

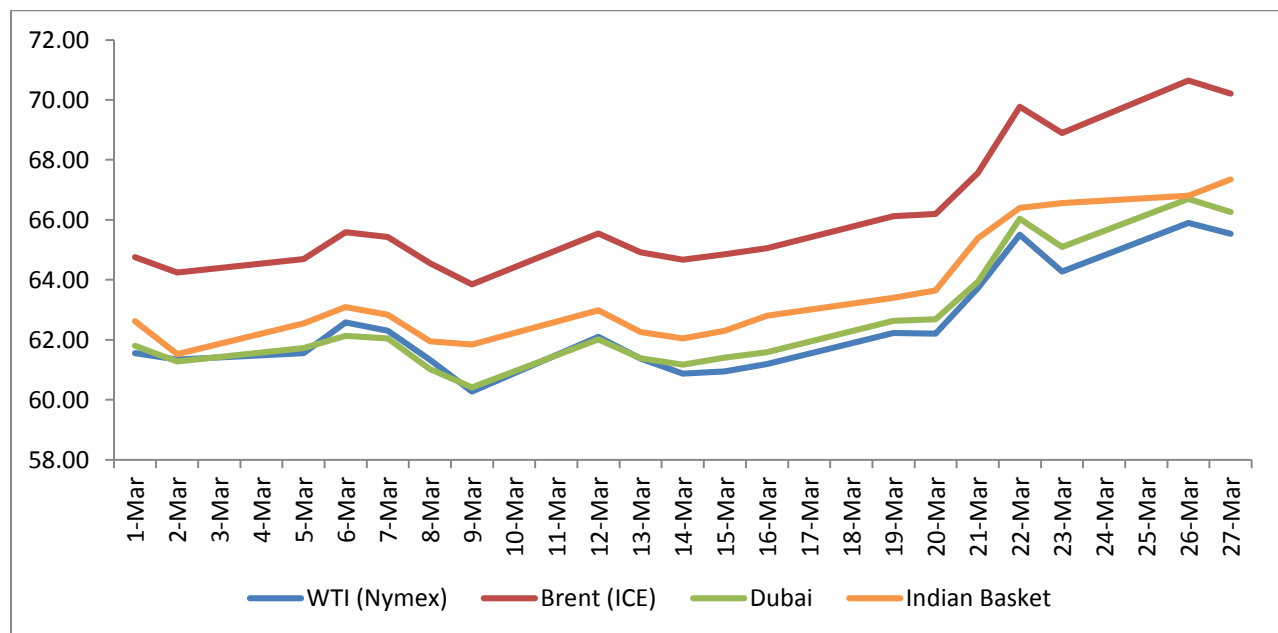
Source: EIA, World Bank,

Volatile crude oil prices in March

Crude oil prices remained highly volatile within a range in March, as concerns about rising supply from the US and elsewhere threatened to undermine efforts by OPEC and other producers to tighten the market. Key fundamentals that drove prices during the month were:

- **OPEC & Russia led production curbs could last till 2019:** Oil prices got pushed up by Saudi plans for OPEC and Russian-led production curbs introduced in 2017 to be extended into 2019. OPEC, together with a group of non-OPEC producers led by Russia, started withholding production in 2017 in order to prop up prices. The deal to cut is scheduled to last through 2018, and there has been recent support by OPEC's de-facto leader Saudi Arabia to extend the cuts into 2019.
- **US trade dispute with China:** Oil prices reversed gains on concerns of a looming trade dispute between the United States and China. The falls came after U.S. President Donald Trump last week signed a memorandum that could impose tariffs on up to \$60 billion of imports from China.
- **Geopolitics in Middle East:** Supply-side geopolitical developments in Venezuela, Libya and Iran, the most acute of which is Iran have been putting upward pressure on oil prices. The United States has threatened to withdraw from a nuclear deal that Iran signed with six nations in 2015, which expires in May this year, raising the chance that it may impose sanctions on Tehran and hinder oil exports.
- **Soaring US output:** However, increasing crude oil output from US is putting downward pressure on oil prices. Many reports expect the global oil markets to flip from slight undersupply in 2017 and early this year into oversupply later in 2018. Crude price was also squeezed led by a rise in the number of U.S. rigs drilling for oil to a three-year high of 804, implying further rises in production.

Figure 2: Crude oil price in March marked by range bound volatility

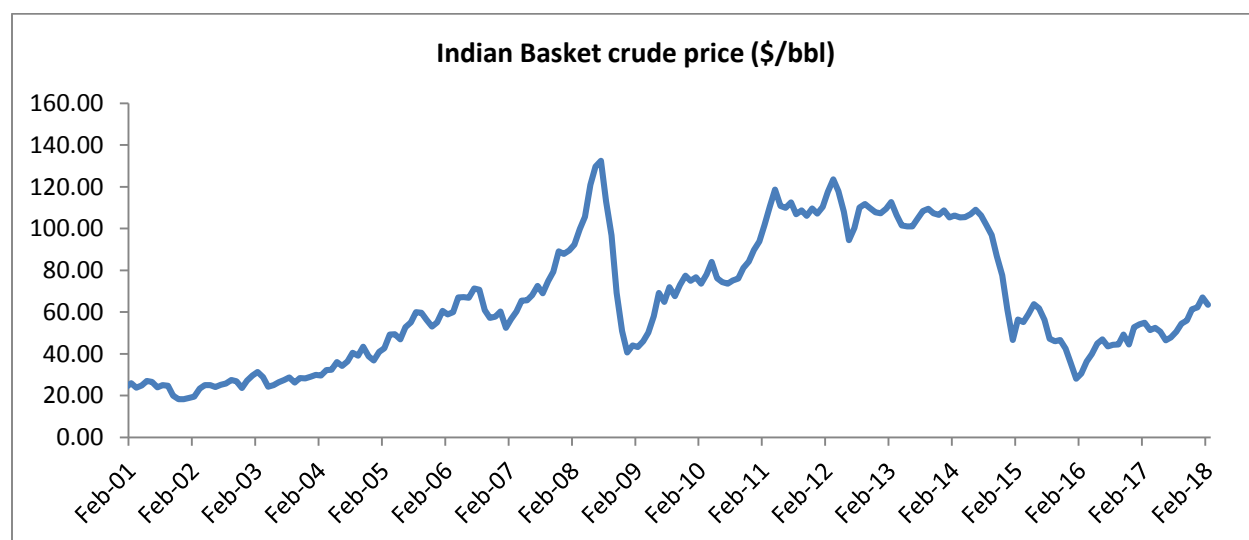


Source: EIA, PPAC

Indian Basket Crude oil price

- The Indian basket of Crude Oil represents a derived basket comprising of Sour grade (Oman & Dubai average) and Sweet grade (Brent Dated) of Crude oil processed in Indian refineries in the ratio of 72.38:27.62 during 2016-17.

Figure 3: Indian crude oil basket price in \$ per bbl



Source: Petroleum Planning & Analysis Cell

- Indian crude basket price averaged \$63.5 per bbl in February 2018, and was down 5.2% and up 15.8% on a month on month (MoM) and year on year (YoY) basis, respectively.

Oil demand & supply

- According to OPEC, World oil demand grew by 1.64% in 2017 to 96.99 mbpd from 95.42 mbpd in 2016. India's demand for oil in 2017 was 4.47 mbpd.

Table 2: World Oil demand in mbpd

| | 2016 | 1Q17 | 2Q17 | 3Q17 | 4Q17 | 2017 | Growth | % |
|-----------------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------|-------------|
| Total OECD | 46.90 | 47.04 | 46.92 | 47.69 | 47.84 | 47.37 | 0.48 | 1.01 |
| Dev. Countries | 31.39 | 31.49 | 31.90 | 32.33 | 31.97 | 31.93 | 0.54 | 1.71 |
| ~ of which India | 4.39 | 4.43 | 4.42 | 4.20 | 4.81 | 4.47 | 0.08 | 1.80 |
| Other regions | 17.13 | 17.14 | 17.46 | 17.77 | 18.57 | 17.74 | 0.61 | 3.55 |
| ~ of which China | 11.80 | 11.88 | 12.40 | 12.30 | 12.68 | 12.31 | 0.51 | 4.35 |
| Total world | 95.42 | 95.67 | 96.28 | 97.79 | 98.38 | 97.04 | 1.62 | 1.70 |

Source: OPEC monthly report, March 2018

- According to OPEC, world oil supply in December increased by 0.40 mb/d m-o-m, to average 97.49 mb/d, representing an increase of 0.83 mb/d y-o-y.
- Non-OPEC oil supply in December 2017 rose by 0.34 mb/d m-o-m, mainly in Canada, Mexico, Norway, Brazil and Kazakhstan to average 58.62 mb/d, while production declined m-o-m in the US, and the UK.
- The share of OPEC crude oil in total global production was steady at 33.3% in December, compared with the previous month.

Global petroleum product prices

Asian product markets recovered during the month of February. The Asian gasoline market recovered from the weakening seen in the previous month and received support from higher gasoline demand in Japan. Naptha spreads continued to decline due to growing preference for LPG as a petchem feedstock.

Jet/kerosene showed remarkable gains on a monthly and yearly basis. Strong jet fuel demand growth and higher kerosene heating requirements due to colder winter temperatures supported this positive trend.

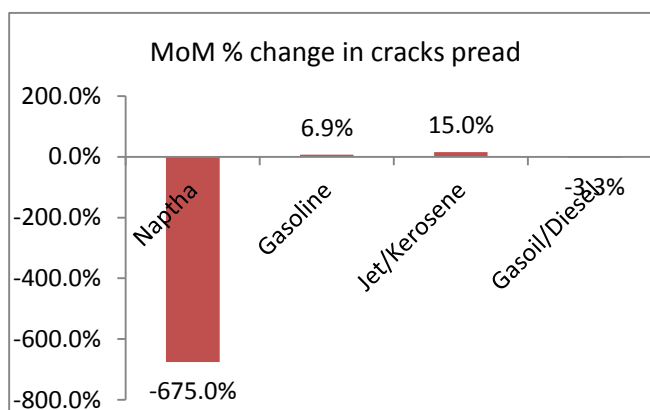
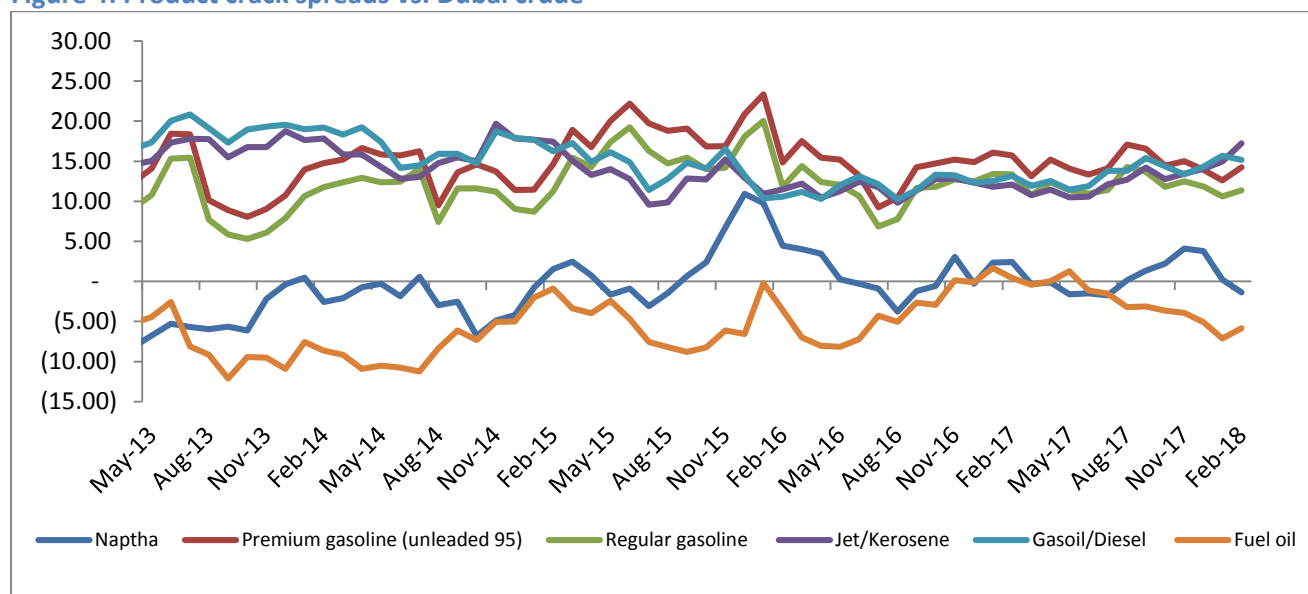


Figure 4: Product crack spreads vs. Dubai crude



Source: OPEC, World Bank, FIPI

Table 3: Singapore FOB, refined product prices (\$/bbl)

| Products | Price (\$/b) in Feb 2018 | MoM (%) change | YoY (%) change |
|---------------------------------------|--------------------------|----------------|----------------|
| Naptha | 61.41 | -7.3% | 8.5% |
| Premium gasoline (unleaded 95) | 77.02 | -2.0% | 10.2% |
| Regular gasoline (unleaded 92) | 74.15 | -3.3% | 9.8% |
| Jet/Kerosene | 80.01 | -1.2% | 20.8% |
| Gasoil/Diesel (50 ppm) | 77.95 | -4.6% | 15.8% |
| Fuel oil (180 cst 2.0% S) | 56.96 | -3.3% | 4.3% |
| Fuel oil (380 cst 3.5% S) | 56.56 | -3.9% | 20.2% |

Source: OPEC

Petroleum products consumption in India

- With the push by government on promotion of LPG, its Consumption has steadily increased in India. In February, LPG consumption increased by 7.9% YoY basis.
- Consumption of gasoline increased significantly (9.4% YoY) driven by higher demand from transport segment.
- Demand for diesel also witnessed robust growth of 6.0% YoY in the month of February.

Table 4: Petroleum products consumption in India, February 2018

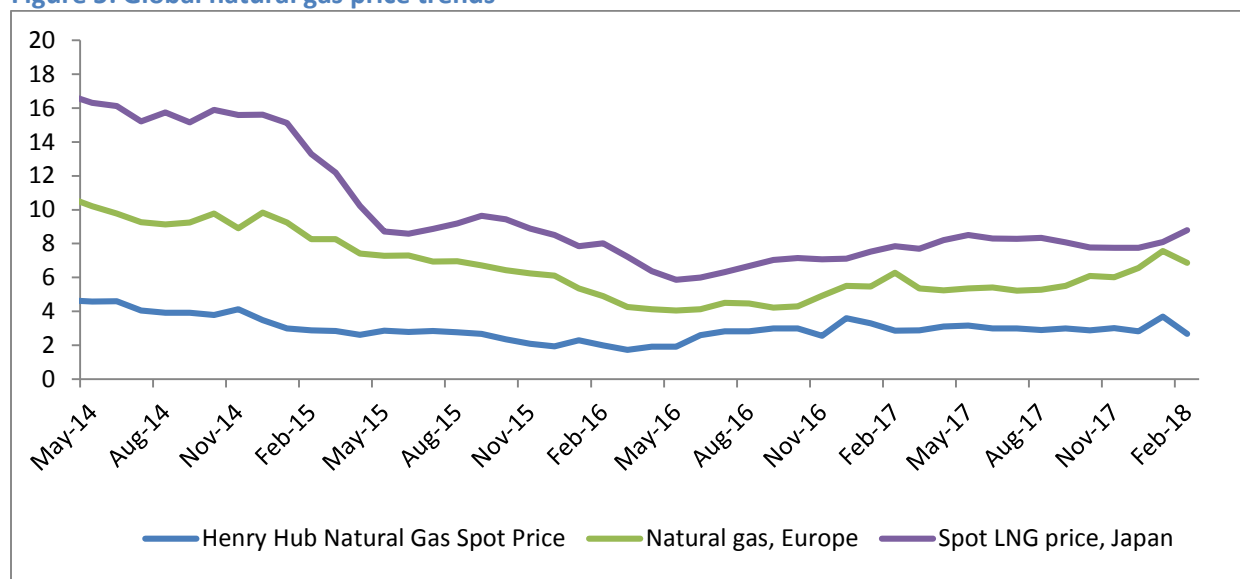
| Petroleum products | Consumption in '000 MT Feb 2018 | MoM (%) change | YoY (%) change |
|---------------------------------|---------------------------------|----------------|----------------|
| LPG | 1,946 | -6.4% | 7.9% |
| Naphtha | 956 | -5.1% | -10.7% |
| MS | 2,075 | -0.6% | 9.4% |
| ATF | 625 | -10.2% | 7.9% |
| HSD | 6,532 | -1.7% | 6.0% |
| LDO | 47 | -15.6% | 32.1% |
| Lubricants & Greases | 292 | -0.4% | 3.2% |
| FO & LSHS | 527 | -7.3% | 0.1% |
| Bitumen | 632 | 13.2% | 10.7% |
| Petroleum coke | 2,201 | 11.1% | 27.6% |
| Others | 591 | -6.2% | 13.9% |
| TOTAL | 16,732 | -1.1% | 7.7% |

Source: PPAC

Natural Gas Price

Natural gas prices in US remained low due to higher US production. LNG prices saw an upswing due to colder winters and higher natural gas demand.

Figure 5: Global natural gas price trends



Source: EIA, World Bank

Table 5: Gas price

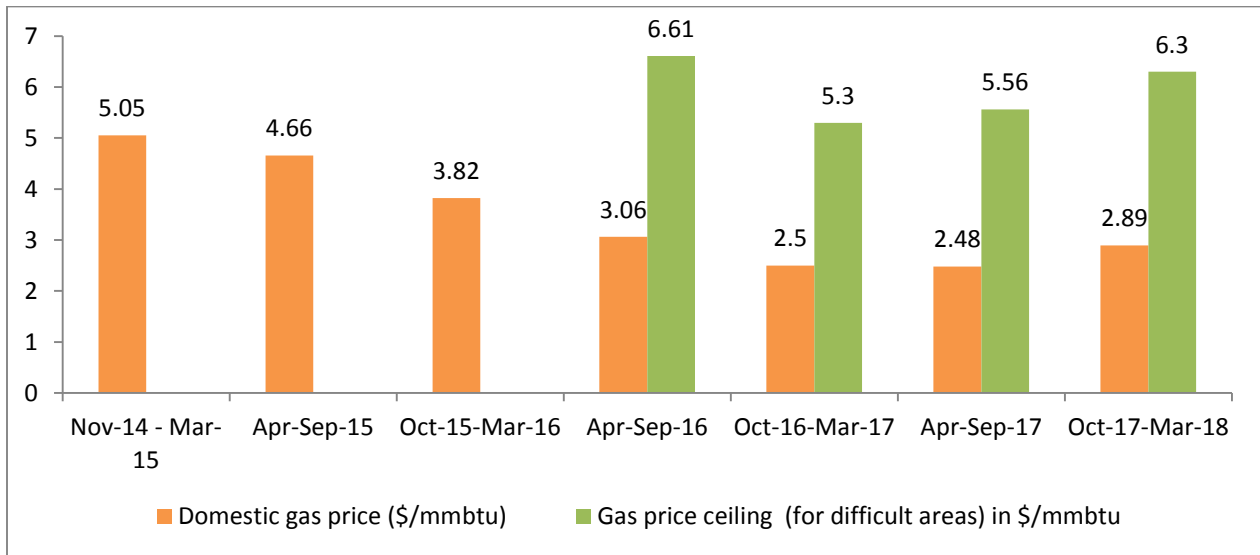
| Natural Gas | Price (\$/MMBTU) in Feb 2018 | MoM (%) change | YoY (%) change |
|---|------------------------------|----------------|----------------|
| India, Domestic gas price | 2.89 | 0.0% | 15.6% |
| India, Gas price ceiling – difficult areas | 6.30 | 0.0% | 13.3% |
| Henry Hub | 2.67 | -27.6% | -6.3% |
| Natural Gas, Europe | 6.87 | -9.1% | 9.6% |
| Liquefied Natural Gas, Japan | 8.80 | 8.6% | 12.1% |

Source: EIA, World Bank, PPAC

Domestic natural gas price which takes into account international benchmarks including Henry Hub, Alberta hub, Russia and UK National Balancing Point, has increased around 16% as compared to a year before, thus capturing the international gas price trends.

A notification was issued by MoP&NG on 21st March 2016, for marketing including pricing freedom for gas to be produced from discoveries in deep water, ultra-deep water, and high pressure high temperature areas. For the Oct -17 to Mar-18 period, the price of gas from such areas was notified at \$6.30 per MMBTU.

Figure 6: Domestic natural gas price

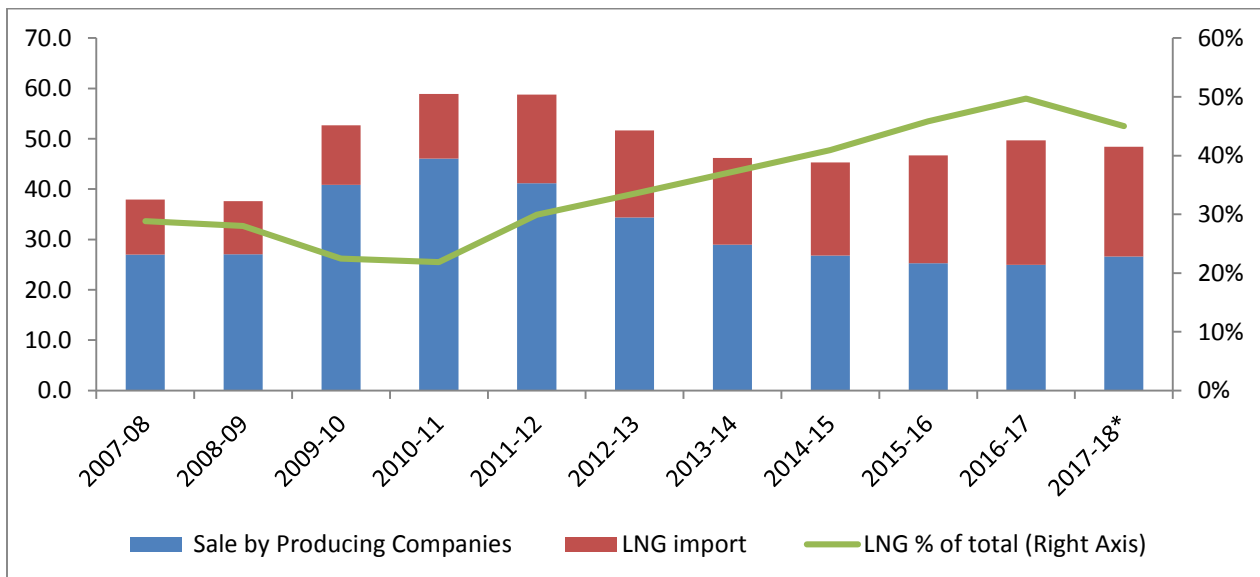


Source: PPAC

Natural gas production, consumption and import in India

- Natural gas constitutes for 6.5% of total energy primary mix of India
- Natural gas consumption in India has grown at a very slow pace in the past 3 – 4 years, with share of LNG imports increasing in the overall consumption mix

Figure 7: Domestic natural gas consumption, domestic production and LNG import in BCM



Source: PPAC

*Figures for 2017-18 are for the period of April to January only. Sale by producing companies includes internal consumption

Key policy announcements in energy sector during the month

• **LPG connection to every household; Pradhan Mantri LPG Panchayat**

The Government has launched Pradhan Mantri LPG Panchayat which is an interactive communication platform for rural LPG users on various subjects like safe usage of LPG, its benefit to environment, women empowerment and women health, and also use the forum to motivate the consumers to use LPG regularly as a clean cooking fuel. Government had launched “Pradhan Mantri Ujjwala Yojana” on 1st May 2016 to provide deposit-free LPG connections to 5 crore women belonging to the Below Poverty Line (BPL) with a budgetary provision of Rs. 8000 crore and the target has now been enhanced to 8 crore with additional budgetary provision of Rs. 4,800 crore. The beneficiaries under the Scheme are identified through Socio Economic Caste Census (SECC) 2011. The Government has now decided to cover the following categories under the Scheme:

- I. All SC/STs households beneficiaries of Pradhan Mantri Awas Yojana (PMAY) (Gramin),
- II. Antyodaya Anna Yojana (AAY)
- III. Forest dwellers
- IV. Most Backward Classes (MBC)
- V. Tea & Ex-Tea Garden Tribes
- VI. People residing in Islands
- VII. People residing in river islands.

• **Policy measures for promotion of new & renewable energy**

The Government of India has undertaken a number of policy measures for increasing share of renewable energy in India’s energy mix. These, inter-alia, include:

- a) Provision of Renewable Purchase Obligation (RPO) under the National Tariff Policy;
- b) Notification of the long term growth trajectory of RPO for solar and non-solar energy for next 3 years from 2016-17, 2017-18 and 2018-19;
- c) Development of Solar Parks and Ultra Mega Solar Power Projects;
- d) Development of power transmission network through Green Energy Corridor project;
- e) Making roof top solar as a part of housing loan provided by banks;
- f) Waiver of Inter-State Transmission Charges and losses;
- g) Repowering of Wind Power Projects for optimal utilization of wind resources;
- h) Offshore wind energy policy for development of offshore wind energy in the Indian Exclusive Economic Zone;
- i) Supporting research and development on various aspects of renewable energy including with industry participation;

- j) Financial incentives for off-grid and decentralized renewable energy systems and devices for meeting energy needs for cooking, lighting and productive purposes; and
- k) Permitting 100 percent Foreign Direct Investment in sector through automatic route.

The Government of India has set up a target of installing 175 GW capacity through renewables by 2022. As on 28.02.2018, a total capacity of 65 GW had been installed in the country.

- **EU-India Conference on Advanced Biofuels**

A two day conference was organized jointly by MoPNG and EU on advanced biofuels. The aim of the two day Conference was to facilitate the market deployment of advanced biofuels to enable commercialization of Advanced Biofuel Projects by improving the dialogues between the research community and technology developers of both sides.

Petroleum Minister Shri Dharmendra Pradhan emphasized the importance of research to promote the use of biofuels. For India, in the future, biofuels would be the cost-effective, pollution-free import substitute to polluting fossil fuels. While first generation biofuels are made from sugars via molasses and vegetable oils, advanced biofuels are made from lignocellulosic biomass or woody crops, agricultural residues and municipal waste. Elaborating on this he said we are committed to reaching the target of 10 percent blending of ethanol in petrol by the year 2022. He also said 12 bio-refineries are being set up in the country by the Oil PSUs to enhance the ethanol production capacity. Noting that biofuels in India are currently "only made from molasses", Mr. Pradhan pointed out that Budget 2018-19 presented last month had announced incentives for "waste-to-wealth" conversion projects, including the Gobar Dhan scheme focused on producing bio-CNG.

Session wise Report on EU-India conference on advanced biofuels

European Union & Ministry of Petroleum & Natural Gas jointly organized a conference on advanced biofuels on 7th and 8th March 2018 in New Delhi. The conference played an instrumental role in bringing together stakeholders from across the biofuels value chain who discussed the pertinent issues prevalent in the sector. The conference incited informative discussions, presentations and question answer sessions around availability of biomass resources in India, decarbonising transport and national policies for biofuels, role of biofuels in aviation, lignocellulosic ethanol, gasification & pyrolysis, new concepts, advanced biofuels and Carbon Capture & utilization.

Day 01

Session 1: Opening

The context for this “EU-India conference on Advanced biofuels” was set on the first day of the conference in the inaugural address delivered by Mr. Dharmendra Pradhan, Hon. Minister of Petroleum and Natural Gas & Minister of Skill Development and Entrepreneurship wherein he highlighted that around 95% of demand for transport fuels in India is met by fossil fuels which contributes to emissions of various kind. Moreover, the fossil fuels resources are limited, non-renewable, polluting and therefore, need to be used prudently. In this scenario, India is bound to look out for alternative sources of energy for increasing its self-sufficiency.

Hon. Minister added that India has set a national target of energy imports reduction by at least 10% by 2022. Biofuels from conventional route such as molasses, non-edible oil seeds, palm stearin etc. may not be sufficient to meet our desired targets, this is where advanced Biofuels from other non-conventional routes such as crop residues, Municipal solid waste (MSW), waste gases, industrial waste etc. will play a pivotal role in achieving this target.

Mr. Tomasz Kozlowski, Ambassador of the EU to India, in his opening remarks, stressed on EU and India’s long term cooperation in areas such as political security, economic growth and bilateral trade. He further highlighted that, EU is partnering India in certain key projects like designing offshore wind projects in Gujarat, Solar Wind farm projects, solar roof-top projects and energy efficiency projects. The EU India partnership will play an instrumental role, in providing significant opportunities for developing our economies, and working towards clean energy transformation. He further emphasized on the EU – India partnership which will provide significant opportunities for developing our economies, and working towards clean energy transformation. He also invited universities, research institutions, and SMEs for participation in research projects at Horizon – 2020.

Session 2: Decarbonising Transport, National policies

The second session of the day was titled “Decarbonizing Transport, National policies”, and was chaired by Dr. Anil Kakodkar, Chairman, Scientific Advisory Committee, MoPNG. The key takeaways from the session were:

- Emphasis on global focus of carbon emission reductions in transport segment, and requirement of effort in technology, innovation and diversification to achieve targets.
- Emergence of new technologies, achieving economies of scale, feedstock sustainability and international collaboration to play an important role for promoting biofuels.
- As far as India is concerned, there is a 3- pronged approach for bio fuels, namely – for Bio-diesel blending, 1st generation ethanol and advanced biofuel production. The GOI has framed various policies and incentives for promoting biofuels, and is also considering Viability Gap Funding schemes for biofuels promotion.

- There is a strong focus of EU on reducing the imprint of fossil fuels in the primary energy mix, by increasing share of renewable energy, and bio fuels and gradually moving towards a carbon neutral society.

Session 3: Availability of biomass resources in India

The third session focused on Availability of biomass resources in India, and was chaired by Dr. Ramakrishna Y B, Chairman, Working Group on Biofuels, MoP&NG. The session incited intense discussion on biomass availability in India, development of new biomass hybrids, and the way they can revolutionize the biomass industry. The key takeaways were:

- Developing an effective supply chain system for biomass will be critical for bringing down costs of the overall biofuels value chain.
- For sustainability of 2G biofuel plants, it is essential to have sustainable crop intensification, rotation and farmers training & locating plants in ecologies with adequate rainfall.

Invited Presentation: The challenging role of biofuels in aviation

Mr. Srinivas Duvvuri, Director, Strategy & International Cooperation, Airbus in his invited presentation highlighted the Huge growth happening in Asia pacific region in global aviation traffic with Indian domestic air traffic growing at an average rate of around 20% and that Sustainable fuels are a key pillar to reduce GHG emissions in aviation sector.

Session 4 & 5: Lignocellulosic ethanol (part 1 & part 2)

The fourth and fifth session on Lignocellulosic ethanol, highlighted the challenges encountered at each step i.e. feed handling, pre-treatment, enzymatic hydrolysis and fermentation FOR production of cellulosic ethanol. During the session, technology providers from EU and India talked about the various upcoming technologies for production of advanced biofuels, which are under various stages of research and development and commercialization, which can revolutionize the way biofuels are currently being produced. It was stated above in the session that, the way forward for indigenous 2G technology development requires, multidisciplinary scientific breakthroughs, focus on biocatalysts, use of C-5 sugars and oil industry expertise. It was also stated in the above session that 2nd/3rd generation biofuels technologies from alternate raw materials required to meet 20% bio-fuels blending mandate of India National Biofuel policy.

The first day of the conference ended with a vote of thanks from the session chair, Mr. Andrew Murfin, Shell.

Day 02

Session 6: Gasification and Pyrolysis

The second day started with session six of the conference on gasification and pyrolysis. Chaired by Didier Masy of Leaf, this session saw valuable contributions from all the renowned speakers.

The key takeaways from this session are as follows:

- Advantages of Fast pyrolysis based advanced biofuels” namely; decoupling biomass resource from location and scale of application, applicability with a variety of biomass feedstocks, advanced biofuel yield which is a sustainable alternative to fossil fuels and has an overall efficiency of 85%.
- Fast pyrolysis bio-oil finds its applications in bio—based materials, biofuels, bulk chemicals, commodity chemicals and power and heat generation
- Requires minimum modification at the refiners and is low cost route (low CapEx and low OpEx).
- Advantages of Thermo Catalytic Reforming in terms of utilization of residues, utilization of residues, short logistic ways and nutrients available again through the utilization of coal locally.
- MSW plasma gasification technology has been tested on all kinds of biomass; hazardous waste, pet coke, toxic waste and others. Hence it can process in the absence of any one kind of feed thereby proving advantageous to the customer.

Session 7: Novel Concepts, Renewable Fuels and CCU

The seventh session was on novel concepts, renewable fuels and CCU and was chaired by Anjan Ray, CSIR-IIP. The session focussed on:

- E-fuel known as Power-to-X (PtX), or Renewable Fuels of Non-Biological Origin (RFNBO) can be integrated in existing production processes.
- E-fuel opportunities for India will help reduce emissions, store increasing supply of renewable energy, broaden fuel mix, reduce oil import and provide energy security and create new export product.
- Electrification will not be enough and will take a long time. Hence it is essential to produce a higher value added product from electricity since there are practical challenges in storing electricity in batteries.
- IH2 technology converts MSW, agri residue and forestry into hydrocarbon fuels and uses proprietary catalysts. H₂ & heat are used to remove O as water and is an exothermic process

Session 8: Co-Processing & Transport sectors

Session eight concentrated on co-processing and transport sectors and was chaired by Mr. Kyriakos Maniatis, Principal Administrator, EC, DG ENER.

The key takeaways from the session were:

- With the underlying vision of reducing oil dependence by 10% by 2022 and climate change being a major concern, it is essential to adopt a spoke and hub model.
- Conversion of locally available biomass into bio-crude through Rapid Thermal Processing and transporting the same to the nearest refinery.
- Main sources of waste to fuel are – sewage water, organic solid waste and landfill gas
- Shift to non-fossil fuels will happen when profitability levels are viable.
- Methane can be used as a cooking gas, automotive fuel, electricity generation; CO₂ can be recovered and sold as Industrial gas and Slurry can be used as organic manure/fertilizer for cultivation/horticulture
- Future fuels for Rail Transport – Bio-Diesel, CNG/LNG , methanol, fuels from renewable sources

Invited Presentation: The ART Fuels Forum, The forum where the Advanced Biofuels Industry meets

The invited presentations by David Chiaramonti & Y B Ramakrishna delved into the concept of The Arts Fuel Forum – The Forum where the Advanced Biofuel Industry meets. Alternative and Renewable Fuels forum is supported by EC-DG Energy and is an industry led forum with the goal of market and policies post 2020 (to 2030). Along with structured links to US, Canada and India, collaborations and joint actions have been established with IRENA, biofuture platform, IEA, below 50, ETIP Bioenergy and Flight Path. The work of Arts Fuel Forum is focused on the new EU Directive on Renewable Energies.