

Current Global Energy Trends- Indian Perspective

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Summary:

India has emerged as the leader of the developing world as far as energy diplomacy and climate negotiations are concerned. India consisting 18% of the world population and one of the fastest developing countries with an estimated economic growth rate of 8% and 4.5% growth in energy consumption for the next decade is always in the focal point of Global Energy Business scenario. As far as the distribution of energy source is concerned, India energy consumption is about 36% hydrocarbon based and unfortunately almost 83% is met by import, eating a major chunk of foreign currency and widening the Current Account Deficit (CAD).

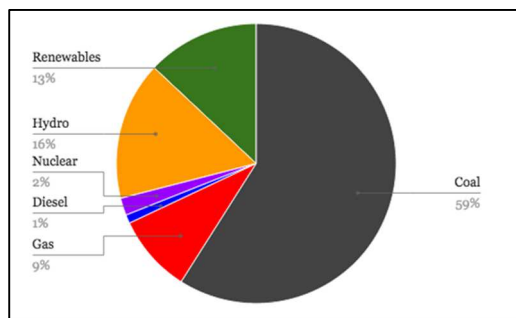


Fig.1, India Energy Mix, Source: EIA installed capacity

It is expected that the country will become the world's second largest energy consumer in the next 25-30 years. Economic development of a nation is hugely determined by its energy needs and is directly proportional to its share in global energy consumption. In the present world energy scenario the market share of natural gas is quiet less as compared to coal and oil in the energy mix. With the expected economic growth, India will naturally demand enormous amounts of energy to meet its growth objectives in a sustainable manner. Energy consumption in India has almost been doubled since year 2000, although per capita consumption is only around a third of the global average. Today, the major fossil fuels account for more than 90% of India's total primary commercial energy supply. This necessitates a fast transition into renewable energy production so that India not only meets its INDC commitments under the Paris Climate Action Network but also caters to its growing energy demands under limited hydrocarbon reserves.

India has pledged 40 percent cumulative energy demand from renewable sources of energy by 2030, one of its core INDC (Intended Nationally Determined Contributions) under the Paris Climate Action. (Transition to renewable energy). In addition to this, the Government of India has also approved a target of 660 GW target of electricity production by 2030 and by 2022, it aims to generate 175 GW of Renewable energy to aid electricity production in the country. International Solar Alliance spearheaded by India along with France is a good example in this regard. It aims to help the developing tropical countries to harness their solar energy potential and contribute to renewable energy production in the world. The alliance has been committed \$1 trillion as investment, and it is committed to making the costs of solar power more affordable for remote and inaccessible communities. The alliance will endorse India in achieving its goal of generating 100GW of solar energy and 175GW of renewable energy by 2022. The countries shall support each other in research and development as well as other high level activities.

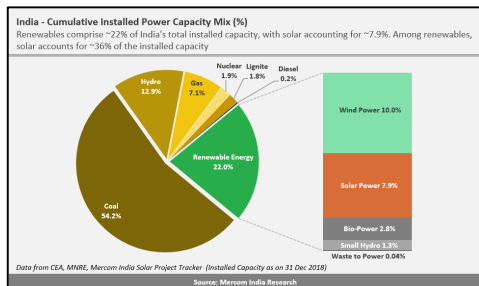
In addition to this, India is also trying to transition to clear forms of hydrocarbon fuels like LPG so that the problem of pollution as well as energy shortage are both tackled simultaneously. A good example is India's UJJWALA Yojna which has provided 5 crore poor households LPG connection and aims to add another 3 crore, thus transitioning into a cleaner rural India. (Another initiative that can be added on India's transition to cleaner forms of energy). Another important aspect in India's energy scenario is the transition into electric vehicles. This will not only spur renewable energy production in the country but would also reduce dependence of the transportation sector on fossil fuels.

India under its FAME II Scheme has set a target of 30 percent electric vehicles by 2030. This is more realistic compared to the earlier target of 100 percent electric vehicles by 2030. Moreover, this will substantially help reducing pollution and fossil fuel demand in the developing world. The green climate fund under the aegis of World Bank along with the Adaptation fund must be effectively utilized to spur renewable energy transition. India, being a developing country must pitch for effective utilization of this fund. Moreover under the Talanoa Dialogue and the COP Katowice Summit, countries have failed to arrive at a consensus with regard to green climate funding. Opposition by the US is one of the primordial reasons. The developed countries

must come together in transferring technology to developing countries keeping in mind the spirit of Kyoto Protocol and the Paris Climate Deal. Therefore, keeping India's current domestic energy scenario in mind, India must effectively utilize these international mediums along with China.

Introduction:

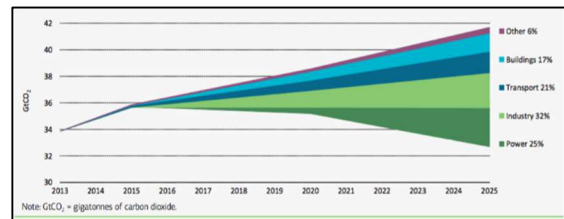
India is already the world's fourth largest consumer of energy and as its economy grows so will its energy needs. Hydroelectricity, nuclear energy and non-conventional sources of energy will have a marginal impact on India's energy security, which will remain dependent on coal, oil and gas for the next quarter century. As India's own resources and production are insufficient, India will have to import large quantities of oil and gas, even coal to some extent. Given the size of its reserves, the Persian Gulf region of the Middle East Asia will remain critical to ensuring that there is sufficient production to meet the increasing global demand for oil, particularly for Asian countries. Asian countries cannot count much on Russia, the other large global oil producer, since the latter's priority market will be Europe, since it brings Russia both economic and geopolitical benefits. Although difficulties remain, South Asia could get access to Russian and Central Asian gas. It is important to note that non-renewable resources are significantly depleted by human use, whereas renewable resources are produced by ongoing processes that can sustain indefinite human exploitation.



Fig, 2. India's cumulative Installed power capacity, 2018, Source: Mercom India

By 2050 electricity could become the central energy carrier, growing from a 20% share of final consumption to an almost 50% share and, as a result, gross electricity consumption would more than double. Renewable power will be able to provide the bulk of global power demand (86%). The primary drivers for this increased electricity demand would be over 1 billion electric vehicles, increased use of electricity for heat and the emergence of renewable hydrogen. Electrification, when paired with renewables, goes hand-in-hand with energy efficiency, resulting in lower overall energy demand. Overall, renewable energy would supply two-thirds of final energy consumption.

Overall, total investment in the energy system would need to reach USD 110 trillion by 2050, or around 2% of average annual gross domestic product (GDP) over the period. The green climate fund under the aegis of World Bank along with the Adaptation fund must be effectively utilized to spur renewable energy transition. India has pledged 40 percent cumulative energy demand from renewable sources of energy by 2030, one of its core INDC's under the Paris Climate Action.



Fig, 3. Sector contributing to emission reduction globally, Source: Carbon Brief

An estimated 75% of this reduction can be achieved through renewable energy and electrification technologies; if energy efficiency is included, then this share rises to over 90%. However, the world is on a much different path: energy-related emissions have risen by over 1% annually, on average, over the last five years. Current plans and policies, including Nationally Determined Contributions (NDCs), result in a similar level of annual emissions in 2050 compared to today, which risks putting the world on a pathway of 2.6 degrees Celsius of temperature rise or higher already after 2050.

The emissions would need to be reduced by around 3.5% per year from now until 2050, with continued reductions after that time. Energy-related emissions would need to peak in 2020 and decline thereafter.

Discussions:

Transition to renewable energy is key to India's energy security. It is envisaged that Renewable energy supply, with increased electrification of energy services, and energy efficiency can deliver more than 90% of needed reductions to energy-related CO2 emissions. Renewable energy and electrification alone deliver 75% of emission reductions. The share of renewable energy in primary energy supply would grow from less than one-sixth today to nearly two-thirds in 2050. Electricity would progressively become the central energy carrier, growing from a 20% share of final consumption to an almost 50% share by 2050, and



renewable power would be able to provide the bulk of global power demand (86%) economically. As a result gross electricity consumption would more than double. The transition to increasingly electrified forms of transport and heat, when combined with the increases in renewable power generation, can deliver around 60% of the energy-related CO₂ emissions reductions needed to set the world on a pathway to meeting the Paris Agreement. When these measures are combined with direct use of renewable energy, the share of the emissions reductions from these combined sources reaches 75% of the total required. However, emissions will still need to be reduced further, and bioenergy will play a role in sectors that are hard to electrify, such as shipping, aviation and certain industrial processes. Biofuel consumption must be scaled up sustainably to meet this demand. Efforts also are needed to reduce non-CO₂ greenhouse gas emissions and non-energy use emissions (such as by using waste-to-energy, bioenergy and hydrogen feedstocks); to reduce industrial process emissions; and to reduce fugitive emissions in the coal, oil and gas industries. The types of investments required for such transitions will change, with a shift in the composition of investments away from the fossil fuel sector towards energy efficiency, renewables and enabling infrastructure.

According to current and planned policies, the global energy sector will see cumulative investments of USD 95 trillion over the period until 2050. The transition towards a decarbonised global energy system will require scaling up investments in the energy sector by a further 16% (an additional USD 15 trillion by 2050). In total USD 110 trillion would be invested in the energy system, representing on average 2% of global gross domestic product (GDP) per year over the period.

Indian Context

Gas based Economy

Though not a renewable source, natural gas, predominantly methane, is a cheap and environment-friendly fuel and currently the country consumes around 45 million tonnes of oil equivalent (mtoe) of natural gas, which comes to nearly 6.2 per cent of its primary energy consumption.

The domestic gas in the country is being supplied from the oil & gas fields located at western and southeastern areas viz. Cambay basin, Mumbai offshore & KG basin as well as North East Region (Assam & Tripura). It is being supplied and distributed in terms of the guidelines related to pricing and utilization policies issued by the Government from time to time. In FY 2018-19, total

domestic gas production was about 90.05 MMSCMD.

Financial Year	Total Gas Production	Change (%)	Offshore Production	Onshore Production
2011-2012	47.55	(8.92)	38.47	9
2012-2013	40.67	(14.46)	31.80	8.87
2013-2014	35.40	(13)	26.39	9.01
2014-2015	33.65	(5)	24.86	8.79
2015-2016	32.24	(4.19)	23.01	9.23
2016-2017	31.89	(1.08)	22.03	9.85
2017-2018	32.64	2.35	22.01	10.63
2018-2019	32.87	0.62	22.11	10.75

All Figures in Billion Cubic Meter (BCM)
Source: Ministry of Petroleum and Natural Gas (MoPNG)

In order to meet the gas demand, Liquefied Natural Gas (LNG) is imported through Open General License (OGL) in the country and it is imported by the gas marketer under various Long Term, Medium Term and Spot contracts. The price and utilization of imported LNG is mutually decided by buyers and sellers. At present, country is having six (6) operational LNG regasification terminals operational with capacity of about 38.8 MTPA (~140 MMSCMD).

The Indian economy has been projected to achieve an average real GDP growth of 6.4% during the next ten years. Energy availability is key to economic growth and therefore, going forward high economic growth would lead to increase in the energy consumption of the country. The primary energy mix of India is also set to alter on account of the substitution of oil by natural gas. The share of natural gas in the energy mix is expected to increase to 20% in 2025 and beyond. The expansion in natural gas supply in the country with the help of additional RLNG terminals, nationwide transmission pipeline network and transnational pipelines is expected to materialize in next 5 to 10 years. Through these ventures, it is envisaged that the share of natural gas in the primary energy mix would reach 20% till 2030. However to achieve a 20% share of natural gas in the primary energy it is required to attract and sustain investments in the gas infrastructure including the cross country pipelines. Globally, natural gas constitutes 24 per cent of the primary energy consumption. In India, Gujarat, which has relatively better access to natural gas, is having a share of 25 per cent in its energy basket. The government proposes to increase the share of natural gas in the whole of its energy consumption to 15 per cent by 2022. A major advantage of this fuel is that it has very low emission of particulate matter. Often, cities are blamed for increased suspended particulate matter (SPM) levels in the atmosphere. Providing gas linkage to domestic households, the automobile sector, and small and major industries will play a major role in elevating the social status of the people.

The major economic advantage of gas over other conventional fuels is that it is 40 per cent cheaper than liquefied petroleum gas (LPG). Compressed natural gas (CNG), often a substitute for petrol and diesel, is 60 per cent cheaper than gasoline and 45

per cent cheaper than diesel. The gas consumption in India is primarily driven by five sectors: fertilizer (34%), electric power (23%), refining (11%), city gas distribution, including transport (11%), and petrochemical (8%) industries. The country faces a widening gap between indigenous gas production and demand, which is met by increasing Liquefied Natural Gas (LNG) imports.

India's move to promote gas usage and moving towards a gas based economy is in line with the commitment made at the Paris meeting on climate change, which aims to reduce the country's carbon emissions up to 35% from 2005 levels by 2030 and producing 40% of the power from non-fossil fuel sources by 2030. Gas based economy helps to reduce a country's carbon emissions intensity. Presently natural gas contribution is around 6% in the Indian energy basket, this mainly comes from customer in Northern and Western India as Eastern India is yet to be connected to the national gas grid.

After the commissioning of the proposed natural gas pipeline the share of natural gas is expected to rise significantly as the industrial belts in West Bengal and Odisha have immense potential in terms of natural gas consumption. The gas pipeline Urja Ganga project aims to provide piped cooking gas to residents of Varanasi and later to millions of people in states like Bihar, Jharkhand, West Bengal and Odisha. Through this project 20 lakh households will get PNG connections. Gas Authority of India Limited (GAIL) has built a network of trunk pipelines covering the length of around 11,000 km. With Urja Ganga project, this number will further increase by 2540 km. The Jagdishpur-Haldia and Bokaro-Dhamra Pipeline (JHBDPL) phase two is a 1,836km-long gas pipeline system being developed in the states of Odisha, Jharkhand and West Bengal in India. Being developed by GAIL, the JHBDPL project is intended to connect the eastern part of the country with the National Gas Grid (Fig-4).

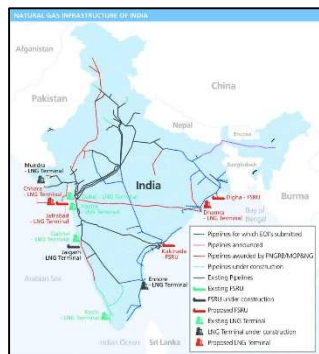
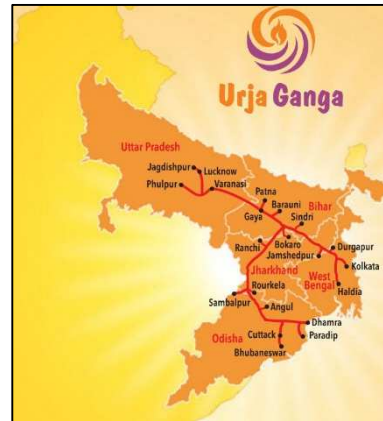


Fig. 4. Map showing Gas pipeline network of India,

Scheduled for completion by the end of 2020, the pipeline project will ensure widespread supply of natural gas for the domestic, industrial and transport sectors.

The demand for natural gas in India has increased significantly due to its higher availability, development of transmission and distribution infrastructure, the savings from the usage of natural gas in place of alternate fuels, the environment friendly characteristics of natural gas as a fuel and the overall favorable economics of supplying gas at



reasonable prices to end consumers.

Fig. 5. Map showing Gas pipeline network of Urja Ganga projects,

Power and Fertilizer sector remain the two biggest contributors to natural gas demand in India and continue to account for more than 55% of gas consumption. India can be divided into six major regional natural gas markets namely Northern, Western, Central, Southern, Eastern and North-Eastern market, out of which the Western and Northern markets currently have the highest consumption due to better pipeline connectivity. However, with the increasing coverage and reach of natural gas infrastructure in India, this regional imbalance is expected to get corrected. In future, the natural gas demand is all set to grow to 746 MMSCMD in 2029-30. Gas based power generation is expected to contribute the highest, in the range of 36% to 47%, by 2029-30.

The Hydrocarbon Vision 2030 for North East India was released in February 2016. It envisages an investment of USD 20 Billion in upstream, downstream and midstream sector in Hydrocarbon Sector in North East India till 2030. To incentivize E&P (Exploration & Production) in the North East, 40% subsidy on gas operation has been extended to private companies operating in the region.

In solar power sector India has taken important



strides. International Solar Alliance spearheaded by India along with France is a good example in this regard. It aims to help the developing tropical countries to harness their solar energy potential and contribute to renewable energy production in the world. The alliance has been committed \$1 trillion as investment, and it is committed to making the costs of solar power more affordable for remote and inaccessible communities. The alliance will endorse India in achieving its goal of generating 100GW of solar energy and 175GW of renewable energy by 2022. The countries shall support each other in research and development as well as other high level activities

Conclusions:

The global energy transformation and the increasing awareness towards climatic change is picking up pace. Though various measures and steps have been taken globally in recent years in the right direction, a greater acceleration is needed that is centered on renewable energy, electrification and energy efficiency. The global energy transformation is more than a simple transformation of the energy sector – it is a transformation of our societies and economies. The energy transformation is multi-faceted, and is evolving in terms of technologies, socio-economics, institutional drivers and forms of finance. The national energy plans, should take a more holistic, socio-economic view. The Sustainable Development Goals of the United Nations, and the revisions of NDCs, provide a great opportunity for governments to work regionally and internationally to drive coordinated action. The share of renewable energy in primary energy supply would grow from less than one-sixth today to nearly two-thirds in 2050. Energy efficiency must be scaled up substantially; the rate of energy intensity improvement would increase to 3.2% per year, up from recent historical averages of around 2.0% per year.

The energy transition is not a simple goal but has to be tackled based on broader socio-economic system. It cannot be considered in isolation. For the transition to renewable sources and technologies to succeed, policies by the Government must be based on a more integrated assessment of the interactions between the evolving energy sector and the wider economy. With the above facts it can be concluded that the nation is at the cusp of a major energy transformation.

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