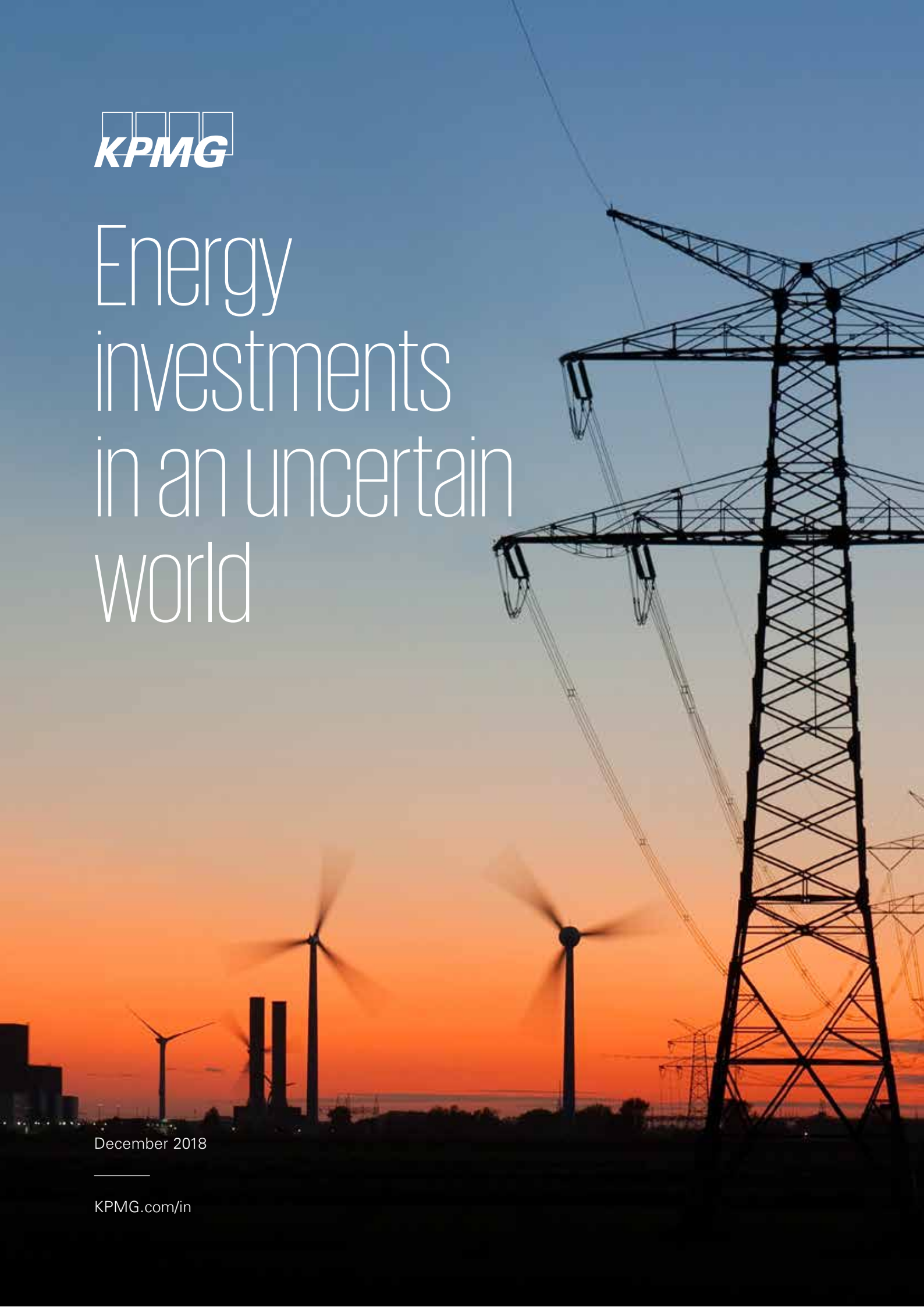

Energy investments in an uncertain world

December 2018

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Foreword

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Large energy projects are expensive to build, have a long gestation period and long operating life. Financing such projects require the risk profile of the projects to be low and utilisation to be high. Whenever that equation gets disturbed, energy projects are rendered difficult to finance. In recent times this has been the case with the dynamics of the sector changing with rapid ingress of renewables, evolution of storage technologies and uncertainty in energy commodity prices. Environmental concerns have rendered long-term financing difficult for polluting resources which the world relied upon for over a century. As the patterns of use change, traditional methods of cost recovery are failing. With cost recovery jeopardised, investments that were traditionally seen as safe are now in the high risk category.

Yet energy infrastructure creation and maintenance is unavoidable, irrespective of these perturbations. It has thus become necessary to explore different business models and alternate methods of risk mitigation to prevent stranding of these assets. In addition, given the large quantum of assets already stranded in India for various reasons it becomes important to find pathways to resolve the existing disputes and bring those assets to production.

If too much risk is transferred onto the investors then investments will disappear, as the investors do have a choice of not investing. Inevitably, governments have a role to play in this through changes in market design and regulatory structures, financing support, fuel allocation and pricing and also ensuring that the demand in the market is not artificially disturbed or curtailed. If the infrastructure is indeed of the nature of public good (or essential for delivery of a human right) then the actions and risks need to shift back to the government.

Between infrastructure being entirely financed by the government at one extreme and entirely private funded on the other, there is a large space where innovation in financing and operations is essential and possible. In this paper we look at dynamics of demand and supply in the sector, evolution of the key risks, the concept of flexible contracts to manage risks better and also some innovative financing structures and instruments that could aid financing of infrastructure in these disrupted times.

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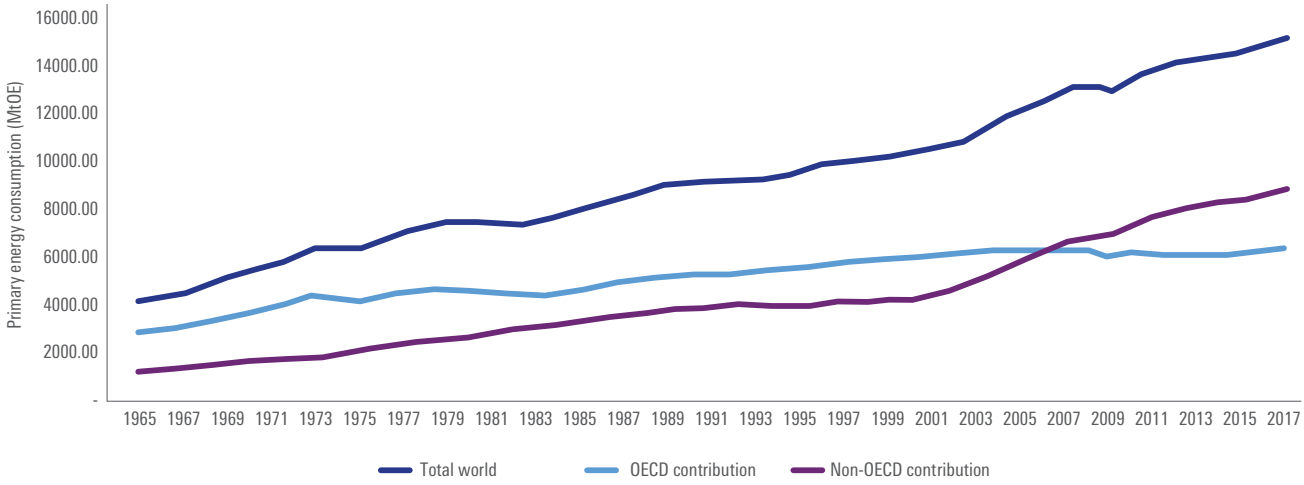
1. Global mega trends reshaping the energy sector

Over the years, energy has become one of the commodities on which national security hinges. Energy (and much of other core infrastructure) is beyond an economic commodity or service, and has tended to be treated as a public good. As the global economy has grown, energy witnessed concomitant growth in a relatively stable environment barring for the oil shocks of the 1970s or economic disruptions witnessed in 2008. Though over the last decade, non-member nations of Organisation for Economic Co-operation and Development (OECD) have continued to grow faster and have captured most of the incremental consumption as compared to OECD nations which are witnessing rather plateaued growth. The figure below depicts this trend over the years.

In general, energy has remained a stable investment avenue, especially in the utility sector where the regulatory apparatus in most parts of the world has tended to ensure that the utility risks are kept low and returns are stable.

Figure 1: Primary energy consumption over the years

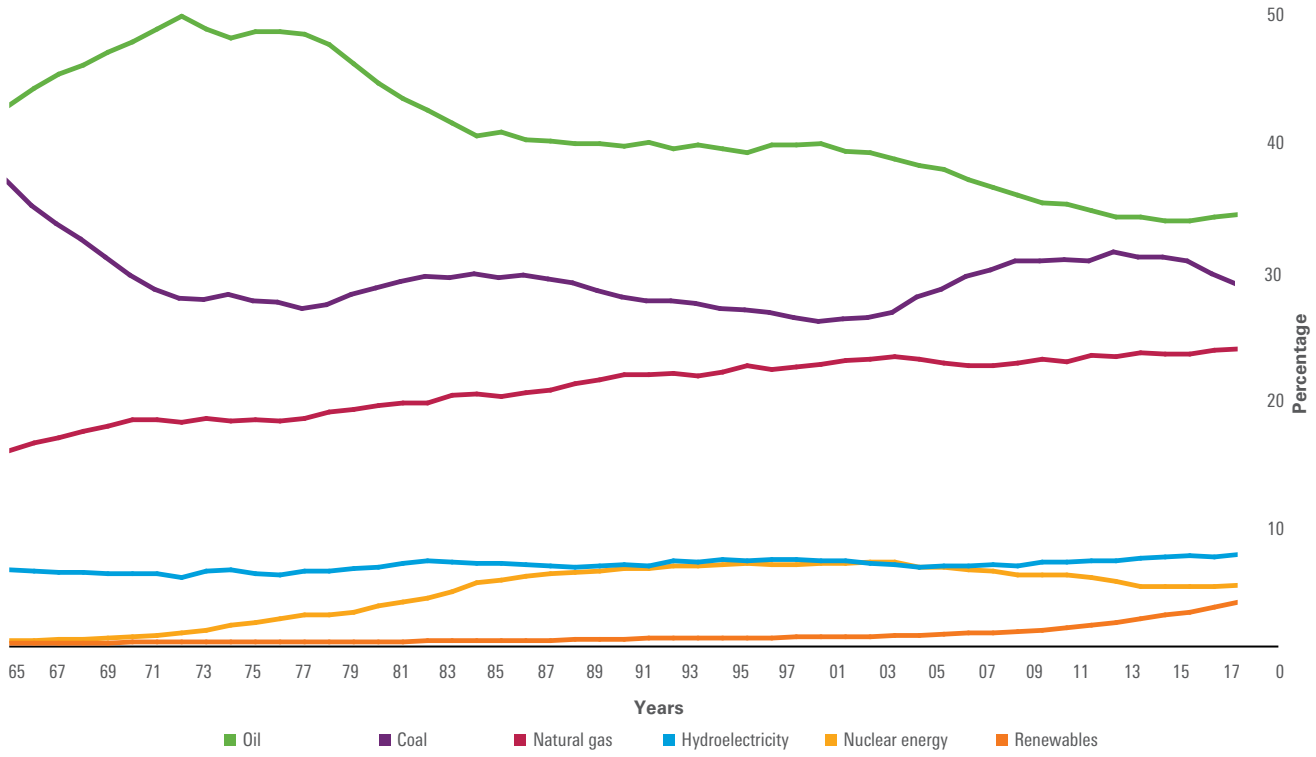


Source: BP Statistical Review of World Energy, British Petroleum, June 2018

After tepid growth in the last few years owing to factors such as increasing energy efficiency, lower growth in global GDP, etc., global energy consumption growth picked up to an average of 2.2 per cent in 2017, recording the fastest growth since 2013 and higher than the 10 year average growth rate of 1.7 per cent per year[1]. The largest share of increment in energy consumption was accounted by natural gas, followed by renewable energy and oil. As per BP, the growth in consumption was led by stronger economic growth and slowing in the pace of improvement in electricity productivity.

The global energy consumption trends over the years have been depicted in the figure below:

Figure 2: Global primary energy consumption over the years



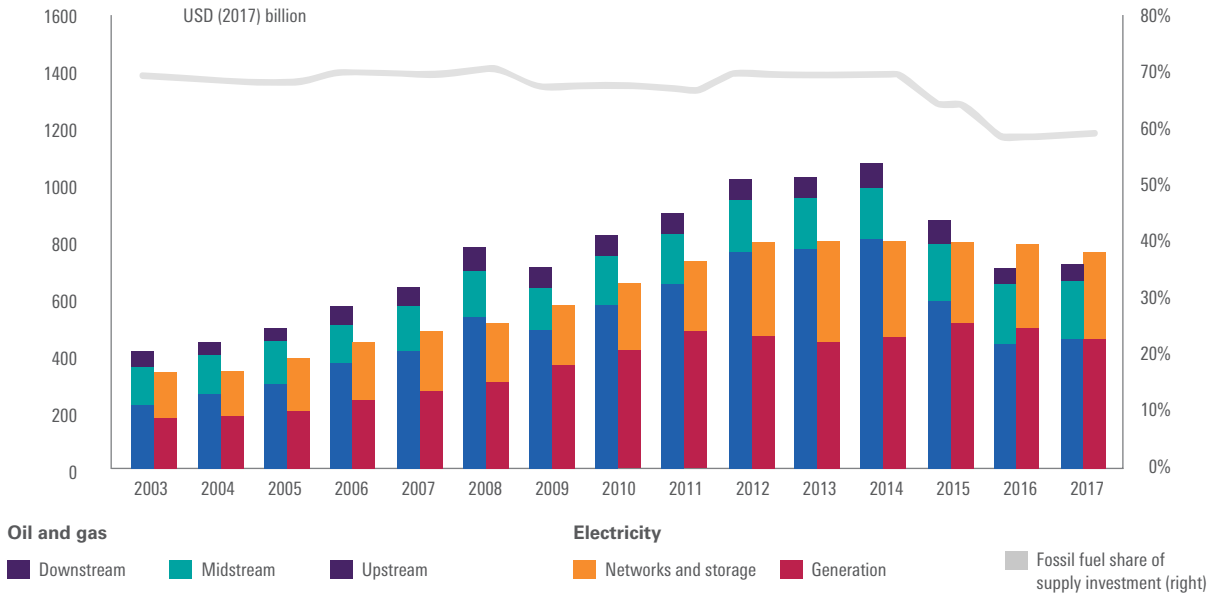
Source: BP Statistical Review of World Energy 2018

Energy investments, however, declined for the third consecutive year. As per International Energy Agency (IEA) World Energy Investment 2018 report, total worldwide investments in energy declined by 2 per cent y-o-y in real terms in 2017 led by a 6 per cent drop in investments in electricity and 13 per cent drop in investments in coal supply. This was offset by 4 per cent increase in upstream oil and gas sector investments, 2 per cent increase in downstream oil and gas sector investments and 3 per cent increase in spending on energy efficiency.

In 2017, electricity sector maintained its position as the largest recipient of energy investment having edged ahead of oil and gas for the first time in 2016. Investment in networks was the largest area of electricity spending followed by renewable generation. While renewable generation investment declined 7 per cent y-o-y mainly due to decline in costs, it accounted for about two-thirds of power generation spending in 2017. [2]

1. BP Statistical Review of World Energy 2018
2. IEA World Energy Investment 2018

Figure 3: Global investments in energy supply



Source: IEA World Energy Investment 2018

The pace and direction of investments in the energy sector going forward will be determined on one hand by expectations on the demand front, and on the other are expected to be deeply impacted by supply side disruptions which are increasingly evident. Widespread adoption of energy efficiency measures, technological advancements in energy generation and distribution will continue to result in declining energy intensity of growth, affecting demand. Further, trends towards electrification of demand (as evident in 2017), are expected to intensify resulting in inter-sectoral shifts in energy investments. On the supply side, continued growth of the U.S. shale, the dominance of RE, adoption of technologies such as distributed RE, battery storage, trends in decentralisation and digitalisation of energy sector are likely to cause deep rooted disruptions in the sector.

Going forward, these factors are expected to intensify, turning business cycles increasingly short. For a business like energy which typically has a longer gestation period, this poses fundamental questions regarding capital allocation, business and operating model and risk mitigation.

The established order in the world of energy is now abound with disruptions on demand and supply sides, impacting the consumption trends and energy mix.

Keeping the above in view, the paper delves into the key reasons which are resulting in investment uncertainties in the energy sector, evidences the problems being encountered by energy resource and energy infrastructure providers by studying global examples and examines how risks have been sought to be mitigated globally to encourage investments. Further, based on the international principles and precedents, the paper provides high level recommendations for key actions that may be taken by developing countries such as India with appropriate rationale.

2. Key themes giving rise to disruptions and the resultant certainties

The key themes that are giving rise to disruptions and uncertainties in the energy industry can be categorised into the following:

- Demand side changes
- Supply side changes
- Environmental stipulations/mandates and future energy pathways
- Geopolitical and other policy risks
- Rigidity in design of contractual structures
- Other country specific risks

These are further discussed below:

Demand side changes

The 2016 edition of World Energy Outlook by IEA emphasises that 'the relationship between global economic growth, energy demand, and related carbon dioxide emissions is steadily weakening.'

Figure 4: Growth in GDP and primary energy[3]

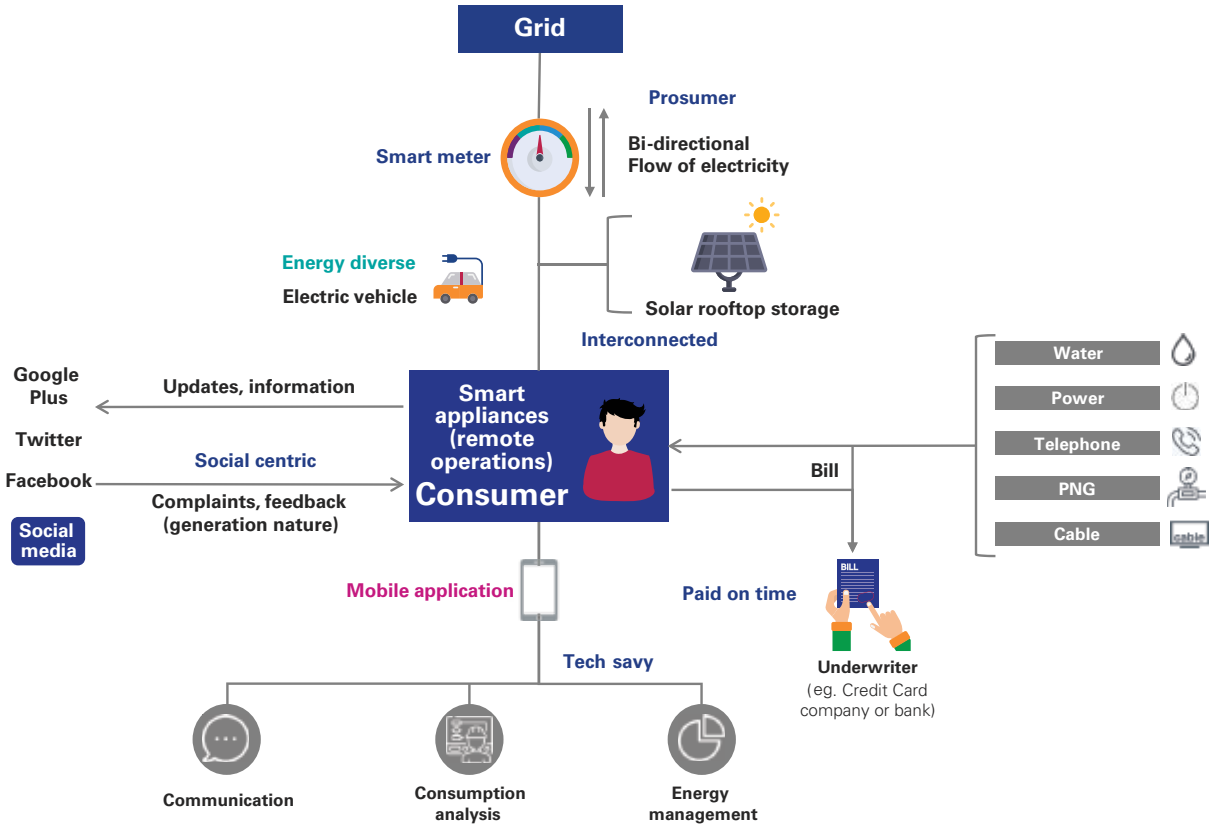
As per BP Energy Outlook 2018, while global Gross Domestic Product (GDP) is expected to nearly double over the next 20 years, energy demand is expected to grow by only 35 per cent over this period. Technology and productivity improvements globally are resulting in better efficiency and lower energy intensity (energy used per unit of GDP) of demand. Half of the growth in energy demand is expected to be contributed by China and India driven by rising urbanisation, economic growth and improving per capita incomes. Even within these important demand centres, movement towards sustainable economic structure through cleaner fuels, measures towards energy efficiency, improvement in transport fuel efficiency, have led to varying estimates for long-term growth in demand for energy.

Aside from regional shifts in demand and decline in energy intensity, factors such as greater electricity access, awareness and empowerment of consumers are likely to play a significant role in influencing energy demand. As per BP Energy Outlook 2018, it is anticipated that almost 70 per cent of the increase in primary energy demand may be for power. This is likely to be driven by shifts in consumer preferences towards electricity as a fuel for meeting energy needs as well as greater access to electricity for nearly 1 billion people without access to electricity in Asia and Africa.

Further, consumer preferences are likely to play a key role the way electricity is produced and delivered. With greater consumer empowerment enabled through the rise of technologies such as distributed energy generation, advance applications of data sciences, digital technologies including smart homes/smart grids, peer to peer digital platforms, block chain technology and enabled by better connectivity, today's consumer is likely to move towards self-generation, optimal energy management, with better and instant information enabling greater choices in products and services.

3. Source: BP Energy Outlook 2018

Figure 5: 'The 'Smart' Consumer



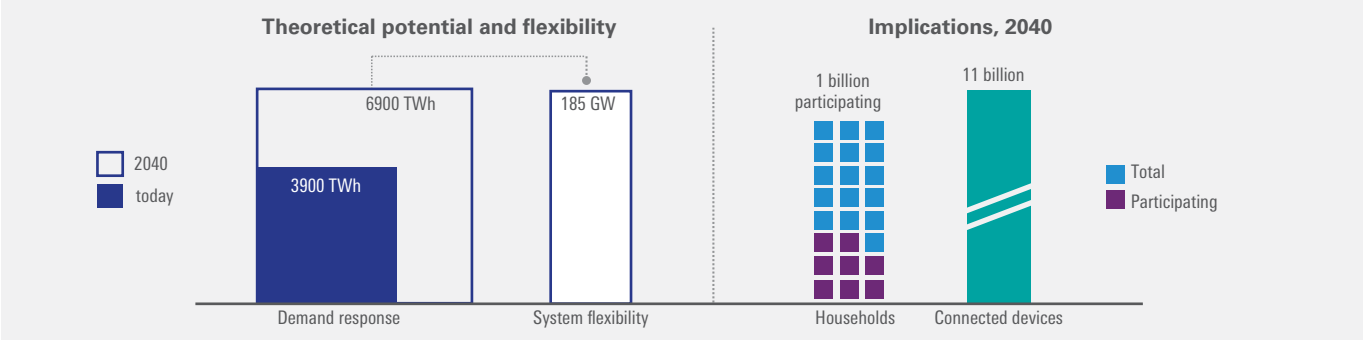
Source: KPMG in India's analysis

As has been witnessed in countries such as Germany where roof top solar penetration is among the highest in the world, consumers are fast evolving into 'prosumers' who are not only producing and consuming electricity, but also through energy efficiency and demand side management, selling electricity to the grid. With declining solar roof top and battery costs, the participation of the consumer base in demand response programmes is likely to grow substantially. The IEA[4] estimates the global technical potential of demand response at about 185 GW in 2040, potentially avoiding a cumulative USD270 billion (in 2016 dollars) of investment in new electricity infrastructure (new power-generation capacity and transmission and distribution).

4. IEA Digitization and Energy 2017

As demand becomes more decentralised, there is an increasing threat of disintermediation on utilities across the world whose business dynamics have been centered around utilisation of own networks.

Figure 6: Demand response and system flexibility



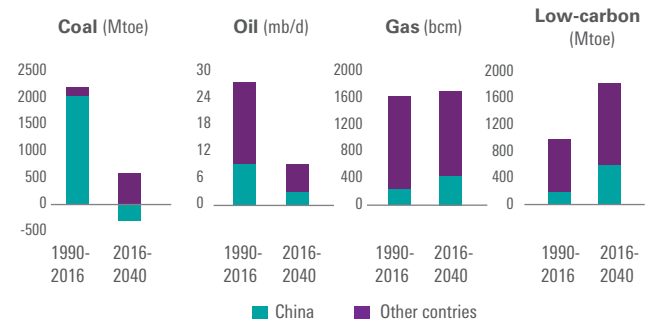
Key message: The largest potential for demand response lies in the buildings sector, with 1 billion households and 11 billion smart appliances expected to be contributing by 2040.

Source: IEA Digitization and Energy 2017

Supply side changes

As per IEA's World Energy Outlook 2017, the future pathways for global energy indicate a dramatic change as compared with the last twenty-five years based on the global policies and intent. Renewables is likely to address 40 per cent of the increase in primary demand and along with natural gas, is expected to take the lead in meeting future energy needs. As per BP Energy Outlook 2018, oil, gas, coal, and non-fossil fuels are projected to each provide around a quarter of the world's energy by 2040. This would be the most diversified fuel mix ever seen.

Figure 7: Change in world primary energy demand[5]



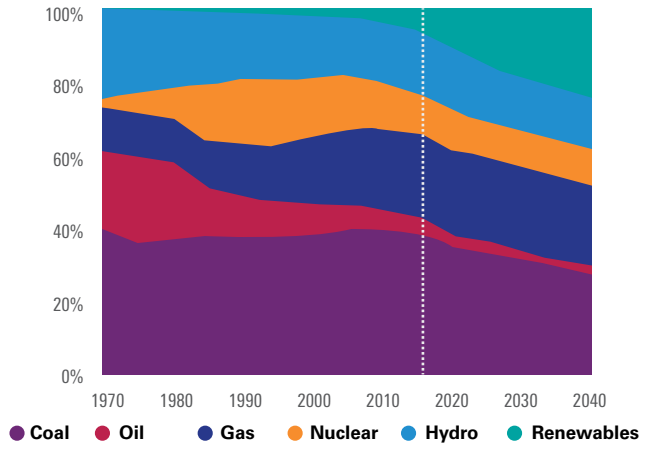
A new energy landscape is clearly emerging giving rise to supply side dynamics which are evident across fuels/ resources as well as the energy sector's value chain.

Coal

Among fossil fuels, coal has been the fastest growing resource over the last quarter-century. In fact, global coal consumption increased by 64 per cent between 2000 and 2014[6]. Going forward, coal consumption is expected to be broadly flat, with its share in primary energy declining from 28 per cent in 2016 to 21 per cent in 2040, its lowest share since the industrial revolution[7].

Coal is currently the largest contributor to global electricity generation at ~41 per cent share[8]. As per BP Energy Outlook 2018, it is likely to remain the largest source of energy for power in 2040. However, its share in electricity generation is expected to fall to ~30 per cent, registering growth of just 13 per cent in share for power as compared to 40 per cent growth over the previous 25 years.

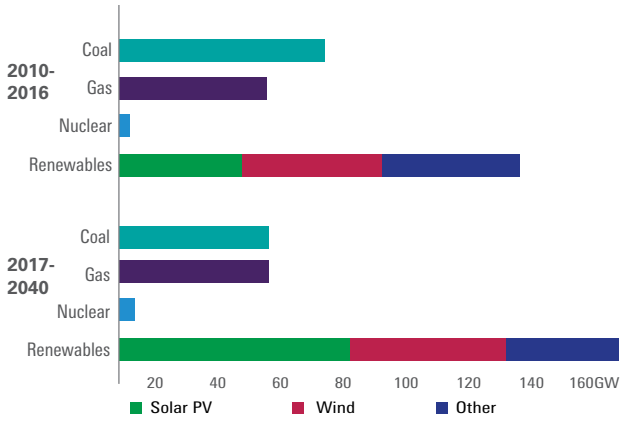
Figure 8: Shares of total power generation[9]



5. World Energy Outlook 2017, International Energy Agency, 2017
6. World Energy Council, World Energy Resources Coal 2016
7. BP Energy Outlook 2018
8. Worldcoal.org
9. BP Energy Outlook 2018

As per IEA World Energy Outlook 2017, while nearly 900 GW coal based power generating capacity was built in the last 15 years, only about 400 GW is expected to be constructed till 2040. Further, analysts expect that the growth anticipated in coal based generating capacities will be largely limited to the existing assets under construction.

Figure 9: Global average annual net capacity additions by type[10]



Global policy shifts are creating demand uncertainties which is creating price fluctuations in this commodity leading to uncertainties regarding margins of coal players. Tumbling coal prices since the beginning of this decade have led to widespread bankruptcies in this sector with some of the world's largest coal producers filing for bankruptcy protection. With the prospects of the sector uncertain, interest of investors in this sector could weaken.

Figure 10: Coal price trend[11]

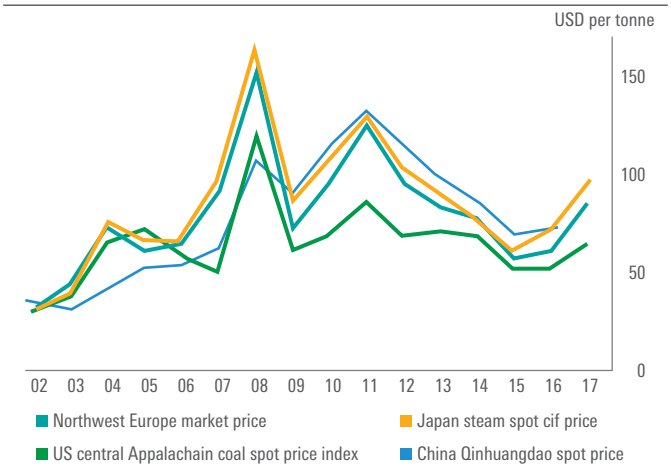
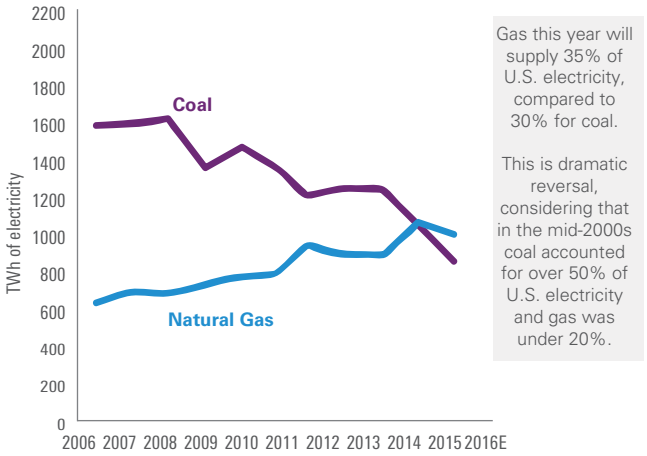


Figure 11: U.S. gas power vs coal power[12]

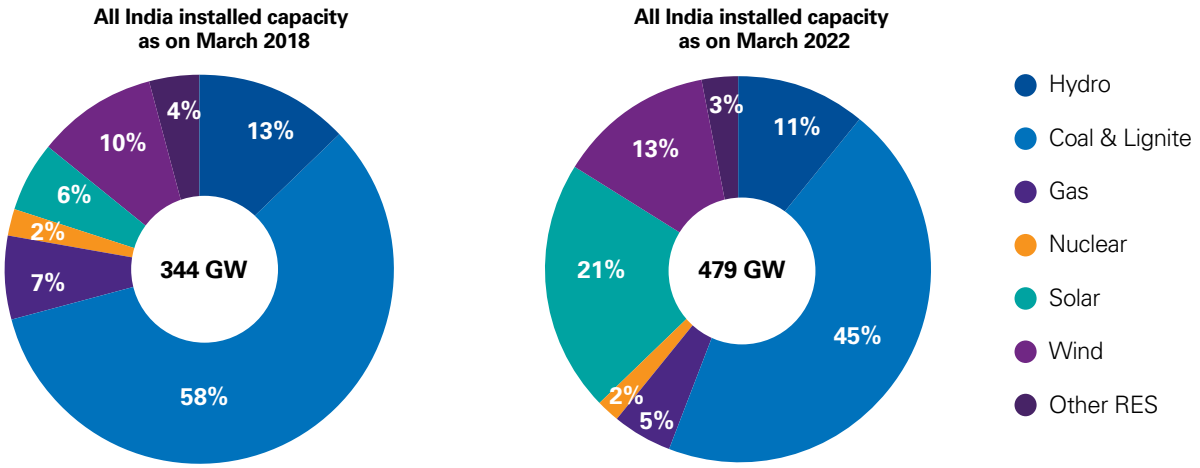


In Asia, coal is expected to remain as a dominant source of energy for electricity generation, with various countries continuing to industrialise and electrify their economies. IIndia is expected to be the largest growth market for coal. As per BP, its share of global coal demand is expected to more than double from a little over 10 per cent in 2016 to around a quarter by 2040[13]. This is to a significant extent due to a slowdown in demand for coal in China and other major markets. While coal consumption is growing in India, the growth in coal consumption (in terms of million tonnes of oil equivalent (MTOE)) is expected to be significantly lower at compounded annual growth rate (CAGR) of 3.6 per cent over 2016-20140 as against CAGR of 5.2 per cent in 1990-2016 .

In India, CEA anticipates requirement of 6,445 MW of coal based capacity (in addition to current installed capacity) till 2022[15]. As per NEP 2018, this capacity may be met through the 47,855 MW of coal based capacity currently under different stages of construction. Since the capacity under various stages of construction is much higher than the required quantum till 2022, this increases the risk of stresses in the system. In fact, as of date, nearly 40 GW of coal based plants have been identified as stressed assets by the government (including 16 GW of assets under construction)[16]. During the period 2022-2027 however, CEA anticipates requirement of 46,420 MW of coal based capacity (as per NEP 2018) expected to be primarily served by the existing and under construction capacities. The key constraints thus are not the capacity pipeline but the completion of projects in the pipe, many of which are under significant financial stress as well as availability of coal which continues to pose challenge. This is despite measures to ramp up coal production in the past several years.

10. IEA World Energy Outlook 2017
11. BP Statistical Review of World Energy 2018
12. Source: United States Energy Information Agency
13. Source: BP Energy Outlook 2018
14. BP Energy Outlook 2018 - India
15. National Electricity Plan 2018 (NEP 2018)
16. IEA World Energy Investment 2018

Figure 12: Conventional capacity additions to slow down[17]



Given the uncertainties surrounding coal globally, the ecosystem associated with coal sector, such as mining companies, thermal capital equipment providers, EPC companies face uncertain times. Their assessment of the emerging scenarios and the decisions they take will impact the future of these companies in critical ways.

Oil

Oil prices have recently hit fresh highs since late 2014, with Brent crude trading upwards of USD72/barrel in early November 2018. This resurgence in prices since hitting historic lows in 2014 has been driven by geopolitical concerns and production discipline by OPEC, which has helped ease the supply glut.

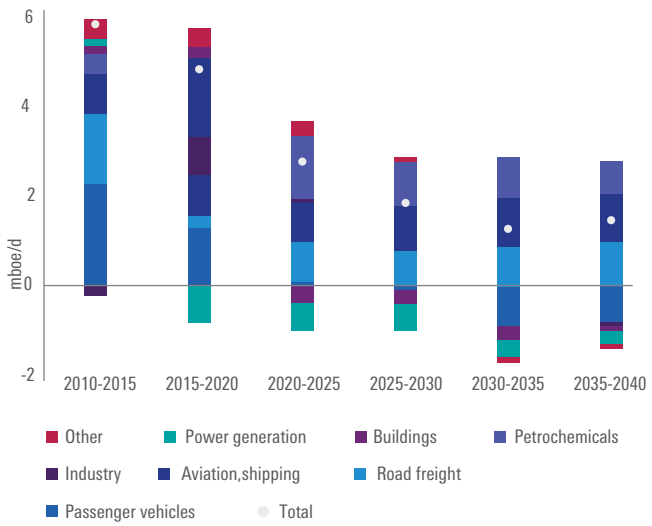
In May 2018, the US president decided to unilaterally exit the Joint Comprehensive Plan of Action (JCPOA), an international nuclear agreement, and imposing the highest levels of economic sanctions on Iran. This has led to multiple investment deals being cancelled by foreign investors fearing sanctions by the USA on themselves as well.

Further, Venezuela, which is responsible for around 6 per cent of OPEC's exports, has cut its production severely on account of domestic political and economic crises, thereby leading to perceptions of a further supply shortage. However, in the recent weeks, the Brent oil prices have softened with USA granting temporary waivers towards countries importing Iranian oil as well as rise in tight oil production in USA.

In addition to these supply side issues, concerns over US-China trade war and International Monetary Fund's forecasts of lower global economic growth have added to investment uncertainties. Although the key oil demand centres of China and India continue to demonstrate strong oil demand, rising protectionism and volatility in emerging markets may add to additional demand side uncertainty.

In the longer term, oil demand will continue to grow to 2040, as per IEA. However, the pace of growth in this sector is expected to be tepid at 0.5 per cent per annum till 2040 as against 1.2 per cent witnessed during 1990-2016[18]. All of the demand growth comes from emerging economies, driven by rising prosperity, with India replacing China as the primary source of growth[18].

Figure 13: Change in global oil demand by sector[19]



17. CEA, National Electricity Plan 2018, KPMG In India Analysis
18. BP Energy Outlook 2018
19. IEA World Energy Outlook 2017

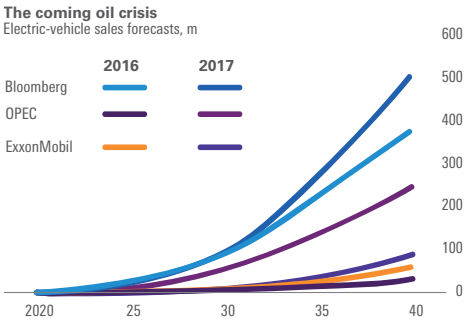
While factors such as higher efficiency and fuel switching will create a downward pressure on oil demand for passenger vehicles after 2020, the industry believes that the overall oil demand is likely to continue to go up bolstered by the demand from petrochemicals, trucks, shipping, aviation, etc. The U.S. shale is expected to cater to almost 80 per cent of the growth in oil till 2025 after which analysts expect the U.S. shale oil growth to plateau.

Further, as global EVs fleet is expected to reach 900 million cars by 2040 (IEA World Energy Outlook 2017), it emerges as a significant disruptor to oil demand in the automotive sector as these become a viable alternative to petrol and diesel-fuelled vehicles. However, industry and analysts widely differ in their estimates of their 'peak predictions'.

Given this, the pace and impact of EV adoption is one of the key uncertainties faced by investment decision makers today.

Investors are likely to be further concerned by far-reaching implications of the recent announcement by World Bank to cease financing of new upstream oil and gas projects after 2019 in order to align its support to climate goals.

Figure 14: Electric Vehicles (EVs) sales forecasts & oil peak predictions[20]



Peak predictions
When big oil companies and the International Energy Agency except global demand for oil to peak.

BP
in the 2040s

Chevron
Doesn't foresee a peak

Royal Dutch Shell
2025-30

Statoil
2030

Total
As soon as 2040

International Energy Agency
After 2040

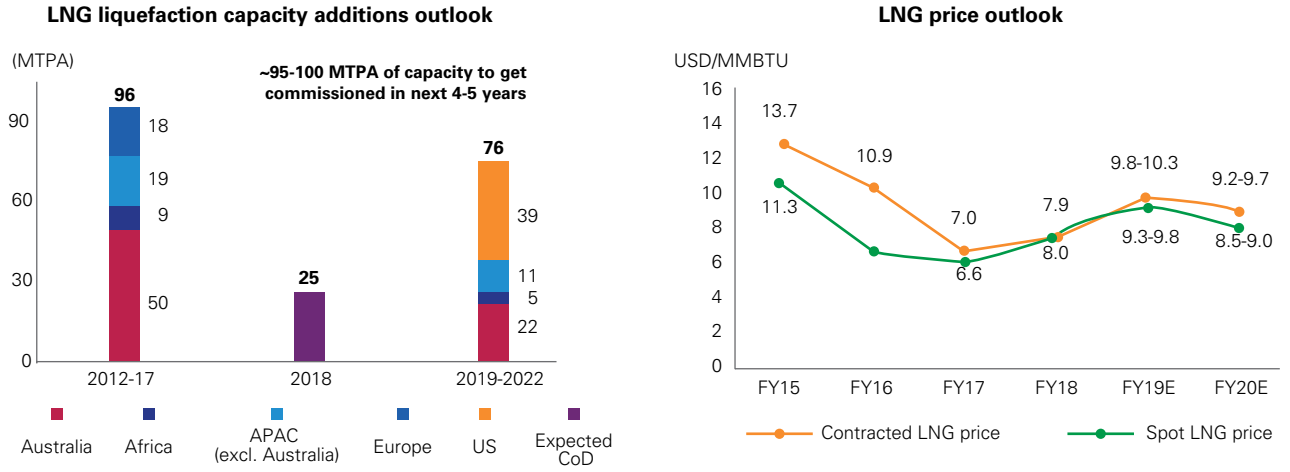
20. Economist.com August 2017 edition; Bloomberg New Energy Finance (BNEF); IEA and the companies, The Wall Street Journal

Natural gas

Natural gas is likely to continue to find investment interest as the prospects remain bright for both power and industry use. As per BP Energy Outlook 2018, natural gas is expected to grow at the fastest rate (among fossil fuels) of around 1.6 per cent per annum between 2015-2040 led by increasing levels of industrialisation and power demand (particularly in emerging Asia and Africa); continued coal-to-gas switching (especially in China); and the increasing availability of low-cost supplies (in North America and the Middle East) contributing over half of the incremental production.

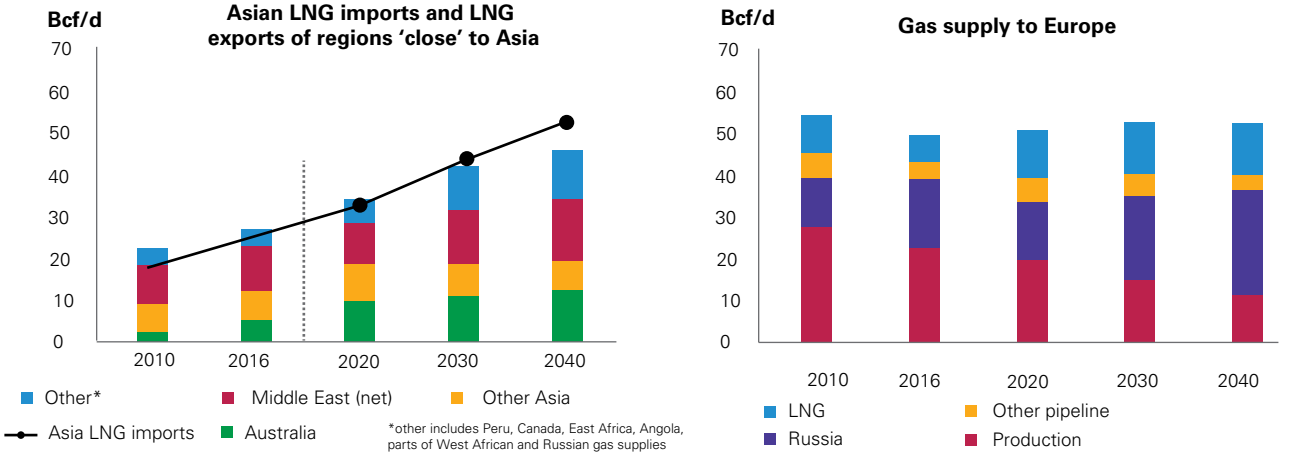
The continued growth in global LNG supplies is expected to immensely increase availability of gas around the world, with volumes of LNG exceeding inter-regional pipeline shipments in early 2020s. LNG exports are dominated by the U.S. and Qatar, which account for almost half of global LNG exports by 2040. Material increases are also projected in Australia, Russia and East and West Africa as existing projects are completed.

Figure 15: Strong LNG supply growth to put downward pressure on LNG price[21]



As per BP Energy Outlook 2018, around 25-30 MTPA of capacity is expected to get commissioned every year till 2022, out of which USA and Australia are expected to add combined capacity of ~60 MTPA in the next 4-5 years.

Figure 16: Developments in Asian and European LNG markets[22]



21. CRISIL Research
22. BP Energy Outlook 2018

As per BP Energy Outlook 2018, by 2040, Asia and Europe together are likely to account for a vast majority of LNG demand. The increasing accessibility and competitiveness of gas associated with LNG would help to develop new and expanding markets, led by China together with other Asian countries such as South Korea, India, Pakistan and Bangladesh. As per BP, Europe is expected to remain a key market, as a potential 'market of last demand' for surplus LNG cargoes and as a key hub of gas-on- gas competition between LNG and pipeline gas.

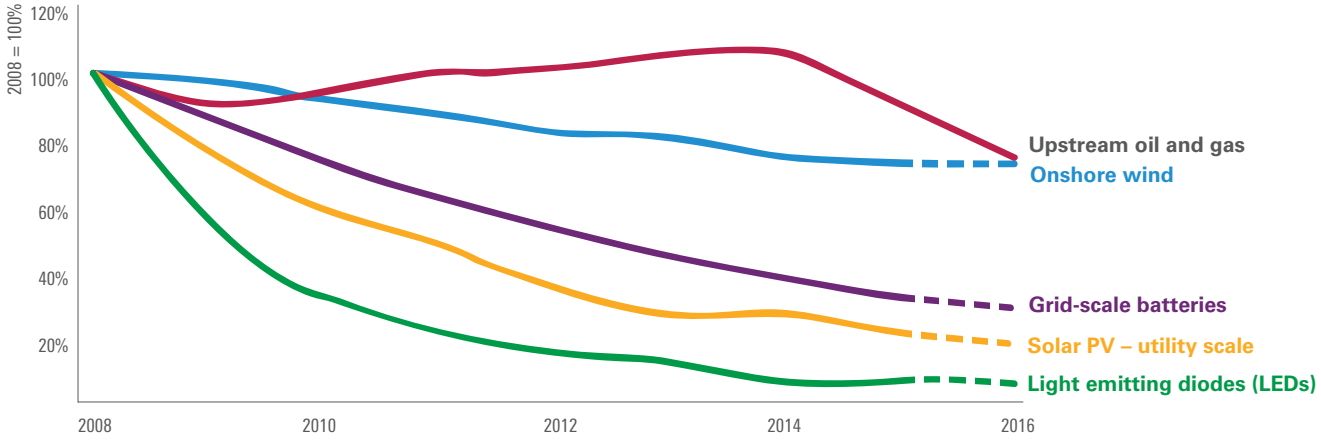
Renewable Energy

Driven initially by concerns on climate change and with subsidies or supportive Feed in Tariff (FiT) regimes, RE growth has now gained substantial momentum with technological advancements and declining cost curves. As per BNEF, [24] going forward solar and wind energy will capture USD8.4 trillion of the estimated USD11.5 trillion to be invested in new power generation capacity worldwide to 2040. As the penetration of RE increases, lack of sufficient flexibility within the power system could increase the risk of curtailment. Various RE markets have had instances pertaining to curtailment due to increasing ingress of RE impacting the grid stability.

As a result, despite increasing cost competitiveness of RE, investors face uncertainty with respect to curtailment which directly impact returns. Aside from mechanisms such as forecasting and scheduling, addressing such issues would need market transformations to provide the right signals for inter-play of solutions such as demand response, ancillary services, capacity remuneration mechanisms etc. for meeting grid security while ensuring resource adequacy.

One of the biggest disruptions on the supply side is expected to be caused by battery storage technologies. As lithium ion battery costs become competitive, storage solutions have the potential to address the flexibility required in the grid competitively, thus facilitating a higher ingress of RE.

Figure 17: Recent cost trends[23]



Cost deflation has affected diverse technologies across the energy spectrum

Environmental stipulations/mandates and future energy pathways

Following the Paris Agreement on climate change, 193 countries with share of nearly 88 per cent in global carbon emissions,[25] have stipulated carbon emission reduction commitments by 2030. The goals set by various governments have been backed by clear policy thrusts in most countries paving way for strong investments signals in clean energy. At the same time, this has brought considerable uncertainty in investments in fossil fuel based technologies. Various global organisations including those associated with conventional fuels have firmed up their commitment towards climate change goals and are redrawing their business strategies to invest in clean energy and technologies. For instance, a global mining major stated in early 2018 that it would leave the World Coal Association and review its membership of the U.S, Chamber of Commerce to evaluate if their stances align with its support for action against climate change.

23. World Energy Investment, IEA 2016
24. New Energy Outlook-2017, Bloomberg New Energy Finance, 2017
25. www.carbonbrief.org.The statistics would change with US's withdrawal from the Paris agreement

One of the biggest contributors to carbon emissions is electricity production. Countries such as India and China which together are expected to add a majority of incremental power capacity, have taken purposeful strides towards RE capacity additions. As per IEA World Energy Outlook 2017, low carbon sources and natural gas are expected to meet 85 per cent of increase in global energy demand from 2016 to 2040.

With cost economics for RE improving rapidly coupled with medium-term uncertainties in demand owing to surplus capacities, existing conventional value chain players face uncertainties with respect to the prospects of the conventional power segment. Further, India has also tightened emission norms for coal based plants with stricter standards on carbon dioxide, sulphur dioxide and nitrogen oxide production in coal plants which imply an increase in fixed costs, affecting plant economics adversely vis a vis RE deployment.

The transport sector is another important contributor to emissions contributing around 14 per cent[26] to emissions globally. In order to control emissions, governments are increasingly looking at providing appropriate fiscal and policy stimulus to drive a faster adoption of EVs. The EV30@30 campaign, announced at the Eighth Clean Energy Ministerial in 2017, has set up a collective aspirational goal for all Electric Vehicles Initiative (EVI)[27] members of a 30 per cent market share for EVs by 2030 with ambitious EV adoption targets being announced by most member countries over this period.

While directional changes in future energy pathways are evident, there is considerable uncertainty around the speed of the transition. A full-fledged drive towards clean energy could drive a much faster transition in future energy pathways. On the other hand, policy reversals such as the U.S.A.'s decision to withdraw from the Paris Agreement and pursue revival of coal industry have the potential to slow down the pace of the transition.

While it is expected that the industry would chart its own path of low carbon footprint and not depend on governments, the intensity of change could be impacted affecting investment decisions.

Geopolitical and other policy risks

Energy is inherently a highly capital intensive sector and pay-back periods for investors are long. Government's policy and regulatory actions can create an uncertain environment for investors, especially in a scenario where governments are seen to be making retrospective amendments. In fact, energy investors face uncertainties not only due to policy shifts within the country where investments are made but also due to geopolitical events/policy changes in other countries since energy resources (especially fossil fuels) are unevenly distributed and under strategic control of a few regions/countries.

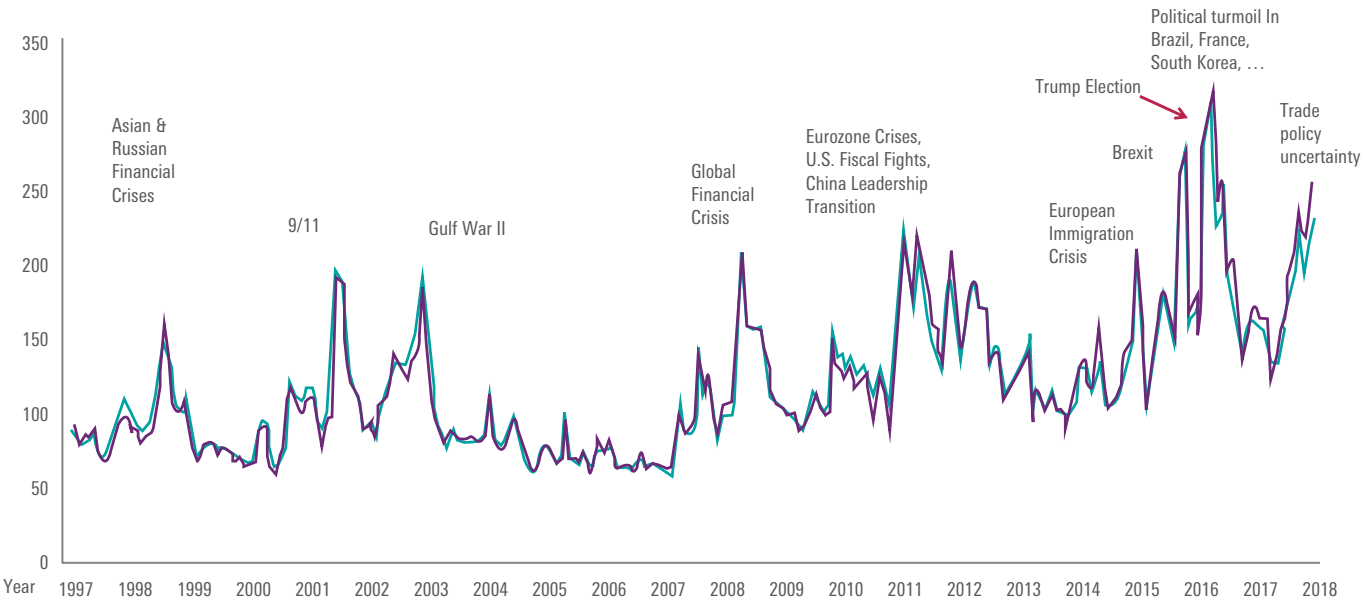
Shifts in political priorities with elections, fiscal constraints, technological progress, etc are some of the common drivers for directional policy amendments globally. In 2013 in Spain, there was a retrospective and sudden reduction of feed-in tariffs for photovoltaic systems by almost 25 per cent for rooftop and 45 per cent for ground-mounted systems by the government in a bid to reduce the tariff deficits.[28] The U.S.A.'s decision to withdraw from the Paris Agreement and subsequently to pull out of the Iran nuclear deal is a stark example of policy risks driven by electoral changes. In the past, industries in the U.S.A. have also been dogged by Production Tax Credit uncertainties.

In the oil sector, after around two years of unrestrained output to gain market share, OPEC decided to resort to production cuts. Even certain non-OPEC countries (including Russia) went ahead with production cuts. These actions have resulted in helping firm up oil prices after record lows witnessed in 2014, favourably impacting investment flows. Since May 2018, oil prices have seen an upswing owing to the possibility of Iranian crude exports falling due to the US withdrawal from the Iran nuclear deal and imposition of sanctions on Iran oil.

As discussed before, the production discipline has been extended for 2018. However, learnings from the past indicate that formal commodity agreements have a limited ability to influence market conditions over extended periods of time (Baffes et al. 2015; World Bank 2016b). Also, an extended rally in oil price is likely to result in a strong supply side response from the U.S. shale producers as well. Therefore, investment flow towards oil sector could be extremely sensitive to any change in policy stance in respective countries.

26. Global Greenhouse Gas Emissions Data, United States Environmental Protection Agency, accessed on 27 November 2018
27. The Electric Vehicles Initiative (EVI) is a multi-government policy forum established in 2009 under the Clean Energy Ministerial (CEM). The initiative seeks to facilitate the global deployment of 20 million EVs, including plug-in hybrid electric vehicles and fuel cell vehicles, by 2020 (Source: CEM)
28. Determinants of Policy Risks of Renewable Energy Investments, Nadine Gatzert, Thomas Kosub- Department of Insurance Economics and Risk Management Friedrich-Alexander University Erlangen-Nürnberg (FAU)

Figure 18: Global Economic Policy Uncertainty Index, January 1997 to Sep 2018[29]



Globally, policy stability and adequate risk balancing have been the key factors leading to increase in equity and debt flow for the energy sector. As the energy sector is going through transition led by disruptive technologies and emission reduction targets, various geopolitical developments and uncertainties too have a direct bearing on investment decisions. The Global Economic Policy Uncertainty Index[30] at the end of 2016 was the highest since 1996. This was triggered by global events such as the U.K. referendum on EU membership, the U.S. elections, slow-down in China, Brazil, etc. While the index was falling in most of 2017, it has seen an upswing recently owing to trade policy related uncertainties and other geo-political developments globally.

Rigidity in design of contractual structures

Uncertainties are getting exacerbated especially in emerging countries owing to badly designed contracts which have rigid structures over Power Purchase Agreement (PPA) period (which can be as long as nearly 20-25 years) and have lopsided risk allocations. Faced with emergent disruptions, the rigid contract structures are discouraging investments in energy sector as developers fear that unfavourable changes in law and other externalities could put assets under stress and create investment risks. There is typically lack of adequate provisions for renegotiation even when the situation clearly warrants the same.

A case in point is of an Indian company which in 2006 won the bid for a large coal-fired power plant based on competitive tariff offered. The rates had been offered at the back of planned procurement of coal from its coal mines in Indonesia at competitive transfer prices. In 2010, the Indonesia's energy regulator issued regulations stipulating that the price for coal exports from Indonesia need to be linked to international rates with the aim to create better frameworks for transfer pricing. This led to a significant increase in the price of the coal sourced for the project, making the plant unviable at the quoted rates and resulting in significant financial stress.

A principal challenge clearly at this time is that the changes and disruptions are threatening to be rapid and co-incidental with massive net impact. Investment frameworks and financing instruments developed to address these situations along with the underlying commercial contracting framework need to be sufficiently robust and/or flexible to cope with these changes.

29. Source: policyuncertainty.com, as accessed on 19 November 2018
30. Created by a group of top 10 economists, this Economic Policy Uncertainty Index for 17 countries which account for 2/3rds of world GDP, using media reporting and economic forecasts to show how much uncertainty there is economic policy

Country specific risks

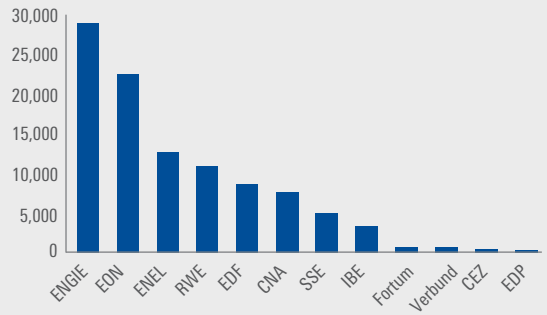
Other than the above global uncertainties, country specific investment risks are also perceived. For instance in India, where power is mostly sold by generators to utilities (discoms), one of the key risks perceived by investors is the counter party risks owing to poor financial health of the utilities/offtakers which have often delayed payments. Further, utilities have also attempted to renege on the PPAs, especially higher cost renewable energy PPAs, given the sharply declining tariffs.

Another example is the gas sector in India which suffers from various challenges. There is lack of flexibility in commercial contracts, pancaking of tariffs, volume risks (extant selection mechanisms), taxation anomalies, lack of pricing reforms in end-user segments amongst others. Uncertainties around the taxation regime are a significant cause for concern in the sector. In particular in India, the partial application of the Goods and Service Tax (GST) regime to the energy sector has caused consternation. In general, investors continue to seek a reasonable, predictable and stable fiscal regime for their investments, especially in these uncertain times where the ability to absorb fiscal shocks is often limited.

Figure 19: Examples of some such challenges faced from across the globe are provided in the box below:

Europe – Policy shifts and global commodity price movements

Utilities impairment since 2010 by co. (EURO mn)



Source: Jefferies estimates, Company Data

In Europe, utilities have witnessed widespread losses in asset valuation with falling wholesale electricity prices. At the peak in 2008, as per MSCI European Utilities Index, the top 20 European utilities were worth EURO1 trillion. By 2013, half of investors' value was eroded.

The downslide began with global commodity price dynamics which made coal cheaper and affected prospects of gas plants. Governments' shift away from nuclear energy further affected asset valuation. The downwards spiral has been exacerbated by increasing penetration of RE which has contributed to an over supply and further dive in electricity prices.

Source: The Economist – "How to lose a trillion Euros"

Indonesia–Risk sharing mechanisms in PPAs

Indonesia energy regulator some months back issued regulations, viz. MEMR Reg.10 which outlines inter-alia new risk sharing mechanisms under PPAs. The regulations require IPPs to also share force majeure risks by removing deemed dispatch provisions for events such as natural disasters impacting the grid.

Although the regulations do allow for the extension of the PPA term in such event, this is unlikely to fully address the lender's concern pertaining to loss of revenue and cash flow thereby impacting project bankability. Also, insurance contracts typically factor the developer asset and performance, and since the developer has no role wrt the utility assets, this heightens investor concerns.

Source: Media articles

Tanzania– Off take risks

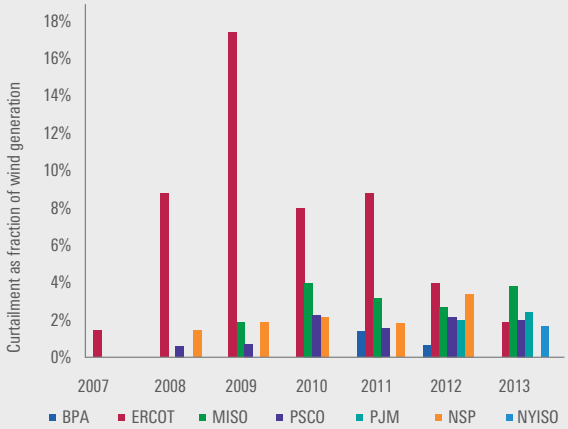
The Tanzania Electric Supply Company (TANESCO) is wholly owned by the government of Tanzania and is a bundled utility. Son Gas (majority owned by Globeleq) is an independent power company that runs a gas-powered plant in Dar es Salaam and contributes nearly 20 per cent of Tanzania's grid power.

TANESCO, has been in arrears in a significant portion of its payments to SonGas Limited from 2012. SonGas owing to arrears has found it difficult to honour its committment for natural gas. In 2016, SonGas threatened to suspend its operations due to long-standing arrears by TANESCO.

Source: KPMG in India's analysis, 2018

U.S.- RE curtailment risks

Levels of curtailment in the U.S.



Source: NREL

As per the NREL study, levels of wind curtailment experienced differed significantly by region and utility service areas

Generally, curtailment in the range of 1 to 4 per cent of wind generation was observed. Higher levels were reported for Electric Reliability Council of Texas (ERCOT) where curtailment in 2009 even jumped to 17 per cent.

Based on utility interviews, issues such as transmission congestion, high wind ramps or over supply have been identified as key reasons.

Source: NREL 2014 study"Wind and Solar Energy Curtailment: Experience and Practices in the United States "

Key risks and challenges across the energy value chain

The key disruptions and uncertainties discussed above are giving rise to projects risks across the energy sector value chain. Some such challenges faced are summarised below:

Table 1: Key risks and challenges in the energy sector

Energy generation fuels	
 **Coal**	• Policy actions deterring coal use • Declining share in energy generation, crowded out by RE and natural gas • Reduced funding avenues
 **Oil**	• Supply glut • Price volatility • OPEC production-cut back agreements • Non-OPEC supply increase • Faster U.S. shale oil drilling activity • Increasing EV deployment commitments
 **Natural gas**	• Abundant supply led by shale leading to soft prices • Slower LNG supply growth
Energy infrastructure	
Coal power plants	• Low PLFs • Increased investment requirement for emission control norms • Balancing and flexibilisation requirements in view of rising RE share • Rigidity of contracts
Refineries	• High product inventories • Weak demand and low prices • Reduction in reserve development projects • High U.S. shale gas production • Newer business models • Increasing technological developments, operating cost discipline crucial
Renewable energy projects	• Dispatch risks • Counterparty risks (for high tariff projects) • Policy reversals with respect to concessions/ exemptions • Lower than anticipated technological advancements in RE and battery storage • Technology/performance risks
Nuclear plants	• Safety concerns • Geopolitical situations
Gas power plants	• Storage and demand response • Maintaining reliability, resource adequacy and fuel diversity • Regulatory challenges in some markets
Network assets	• Right of way concerns • Geographical disputes • Asset integrity issues • Asset utilisation risks with distributed generation • Harsh weather externalities

Global uncertainties deeply influence capital allocation and investment decisions. In an uncertain environment, the decisions tend to sway not only between regions, but also to sectors where investment horizons are shorter and thus are considered low risk-low return.

With the energy sector facing uncertainties in face of emerging disruptions, it becomes important to understand the specific challenges being faced by the resource and infrastructure players and seek ways to address them.

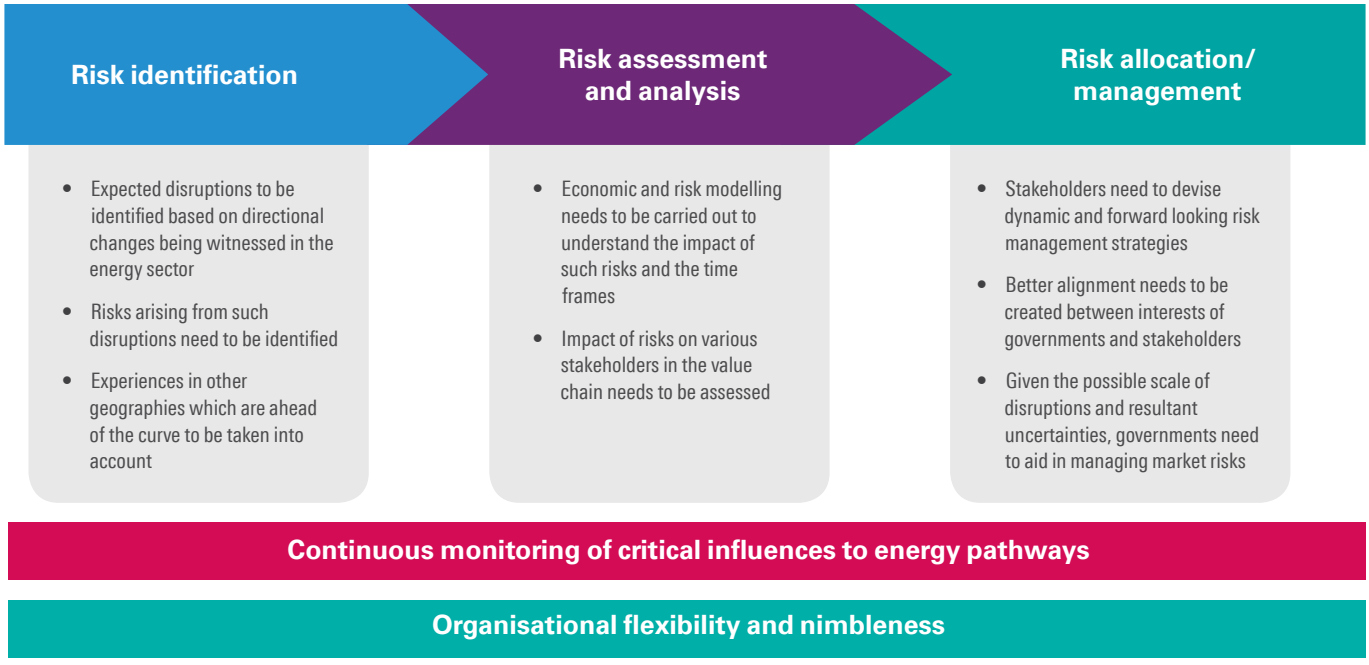
3. Addressing uncertainties from an energy financing standpoint

The investment decisions which were pretty straightforward around 5-10 years back, such as setting up energy generating stations to cater to growth in demand (largely under regulated tariffs or with strong visibility on market prices) are by fair means not so easy in today's changing times. The sector is today deeply influenced by disruptive factors such as customer preference, smart applications and technologies as well as environmental concerns. At the same time, structures and contractual arrangements are weakening and policy shifts are increasingly putting returns at risk.

With uncertainties rife across the energy spectrum, investment decisions need to move beyond evaluating the immediate market opportunities and the evident risks. Stakeholders in the energy space need to increasingly take into account the possible disruptions which could critically influence the pathways that energy sector can adopt, identify opportunities as well as new risks and assess the impact. Further, the sector needs to devise dynamic and forward looking risk management strategies that would allow them to keep pace with new developments.

Nevertheless, the pace of disruptions may still have the ability to beat management expectations. Here, analysing and monitoring critical influences would be the key to spotting both opportunities and risks early.

Figure 20: The process of managing risks in the wake of possible disruptions[31]



31. KPMG In India Analysis 2018

As per conventional risk allocation principles, market and asset performance risks typically need to be borne by investors, while risks arising out of policy shifts and other externalities could be allocated to governments. However, if infrastructure is indeed of the nature of public good (or essential for delivery of a human right), then to an extent even the market risks on account of the energy sector disruptions needs to shift back to the governments and be spread across rate payers and tax payers. If too much risk is put on investors then private capital could move away from the sector, as financiers seek safer areas for capital allocation. In the Indian power sector context, the risk allocation framework for the Rewa Ultra Mega Solar Power Project in Madhya Pradesh is a good example wherein the contractual documents were well-designed covering the roles and responsibilities of the stakeholders and risks were not lopsided. One such risk mitigation measure introduced was an innovative three-tiered payment security mechanism developed within the contractual framework to address counterparty risks. The tiered mechanism also included a guarantee from the state (which was consuming maximum electricity being generated from the project). This allayed investor concerns on payment delays and resulted in steep fall in tariffs and huge investor interest.

Governments need to ensure that to the extent possible, necessary support for management of emerging risks is provided to the sector through 1) strengthened contractual structures and flexible contracts 2) development of enabling market structures 3) conducive and stable policy frameworks and 4) innovation in financial de-risking instruments.

Some measures which can be taken in this regard by governments are further discussed below:

Strengthened contractual structures and flexible contracts

The investment decisions by debt and equity providers and pricing is largely guided by the provisions of contractual terms and the credit profile of the off-taker both in regulated as well as non-regulated markets. However, contractual structures in many emerging countries suffer from unimaginative design and improper risk allocation framework. There is a tendency to load all residual risks on the project sponsors and lack of adequate provisions for renegotiation even when the situation clearly warrants (rigid contracts).

It is imperative that contractual frameworks with utilities/authorities, as well as financing agreements are revisited to ensure robustness. There should be a clear definition of risks and an optimal allocation which allows clarity in understanding, assessing and pricing these risks. The Kelkar Committee[32] report on 'Revisiting and revitalizing PPP model of Infrastructure' (November 2015) also proposes re-balancing of the risk sharing in infrastructure projects in India. While this may need to be evolved with changing times and country specific requirements, it does lay down specific framework which can be adopted suitably in energy infrastructure financing.

Some specific recommendations put forth by the Kelkar Committee for allocating and managing risks under PPAs are:

- An entity should bear the risk that is in its normal course of business
- An assessment needs to be carried out regarding the relative ease and efficiency of managing the risk by the entity concerned
- Cost effectiveness of managing the risk needs to be evaluated
- Any overriding considerations/stipulations of a particular entity need to be factored in prior to implementation of the risk management structure
- Sophisticated modelling techniques are prevalent to assess probabilities of risks and the need to provision them. The Department of Economic Affairs may hone its skills in this and provide guidance to project authorities
- There should be ex-ante provisioning of renegotiation framework in the bid.

32. Kelkar committee to evaluate PPP in India was a committee set up to study and evaluate the extant public-private partnership (PPP) model in India. The committee was set up by India's central government and headed by Vijay Kelkar

The issue of renegotiation is at the core of contract administration. Empirical and theoretical research over the past two decades clearly has moved from a preference for rigid contracts towards the fact that uncertain economic environment and limited rationality necessitate long duration infrastructure contracts to be incomplete.

There is a broad body of research and knowledge that have been led by Oliver Hart (1995, 2003) and Jean Tirole (1999) that characterise infrastructure contracts as 'incomplete contracts'. Infrastructure contracts, in such research and analysis have been broadly covered under two basic typologies by Athias and Saussier (2010):

- 'Rigid contracts, in which the contracting parties attempt to specify the means of coordination according to future states of nature. In other words, in such a contract, parties try to prevent renegotiation, essentially by deciding the price to be charged by the private operator for the whole duration of the contract.
- 'Flexible contracts', in which the parties do not try to avoid renegotiation and plan to renegotiate price once any uncertainty unfolds.

Since no probability can be assigned to unknown events, contracts cannot have provisions for all possible future contingencies. As they are confronted with risks to which they cannot assign any probabilities, agents find it impossible to write complete contracts[33]. Hence long term contracts need to reflect an element of flexibility to address their inherent incompleteness. Such flexibility can be accorded to the contracts through explicit renegotiation clauses. International literature indicates that such provisions for tariff renegotiation are not only essential, but must be explicitly provided for in the contract framework to render them sufficiently flexible to address emergent situations over the contract life.

There have been various instances where mutual re-negotiations between contracting parties have benefited both the parties and the larger good for the nation. Some examples pertain to Phnom Penh Airport Concession Renegotiation (Cambodia, 1997), Thailand financial crisis and re-negotiation of PPAs, re-negotiation of gas PPAs in Andhra Pradesh (1999-2007) among others. Of course, due regulatory process for renegotiation and benefits have to be established to initiate re-negotiations.

33. The Dark and Bright Sides of Renegotiation: An Application to Transport Concession Contracts, Julie D Brux

Role of markets in promoting risk management

Energy markets need to be designed with adequate flexibility and adequacy of products to manage the dynamic environment and address the consequent risks of market players. In particular, market design needs to focus on the following aspects:

Figure 21: Enabling market structures[34]

Development of	Balancing high	Risk management	Providing resource
• Long-term and short-term markets markets are complements • Short-term markets enhance competition, improve economic efficiency, provide investment signals	• Variability cause by RE has implications on system balancing • Need for development of ancillary and balancing markets for frequency response	• Price volatility in short-term markets increases risks for buyers and sellers • Instruments such as energy futures and contracts for differences need to be developed to enable firm lock-in of prices	• Capabilities in load forecasting, generation portfolio optimisation and generation flexibility in conventional plants • Capacity markets need to be evaluated to complement wholesale markets • Separation of content and carriage

Improving market efficiency through development of short-term market: Long-term and short-term markets have emerged as complements. Global experiences including lessons from India have demonstrated that both long-term contract driven structures and short-term market driven structures must coexist to enhance competition, bring economic efficiency. Further, the scale has to be sufficiently deep to provide the right investment signals and improve market efficiency. Presence of enabling short-term markets is especially critical for natural gas sector wherein the market has been largely driven by long to medium-term supplies (domestic and re-gasified LNG), resulting in supply chain inflexibility/rigidity.

Balancing high ingress of RE: Variability caused by the large ingress of renewables in the grid has implications on other generation sources from system balancing point of view. Using spinning and supplemental reserves becomes critical. Therefore, there is a need to focus on development of frequency response and operating reserves through creation of well-structured ancillary and balancing markets. There is a need to evaluate and encourage solutions such as battery storage ecosystem where cost curves are sharply declining, in order to achieve scale and further bring down integration costs. With growing ingress of RE, role of hydro and gas based secondary and tertiary response is critical in grid balancing.

34. KPMG In India analysis

Providing resource adequacy: Further, the right signals need to be provided for encouraging conventional generation to provide resource adequacy. A scientific approach needs to be adopted towards modelling the future demand, load forecasting and portfolio optimisation/balancing, etc. Apart from these, there is also need to have more flexibility built into the design of the conventional generation plants to maintain base load. Further, at the right stage, capacity market statements need to be introduced and eventually capacity markets needs to be developed to complement wholesale energy markets.

Developing risk management tools like energy futures and Contracts For Difference ('CFDs'): Wholesale market participants can face significant risks owing to spot price volatility in electricity markets. Generators could face a risk of low prices which can impact their margins. On the other hand, discoms/ consumers can face the risk of price surges. While long-term contracts are available to manage pricing risks, such contracts come with inherent inefficiencies and improperly allocated risks, as discussed before. In such a scenario, markets need to offer financial risk management tools like energy futures and Contracts For Difference[35] which allow market participants to lock in firm prices for the electricity they generate or purchase in future.

35. CfDs are contractual arrangements for low carbon generation technologies such as renewables, nuclear and carbon capture & storage (CCS). CfD essentially provide protection against volatility in wholesale electricity prices. Depending on the nature of the generation technology, generators will received a CfD contract through auctions to be held for the same. The contractual arrangement offers to maintain a fixed 'strike price' such that if the market prices exceed the strike price, the generators will be liable to pay the difference, thereby avoiding over payment by the consumers. On the other hand, if market prices are lower than the strike price, generators will be provided a top up, thereby eliminating price volatility risk for generators.

Financing instruments/options to address risks

For the last few years, more than 90 per cent of investment in energy is being financed through balance sheet financing globally. While the availability of project finance to the overall energy sector has remained small, the past five years have seen a growth of 50 per cent in project finance for power generation, especially renewables based capacities which reflects lower perceived risks by lenders for this segment.[36]

It is imperative that innovative new mechanisms are evolved to address risks considered as significant and alternative means of financing are widened.

One of the critical aspects to also consider here is the access to a desirable investor base. Long-term patient capital from international institutional investors such as pension funds and insurance funds need to be attracted to the sector. However, although the return expectations of such investors are more aligned to the returns typically generated by infrastructure projects, the investors have limited appetite for risks. Further, with the new energies landscape increasingly led by innovations in technologies such as battery storage, digitalisation, etc., new business models are likely to drive the future growth. It is imperative to attract classes of investors such as angel funds, start-up funding, accelerator and innovation funds, to scale up such business opportunities.

Deployment of financial de-risking instruments backed by enabling policy measures can improve risk return profile of projects and help scale up investments attracting different categories of investors to energy projects.

Financial instruments →

Investment risks ↓

	Government guarantee	Political risk insurance	Partial risk/credit guarantee	Export credit guarantee	Currency risk hedging	Currency risk guarantee fund	Local currency lending	Internal/ external liquidity facility	Liquidity guarantee	Put option	Grant and convertible grant	Resource guarantee fund	Geothermal exploration insurance	Portfolio guarantee
Political risk	✓	✓	✓	✓										
Policy and regulatory risk	✓	✓	✓	✓										
Counterparty risk	✓	✓	✓	✓				✓						
Grid interconnection and transmission risk		✓	✓	✓										
Technology risk			✓	✓										
Currency risk		✓			✓	✓	✓							
Liquidity and refinancing risk								✓	✓	✓				
Resource risk											✓	✓	✓	✓

Source: IRENA

Financial risk mitigation techniques have commonly involved the use of credit enhancement techniques such as guarantees. These are typically issued by public entities, i.e. governments and multilateral finance institutions to address general credit risks or specific risks, for instance technology risks. Credit enhancements may also be done by issuers of instruments through tranching of securities into superior, sub-ordinate securities etc. where credit profile of the securities are structured based on the risk and return expectations of investors.

36. IEA: World Investment Outlook 2017

For emerging countries where financing costs are high, international capital provides an attractive avenue for attracting long term capital and low costs. However, a particular pain point in raising international debt by emerging countries is the risk of foreign exchange fluctuations. With hedging costs eating away the interest rate arbitrage, innovations in currency risk mitigation instruments such as masala bonds in India[37], which allow developers to raise local currency denominated loans from international investors, need to be explored. However, the associated regulatory framework should ensure holistic involvement of players and not just few top rated ones only.

Other risk mitigation instruments can include liquidity facilities to address payment delays by utilities, resource risk mitigation tools, etc.

Through regulatory and policy support, financing instruments can be structured with appropriate risk mitigation and allocation measures to facilitate sustained financing flow towards the energy sector.

Of course, robustness of the contracts has to go hand in hand for financing to be effective. Therefore, a combination of financial and non-financial measures are required for creating a more favourable investment environment or supporting financing through risk mitigation measures. Examples of financial innovations across the globe are provided in section 4.

Conducive and stable policy frameworks

Long term policy and visibility is critical for creating a conducive environment for sustained investments in energy. In sectors such as RE, while there is directional certainty in terms of government's intent to promote RE, there is considerable uncertainty caused by policy amendments impacting the sustainability of the envisaged returns. For e.g., in an Indian state, wind assets were developed under Average Pooled Procurement Cost (APPC) along with Renewable Energy Certificate (REC) route a few years back which provided compensation to the project at the pooled power purchase cost. Further, RECs were issued to the project, which could be traded on the power exchange. However, subsequently, the state regulator issued an amendment to the definition of APPC capping the APPC to a certain percentage of the applicable preferential tariff for wind determined from time to time for the state. The said amendment applied to all existing projects. At the same time, a significant inventory of RECs remained unsold with projects, owing to the glut in the REC market. As per the developer/investor community, the combined occurrences significantly impacted the project and equity returns for the investors.

Further, in the natural gas sector in India, lack of an integrated policy for pipeline development has led to pancaking of tariffs for end consumers as well as lack of access to natural gas. As per global best practices, gas transmission and distribution is either planned collectively by different network owners or there is a centralised Transmission System Operator. Therefore, there is a need for a long-term integrated policy for streamlining gas distribution in India and improving investor interest. The policy must consider state support for infrastructure development where overall government policy goals alignment and societal benefits are strong, but the financial goals of the project may not be fully addressed for conventional financing or Public Private Partnership. Viability Gap Funding or innovations like the Hybrid Annuity Model as adopted in the case of Indian highway development provide interesting case references for this.

While it is paramount for investors and investee companies to review their risk management strategies, clearly governments have an important role to play in helping the sector address uncertainties arising from the potential disruptions. The investment decision makers have to be incentivised to prioritise investments which deliver greater social and environmental benefits, not at the cost of sacrificing financial returns, but measuring and assessing wider basket of benefits that an investment delivers to arrive at its true value.

In the ensuing section, the report examines some international examples of measures to encourage energy financing in uncertain business environment.

37. Masala bonds are rupee denominated bonds issued outside India thereby giving access to international capital markets, while addressing challenges such as high cost of hedging by issuer since the lending is Indian Rupee denominated. Here the currency risk is borne by the investor. Issuance through masala bonds stood at around INR 30,600 crore till March 2017.

4. International examples of measures to encourage energy financing in uncertain business environment

Innovative business and financing strategies have been adopted both in developed countries as well as the emerging economies to address uncertainties arising from the business environment. These include measures such as business restructuring, or use of instruments such as guarantees, credit enhancements, derivatives, special purpose vehicles, etc. Efficacy of different structures and instruments is highly dependent on project and country specific peculiarities and requirements, including the robustness of contracts and the enforcement mechanism.

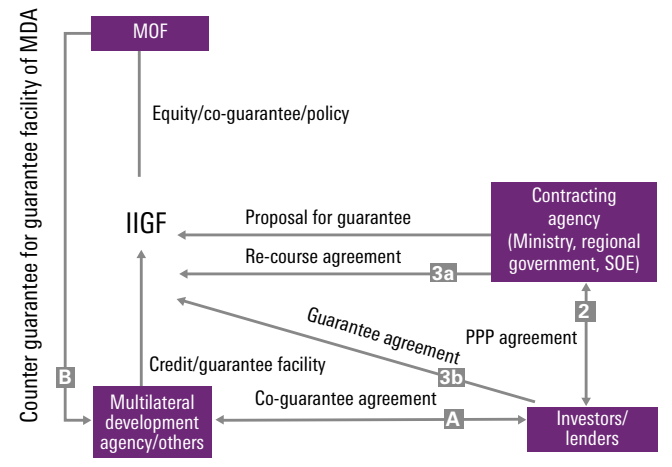
This section provides examples of following strategies adopted across the world to address uncertainties:

1. Managing financing and investment risks in uncertain times through risk mitigation tools
2. Re-orientation of businesses to adapt to sector transformations
3. Improving flexibility, sustainability and profitability of conventional segments to promote investments

Managing financing and investment risks in uncertain times through risk mitigation tools

Indonesia: Indonesia Infrastructure Guarantee Fund (IIGF):[38]

Figure 23: IIGF structure



Background: Indonesia Infrastructure Guarantee Fund (IIGF) was formed in 2009 to provide contingent support to PPP projects in the form of government guarantee. The IIGF engaged with the World Bank and other international Financial Institutions (FIs) and institutions to strengthen its risk management framework and processes and develop right guarantee structures. The IIGF acts as the guarantee provider to the private sector for various infrastructure risks that may occur on part of government, such as delays in the processing of approvals and licenses, change in rules and regulations, tariff adjustment issues, non-integration of network/ facilities and other risks allocated to the government as per the PPP contract. This facility reduces the risks and enhances the credit rating of projects making them more bankable and accessible to wide range of investor class.

Experience[39]: A notable big transaction in energy sector involving IIGF pertained to Japan Bank for International Cooperation (JBIC)-led consortium funding of 2 GW ultra-supercritical coal-fired power generation plant, Central Java Power Plant, being developed by PT Bhimasena Power Indonesia (BPI). The BPI will sell the generated electricity to PT PLN (Indonesian utility) for 25 years. Japanese companies such as the Electric Power Development Co Ltd, ITOCHU Corporation have stake in BPI. The loan provided on project finance basis is being co-financed by multiple lenders, including various Japanese Banks. The JBIC has provided political risk guarantee for the portion financed by private financial institutions. The IIGF has provided a guarantee concerning PLN's obligation stipulated by the power purchase agreement, together with the Indonesian government.

38. www.iigf.co.id

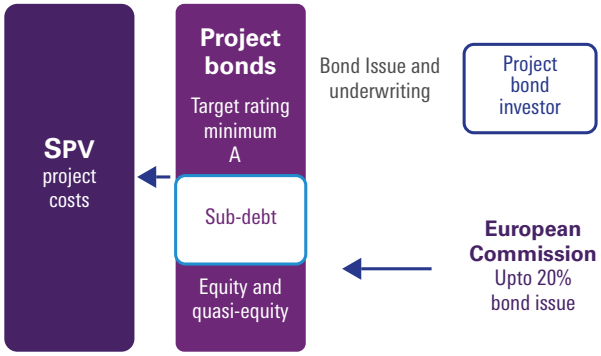
39. www.jbic.go.jp

EU: Europe Project Bond Initiative:[40]

Background: The Europe 2020 Project Bond Initiative is a joint initiative of the European commission and European Investment Bank (EIB). The initiative is designed to enable eligible infrastructure projects, usually PPP projects, attract additional private finance from institutional investors such as insurance companies and pension funds by providing credit enhancement via subordination.

This subordination can be in the form of a contingent credit line or in the form of a subordinate loan for the project, thereby increasing the debt coverage and reducing risks for the senior lenders. The EIB seeks to cover up to 20 per cent of the project debt on a first loss basis.

Figure 24: Euro Project Bond 's structure



Experience: One of the first issues supported is a GBP305.1 million bond issue for the Greater Gabbard offshore transmission link which are electricity transmission assets connecting the 140 wind turbines of the 504 MW Greater Gabbard offshore wind farm to the U.K. onshore grid. The EIB provided credit enhancement of GBP 45.8 million (amortising with bond) which resulted in an upgrade in the bond rating from Baa1 to A3. 'As per Office of Gas and Electricity Markets (Ofgem) "the PBCE reduces the investment risk, enabling the project to attract cheaper finance, which ultimately reduces costs for consumers.

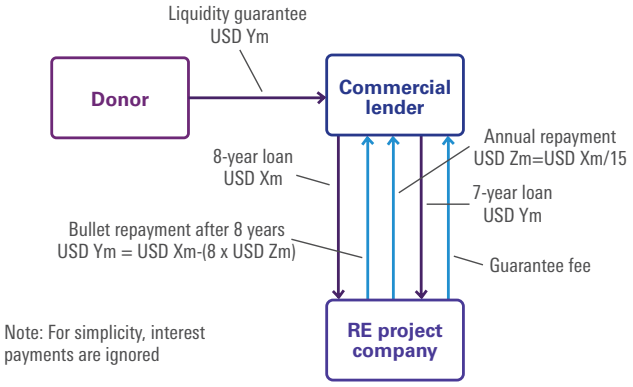
Developing countries: Liquidity guarantees:[41]

Background: Liquidity guarantees have been deployed to provide short term cash flows to projects, for example, in case of delays under PPA or to extend tenors to improve a project's liquidity profile.

Experience: In the West Nile Rural Electrification Project in Uganda, one of the challenges to increase the rural electrification was the replacement of the conventional government-led rural electrification, with a private sector-led, commercially oriented program. A significant limitation to attracting finance was that project pay back was long, however, regulations limited maximum loan tenor to eight years. To allow for a longer-term loan, the World Bank structured two separate senior loans for local banks to lend to the project. The first loan expires after eight years when a bullet repayment of the outstanding principal is to be made. This repayment was funded from a new seven-year loan, making the total period loan repayment period 15 years.

A liquidity facility guarantee was used to ensure that local banks would have sufficient funds to make the second loan after eight years, thereby removing repayment risk for the project developer. The fees and margin payable to each local bank were designed to incentivise it to continue financing for the full 15 years (Wang et al., 2013).

Figure 25: Liquidity guarantee structure



40. The EU-EIB 2020 Project Bond Initiative and Developments in Infrastructure Financing, Project & Infrastructure Finance Conference S&P Capital IQ, London

41. IRENA: Risk mitigation and structured finance 2016 and World Bank case study UGANDA - West Nile Rural Electrification Project

The U.S.: Credit enhancement through pooling in assets/ cash flows:[42]

Background: Apart from credit enhancement through guarantees or liquidity lines, aggregation of the assets/ pooling of cash flows of various assets mitigates the geographical, offtake and technology concentration risks through portfolio diversification. This instrument has been extensively used across the segments where risks associated with individual assets creates challenges in access to and cost of capital.

Experience: In 2012, the U.S. Department of Energy and the National Renewable Energy Laboratory (NREL) created the Solar Access to Public Capital (SAPC) mock project to analyse securitisation. Via the SAPC for solar roof top assets, standardised residential lease and commercial PPA contracts were developed with the aim to facilitate investments through aggregation of assets and securitisation. Since then, solar securitisation has been used extensively by some of the leading industry players, where loans to customers have been aggregated and asset backed securities have been issued to investors such as pension funds.

42. NREL, KPMG in India 2018 analysis

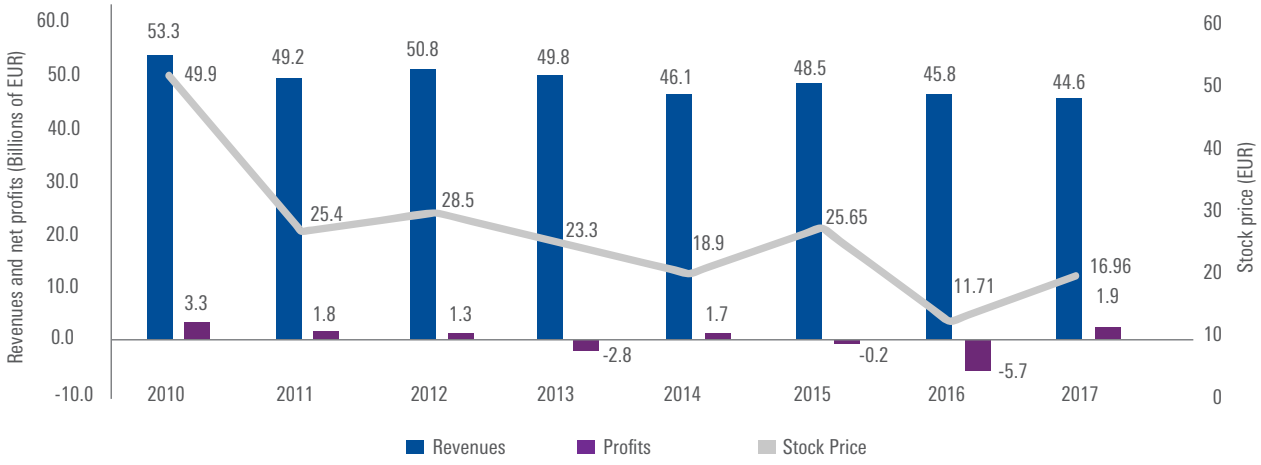
Re-orientation of businesses and financing models to adapt to sector transformations:

Germany: Restructuring by utilities in wake of losses into companies with different assets classes which unlocked shareholder value (E.g., RWE Group) :[43]

The RWE Group (RWE) is the largest supplier of electricity in Germany and the third largest supplier of gas. It has a total generation capacity of around 46 GW with ~18 per cent coming from Renewable Energy. Over the years till 2016, RWE saw about 90 per cent decline in its stock price since its peak reached in 2008, largely attributable to the decline in wholesale electricity prices due to increase in RE and falling utilisation of fossil plants. It posted a loss of EUR2.8 billion in 2013 for the first time in 60 years. It was due to EUR4.8 billion in impairment losses over its fossil fuel plants.

Witnessing these trends and erosion in their market capitalisation, RWE restructured its business in Q4 2016 to allow a division into a 'clean' and a 'fossil based' utility. This provided investors the option to invest in two different risk classes which ultimately favourably impacted the utility company with overall higher value and market capitalisation.

Figure 26: Financial and stock performance of RWE Group



Source: KPMG in India analysis, 2018

Note: Stock price is calculated as simple average of high and low for last trading day of the respective year.

In fact, the renewables focused arm created by RWE, Innogy, which was listed on the Frankfurt Stock Exchange, was valued at more than twice the market capitalisation of RWE at that time. Further, Innogy's listing raised about EUR5 billion, of which EUR3 billion went to RWE and provided it a useful infusion of cash. As can be seen in the financial and stock performance figure for RWE presented above, post restructuring in Q4 2016, RWE has seen strong profitability growth as well as recovering stock prices.[44]

Brazil: Re-orientation of focus by Brazil's National Development Bank (BNDES) to suit investment trends: [45]

The Brazilian Development Bank (BNDES) is the main financing agent for development in Brazil and is fully owned by the Brazilian government. It has been redefining its priorities and its role going forward. In 2014, it revised its Operational Policy (OP) aligning it to suit investment trends in the country, the national financial industry's experience and the need to serve companies more efficiently and provide higher quality services.

The BNDES conducted a review of its energy strategy and in October 2016, announced a new funding policy under which it ruled out investments in new coal and oil fired power plants and a focus towards RE and energy efficiency project with favourable terms offered for such projects, to aid Brazil's goals for clean power.

43. RWE Group annual reports, KPMG in India analysis
44. This strong financial turnaround has been attributed to multiple factors including refund of nuclear tax worth EUR1.7 billion after a German High Court ruling declaring the tax as illegal and void, increased revenue through dividend payments from Innogy, reports of France based Engie showing interest in acquiring Innogy and better performance of RWE's power trading operations as well as gas based power plants.
45. World Bank media articles and www.bndes.gov.br

The BNDES has obtained significant financial and technical support from various development banks to meet its objectives including funding from Inter-American Development Bank (IDB), New Development Bank (NDB), etc. The World Bank recently conducted a study to contribute to the improvement of BNDES OP. The paper provides recommendations to establish BNDES as a more effective and focused development bank, less dependent on the government for funding, and less subject to interference by improving its governance.

Increased focus on leveraging digital technologies such as data analytics, artificial intelligence (AI) to achieve business goals:

Various traditional energy players and utilities are re-orienting their strategy and incorporating digital at the heart of their business strategy to address areas such as

1. operational improvement
2. customer management
3. management of distributed generation assets
4. identifying new business models, etc.

As per Harvey Nash/ KPMG CIO Survey 2018, Power & Utilities companies are more likely to maintain an enterprise-wide digital business strategy than those in other sectors with 57 per cent companies surveyed globally having a clear strategy, either enterprise-wide or within business units.

For example[46], Eneco, a major Dutch utility, has sought to provide new services to the customers, in order to re-orient itself to the changing energy landscape. It's venture Jedlix (in partnership with Tesla and BMW), is engaged in electric vehicles charging business wherein it allows EV owners to smart charge their vehicles at nominal rates when there is large supply of RE in the grid. Eneco has also supplied its consumers a wall-mounted energy monitor, Toon, which allowed its customers to control their domestic heating settings through a phone-based application showing in detail the electricity and natural gas consumption and other information such as weather forecast etc.

As per Harvey Nash/ KPMG CIO Survey 2018, Power & Utilities companies have implemented digital labor/ machine learning more often than others across all corporate functions. There is an ever increasing number of startups which are contemplating commercialising blockchain-based energy trading concepts, and therefore blockchain players might become the imminent focus for investments and mergers and acquisitions activity.

Oil majors diversifying into RE business[47]:

Global oil major BP, which adopted a sunburst logo around two decades back to express its solar energy ambitions, has recently announced a USD200 million investment in UK based solar generator Lightsource, which has ambitious plans to increase its solar generation capacity to 8 GW through large scale projects in countries such as India, US, Middle East and Europe. Though this investment is small as compared to BP's size and as compared to BP's spending in the past, this investment marks BP's second entry and renewed focus on the solar segment. In around 2011, BP wrote down billions of investments made into solar panel manufacturing business on account of inability to face competition from China. As per statements made to Reuters by BP's senior management, they see attractive long-term value proposition and growth in terms of return, cash delivery and profitability in the solar generation business. Other oil majors, such as Royal Dutch Shell, Total have also invested into the RE segment in order to diversify and prepare for the new energies landscape.

Global gas contract renegotiations[48]:

Globally, historical contracts are being reworked to reflect the current and future expected market dynamics. If one looks at natural gas, given the supply situation, various countries/companies have undergone contract restructuring by either reducing the prices to the present trends (delinking from oil) and/or reducing contract durations from 25 years to 10-15 years in order to protect their market shares. For example, recently India renegotiated its deal with ExxonMobil for a price cut on its 20-year LNG contract. Globally, French utility major Engie and Statoil agreed for renegotiation of their long-term gas supply contracts to adapt to the evolution of the European natural gas markets, by adjusting the prices to be fully reflective of the market conditions.

46. NYTIMES article "Dutch utility bets its future on an unusual strategy: Selling less power" dated August 18, 2017
47. KPMG in India analysis
48. KPMG in India analysis

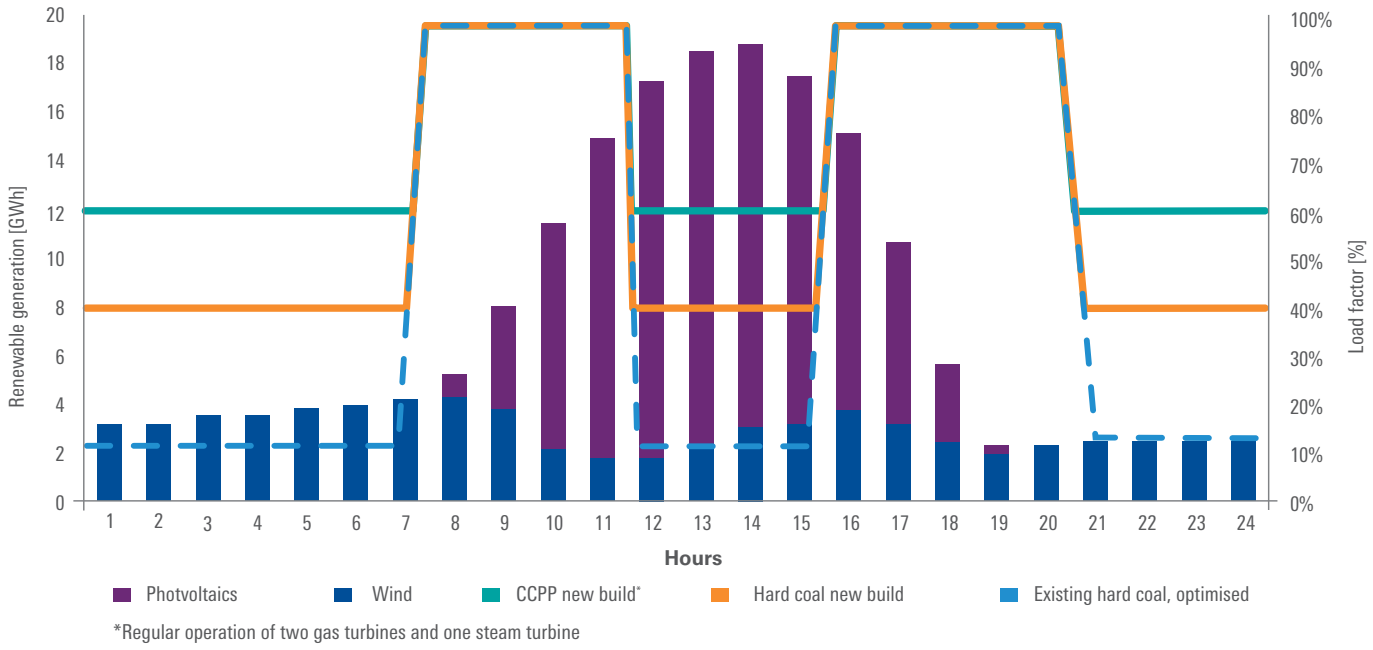
Improving flexibility, sustainability and profitability of conventional segments to promote investments

Germany: Flexibilisation of coal plant

Background: The fundamental stochasticity, variability and geographic concentration inherent in renewables is perceived as a challenge given the dominance of coal in electricity mix for most countries. More so, in emerging countries such as India where the grid is operated far from optimally and where ancillary mechanisms are still in infancy. However, the role played by coal in balancing the grid can be far more than is visualised by the policy makers and grid operators.[49]

Experience from Germany has demonstrated that necessary flexibilisation can be built into coal plants so that they can play an important role in balancing RE and remain relevant in future energy scenario. Germany's solar PV capacity is almost half of its peak demand, with a higher solar penetration than any other country in the world. Despite the RE dominance, Germany ensured the continued relevance of fossil fuel based plants for the power sector. Germany ensured that coal and gas plants were made increasingly flexible to allow these to play an important role in Germany's electricity markets.

Figure 27: Germany experience



Source: www.transparency.eex.com

Experience: On 16 March 2012, Germany encountered intense solar radiation where the generation from solar ramped up by 16 GW in a matter of five hours and decreased thereafter.

Germany was able to manage the fluctuations well by operating both coal and gas plants intermittently between partial and full-load operation as these had short-term flexible operating capability. The German example demonstrated how with a well prepared and planned system, a high penetration of intermittent energy resources can be accommodated. A combination of resources with flexible generation capabilities and a strong transmission network can help manage the variability in an effective manner and also provide a case for conventional plants to remain relevant.

49. Dispelling Myths: Coal cannot be cycled to manage Renewable Variability, published by Shakti Foundation with KPMG India as knowledge partner

Focus on cost and efficiency improvements:

There are many examples of how efficient operations and reduced cost of technologies are leading to lower breakeven price of oil for a lot of fields. Many U.S. shale producers today operate at below USD30 per barrel breakeven prices, as compared to their initial cost of USD80 per barrel. The focus on cost reduction led by technology advancement is helping the oil and gas industry sustain business profitability in the current market scenario. In the North Sea area of Europe, efficiency improvement initiatives have reduced the cost of oil extraction from USD30 per bbl to USD15 per bbl.[50]

Globally, several strategies have been adopted by industry and governments alike for mitigating financing risks and addressing transformations which are likely to impact businesses significantly. Greater awareness, capacity building, demonstration of early successes are crucial for the energy sector to understand, anticipate and address risks arising from disruptions.

50. "Lower operating costs keep North Sea viable in low-price environment" by Dr. Berislav Gašo from MOL Group and Nico Brunsmann from MOL Energy UK; published on offshore-mag.com; last accessed on 27 November 2018

Summary conclusion and next steps

The energy sector is in the midst of a deep transformation, globally as well as in India, giving rise to increasing uncertainties around energy investments. A complex interplay of factors such as policy thrust on low carbon pathways, technological advancements, changing consumer preferences, shifting balance of power in oil and gas industry and government policies and actions are causing disruptions to conventional business models and investment flows. These shifts are impacting the entire value chain of the energy sector. The energy sector is responding through reduced investments in carbon heavy technologies such as coal based generation, re-alignment of incumbent business models to the evolving trends, larger investment allocation to renewables, increased focus on grid integration, greater focus on cost rationalisation and productivity improvements, etc.

As per the World Energy Outlook (IEA), while fossil based fuels and infrastructure, especially natural gas and oil, are expected to remain as the key backbone of the global energy systems, a sharp transition in energy pathways driven by global policies, could have consequences for fossil fuel segments and the associated value chain players (although the impact is likely to vary from resource to resource). Therefore, financing decisions in capital intensive energy assets where pay-back period is typically long, is fraught with uncertainties over recovery of costs and availability of financial returns.

Globally, a basket of options have been employed by the sector to mitigate risks associated with such uncertainties through innovative financing arrangements accompanied by re-orientation of business models to align with policy and technological shifts. Given that energy is often considered a public good and one of the key social responsibilities of governments, in order to meet the requirements of this capital intensive sector, it is paramount for governments to encourage private investments to supplement strained public resources. Hence, it is important for governments to step up risk mitigation measures and look to strengthen policy and regulatory environment, develop efficient market structures and improve contractual design to make these less rigid and ensure a fair risk allocation.

Based on the discussions in the paper, the following key themes of action emerge for developing countries such as India, to deal with the uncertainties that disruptive forces are bringing in its wake:

Increasing role of governments: Governments, especially for developing markets, should step-up their role in infrastructure creation, and take on more considered approach, if not more risks. Government needs to focus more on delivering longer-term economic and social goals for its citizens and lesser on the short-term measures of risk mitigation, inaction and cost avoidance. The support can take evolution in any shapes, viz. standardisation of contracts and agreements, building flexibility into contracts to allow renegotiations to withstand adverse externalities, tax credits, long-term visibility on policy and regulations, etc. which could enable a more widespread access to a diverse pool of investors for the developer community. Further, with initial handholding by government through financial risk mitigation measures in underdeveloped though essential energy segments, the energy infrastructure market once developed would find their own takers ultimately reducing the pressure on public finance. Further, newer models and learnings from other sectors such as the HAM for asset financing and the Toll-operate-Transfer (TOT) model in road sector for assets recycling can be considered to be implemented for monetisation of stable revenue earning assets in the energy sector.

Improving market designs: The structure of power markets need to evolve as energy sector transforms, to provide the right investment signals and improve market efficiency. In most developing countries, electricity supply has been largely regulated and competitive market structures are slowly evolving. Developed countries with power exchanges have significantly more liquid exchange trading volumes as compared to India:

Global power exchange trading

S. No	Country	Power exchange trading as per cent of total energy consumption
1	India	3%
2	France	23%
3	Belguim	29%
4	U.K.	53%
5	Germany	53%
6	Austria	53%
7	Nordic Countries	91%

Source: IEX investor presentation, September 2017

Long-term bilateral contracts in most nations with highly liquid exchange trades is limited (typically five-seven years). Apart from bilateral contracts, many exchanges also trade in futures – duration usually limited to three years beyond which liquidity decreases significantly. Most of the above nations also have well segregated products (futures/forwards) catering to base load, peak load, seasonal variations etc. Some are looking at capacity markets as a solution, some are also advocating long term bilateral contracts (more than 15 years) to reduce price uncertainty.

It is imperative that experiences from developed economies are studied and market reforms are implemented while bearing in mind that the pace and extent of transformations required may significantly vary from past experiences. Measures such as development of short term markets, introduction of new products such as weather derivatives, day ahead/ intra-day products, development of ancillary and capacity markets need to be evaluated to improve market efficiency, improve grid security and provide resource adequacy.

Institutional strengthening: Measure such as tariff reforms, separation of carriage and content need to be taken to strengthen the utilities in emerging countries so that utilities are empowered and adapt well to change and continue to play an important role in managing consumer requirements nimbly and efficiently.

Tariff distortions have been perennially present in emerging economies with large users being subjected to high tariffs, often rendering grid supply uneconomical for these consumers. Utilities, on the other end, continue to face losses on account of under-recovery of power purchase costs due to subsidised retail tariffs coupled with high aggregate technical and commercial losses. It is important to strengthen utilities by measures to optimise costs, modernise networks through deployment of technologies to improve information flows, and rationalise tariff structures to increase the competitiveness of utilities.

Further, with deep disruptive influences on the demand side such as evolution of smart technologies, distributed generation and storage solutions (with rapidly declining battery costs), there will be newer challenges for the utilities to adapt to serve the much empowered customer. As power systems in emerging economies becoming amenable to competition, especially in the supply function that involves procurement and sale of energy, measures to separate carriage and content need to be explored not only from the perspective of competition or consumer choice, but also to de-risk the utilities from financial stress.

Supporting financing innovations: Regulations and policies aiming at development of structured financial de-risking instruments such as credit guarantees, aggregation models, Infrastructure Investment Trusts (InvIT), masala/green bonds, security tranching and liquidity facilities to address various risks should be developed. The enabling regulations should consider deepening the corporate bond market, by enabling low-investment grade or non-investment grade entities to tap requisite investor community.

Government needs to support such financial innovations through information exchange between countries, capacity building, greater stakeholder awareness, policy, regulatory and fiscal measures and exploring support of developmental funds.

Improving investment climate: The investment climate especially in emerging countries needs to be considerably improved to provide ease of doing business for energy players. Governments need to make a significant effort to improve governance by increasing transparency, laying down well defined procedures, improving controls, stringent monitoring and accountability to provide a better investment climate to investors which allow them to be nimble and quickly adapt to the challenges emerging in the energy space. An important measure here is also setting up quasi-judicial expert adjudicatory bodies with deep understanding of energy sector issues, who can speedily and efficiently address arbitration and bring relief to stakeholders thereby reducing investment certainties.

New investment avenues: The adoption of new disruptive technologies such as smart grid technologies, battery storage, EVs, AI based automation etc. needs to be facilitated by creation of awareness, capacity building of critical stakeholders such as utilities and creating a conducive ecosystem for attracting investors such as angel funds, venture capitalists, development institutions, which can assist in start-up funding towards these newer areas in energy technology going forward.

While the role of the government in identifying and addressing critical risks and uncertainties in an increasingly complex energy landscape is paramount, finally, industry players need to revitalise their risk management strategies and processes. There is a need to move beyond assessing immediate market opportunities and the evident risks. A longer-term view needs to be taken of possible disruptions which could critically influence the pathways that energy sector can adopt. Both opportunities as well as new risks need to be identified, their impact assessed and strategies adopted. To reduce the element of surprise, critical influences to change need to be monitored closely. Strategies that may be adopted by players could range from business re-organisations to allow for flexibility and nimbleness, evaluating the need to refocus business strategies and gain first mover advantage in new areas through leveraging technology, exploring innovations in financing avenues, examining learnings from countries and companies ahead of the curve and greater policy advocacy to represent the risks from policy, market and contractual environment to governments.

About KPMG in India

KPMG in India, a professional services firm, is the Indian member firm affiliated with KPMG International and was established in September 1993. Our professionals leverage the global network of firms, providing detailed knowledge of local laws, regulations, markets and competition. KPMG has offices across India in Ahmedabad, Bengaluru, Chandigarh, Chennai, Gurugram, Hyderabad, Jaipur, Kochi, Kolkata, Mumbai, Noida, Pune and Vadodara.

KPMG in India offers services to national and international clients in India across sectors. We strive to provide rapid, performance-based, industry-focussed and technology-enabled services, which reflect a shared knowledge of global and local industries and our experience of the Indian business environment.

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