



PETROTECH-2019

13th INTERNATIONAL OIL & GAS CONFERENCE AND EXHIBITION

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Greater Noida, Delhi - NCR, India

**Shaping the New Energy World
through Innovation & Collaboration**

Ministerial Session

Collaborating for a sustainable and secure energy access for all

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**Collaborating for a sustainable
and secure
energy access for all**

Collaborating for a sustainable and secure energy access for all

Summary:

One of the biggest challenges we currently face is the lack of basic energy access for a significant part of the population. Case in point is that currently, 1.1 Bn people globally do not have access to electricity. The UN has identified universal access to energy by 2030 as its 7th Sustainable Development Goal. However, analysis shows that the countries are still lagging behind in all the targets defined.

Access to energy has three-pronged benefits - increase in income levels with increased operational hours; effective deployment of income and an improvement in the general well-being of the people.

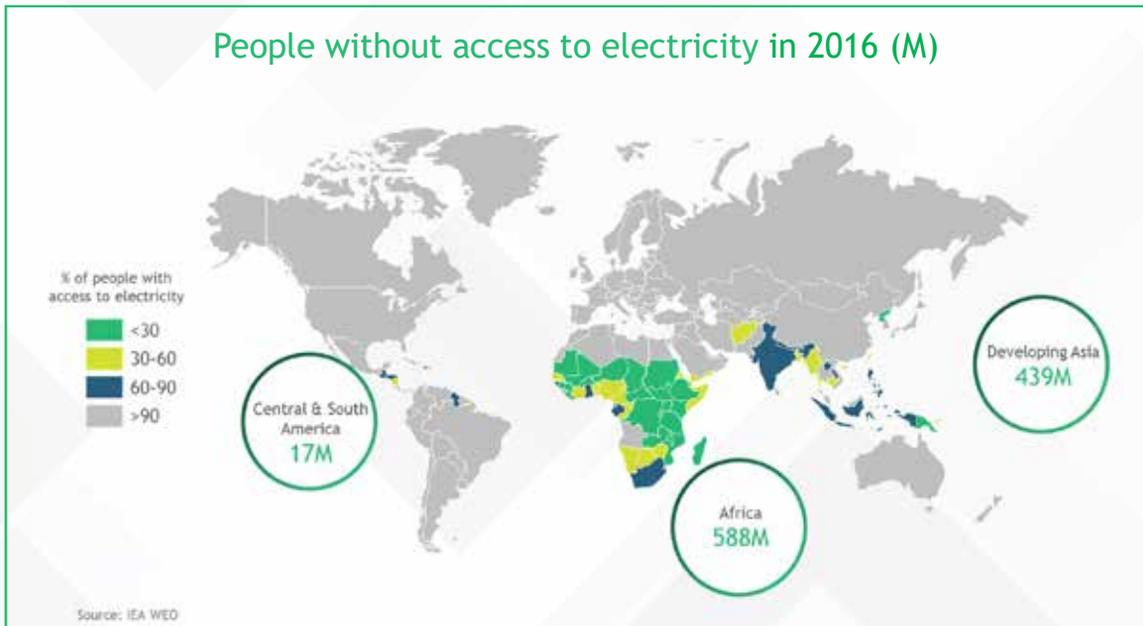
In this paper, we present 3 crucial levers for making universal energy access a reality- technology, government policies and collaboration between and amongst nations and companies.

While technology over the years has helped the world access cheaper and affordable alternate energy sources, policies have provided the framework for the efficient deployment of these technological advancements. As oil and gas continue to play a significant role in the energy sector, collaboration between different stakeholders will be the key to cost reduction as well as knowledge transfer.

Case studies from India and Africa demonstrate how the efficient use of technology, positive policy frame work and collaborative initiatives can help achieve accelerated results in providing energy access to a large share of the population. These success stories can be replicated in other parts of the world in order achieve the goal of energy access to one and all.

World moving towards Sustainable Development Goal of universal energy access

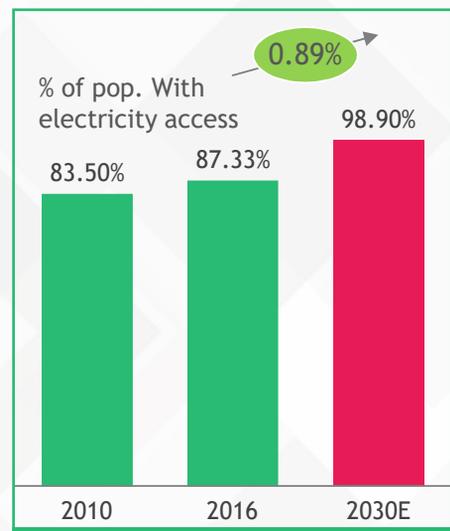
There are 1.1 Bn people globally without any electricity access, majority of those being in the developing nations.



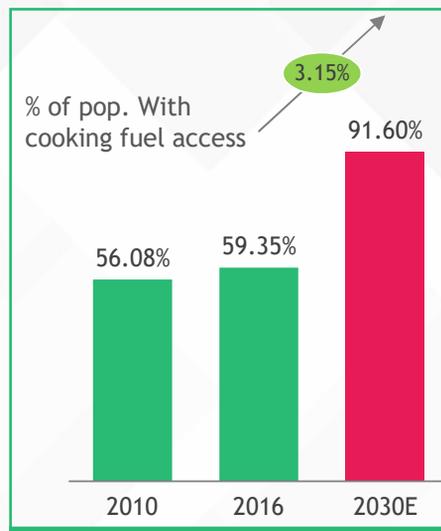
Considering that access to energy is one of the parameters for sustainable development, the UN has defined 'Access to affordable, reliable, sustainable and modern energy for all' as one of its Sustainable Development Goal.

Under this, there are 4 specific targets which we will evaluate in detail:

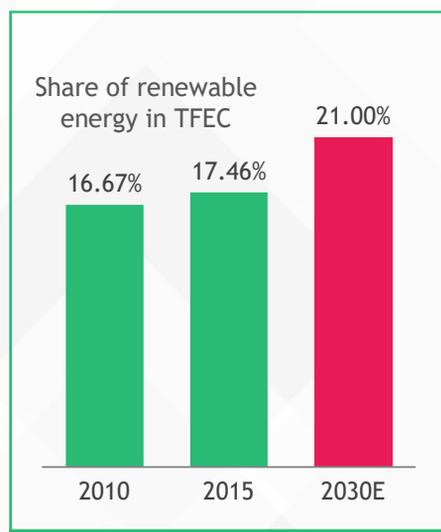
- Ensure universal access to affordable, reliable and modern energy services by 2030:** We stand at 87% electrification rate as of 2016 from 85% in 2014. It is estimated that we will be able to achieve 98.9% access by 2030. However, in order to achieve 100% access, the electrification rate needs to increase at 0.98% CAGR from 2016-2030. If access-deficit countries do not accelerate their progress, there would still be 674 million people living without access in 2030.



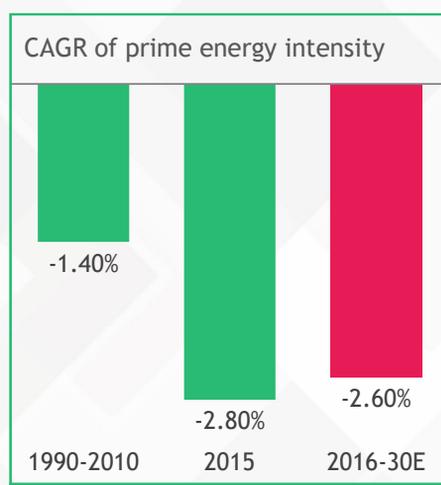
2. **Ensure universal access to clean cooking fuel by 2030:** The share of the global population with access to clean cooking fuel increased from 58% in 2014 to 59% in 2016 with an additional 84 million people gaining access annually during 2014-16. It is estimated that we will be able to achieve 91.6% access by 2030. However, in order to achieve 100% access, the fuel access rate needs to increase at 3.8% CAGR, failing which 2.3 billion of the global population will be without access in 2030.



3. **Substantial increase in the share of renewable energy in the global energy mix by 2030:** The global share of renewable energy in TFEC (total final energy consumption) reached 17.5% in 2015, up marginally from 17.3% in 2014 and less than 1% higher than where it stood in 2010. Going by current trends, the world won't be able to meet its goal as average annual progress from 2010 to 2015 has been only 0.09 percentage points and has been slowing down each year since 2012.



4. **Double the global rate of improvement in energy efficiency by 2030 (Target: -2.6%):** During the period 2014-15, global primary energy intensity fell by 2.8%, reaching 5.3 mega joules (MJ). The threshold of -2.6% has only been breached thrice since 1990. Hence, to achieve the target, the energy intensity needs to reduce by -2.7% every year from 2015

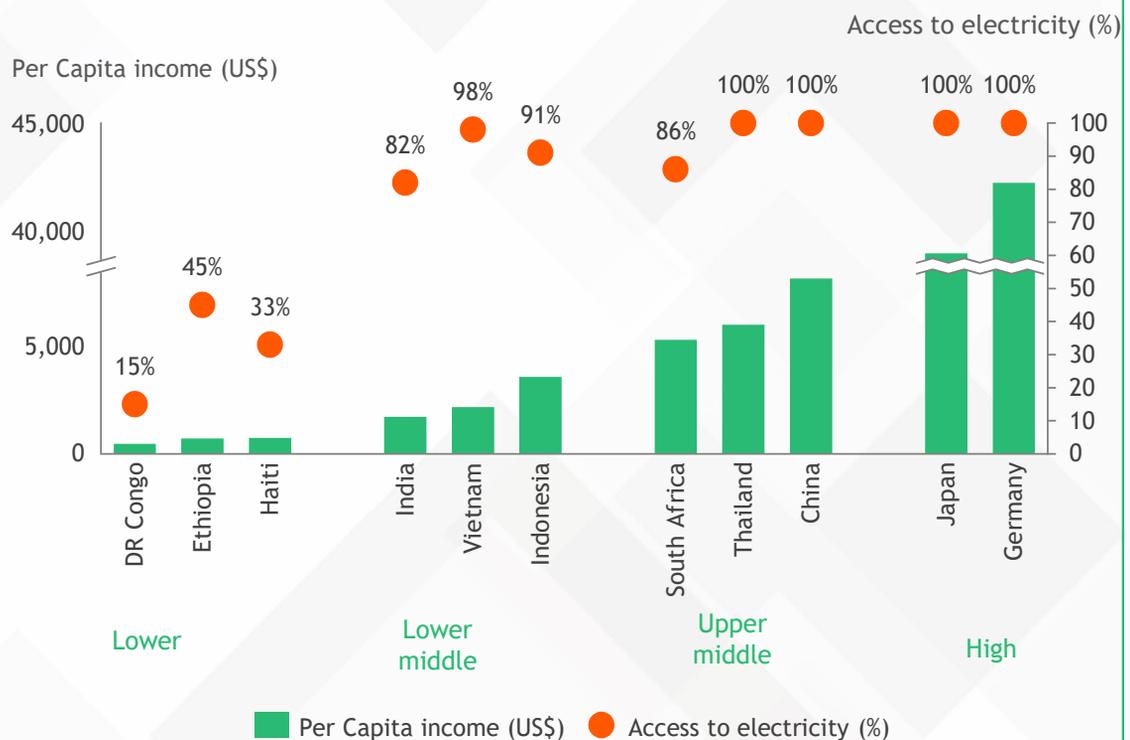


Energy access important for economic development

Economic and social development goes hand-in-hand with energy sector transformation. Access to modern energy is a critical enabler for development at a household and community level and leads to poverty alleviation.

1. **Economic benefits:** It helps to improve the overall productivity levels in the economy. More energy means more number of operational hours - power, mobile connectivity etc. It also leads to a multiplier effect in terms of job creation, higher investments among other things.

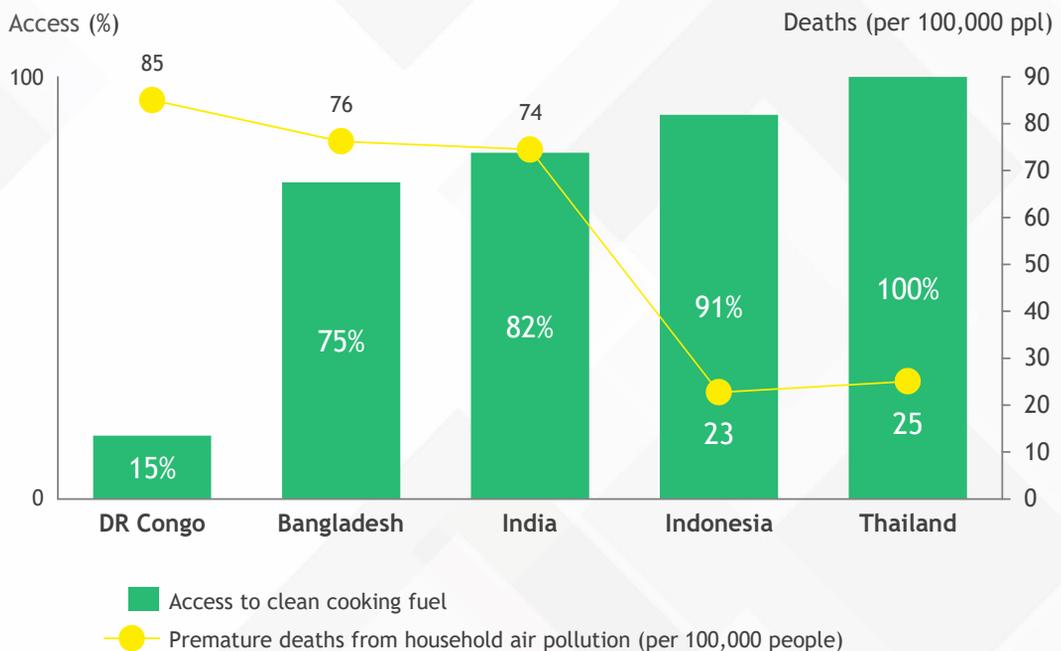
Levels of electrification positively correlated to per capita income



Source: IEA Report (2016), World Bank Data

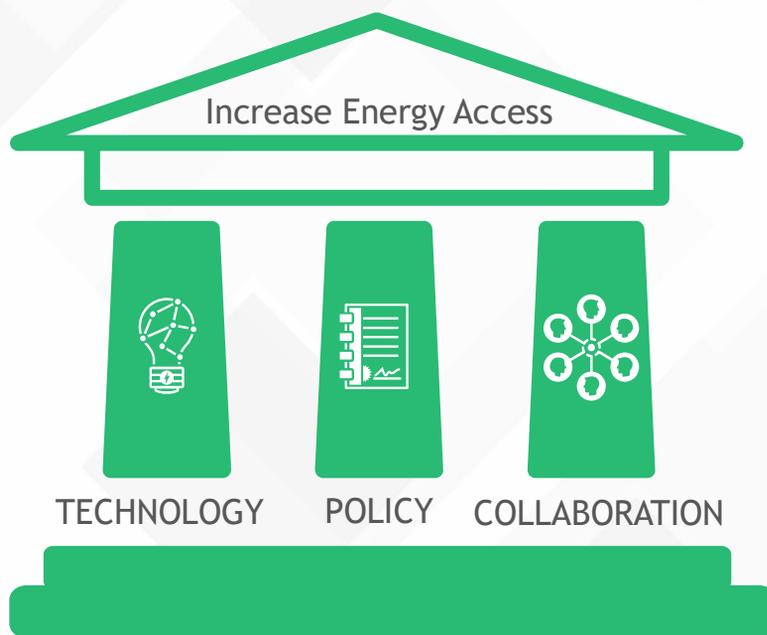
2. **Social benefits:** It leads to overall enhancement of standard of living. For some poor households, a large share of their income may be directed towards low quality and often expensive energy sources, such as kerosene and candles for lighting. High energy access will help direct that income to more productive activities like education, health etc.
3. **Health benefits:** In absence of energy access, sources such as kerosene, cow dung etc. are used. These create multiple health hazards- high particulate matter, risk of fires etc. Access to clean energy greatly helps in improving the quality of life.

Lower number of pre-mature deaths from household air pollution in countries with higher access to clean cooking fuel



Source: IEA database 2016, Global Burden of Disease Study 2016

Technology, policy & collaboration to enable increased energy access



TECHNOLOGY: While technological advancement tends to germinate predominantly in developed economies, we have seen some innovative solutions in developing countries as well, especially when it comes to adapting technology for local markets and needs. For the poorer nations, technology has made energy both accessible as well as affordable, with price parity for new energy sources being achieved with further advancements.

GOVERNMENT POLICY: While technology helps make energy more accessible and cheaper from a production point of view, it is government policies that aid in effective disbursement of these technologies so as to ensure impact at the grass-root level. Effective regulatory framework takes into account all the stakeholders and proper alignment of objectives.

COLLABORATION: Even though the installed capacity of renewables is increasing, oil and gas will continue to play a significant role in the global energy basket. Hence, effective collaboration between producing and consuming nations will greatly help in securing energy access.



TECHNOLOGY ADVANCEMENTS

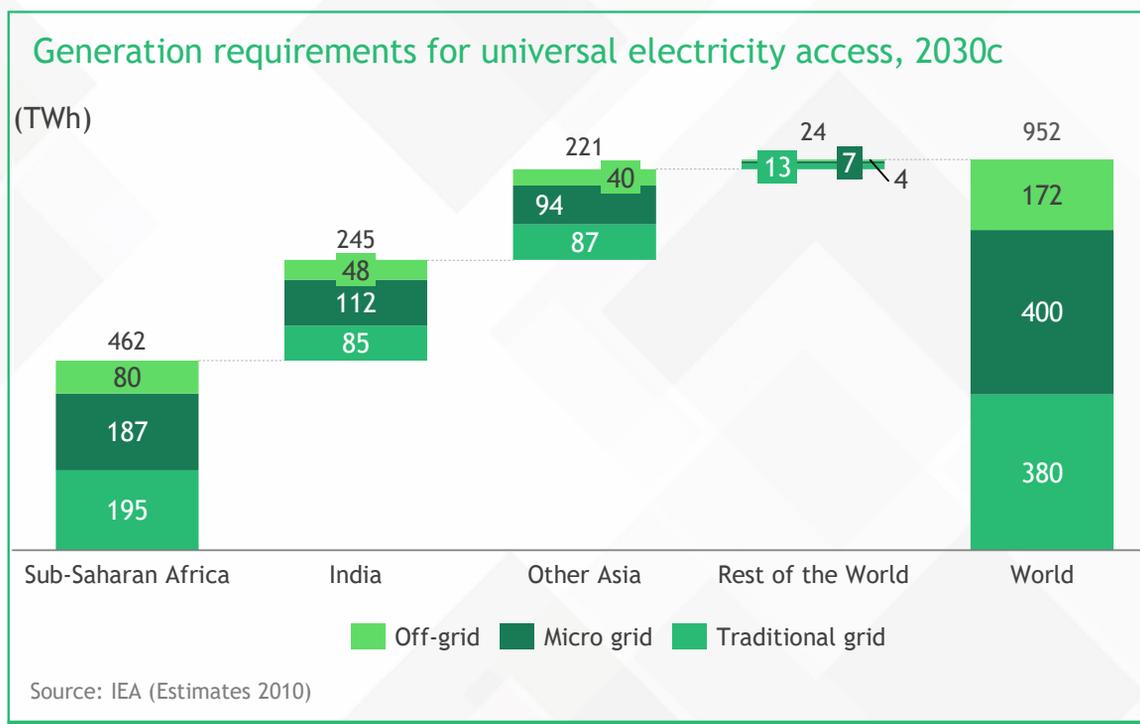
- Micro Grids and Off Grids
- Reducing cost of renewable energy

Micro grids & off-grids improve last mile connectivity

Countries like Africa, India etc. are also at a geographical disadvantage with large areas of land and small pools of population concentrated in distant regions. As a result, grid extension to make electricity accessible to them becomes significantly expensive and is often, unviable.

However, renewable energies such as solar, hydro etc. have increasingly achieved price parity, more so for the small rural areas. Cost of installing micro-grid and off-grid has become significantly cheaper than extending grids.

In fact, 60% of new generation needs to be connected to micro grid or off grid if full electricity access needs to be achieved.



Bloomberg NEF estimates that solar home systems and microgrids could grow to become a \$64 billion market by 2030 as, from the mid-2020s onwards, more people will be gaining access to power through decentralized technologies than through grid connections. Of the 238 million new households to get electricity between now and 2030, 72 million will use solar home systems and 34 million will benefit from microgrids.

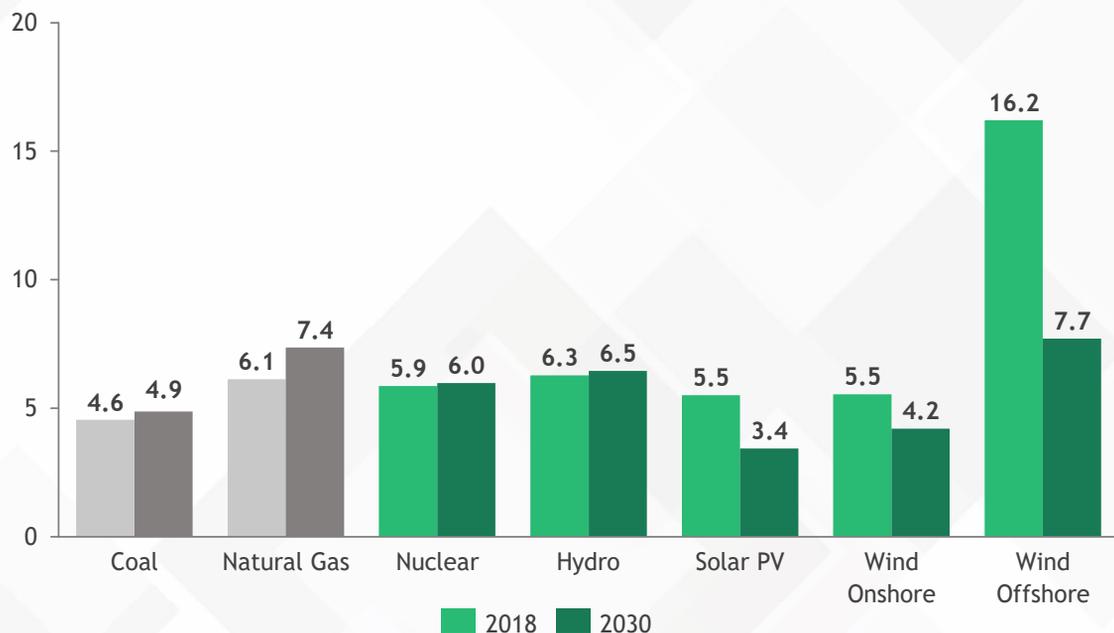
Technology aided in reducing the cost of renewable energy

One of the biggest barriers in using renewable energy was the high cost of generation. However, due to increasing acceptance and improving technology, renewable energy has achieved or is going to achieve price parity in near future vis-à-vis fuels like coal, natural gas etc. This has greatly enabled middle to lower income group households to get energy access; typically in places where installing last mile infrastructure was unviable.

The current cost of coal and natural gas in India is \$5 ct/kWh and \$6/7 ct kWh, respectively. Solar energy has almost matched coal with \$5-6 ct/kWh, which is likely to reduce to \$3-4 ct/kWh by 2030. Similarly, in the case of wind energy, cost is expected to drop to 4-6 ct/kWh by 2030. Overall, where coal and natural gas prices are slated to increase, cost of producing renewable energy is estimated to drop significantly due to advancement in technology.

Levelized cost of energy in India, development from 2018 to 2030

\$ct/kWh, technically feasible load hours



Source: BCG analysis leveraging IEA data points

Some other examples of technology advancements are given below:

1. **Energy storage:** Solar and wind energy can be viable replacements for traditional fuels when combined with storage solutions. Since the cost of lithium-ion batteries has decreased more than 70 percent since 2012, energy storage deployment in many countries has increased.
2. **Blockchain:** It is enabling excess output from wind plants in northern Germany to be discharged as needed into a networked pool of home battery storage systems.
3. **Leveraging mobile phones:** Many solar home systems can be deployed with these new mobile platforms and pay-as-you-go (PAYG) financing. PAYG helps consumers overcome the high upfront costs of the technology.
4. **Bundling:** New business models providing off-grid access with solar PV are also bundling with efficient appliances to decrease electricity demand, hence reducing the upfront installation cost.



POLICY INTERVENTIONS

- SAUBHAGYA - Rural electrification
- UJJWALA - Providing clean cooking fuel
- Kenya's electrification success story



SAUBHAGYA- Rural electrification in India

India has a population of 1.25 Bn people, with 70% of them living in the rural areas. Providing energy access to far distributed areas becomes a substantial challenge because of affordability and last mile infrastructure.

ABOUT THE POLICY:

- Prime Minister Narendra Modi launched Pradhan Mantri Sahaj Bijli Har Ghar Yojana, or Saubhagya in September 2017.
- The objective was to provide electricity access to all households in India by December 31st, 2018.
- The total outlay of the project is INR 16,320 Cr.

HOW DOES IT WORK?

- To ensure on-the-spot registration, mobile applications will be used.
- Free connections to BPL households and a payment of INR 500 in 10 installments of INR 50 each, for other households.
- In case of places where the national grid can't reach, households will be provided with solar power packs along with battery banks.

POLICY SUCCESS:

- 15 states in the country have achieved **100% household electrification (till Nov 2018)**.
- The government is trying to provide 100% electrification for other states by March 31st, 2019.
- According to the World Bank, between 2010 and 2016, India provided electricity to 30 Mn people each year, achieving **the highest incremental electricity access globally**, with 85% of the population now having access to electricity.



UJJWALA- Providing clean cooking fuel in India

WHO has estimated that 1.5 million premature deaths per year are directly attributed to indoor air pollution from the use of solid fuels globally. In India, 83% of rural and 20% urban households use solid biomass fuels for cooking.

ABOUT THE POLICY:

Pradhan Mantri Ujjwala Yojna envisaged a target of 5 crore connections with an allocation of INR 8000 crore over a period of 3 years starting from FY 2016-17. The scheme is partly funded by the money saved, amounting to INR 5,000 Cr., from the 1.13 crore cooking gas users who voluntarily gave up their subsidies through PM's 'Give It Up' initiative.

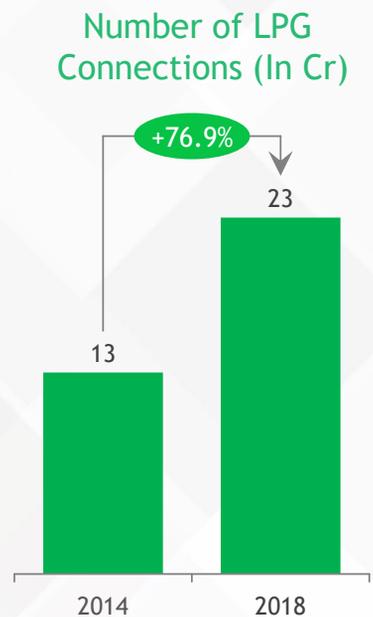
HOW DOES IT WORK?

- Make an upfront payment or get into an EMI agreement with the oil marketing company to pay for the LPG stove, or the first refill.
- In the event of a loan, the cost of the LPG stove is adjusted against the subsequent subsidy amounts on each cylinder.

POLICY SUCCESS:

IEA has specifically mentioned the success of govt. policy in providing clean cooking fuel access. Some of the major feats are:

- **Achieved ~70% target in a short span:** 3.3 crore Ujjwala connections have been issued since the inception of the scheme against the target of 5 Cr connections by 2020. Consequently, target has been revised to 8 Cr connections.
- **Continued success:** 79 per cent of the beneficiaries return for refills, taking as many as four refills per year on an average.





KENYA: Rapid electrification with high focus on renewable energy

Kenya had a mere 27% electrification rate in 2013. It added 1.3 Mn households to its electricity grid in 2016, jumping to an impressive rate of 55% with a vision to achieve 95% energy access by 2020.

In addition to this, another feather in its cap is that its energy comes from non-fossil fuel sources—more than 60% of installed capacity comes from hydro and geothermal power. It currently has Africa's largest windfarm and the world's largest geothermal power plant.

Some steps taken by the government to achieve this feat are:

1. **Independent regulator:** The government created an independent energy regulator in 2007- The Energy Regulatory Commission, which acts as an autonomous, independent sector regulator responsible for licensing and policy recommendations. Through this, it removed the conflict of interest with the Ministry of Energy and ensured transparency and independence from government institutions.
2. **International funding and effective allocation:** The Kenyan government has actively reached out to the World Bank to provide risk guarantees so as to attract private investors as well as to have the ability to negotiate favorable terms. Other development funding has also been utilized to push last mile connectivity.
3. **Boosting industrialization through incentives:** To tackle both, the issue of cost and lack of capacity, the Kenyan government began offering tariff discounts to manufacturers who move their operational base to Kenya and operate at night, an off-peak time for energy consumption.
4. **Support to Geothermal energy plants:** For building the largest geothermal plant in Olkaria, the government showed commitment to exploration by willing to bear a portion of the risk of developing the resources, which attracted private developers and investors. In addition, it is encouraging the implementation of competitive tender processes in an attempt to lower the unit costs and is also working on lowering the overall cost of business.



COLLABORATION

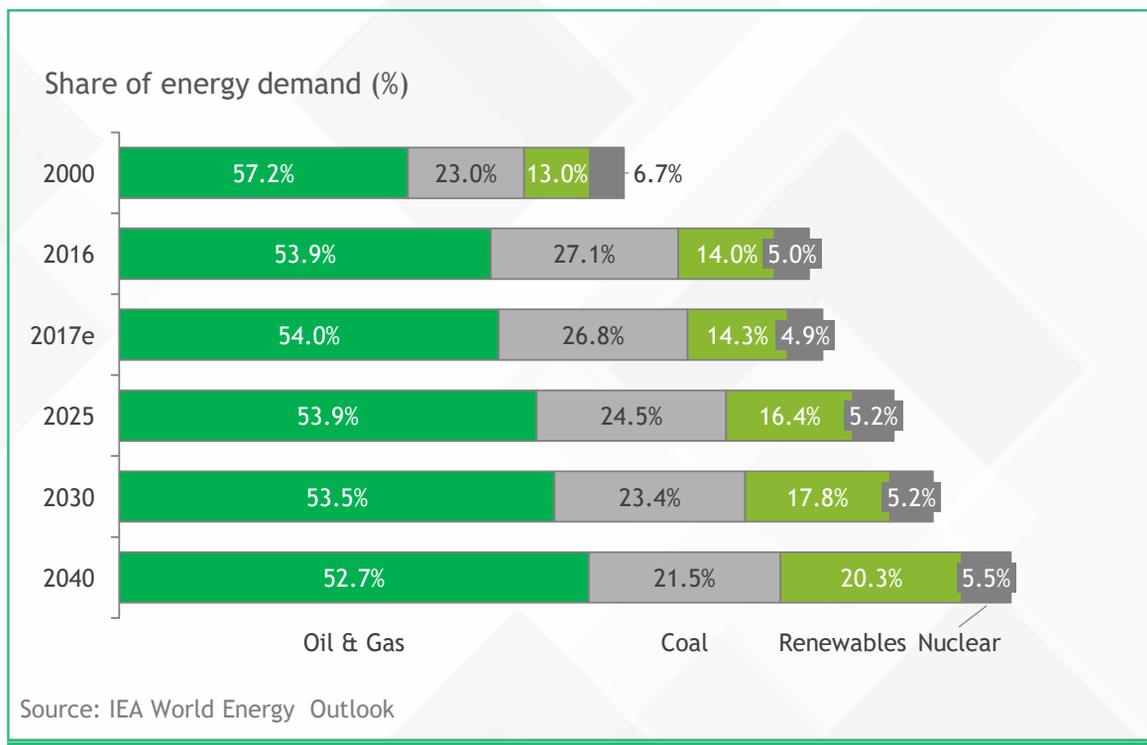
- Continued high significance of oil and gas
- Initiatives taken by India

Collaboration as a key to enable to energy access

Collaborations in oil and gas sector:

Even though technological advancements and reduced cost of renewables has made energy more accessible to a larger share of global population, oil and gas is and will continue to play a major role in the global energy basket.

Oil and gas will continue to form more than 50% of the total energy demand even till 2040.



Even in 2040, the oil and gas sector is expected to account for over 50% of the global energy mix. It is important for the oil and gas producing and consuming nations to come together and collaborate to ensure secure access of oil and gas to one and all. It is imperative for nations and companies to work together towards this shared goal.

Also, it is extremely important for producing and consumer nations to come together to ensure a mutually beneficial solution. High volatility in oil prices prove to be extremely detrimental to consumers, especially to those in importing nations.

Hence, it is in the combined interest of all parties to follow responsible pricing and align the prices to market fundamentals.

India has already started initiating a number of partnerships with various countries in the oil and gas sector:

Some of recent examples include:



Russia

- India and Russia have a long standing relationship of cooperation in the energy sector
- The two countries are looking for increased collaboration in the gas sector



Vietnam

- India has signed an agreement with Vietnam for cooperation in oil exploration
- The Indian national oil company, ONGC's subsidiary OVL, already operates in the country



USA

- India has started to import oil and gas from the US and expects the volume to increase in the coming years
- Indian firms have already invested \$4 billion in US shale gas assets
- Also looking towards collaboration on strategic crude oil reserve program,



Saudi Arabia

- India and Saudi Arabia are working to expand their cooperation in the oil and gas sector.
- Saudi Arabia is expanding its downstream presence in India through its stake in planned 60 MMTPA mega refinery
- Saudi Aramco is also keen to invest in consumer-facing segments such as retail fuels and petrochemicals



UAE

- India and UAE have further strengthened its ties in the energy sector with ADNOC agreeing to fill 50% capacity in two of India's strategic oil reserves
- ADNOC is also a strategic partner in the Ratnagiri refining and petrochemicals complex
- ONGC Videsh-led consortium participation in Abu Dhabi's Lower Zakum offshore concession

Collaborations in renewable energy sector:

Not only in oil and gas, it is also important that the countries globally collaborate in the new and renewable energy space in order to facilitate rapid deployment of these technologies.

The Indian Ministry of New and Renewable Energy has taken the lead by inking cooperation agreements with other countries for growth in the renewable energy sector. The ministry has signed over 50 agreements across different fields/ technologies with other countries during 2007-2018.

The focus of the interaction for cooperation has been to explore opportunities for the exchange of scientists to share experience and for taking up joint research, design, development, demonstration and manufacture of new and renewable energy systems/devices by R&D institutions/organizations of both countries. This will help establish institutional linkages between institutions of India and other countries. Bilateral/multilateral cooperation frameworks have also been established for cooperation.

International Solar Alliance (ISA):

Initiated by India, the International Solar Alliance is a common platform for cooperation among sun-rich countries lying fully or partially between the Tropics of Cancer and Capricorn who are looking to expand the use of solar energy to meet their energy needs.

The initiative was launched at the UN Climate Change Conference in Paris at the end of 2015 by the President of France and the Prime Minister of India. The alliance includes around 80 countries

ISA aims to invest \$1 trillion, raised from public and private investors, for solar projects that will provide 1 TW of solar energy globally.

Collaborating for sustainable and secure energy access for all

Conclusion:

Energy access remains one of the biggest enablers of economic as well social development for the world. It is the basic right of every citizen of the world to get access to secure energy and it is at forums like these that global leaders can come together and pledge to achieve energy security.

The significant strides made globally in terms of development of low cost technologies gives countries an opportunity to work towards a sustainable solution for the deployment of energy access to one and all. The falling cost of power generation from renewable energy together with decreasing cost of storage can provide a stable alternative to fossil fuel power generation. The micro/mini/ off grids have emerged as a strong solution for providing energy access in rural locations.

Governments and policy makers continue to play a pivotal role in this journey. The government with the right policy framework can provide a platform to fast track this deployment. It is also important that policy-makers include a wide range of stakeholders, including the private sector, align objectives with local level policies and dynamics and support capacity-building at the community level to ensure that the energy access solutions delivered are absorbed and maintained.

It is also imperative that the nations realize that they have a shared goal to secure energy access and hence, initiatives should be taken which encourage collaboration and benefit all stakeholders, rather than favor only few at the expense of other developing nations.

With a conscious effort from all stakeholders, universal energy access can surely become a reality in the near future.



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