



Rooftop Power to the People

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HITEX Process Engineering Conference 2014

BigSwitch
India

A whitepaper on utilising Roof-top space of Industries for Energy generation. Presented at the HITEX Process Engineering Conference, Hyderabad. 04-06 September 2014.

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Rooftop Power to the People

A 'power-full' option towards making India self-reliant

A whitepaper on utilising Roof-top space of Industries for Energy generation

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Introduction

India with its 1.21 billion plus population of humanity needs no mention to the world. While India has the distinction of having culturally conquered the world in her historical past, she continues to lag in several areas of the present when it comes to the welfare of her citizens.

This white paper attempts to present a compelling case for adoption of Rooftops at a local level by Industries for generation of Renewable Energy, and why it is important for the country to become self-reliant in its never-ending quest for Energy.

The great Indian diaspora

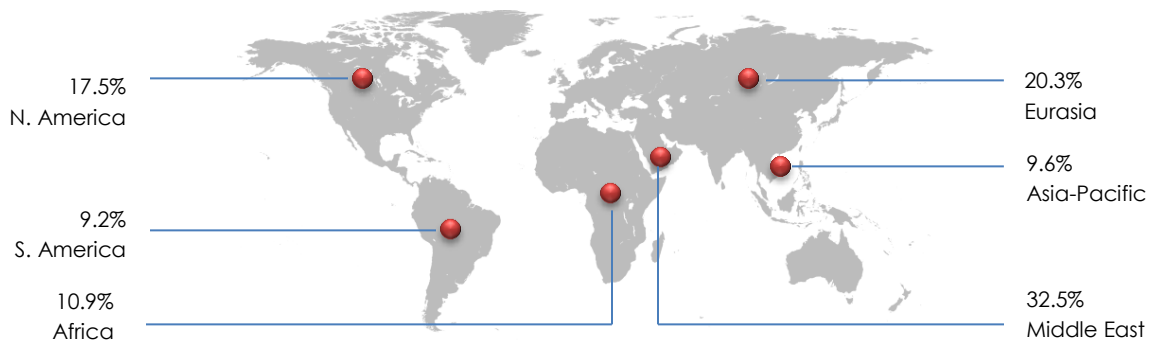
India sustains 17.5% of the world's population over an area that is 2.4% of the world's land surface. From Kashmir to Kanyakumari, and from Gujarat to Guwahati and beyond, India is a mini-Europe in itself, with a myriad of spoken tongues, festive colours and customs as well as changing topography and climate. Increasingly and beyond, the penetration of knowledge and technology has led to a highly informed Indian, as compared to his counterparts 25 years ago. With effective tele-density figures of 74.2% (i.e. number of fixed/mobile telephone connections per 100 individuals in an area), India is well on her way to achieve cent-per-cent penetration soon, a change that is expected to be ushered in almost wholly by the wireless medium of the mobile phone. A multitude of reforms and opportunities in banking, infrastructure, education and health-care have opened up and India's communities are reaping the benefits in every sector of growth, and improving their quality of life in a way akin to a secondary Industrial revolution. From being categorised a third-world country not so long ago, India displaced Japan in April 2014 to become the 3rd largest economy in the world in terms of purchasing power parity (PPP).

The Energy crisis

Economic progress needs power, and with power comes great responsibility. Never before has this adage been more applicable, than in the current Indian Energy and Power generation environment.

A review of the world energy scenario and a closer look at how India is placed against other countries is merited in order to understand the implications of our increasing needs. It may be noted that this comparison could be against developed countries of the western world, who have had atleast a 20-30 year head-start as compared to India in terms of reforms and governance.

Worldview : Crude Oil production & consumption

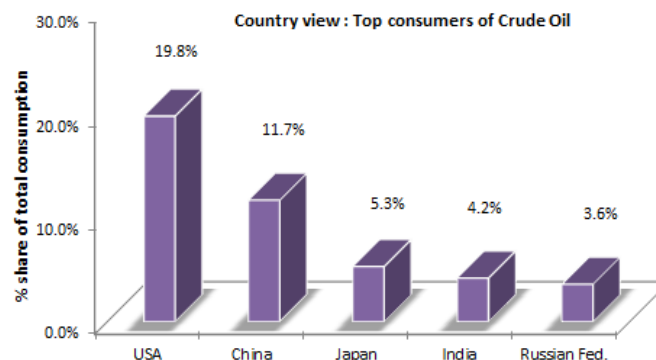
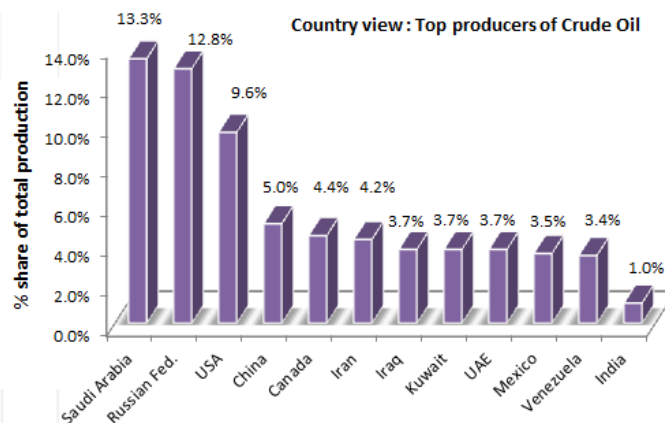


World Crude Oil production

The Middle Eastern region continues to be the world's largest producer of Crude Oil, followed by Eurasia. Country-wise, Saudi Arabia and the Russian Federation provide for almost 25% of the world's crude oil requirements. India contributes just about 1%.

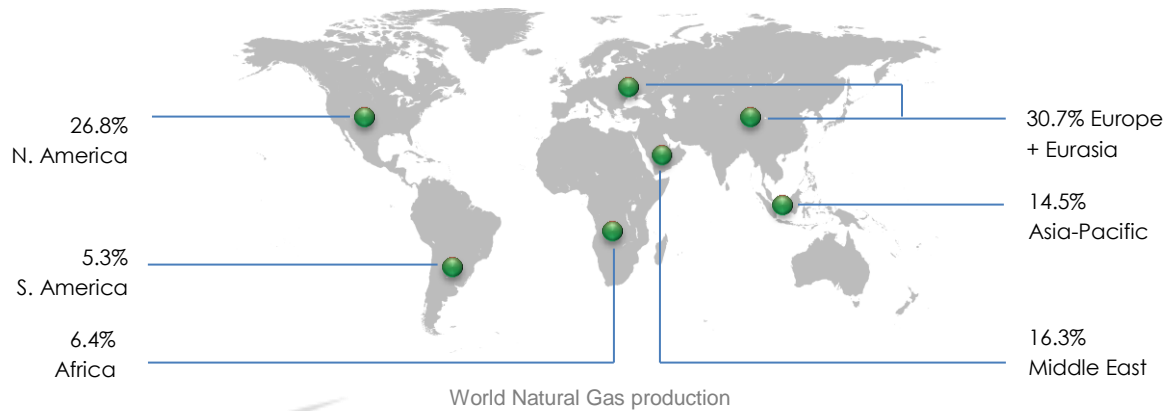
In terms of consumption, the United States of America is the world's largest consumer of Crude Oil, followed by China with a significant margin between their consumption levels. India is the 4th largest consumer of crude oil, and ranks 3rd in Asia-Pacific countries.

It may be worth noting that India's consumption to production deficit is at 3.2% against world figures. In other words, the Indian Energy scenario is extremely skewed with more than 70% of Crude Oil being imported at a huge loss of foreign exchange to the exchequer.

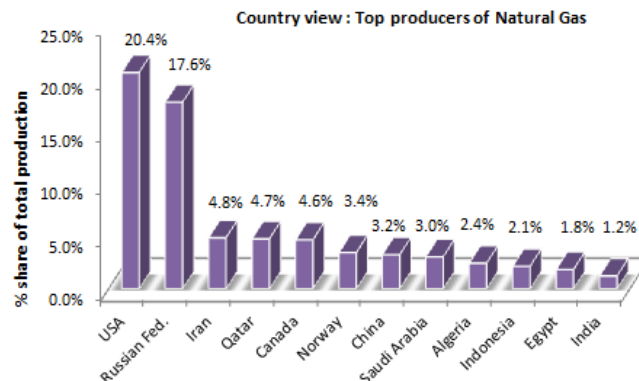


Source : Ministry of Statistics & Programme Implementation, GOI Graphics : BigSwitch India

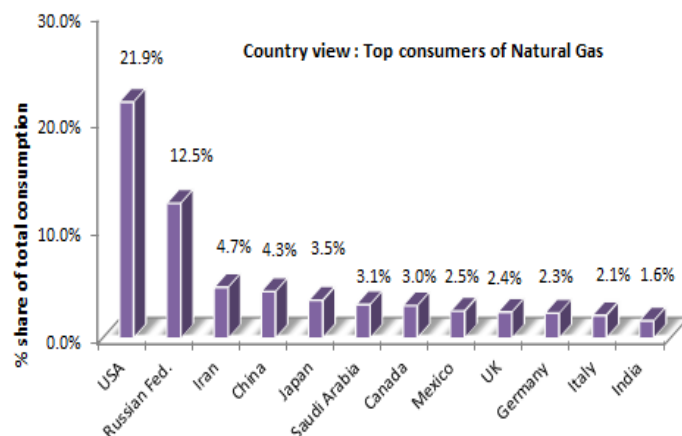
Worldview : Natural Gas production & consumption



The area comprising of Europe and Northern Asia collectively produces about 30% of the worlds' Natural Gas requirements, closely followed by the United States of America. From an individual country-perspective, USA is the worlds' largest producer followed by the Russian Federation. India contributes about 1.2% to world production.



Quite paradoxically, USA is also the worlds' largest consumer of Natural Gas. The difference between the top 2 countries is quite significant, and consumption of other countries pales in comparison to these 2 economies. India contributes about 1.6% of world consumption, which in other terms means the ratio of consumption to production is better matched, though there is dependency of about 25% on imports.



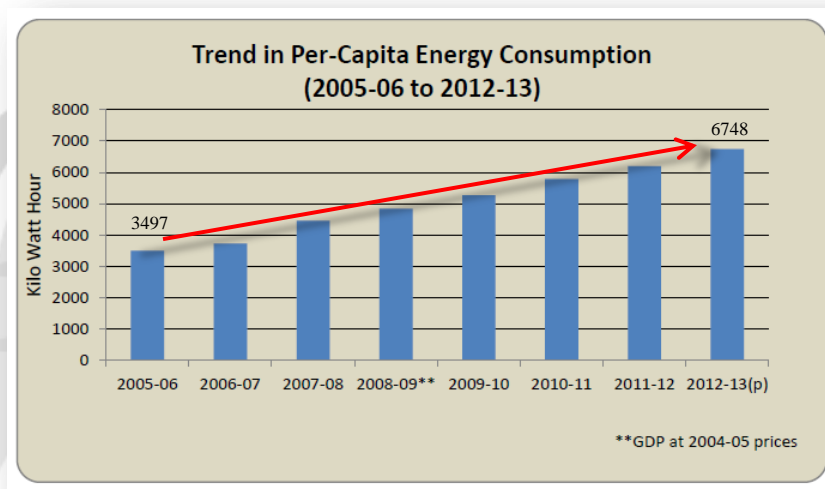
Source : Ministry of Statistics & Programme Implementation, GOI Graphics : BigSwitch India

India is reeling under a steep Energy crisis, made difficult due to our extreme dependency on fossilised fuels to run our economy, most of which are required to be imported.

Energy trends

1. Per-Capita consumption of Energy in India

The ratio of the estimate of total energy consumption during the year to the estimated mid-year population of that year) is called the Per-capita Energy Consumption (PEC). As is evident from the graphic released by GOI, the PEC increased from 3,497 KWh in 2005-06 to 6748 KWh in 2012-13. At a CAGR of 8.56%, India ranks amongst the highest in the world.



Source & Graphics : Ministry of Statistics & Programme Implementation, GOI

2. Energy-intensive Industrial sectors

Extensive research conducted on data held by the Bureau of Energy Efficiency (BEE), the Annual Survey of Industries (ASI) and the 'Prowess database' provides us a further drill-down of the list of various energy-intensive industrial sectors of India. The top-15 Energy consumers of the Industry sector are depicted in the snapshot below. These include Energy in all forms, with the primary ones being Electrical, Coal and Petroleum based.

The industries that are responsible for maximum Energy consumption are Automobile, Textiles (Spinning, Weaving & Finishing), Paper & pulp, Breweries, Dairy-based, Leather, Petroleum offshore rigs, Food-processing, Pharmaceuticals, Rubber, Jute, Galvanising/Electroplating, Tea & Tobacco and Agro malls.



Source : Ministry for New & Renewable Energy (MNRE), GOI; Graphic : BigSwitch India

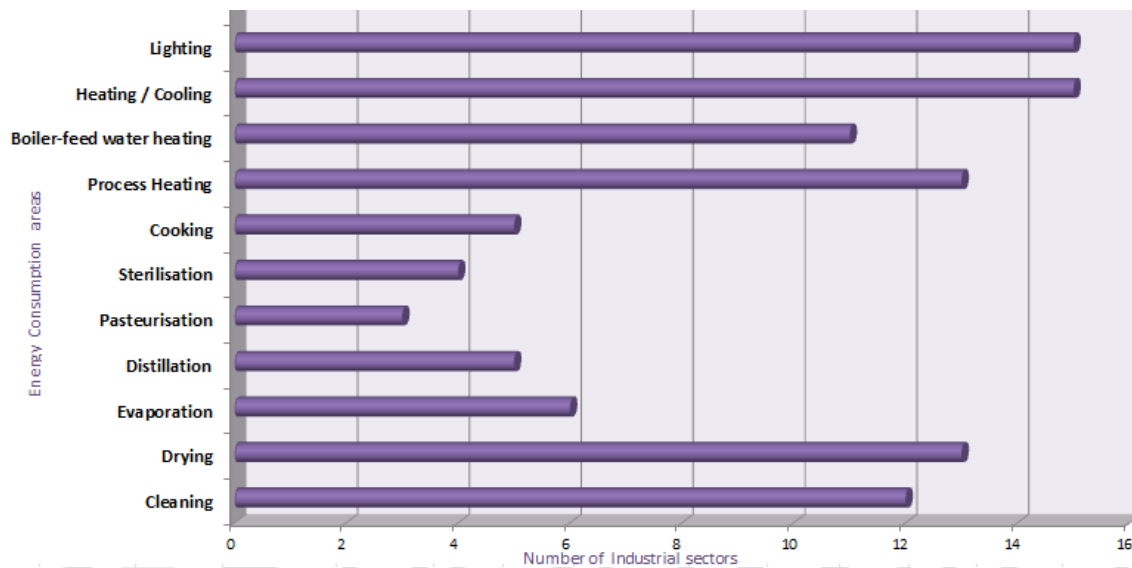
The Textile industry (both ‘Spinning & Weaving’, and ‘Finishing’) consume very high levels of Energy, closely followed by ‘Pulp & Paper’, and ‘Food processing’. Together, these 3 industries can well surpass the annual Energy requirements of a small country.

Within the top-15 consumers of the Industrial sector, a further data-mapping of the Energy applications that consume a significant amount of Energy has been conducted, and is as below-

#	Sector	Cleaning	Drying	Evaporation	Distillation	Pasteurisation	Sterilisation	Cooking	Process Heating	Boiler-feed water heating	Heating / Cooling	Lighting
1	Automobile	X							X		X	X
2	Breweries	X	X	X	X	X	X	X	X	X	X	X
3	Dairy	X	X	X	X	X	X	X	X	X	X	X
4	Food processing	X	X	X	X	X	X	X	X	X	X	X
5	Leather		X	X				X	X	X	X	X
6	Petroleum Offshore rigs	X									X	X
7	Pulp and Paper		X						X	X	X	X
8	Rubber		X	X					X	X	X	X
9	Pharmaceuticals	X	X	X	X		X	X	X	X	X	X
10	Textile (Spinning)	X	X						X	X	X	X
11	Textile (Dyeing & Weaving)	X	X						X	X	X	X
12	Electroplating/Galvanizing	X	X						X		X	X
13	Tea and Tobacco processing	X	X		X				X	X	X	X
14	Agro Malls	X	X								X	X
15	Jute Mills	X	X						X	X	X	X

Source : Ministry for New & Renewable Energy (MNRE), GOI Graphic : BigSwitch India

The common Energy usage areas across all top-15 industries involve their Heating/Cooling and Lighting requirements. A significant amount of applications also involve Drying processes. In some cases, industries depend on DG power in order to supplement erratic or broken power that is available from the State Utility & Distribution companies.

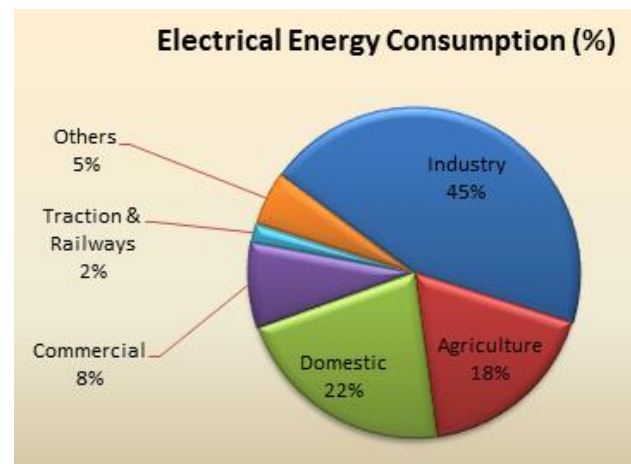


Source : Ministry for New & Renewable Energy (MNRE), GOI; Graphic : BigSwitch India

Electrical Energy consumption distribution

It is a well-established fact that development of Industry, especially MSME sector is the key driver for improvement of the GDP of an economy. Indian industry contributes significantly towards GDP calculation.

Industrial sector also consumes about 45% of all Electricity that is produced in the country, making it by-far the largest segment of electrical Energy users, easily surpassing the combined consumption of Agriculture and Domestic users.



Source : Central Electricity Authority, GOI; Graphic : BigSwitch India

Conclusion

The above information clearly points to the Indian Industry being one which is overtly dependent on costly, harmful fuels for Energy-generation. Whilst the cost of production is being passed on to the consumer, the intangible components are what the overall Indian population shall have to bear in mind.

In our opinion and assessment, Indian Industry, and specifically the top-15 industries depicted above present the best opportunity to the country to move towards Renewable Energy. The Industrial sector is an energy-intensive sector, and with significant Energy consumption figures, could be a cause of worry over the next 30 years. While Government has been very supportive in terms of the policy changes and programmes launched in recent years, the onus to gift a sustainable country to our future generations depends majorly in the way Industry deals with its Energy requirements. An entire gamut of challenges, not limited to depletion of Forex reserves, increase in local environmental pollution levels, stagnation of economy, etc could become a thing of the past, if we change our thinking and adopt newer processes and products that shall impact the way we generate and consume Energy.

Solar PV and Wind based Energy offers the greatest hope for a country that has these in abundance. With more than 5 hours of sunshine over 300 days in a year, as well as significant wind factor in several areas, Industrial roofs and sheds provide for a one-time investment opportunity to several small, medium and large industries who are dependent on fossil-based Energy for their production and processes. Besides being the cheapest in terms of costs, these systems pay back for themselves over a few years and continue to generate Clean Energy for generations to come.

Benefits

The obvious advantage of having opted for a Renewable solution is reduced Energy costs. In addition, accelerated depreciation for sunken capital costs can be availed by Industries in their annual balance sheets and tax filing. Several other options such as capital subsidy and small ticket loans are available for making a positive impact to the businesses that Industry is engaged in. Carbon credits for Energy thus generated and CSR benefits to registered companies are also key facets that shall appeal to Industry. Renewable Energy systems are also easily scalable and portable, should there be a requirement to do so in the future.

All in all, it's a win-win situation for Industry and for the community. The question is, are we up for it ?

The time to act is now !

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About the author

Prasad Kulkarni is an Engineer by profession. He is a certified 'Black Belt' in Process Design and Improvement methodologies using Six Sigma and Lean principles and TRIZ. Having helped several multinationals globally achieve their corporate goals over the past decade and a half, he co-founded BigSwitch India along with Puja Goswami to help corporates and individuals adopt an 'Energy-mix' that includes a significant inflow of Clean Energy.

He is based in Mumbai and can be reached at prasad@bigswitchindia.com

About BigSwitch India

BigSwitch India is a fast-growing EPC* company engaged in the field of Renewable Energy, and provides end-to-end solutions that comprise of Solar, Wind or Hybrid systems to Clients who would like to use Clean Energy as part of their energy-mix. Solar and Wind being Renewable, are the most promising sources of Energy available to mankind, and are highly promulgated by Governments around the world as being the fuel-sources of the future. You may read more at www.bigswitchindia.com

*EPC stands for Engineering, Procurement & Construction