

ENERGY SCENARIO



Lesson Objectives

After completing this lesson, you will be able to describe the followings.

- Energy and their classifications
- Indian Energy scenario
- Sectoral energy consumptions
- Long term Energy scenario
- Energy Pricing
- Energy security
- Energy conservation and its importance
- Energy strategy for the future, Energy Conservation Act 2001 and its features.

Energy

- It is a ‘capacity to do work’.
- Energy is one of the major Inputs for the economic development of any country.
- Fossil fuel like coal, oil & natural gas are main source of energy.
- The **electricity sector in India** had an installed capacity of 267.637 GW as of end March 2015.
- India became the world's third largest producer of electricity in the year 2013.

- During the fiscal year 2014-15, the electricity generated is 1,030.785 billion KWh with a short fall of requirement by 38.138 billion KWh (-3.6%).

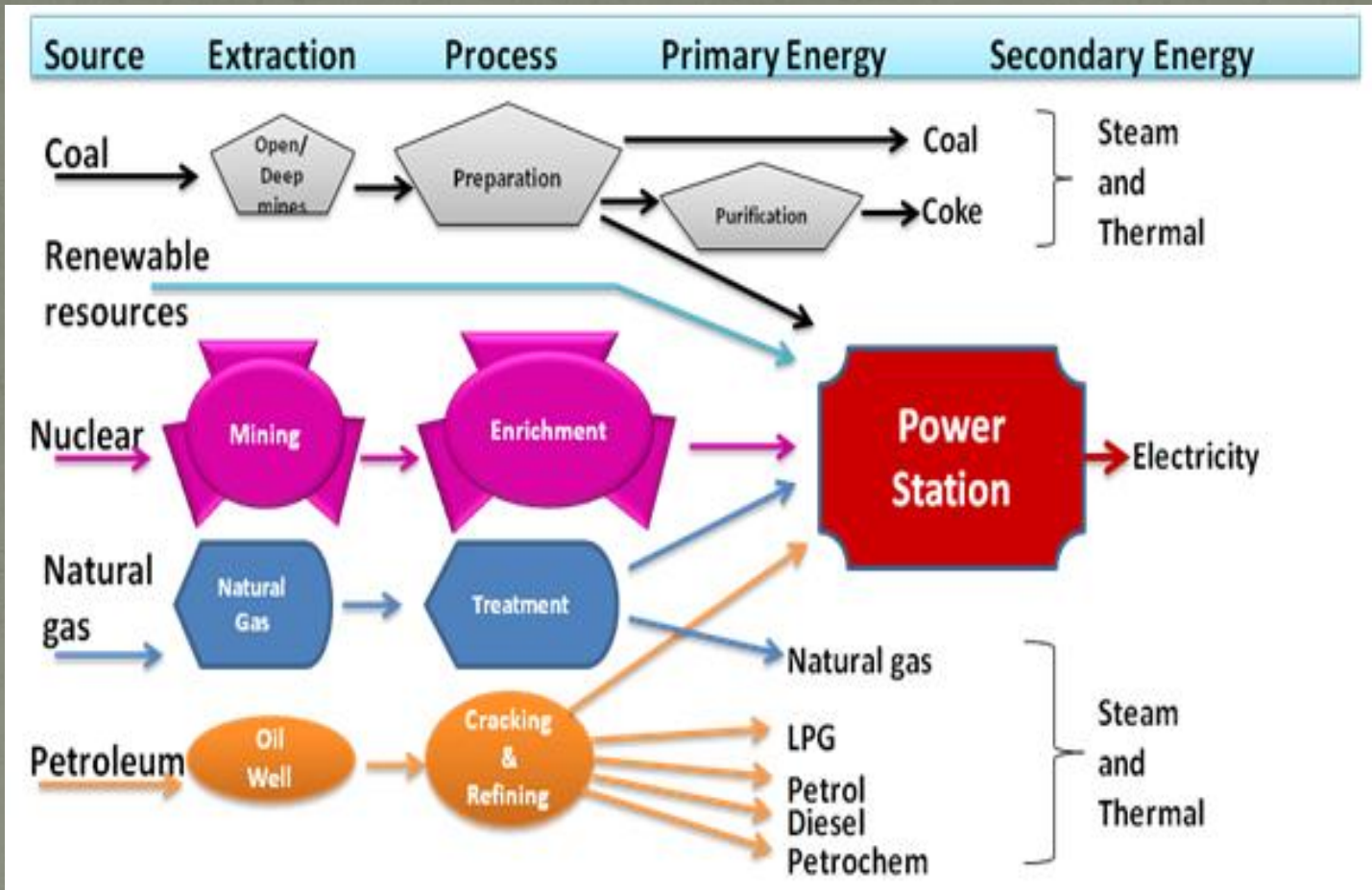
Energy Classifications

Energy can be classified into several types based on the following criteria:

1. Primary and Secondary energy
2. Commercial and Non commercial energy
3. Renewable and Non-Renewable energy

Primary and Secondary energy

- **Primary energy** is an energy form found in nature that has not been subjected to any conversion or transformation process. It is energy contained in raw fuels, and other forms of energy received as input to a system. Primary energy can be non-renewable or renewable.
- Common primary sources are Coal, natural Gases, Oil, Nuclear, Biomass etc.
- Primary energy sources are mostly converted in industrial utilities in **SECONDARY** energy. Common secondary energy are Electricity, Steam etc.

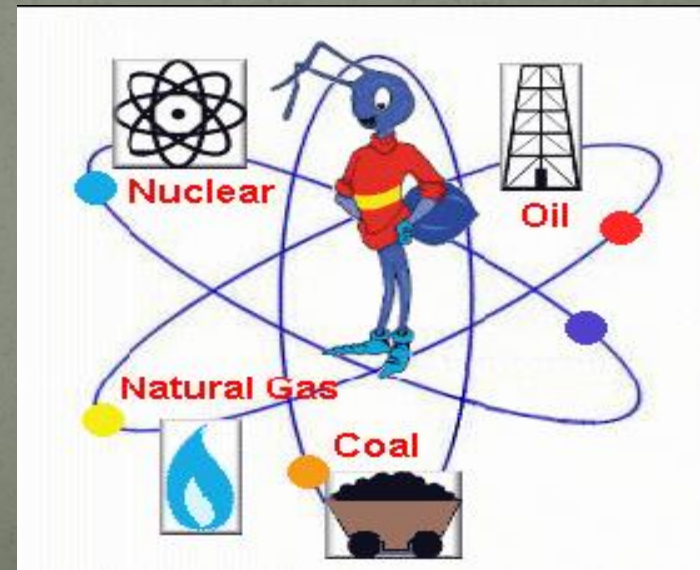
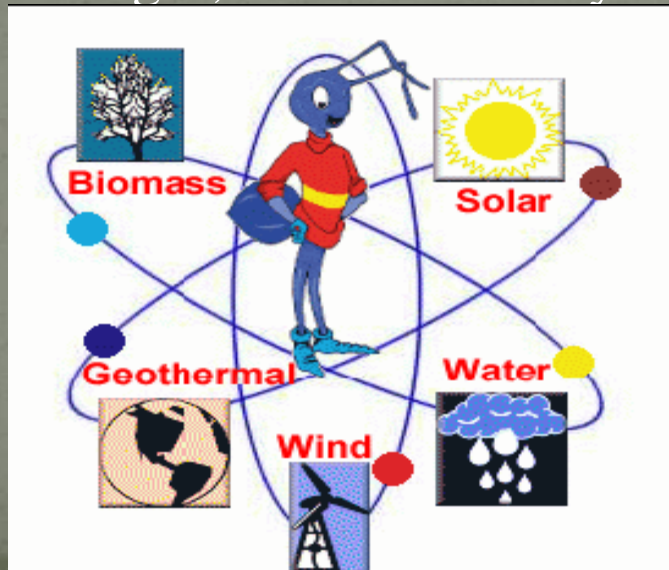


Commercial and Non commercial energy

- The energy available in market for a definite price is called commercial energy.
- Common Commercial energies are coal, electricity and refined petroleum products.
- The energy, not available in commercial market is called non commercial energy.
- Firewood, cattle dung and agriculture waste comes under this category.
- These kind of energy is often ignored in energy accounting.

Renewable and Non Renewable energy

- Renewable energy is energy obtained from sources that are essentially inexhaustible.
- Examples of renewable resources include wind power, solar power, geothermal energy, tidal power and hydroelectric power.
- The most important feature of renewable energy is that it can be harnessed without the release of harmful pollutants.
- Non-renewable energy is the conventional fossil fuels such as coal, oil and gas, which are likely to deplete with time.



Global Primary Energy Consumption

- The global primary energy consumption at the end of 2003 was equivalent to 9741 million tonnes of oil equivalent (Mtoe).
- It may be seen that India's absolute primary energy consumption is only 1/29th of the world, 1/7th of USA, 1/1.6th time of Japan.
- but 1.1, 1.3, 1.5 times that of Canada, France and U.K respectively.

TABLE 1.1 PRIMARY ENERGY CONSUMPTION BY FUEL, 2003

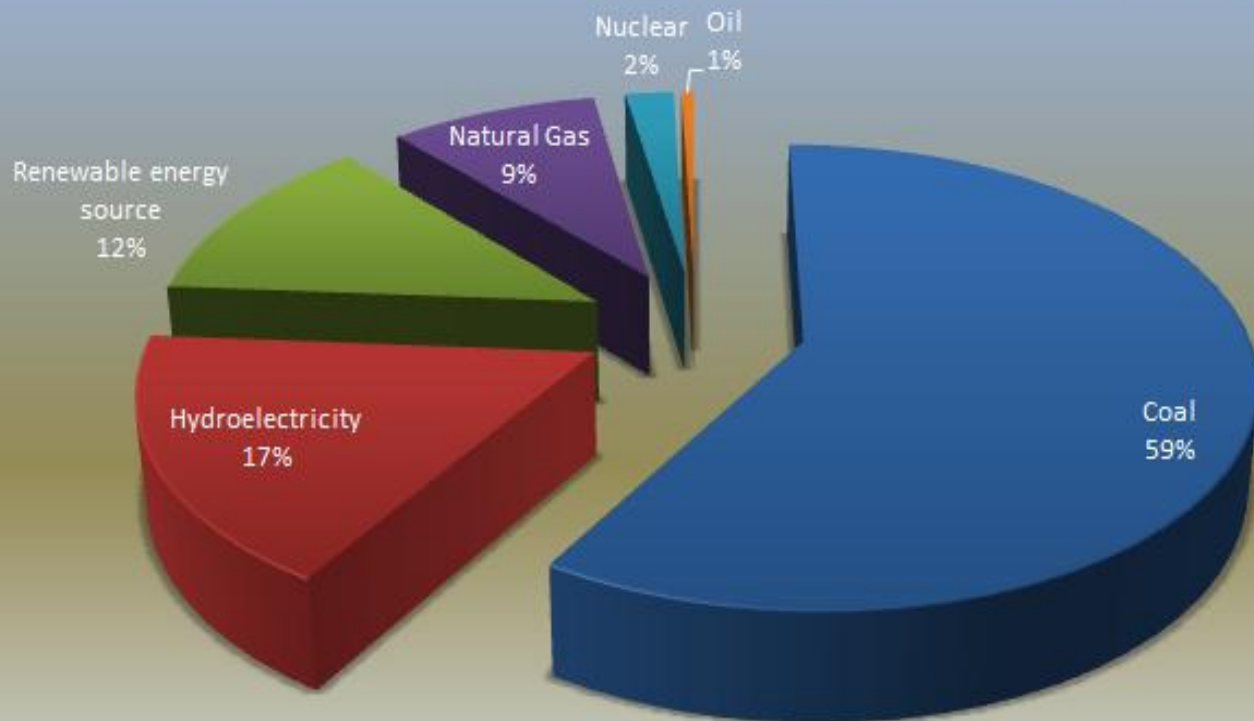
In Million tonnes oil equivalent

Country	Oil	Natural Gas	Coal	Nuclear Energy	Hydro electric	Total
USA	914.3	566.8	573.9	181.9	60.9	2297.8
Canada	96.4	78.7	31.0	16.8	68.6	291.4
France	94.2	39.4	12.4	99.8	14.8	260.6
Russian Federation	124.7	365.2	111.3	34.0	35.6	670.8
United Kingdom	76.8	85.7	39.1	20.1	1.3	223.2
China	275.2	29.5	799.7	9.8	64.0	1178.3
India	113.3	27.1	185.3	4.1	15.6	345.3
Japan	248.7	68.9	112.2	52.2	22.8	504.8
Malaysia	23.9	25.6	3.2	-	1.7	54.4
Pakistan	17.0	19.0	2.7	0.4	5.6	44.8
Singapore	34.1	4.8	-	-	-	38.9
TOTAL WORLD	3636.6	2331.9	2578.4	598.8	595.4	9741.1

Indian Energy Scenario

- Coal dominates the energy mix in India, contributing to 55% of the total primary energy production.
- Over the years, there has been a marked increase in the share of natural gas in primary energy production from 10% in 1994 to 13% in 1999.
- There has been a decline in the share of oil in primary energy production from 20% to 17% during the same period.
- The **electricity sector in India** had an installed capacity of 267.637 GW as of end March 2015.
- During the fiscal year 2014-15, the electricity generated is 1,030.785 billion KWh with a short fall of requirement by 38.138 billion KWh (-3.6%).

Sources of electricity in India by Installed Capacity



Final Energy Consumption

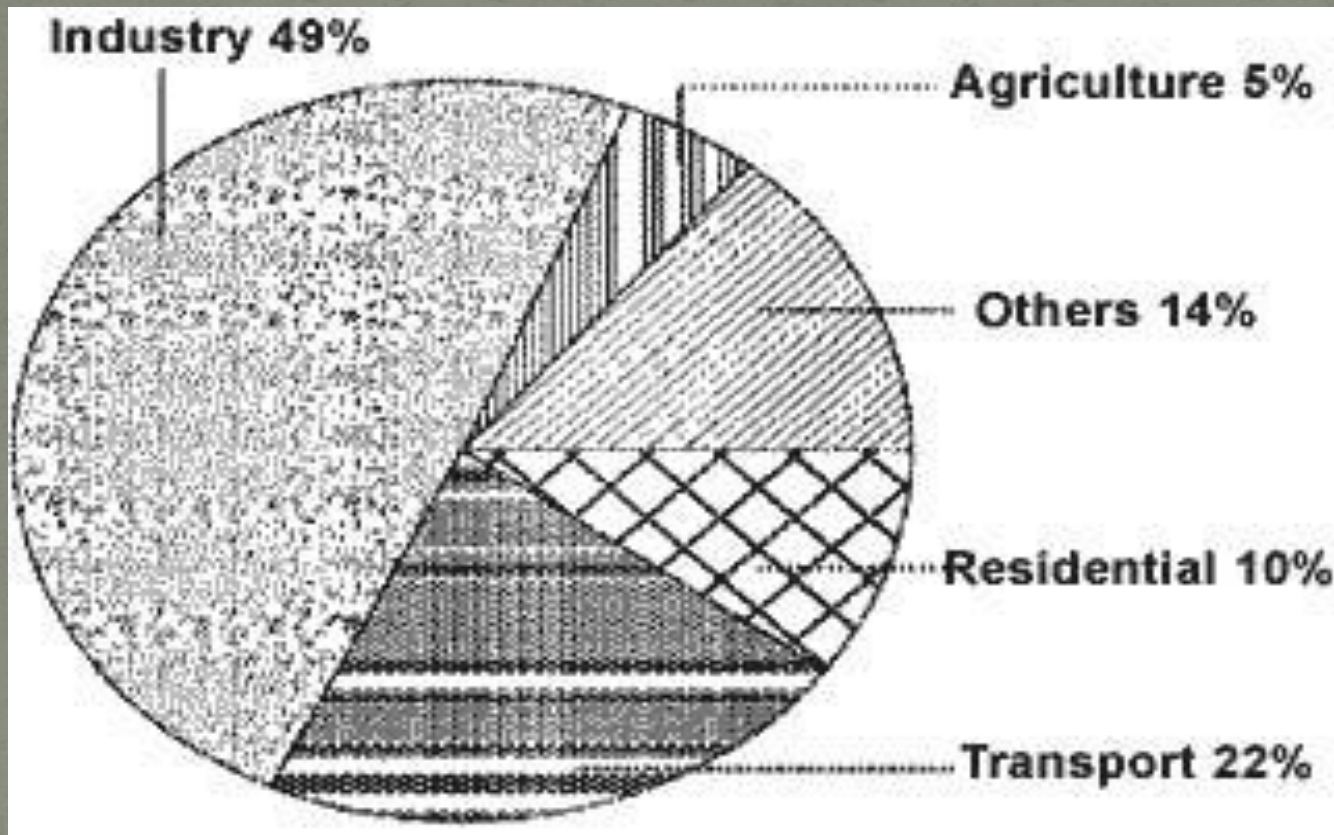
- Final energy consumption is the actual energy demand at the user end.
- This is the difference between primary energy consumption and the losses that takes place in transport, transmission & distribution and refinement.
- The actual final energy consumption (past and projected) is given in Table 1.2.

TABLE 1.2 DEMAND FOR COMMERCIAL ENERGY FOR FINAL CONSUMPTION (BAU SCENARIO)

Source	Units	1994-95	2001-02	2006-07	2011-12
Electricity	Billion Units	289.36	480.08	712.67	1067.88
Coal	Million Tonnes	76.67	109.01	134.99	173.47
Lignite	Million Tonnes	4.85	11.69	16.02	19.70
Natural Gas	Million Cubic Meters	9880	15730	18291	20853
Oil Products	Million Tonnes	63.55	99.89	139.95	196.47

Source: Planning Commission *BAU: Business As Usual*

Sectorial Energy Consumption in India

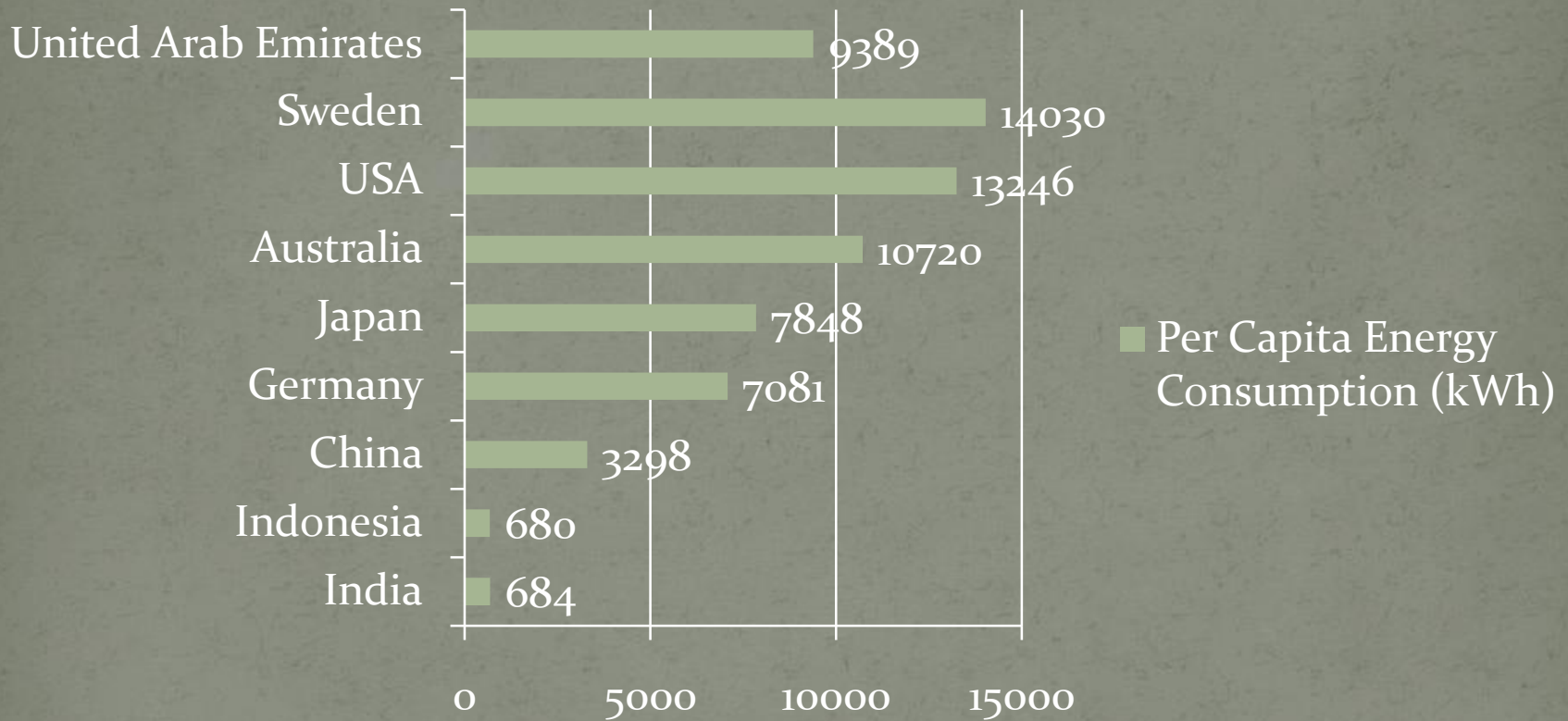


Energy Needs of Growing Economy

- The energy industry contributes to economic growth in two ways. First, energy is an important sector of the economy that creates jobs and value by extracting, transforming and distributing energy goods and services throughout the economy.
- Second, energy underpins the rest of the economy. Energy is an input for nearly all goods and services. In many countries, the flow of energy is usually taken for granted.
- In this context, the ratio of energy demand to GDP is a useful indicator.

- A high ratio reflects energy dependence and a strong influence of energy on GDP growth.
- The developed countries, by focusing on energy efficiency and lower energy-intensive routes, maintain their energy to GDP ratios at values of less than 1. The ratios for developing countries are much higher.

Per Capita Energy Consumption (kWh)



- The per capita energy consumption is too low for India as compared to developed countries. It is just 4% of USA and 20% of the world average.
- The per capita consumption is likely to grow in India with growth in economy thus increasing the energy demand.

Long Term Energy Scenario for India

Coal

- India has the world's 4th largest coal reserves. It is the most important and abundant fossil fuel in India. It accounts for 55% of the country's energy need.
- Energy demand in India is expected to increase over the next 10-15 years; although new oil and gas plants are planned, coal is expected to remain the dominant fuel for power generation.

- to meet expected future demand, indigenous coal production will have to be greatly expanded. Production currently stands at around 290 Million tonnes per year.
- Commercial primary energy consumption in India has grown by about 700% in the last four decades.
- With hard coal reserves around 246 billion tonnes, of which 92 billion tonnes are proven, Indian coal offers a unique eco friendly fuel source for the domestic energy market for the next century and beyond.

- Hard coal deposits, spread over 27 major coalfields, are mainly confined to eastern and south central parts of India. Lignite reserves stand at around 36 billion tonnes, of which 90% occur in the southern State of Tamil Nadu.
- It has been estimated that at current levels of consumption the proven reserves of coal will last for 80 years .
- However, the coal consumption will increase as India tries to meet its energy requirements and thus the reserves will last for fewer years. If domestic coal production continues to increase at a rate of 5% the extractable reserve will run out in around 45 years.

Petroleum/Oil:

- India has total reserves (proved and indicated) of 1201 million metric tonnes of crude oil.
- Crude oil production during 2009-10 at 33.69 million metric tonnes was 0.55% higher than the 33.51 million metric tonnes produced during 2008-09.
- The consumption of petroleum products during 2009-10 was 138.196 million metric tonnes (including sales through private imports) which is 3.60% higher than the sales of 133.400 million metric tonnes during 2008-09.

- India's self sufficiency in oil has consistently declined from 60% in the 50s to 30% currently. Same is expected to go down to 8% by 2020.

Natural Gas:

- India has total reserves (proved and indicated) of 437 billion cubic meters of natural gas as of 1st April 2010.
- Gross Production of Natural Gas in the country at 47.51 billion cubic meters during 2009-10 was 44.63% higher than the production of 32.85 billion cubic meters during 2008-09.

Energy at a glance

- For crude oil, there is no shortage expected before 2020.
- Coal, the most abundant fossil fuel, is estimated to last for at least another 220 years.
- The potential for natural gas is large – including a growth rate of 2.6% per year, it is expected to serve global requirements well into the second half of the 21st century.
- Considering the relative growth stagnation of nuclear fission, nuclear fuel (uranium) is not the limiting factor for this energy source for many decades to come.

- Alternative to fission, there is nuclear fusion being researched and not yet on an industrial scale; it is a completely different nuclear energy supply technology with practically unlimited fuel resources.
- Hydropower, having still a growth potential of a factor of 5 worldwide, for many regions environmental and economic reasons limit this resource being exploited much further.
- Other renewables, like wind, biomass, solar and geothermal have a promising potential, however growth towards significant contributions to the overall energy mix depends on incentives given for further development, future energy prices and energy policies regarding environmental impacts of energy systems.

THANK YOU