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The Scenario of Energy Access and Potentials for Sustainable Energy Development in India

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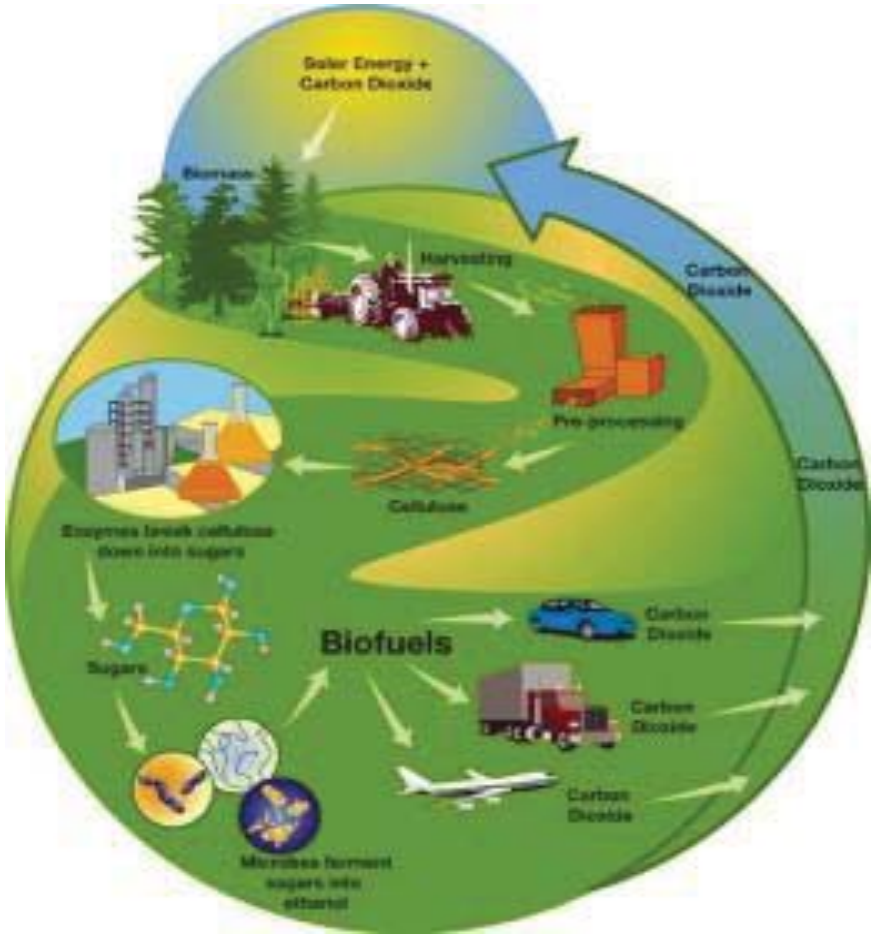

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BACKGROUND

- Energy services are essential ingredients of all three pillars of sustainable development - economic, social and environmental.

- equity of access to basic energy services for cooking, space heating and lighting, like access to water, could be considered a human right.

- When communities gain access to energy effect on basic survival activities to increasing productivity - improving health, well-being, opening up opportunities.

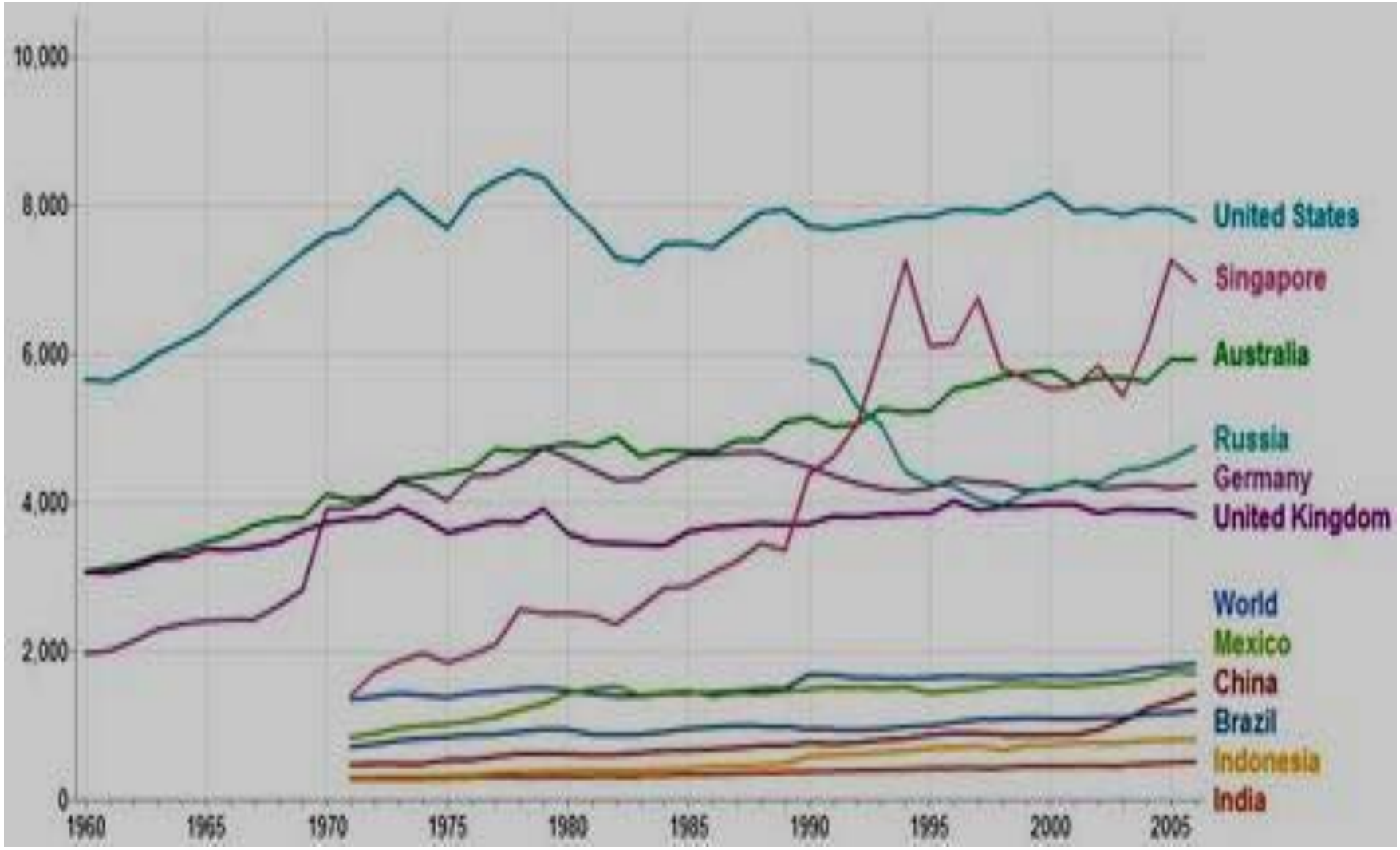
Contd…

- Indian economy has experienced gradual growth over the past several years.
- Indian economy to continue this trajectory, needs to address its energy challenges, which cross all sectors and impact all citizens.
- The quality of the current electricity supply is impeding India’s economic growth.
- Now - The economic development of India is hindered due to “energy poverty”
- Energy in terms of quality and access—is a key challenge.

The Scenario

- Today, for each 1% of economic growth, India needs 0.75% of additional energy.
- India’s total commercial energy supply is dominated by coal and largely-imported oil with renewable energy resources contributing less than 1%.
- India’s electricity shortages have cost the Indian economy 6% of gross domestic product (GDP) in financial year 2007–2008.
- Needs to double its installed generating capacity to over 300 GW.

Percapita energy use (KgOE)



Number of people without access to electricity and relying on the traditional use of biomass, 2009 (million)

Countries	Number of people lacking access to electricity	Number of people using traditional biomass for cooking
Sub-Saharan Africa	585	653
China	8	423
India	404	855
Other Asia	387	659
Latin America	31	85
Developing countries*	1 438	2 679
World**	1 441	2 679

Source: IEA databases and analysis

The Demand

- For achieving GDP annual growth of 8%, needs commercial energy supply at the very least by three to four times by 2031–2032
- the electricity generation capacity by five to six times over 2003–2004 levels.
- The base-load capacity will probably need to exceed 400 GW by 2017.
- In 2031– 2032, India will require approximately 1,500–2,300 million tonnes of oil equivalent (MTOE) to cover its total commercial energy needs.

Generation requirements for universal electricity access, 2030 (TWh)

Region	On-grid	Mini-grid	Isolated off-grid	Total
Sub Saharan Africa	195	187	80	462
China	1	1	0	2
India	85	112	48	245
Other Asia	87	94	40	221
Latin America	6	3	1	10
Developing countries*	379	399	171	949
World**	380	400	172	952

Investment requirements for electricity ($ billion)

Region	2010 -15	2016-30
Sub Saharan Africa	80	262
China	1	0
India	**52**	**130**
Other Asia	74	84
Latin America	5	3
Developing countries*	219	478
World**	223	477

CONTRIBUTION OF ENERGY SOURCES IN INDIA

ENERGY TYPE	CONTRIBUTION TO TPES* (%)
Coal and peat	42.1
Crude oil	27.3
Gas	5.7
Hydro	1.6
Combustible renewables & waste	26.3

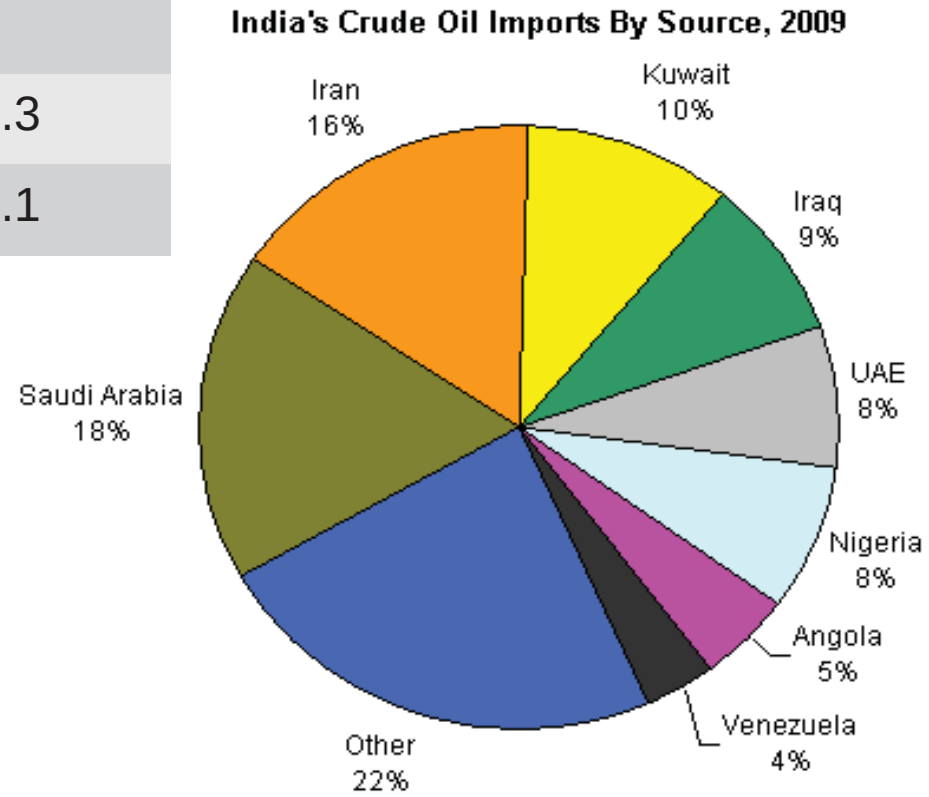
** Total Primary Energy Supply*

Coal dominates the Indian commercial energy basket followed by oil and gas

***Source:** EIA, 2010*

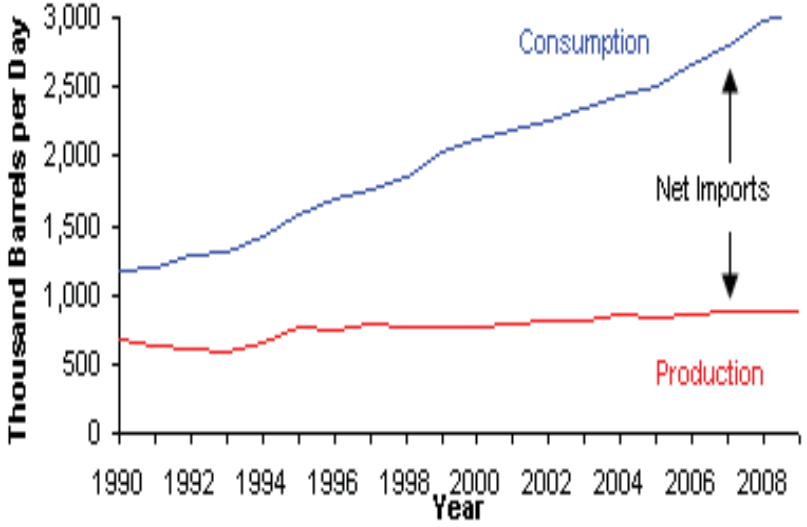
CONTRIBUTION AND IMPORT DEPENDENCE OF MAJOR FOSSIL FUEL TYPES IN INDIA IN 2008

Energy source	TPES (ktoe)	Import dependence (%)
Coal and peat	261373	14.6
Crude oil	169313	77.3
Natural gas	35601	26.1



Source: Global Trade Atlas

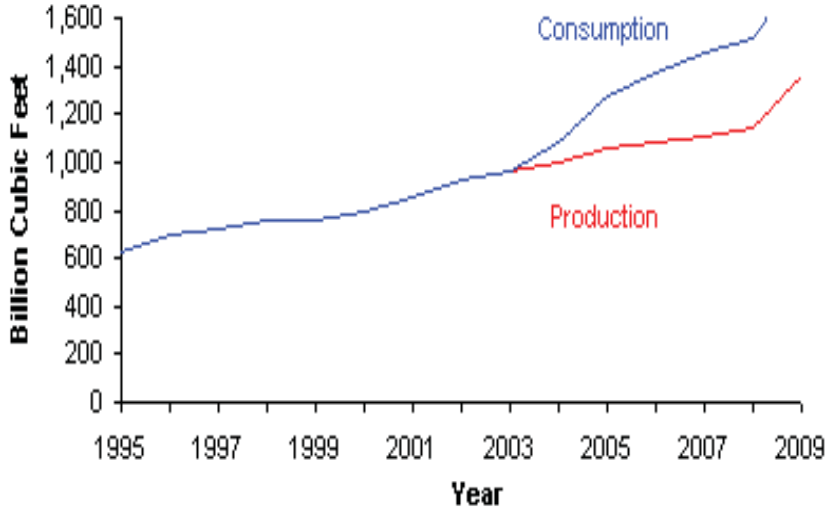
India's Oil Production and Consumption 1990-2009*



*2008-09 is forecast

Source: U.S. Energy Information Administration

India's Dry Natural Gas Production and Consumption 1995-2009



Source: U.S. Energy Information Administration

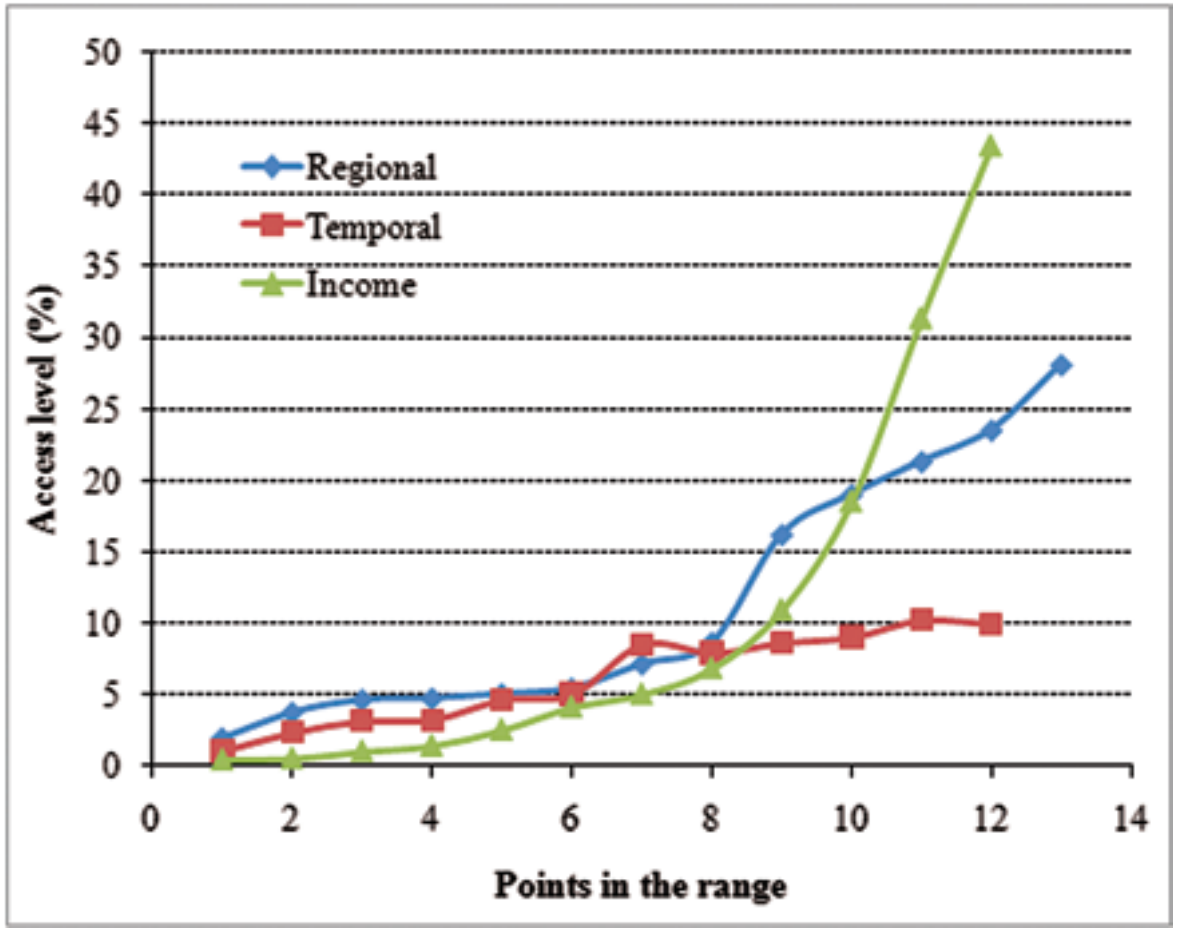
Energy consumption (%)

Source	Rural	Urban
Firewood	77.6	20
LPG	9.1	62
Dung cake	7.4	1
Kerosene	0.6	8

Current and expected future energy consumption in households

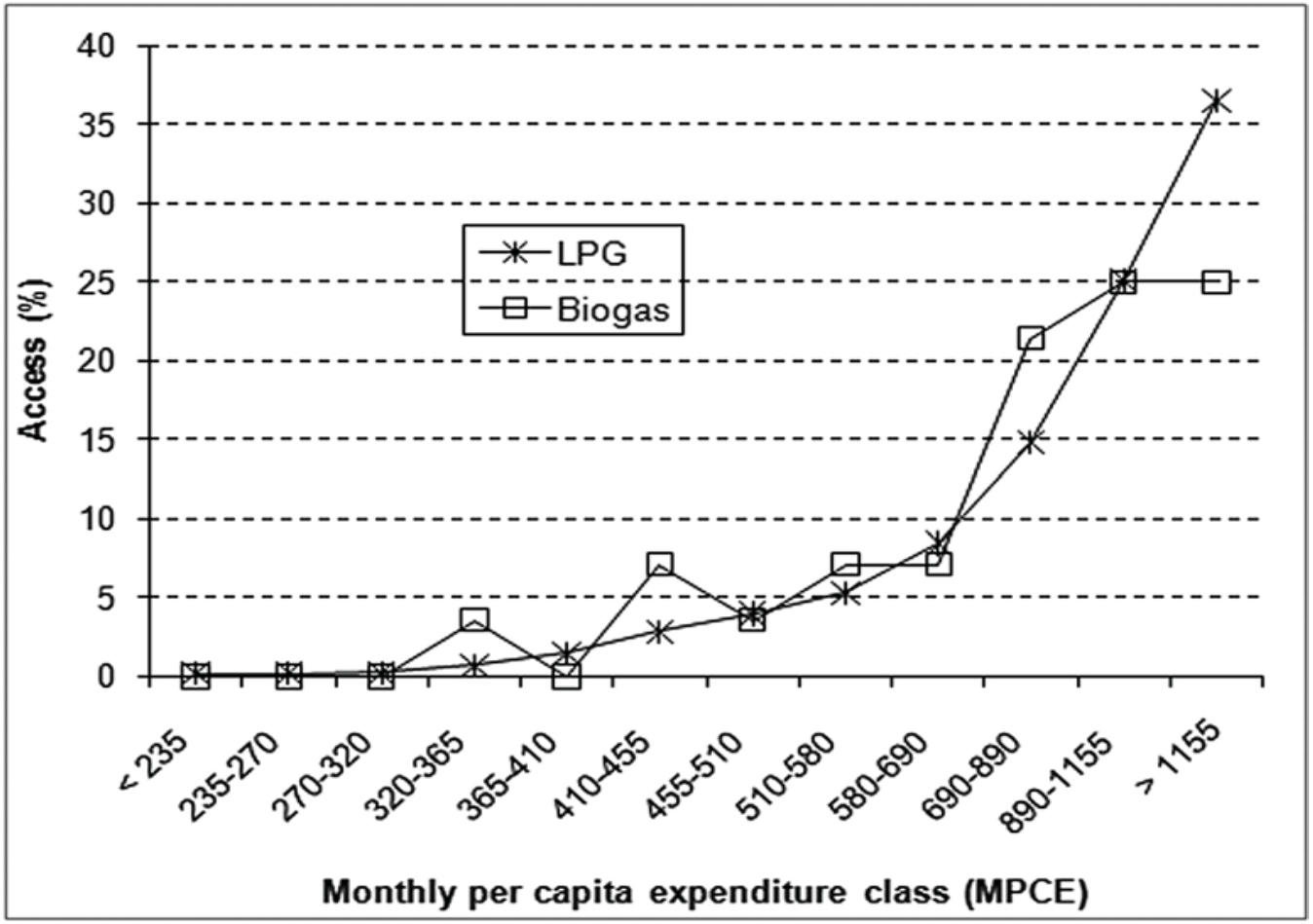
Source	Consumption 2003-2004 MTOE (%)	Projections 2031-2032 MTOE (%)
Fuel wood	92.57 (57.82)	106.39 (37.44)
Agro waste	17.12 (10.69)	-
Dung cake	22.62 (14.13)	40.47 (14.24)
Biogas	0.71 (00.44)	-
Kerosene	10.69 (06.68)	15.12 (05.32)
Electricity	7.72 (04.82)	69.72 (24.53)
LPG	8.68 (05.42)	52.49 (18.47)
Total	160.11	284.19

Dynamic changes in rural cooking energy access



- pro-poor energy access policies of the government have not achieved the desired results

Access to Biogas and LPG



- majority of the rural households that use LPG or biogas as primary cooking fuels fall in the middle and higher income groups

- the impact of the absence of energy services, spend 2-6 hours each day collecting 10-15 kilograms of wood over distances of 4-8 kilometres

- dependence on traditional fuels are posing serious economic, environmental, and health threats

- disease due to indoor air pollution among women and children in rural areas are most affected, more than 400,000 dying every year in India.

- Of these deaths, almost 90 per cent accounts for children under the age of five.

- Rural households have been linked to an additional 450 million cases of acute or chronic illnesses due to the use of biomass fuels.

- Most poor people live in areas that lack access to infrastructure of all types – Electricity, LPG and Kerosene

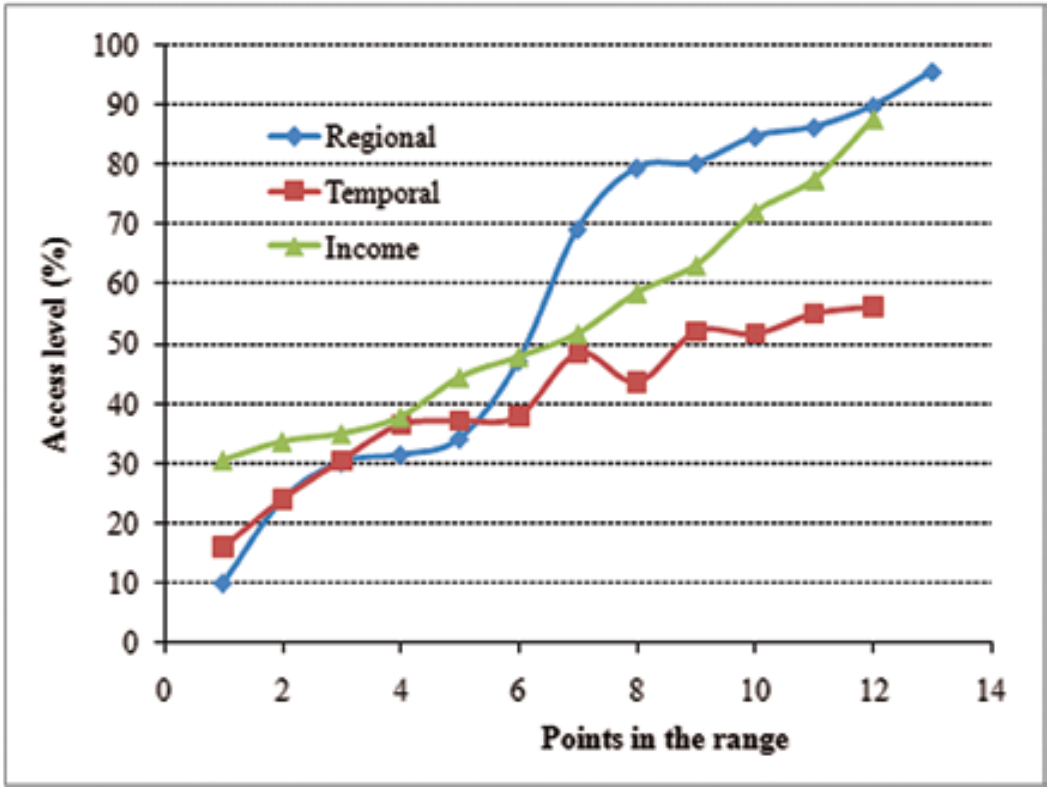
- Though State Government has implemented free LPG connection, not afford for the next one.

- In India, the lack of legal status and migrants (Ration Card) of poor households is a barrier to them having access to kerosene from the public distribution system and to get LPG gas cylinder for cooking and lighting, even if they can afford to pay for them.

- Subsidies in India suffer from poor targeting because of their blanket nature. Blanket energy subsidies always benefit the elite more than the poor, since they use more energy than the poor.

- energy subsidies are highly, and very difficult to reform

Dynamic changes in rural electricity access



- the governments both at the national and state level have initiated many programmes for expanding rural electricity access

Energy Potentials – India

- Climate change is the challenge and the opportunity for developing countries to ‘leapfrog’
  - fossil fuel path dependency and
  - become low-carbon sustainable development

- India has great potential to accelerate the use of its endowed renewable resources to power its growing economy with a secure and affordable energy supply.

Wind Power

- India has been a pioneer in the commercial use of wind energy in Asia since the 1990s
- India had the fifth largest installed wind capacity globally
- During 2009, India added 1,338 MW of wind capacity for a total installed capacity of 10,925 MW.
- India's wind capacity totalled 12,009 MW at the end of June 2010, which represented 70% of India's total renewable energy capacity

Wind Potential for Nine Indian States (C-WET)102

State	Wind Power Potential (MW)
Andhra Pradesh	8,968
Gujarat	10,645
Karnataka	11,531
Kerala	1,171
Madhya Pradesh	1,019
Maharashtra	4,584
Orissa	255
Rajasthan	4,858
Tamil Nadu	5,530
Total	48,561

Solar Power

- On average, the country has 300 sunny days per year and receives an average hourly radiation of 200 MW/km2.
- The India Energy Portal estimates that around 12.5% of India's land mass, or 413,000 km2, could be used for harnessing solar energy.
- Estimated that Concentrated Solar Power technology alone could generate 11,000 TWh per year for India.
- JNNSM's target of achieving at least 20,000 MW154 of grid-connected solar power by 2022

Small Hydro Power

- MNRE has estimated, potential for small hydro in India is15,000 MW for 5,718 prospective plant sites

- The Indian government aims to develop half of the identified potential in the next 10 years

- As of March 2010, a total of 2,735 MW of grid-connected small hydropower has been installed, contributing about 16.2% to India’s total grid interactive renewable power.

Bioenergy

- Biomass becomes a substitute for fossil fuels
- 40 million hectares are suitable for cultivating oil-bearing plants
- Surplus of 189 million tonnes biomass available for power generation could support 25 GW of installed capacity.
- potential for installation of 12.34 million biogas plants but 4.2 million were installed
- 15 GW electricity can be generated through cogeneration

GHG reduction potential

BET	Installation Potential
Biogas	17 million m3
Community biogas	150,000 Nos.
Improved stove	120 million Nos.
Biomass based power generation	57000 MW

Thank you