

Energy and global warming issues

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Presentation Outline

Part 1: The Energy Scene today

Energy outlook

Part 2: Global warming: Issues and implications

Part 3: Concluding Remarks

PART 1

THE ENERGY SCENE

World energy consumption has been growing at an average rate of 2% year over 200 years.

Per capita consumption of developing countries is very low compared with developed countries (2003: India – 439 kgoe; China – 1090 kgoe, Japan – 4052 kgoe; USA – 7835 kgoe).

Access to modern energy services is very low in developing countries at present.

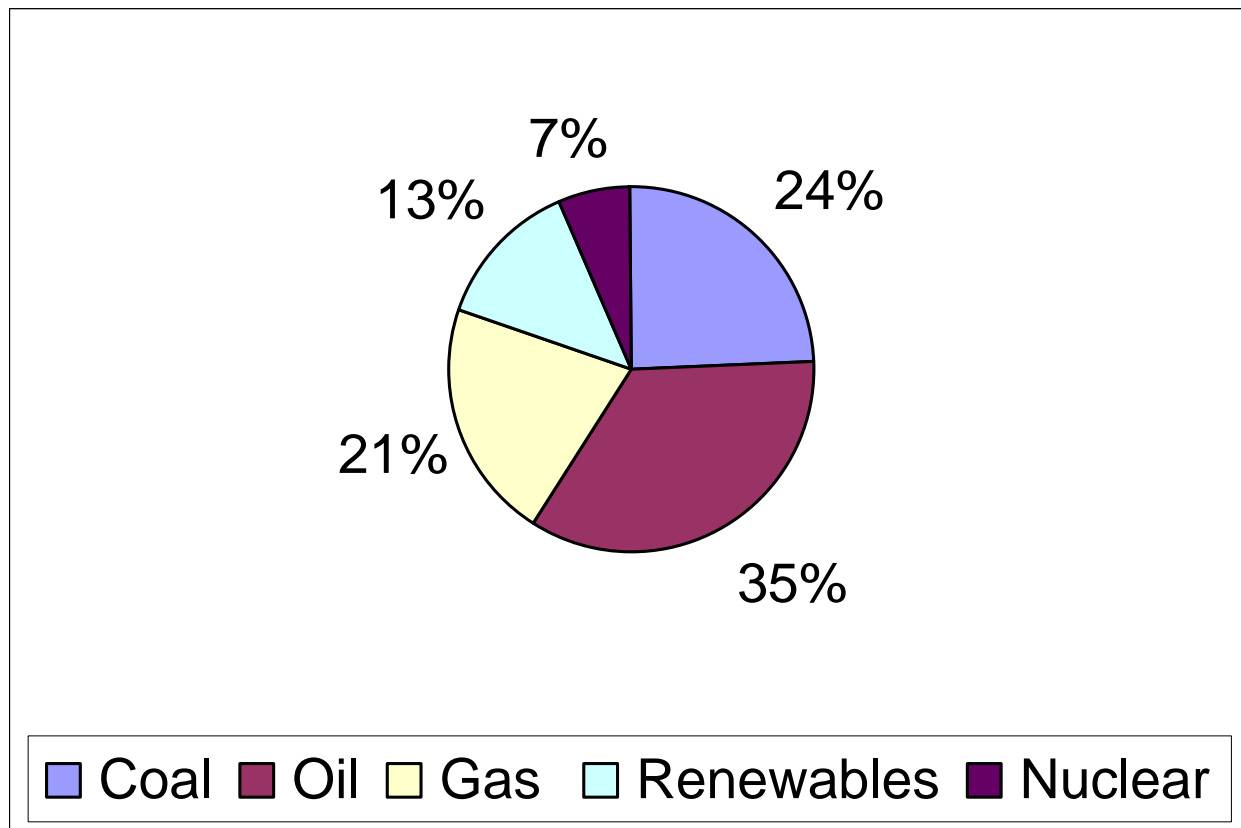
* About 3 billion people (625 million in India) use solid fuels for cooking.

* About 1.6 billion people (44.2% of Indian households) do not have access to electricity.

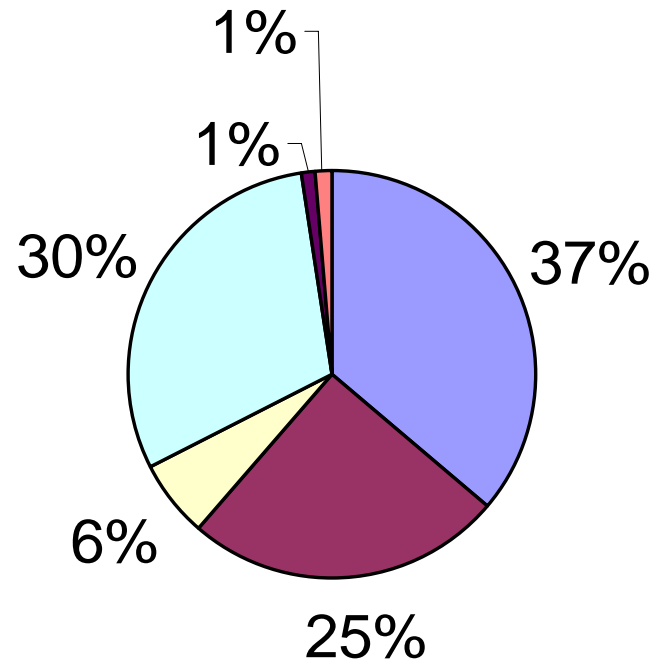
Introduction

The fossil fuels account for 80% of energy consumed in the **world** today.

Oil is the biggest source of energy and supplies about 35% of the total consumption.



Fossil fuels account for 68% of energy consumption in **India**; coal and oil supply 37% and 25% of total energy consumption.

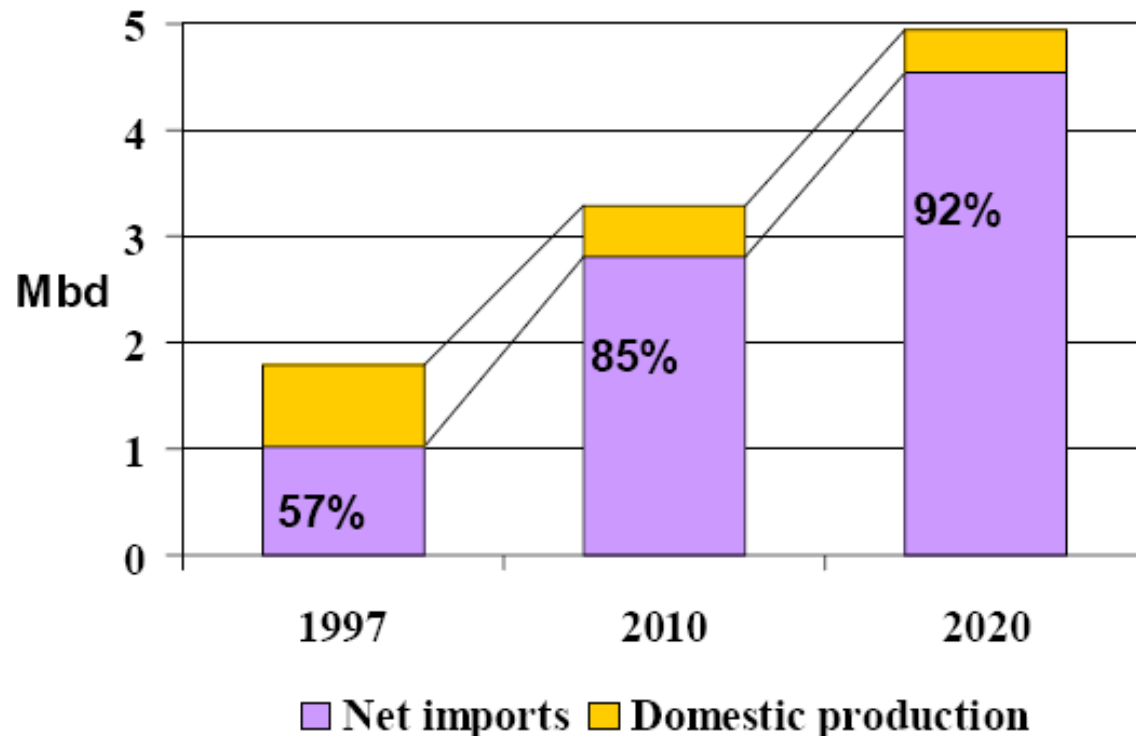


■ Coal ■ Oil ■ Gas ■ Biomass ■ Nuclear ■ hydro

India depends heavily on imports for meeting its oil requirements.

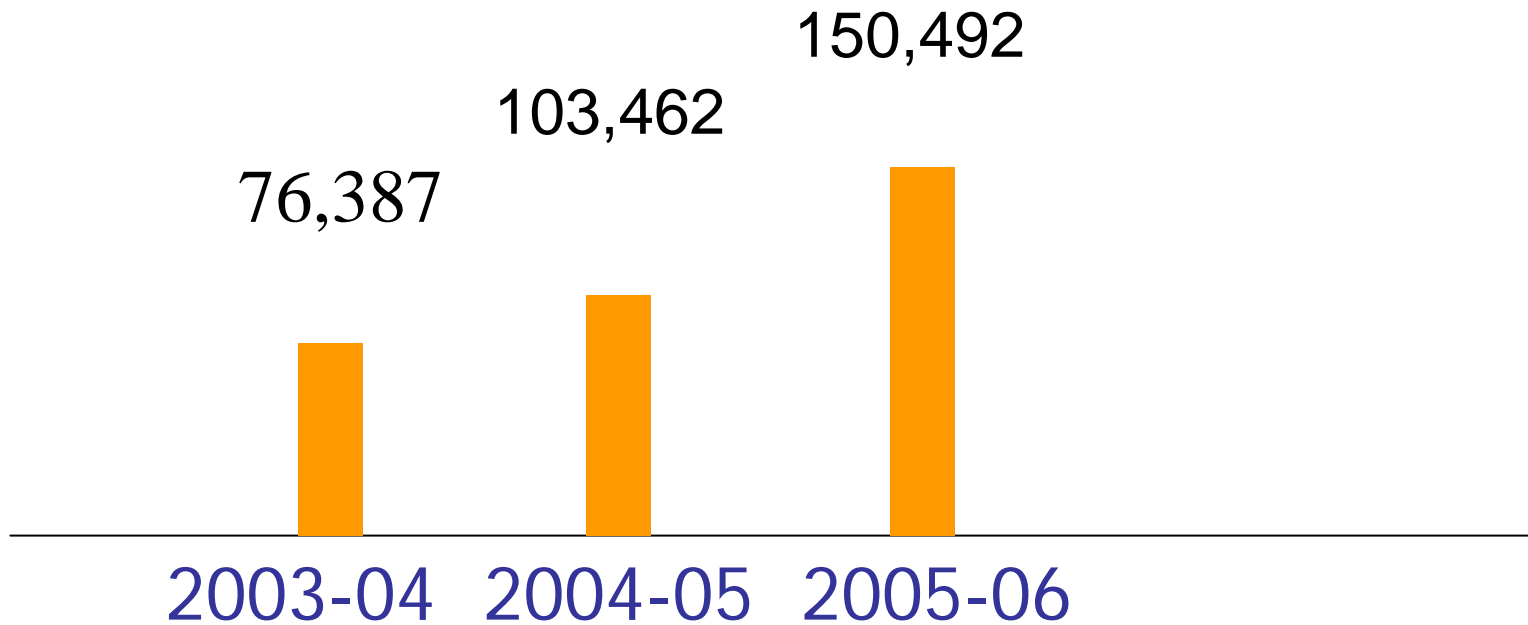
Dependence on import will grow in the future.

India Oil Balance



India's oil import bill has been growing steeply due to:

- * Growth in import
- * Rise in oil price



India's growing oil import bill, Crores of RS.

Fossil fuels:

Oil accounted for 36.4% of world's conventional energy consumption in 2005. At current production rate, the oil reserves will last about 40 years.

Gas accounted for 26.1% of world's conventional energy consumption in 2005. At current production rate, reserves of gas will last about 65.1 years.

Coal accounted for 27.8% of world's conventional energy consumption In 2005. At the current production rate, the proved reserves of coal will last about 155 years.

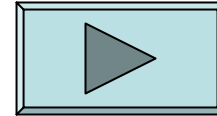
Nuclear Energy: Growth of nuclear energy has been falling since 1970. The future of energy from nuclear fission appears uncertain due to a number of unresolved problems.

Renewable Energy (RE): Traditional renewable energy sources include wood, agricultural residues etc. used for cooking or heat and hydropower used for electricity generation. Some of the new RE technologies (e.g. solar and wind) have been playing an increasingly important role in meeting the rising energy demand worldwide since 1973.

THE ENERGY SCENE contd.

Practically all countries have ongoing renewable energy programs.

Most countries lack a balanced program on renewable energy technologies.



THE ENERGY SCENE contd.

Energy Efficiency:

Several countries introduced policies and programs to promote energy efficiency after 1973. Examples:

Japan: Energy conservation law (1979)

USA: Energy Star (1992)

UK: Energy Efficiency Commitment (1994)

Thailand: Energy Cons. Promotion Act (1992)

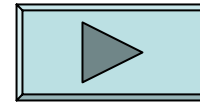
China: Energy Conservation law (1997)

India: Energy Conservation Act (2001)

THE ENERGY SCENE contd.

Efficiency of energy use can be improved significantly in all countries, particularly the developing countries.

Example: The case of India.



ENERGY OUTLOOK

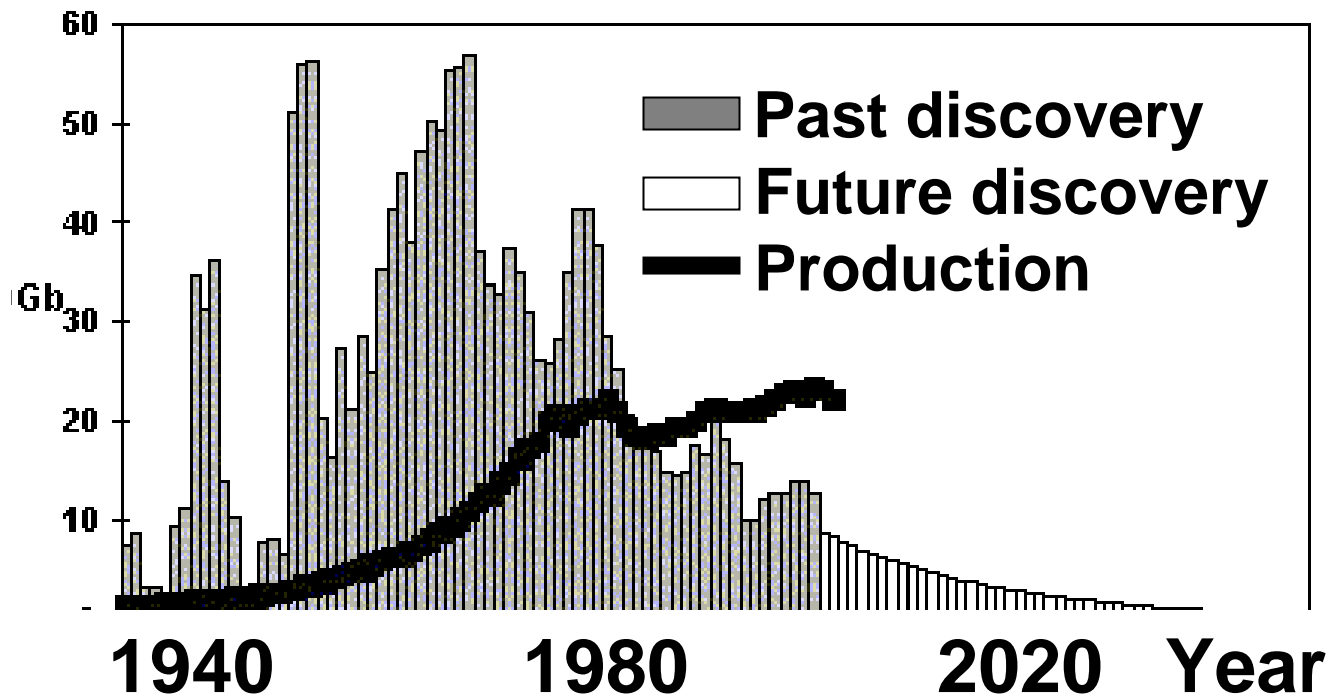
Overall: Global energy demand is expected to grow for several decades to come. The current global energy supply pattern (heavy dependence on fossil fuels and rising demand) is not sustainable because of two problems: reserve depletion (particularly oil) and environmental impacts (particularly global warming).

Fossil fuels:

The use of these fuels will be limited by depleting reserves and growing global warming concerns.

The world may face an unprecedented energy crisis as global oil production starts falling after reaching a peak in the future.

Discovery of oil deposits and production



<u>Projected Date</u>	<u>Source of Projection</u>
2006-2007	Bakhitari
2007-2009	Simmons
After 2007	Skrebowski
Before 2009	Deffeyes
Before 2010	Goodstein
Around 2010	Campbell
After 2010	World Energy Council
2010-2020	Laherrere
2016	EIA (Nominal)
After 2020	CERA
2025 or later	Shell
No visible Peak	Lynch

Six of the above 12 studies predict that world oil production will reach a peak around 2010.

Nuclear Energy:

IEA (2004): "The role of nuclear power will progressively decline during 2002-2030"

MIT 2003 study:

"today nuclear energy is not an economically competitive choice. ---- nuclear power requires significant government involvement because of safety, proliferation and waste concern."

The Future of Nuclear Power

AN INTERDISCIPLINARY MIT STUDY

Renewable energy:

Contribution of the renewable energy sources to world energy supply has been increasing.

A recent study of European Renewable Energy Council suggests that about 50 % of world energy supplies could come from renewable energy sources by 2050.

Energy Efficiency:

Phasing out of inefficient devices/processes; adoption of new/efficient devices and processes; and proper management of energy systems/facilities may result in significant energy saving in the future.

In general the potential of energy saving in both developing and developed countries is substantial.

19-27% of primary commercial energy can be saved in India in 2031 compared to BAU scenario (Planning Commission, 2006; TERI, 2004).

EU Green paper on energy efficiency estimates that EU could save 20% of energy by the year 2020.

PART 2

Global Warming

Global warming refers to rise in earth's temperature due to accumulation in the atmosphere of certain gases, called the greenhouse gases (GHG), which trap energy from the sun.

The main greenhouse gases are carbon dioxide methane and nitrous oxide.

Carbon dioxide (mostly emitted from combustion of fossil fuels) is the most important greenhouse gas and accounts for more than 60 % of the global warming effect.

With current trend, GHG emissions in 2030 is expected to be 25- 90% above 2000 level.

For limiting long-term warming to a reasonably safe range of about 2°C, global GHG emissions need to peak at about current levels and no later than 2015, then need to be reduced to 50-85% below 2000 levels by 2050.

Drastic changes in global energy use will needed for required GHG emission reduction: extensive use of renewable energy, energy efficiency improvements, life-style changes (energy/carbon allocations etc).

CONCLUDING REMARKS

The world appears to be heading towards a two-pronged disaster due to threats of i) an unprecedented energy crisis, and ii) global warming.

The looming energy crisis can cause large-scale disruptions in the society. Global warming probably represents the most serious environmental threat ever faced by mankind.

Promoting renewable energy and energy efficiency will be vital for addressing both of these threats.

Thank you

Shortcomings of Indian RE Programme

Household biogas digesters: 3.89 million in India compared with 12 million in China.

PV: 85 MWp cumulative installed in India vs. 5400 MWp globally at the end of 2005.

Solar thermal: 1.6 million sq m cumulative installation in India compared with 13.5 million sq m sales volume in China in 2004

RE Power capacity: 8.996 GW in India by Sep 06 compared to 42 GW in China and 184.4 GW globally (excluding large hydro) at end 2005.

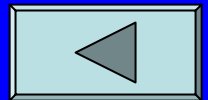
Ethanol and biodiesel: Insignificant so far

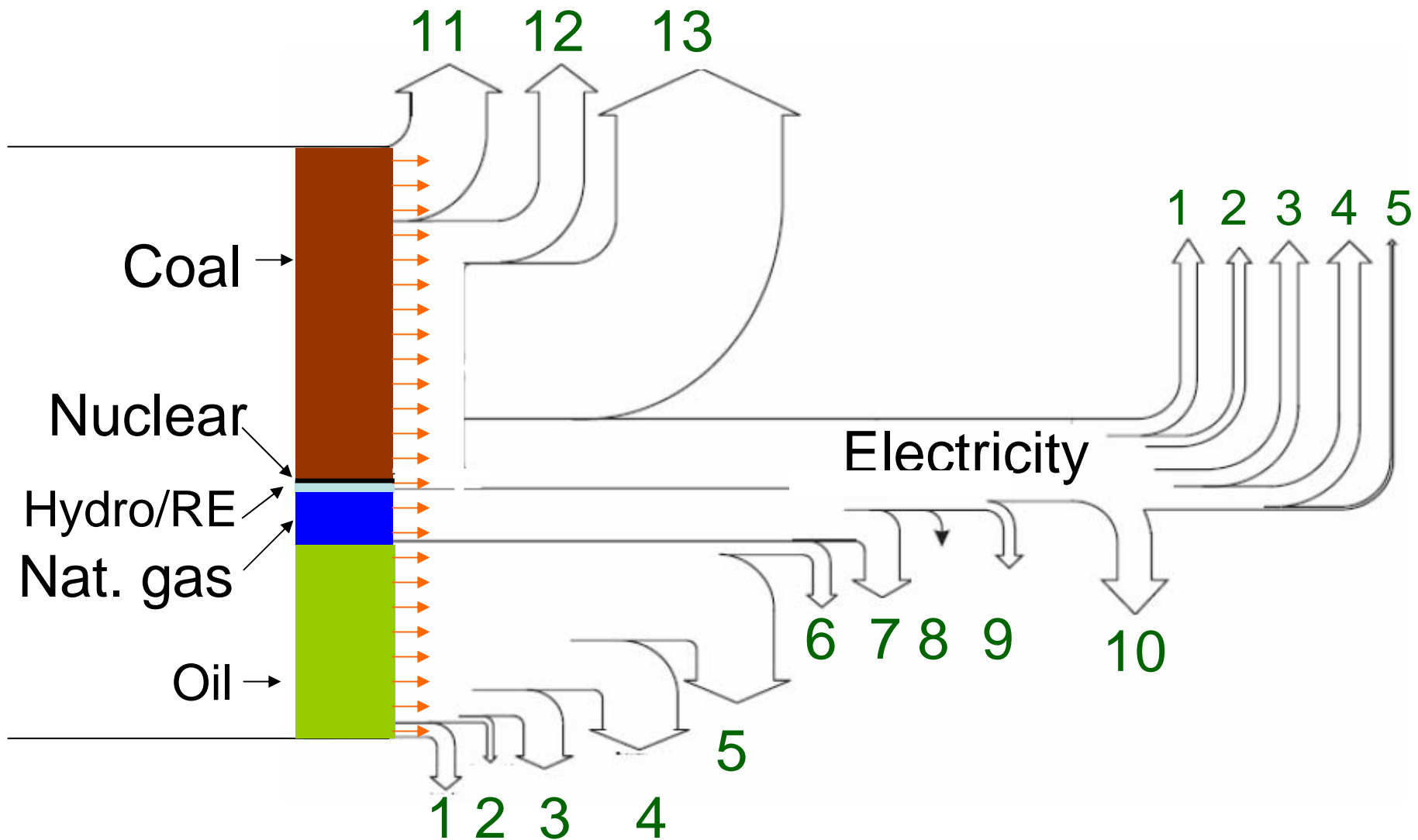
Technologies mostly missing from Research Development, and Demonstration programs

Some vital renewable energy technologies are not yet being promoted.

Examples for biomass technologies:

- Biomass integrated gasification combined cycle
- Cellulosic ethanol
- Stirling Engine
- Co-firing





Indian Energy Balance (2001): 1-Agri; 2- commercial; 3- Domestic; 4- Industry; 5-Transport; 6 – loss; 7-Industry; 8- transport; 9 Generation loss; **10- T&D loss**; 11- Industry; 12- coking coal; **13- Loss from coal power generation.**

Energy conservation options:

- * Reduce losses, e.g.

Coal conversion loss

Transmission and distribution losses

- * Improve efficiency of energy use

Industry: Process, equipment, Lighting, HVAC

Transport: vehicles, modal shift, sharing,
avoiding

Commercial and residential: Lighting, HVAC,
building, lifestyle changes.

