

CONTRIBUTION OF ENERGY EFFICIENCY TOWARDS POVERTY ALLEVIATION

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World Energy Council Workshop

The state of being poor;
“lack of the means of providing
material needs or comforts.”

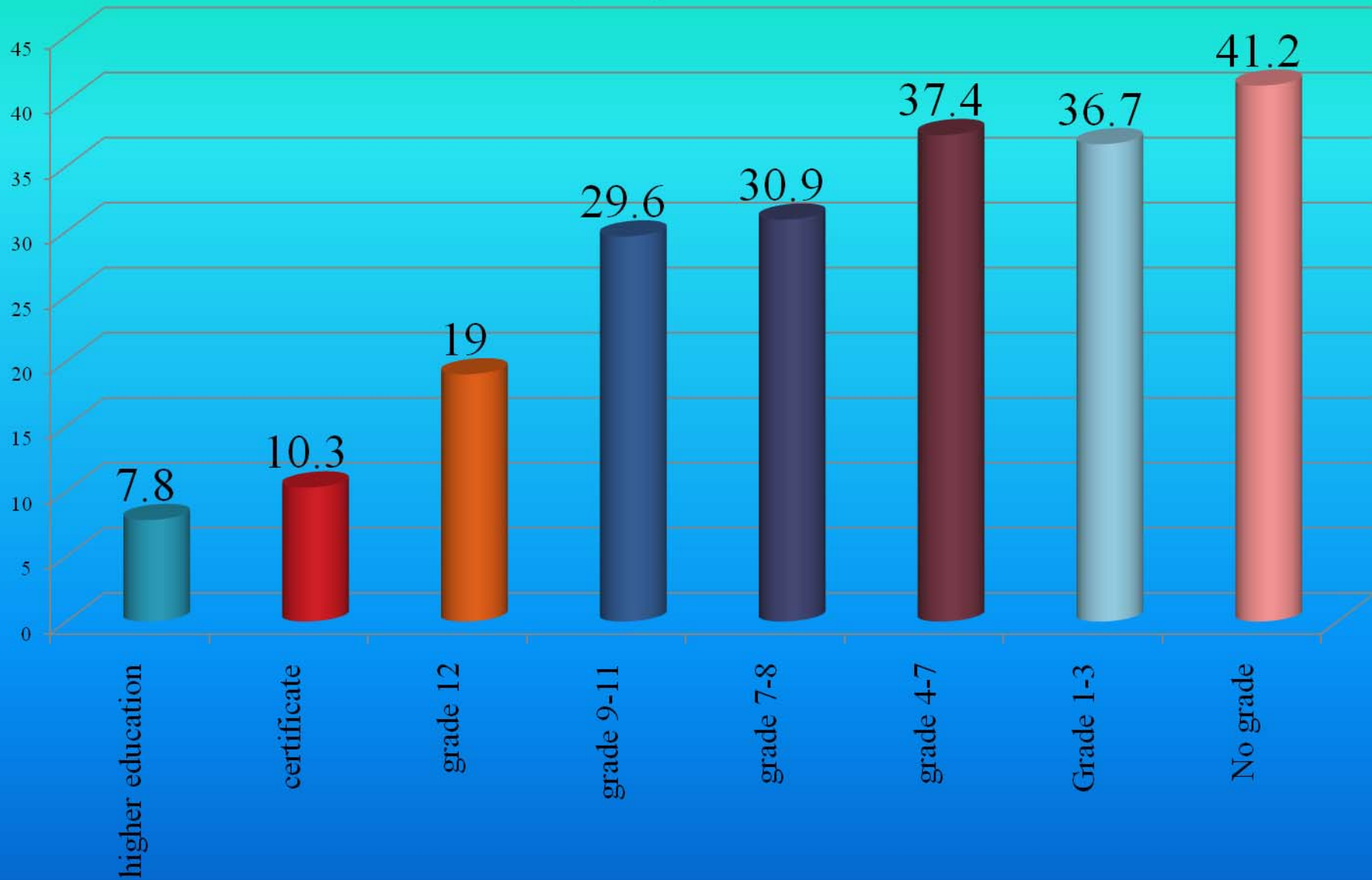
- ENERGY AND POVERTY

- The state of being poor; lack of the means of providing material needs or comforts
- Some 1.6 billion people – one-quarter of the world population – have no access to electricity.
- In the absence of vigorous new policies, 1.4 billion people will still lack electricity in 2030.
- Four out of five people without electricity live in rural areas of the developing world, mainly in South Asia and sub-Saharan Africa.
- But the pattern of electricity deprivation is set to change, because 95% of the increase in population in the next three decades will occur in urban areas.
- Some 2.4 billion people rely on traditional biomass – wood, agricultural residues and dung – for cooking and heating.
 - That number will *increase* to 2.6 billion by 2030.

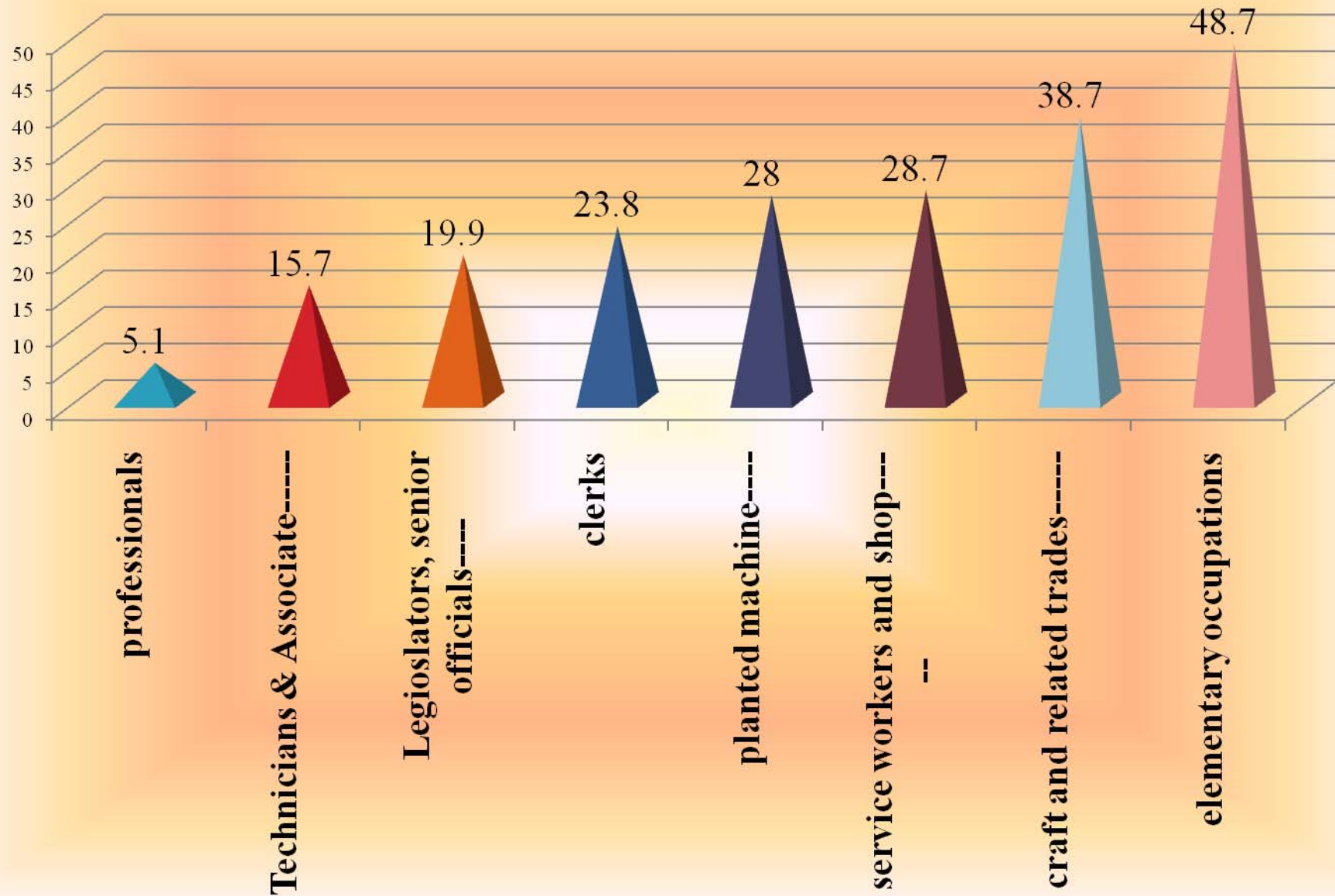
- Lack of electricity and heavy reliance on traditional biomass are hallmarks of poverty in developing countries.
- Lack of electricity exacerbates poverty and contributes to its perpetuation, as it precludes most industrial activities and the jobs they create.
- Access to electricity and other modern energy sources is a necessary, but not a sufficient, requirement for economic and social development.
- The escape from poverty also requires, among other things,
 - clean water,
 - adequate sanitation and
 - health services,
 - a good education system and
 - a communication network.
- Yet cheap and available energy is indispensable.

- Modern energy services enhance the life of the poor in countless ways.
 - Electric light extends the day, *providing extra hours for reading and work.*
 - Electric light facilitate to eradicate **literacy**
 - Modern cook-stoves *save women and children from daily exposure to noxious cooking fumes*
 - Refrigeration allows local clinics to keep *needed medicines on hand* and
 - modern energy can *directly reduce poverty by raising a poor country's productivity and extending the quality and range of its products* – thereby putting more wages into the pockets of the deprived.

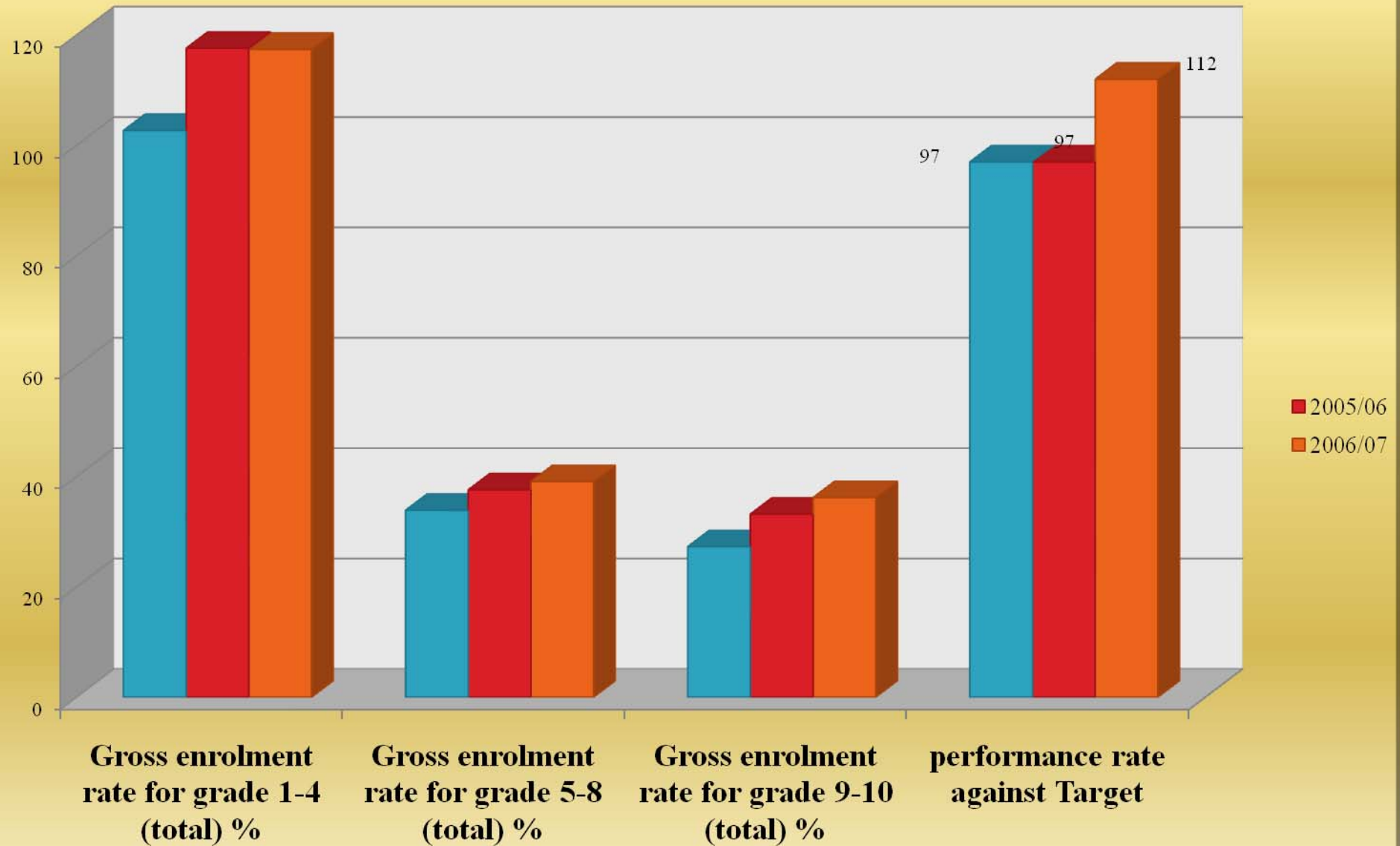
Poverty by level of education



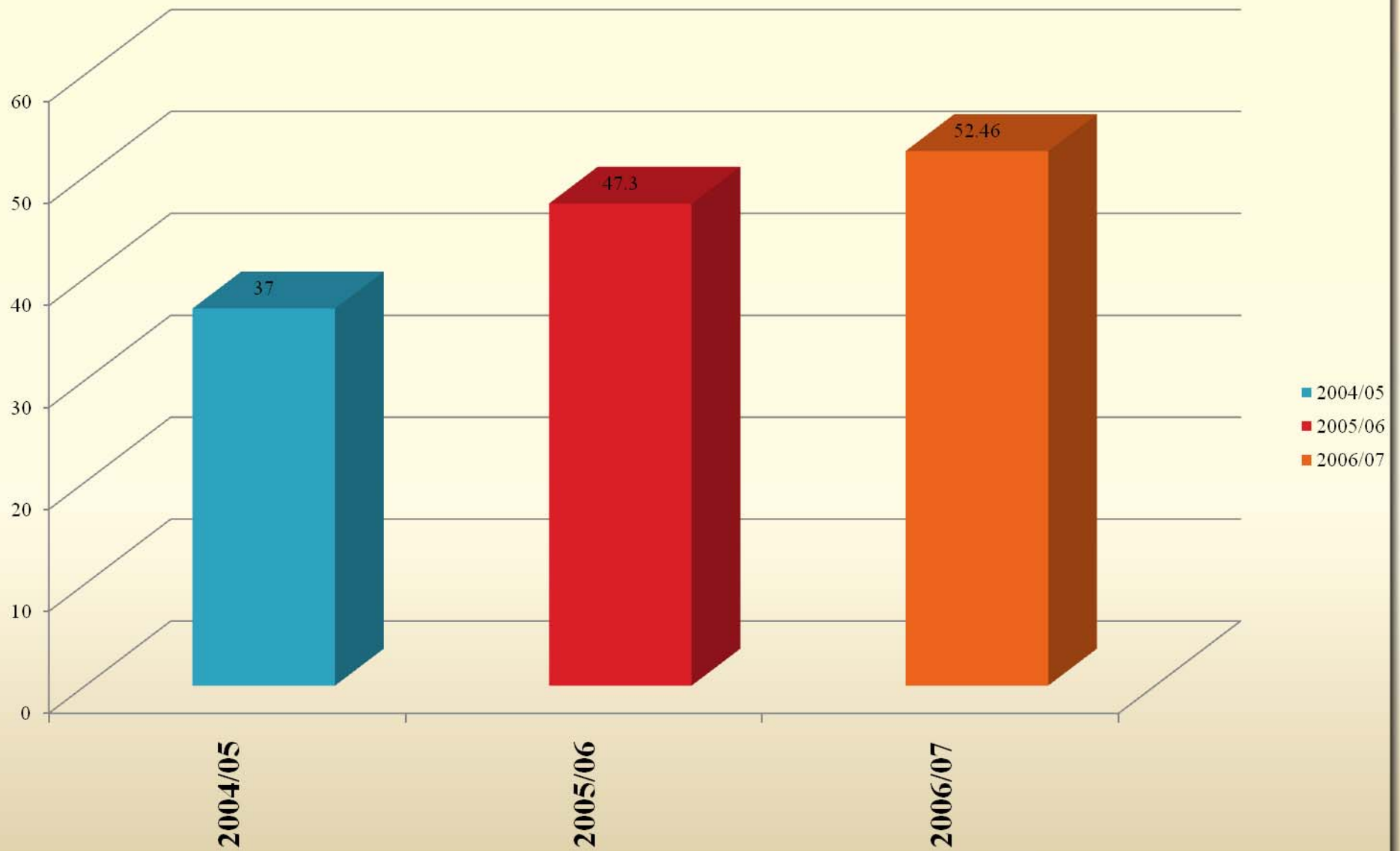
poverty head count index by occupation



Trend in gross enrolment rate



Access to clean water National Average



- The extensive use of biomass in traditional and inefficient ways and the limited availability of modern fuels are manifestations of poverty.
- They also restrain economic and social development.
- *Time spent gathering fuel:*

*“In rural sub-Saharan Africa, many women carry **20 kilograms of fuel wood** an average of five kilometers every day.*

*The effort uses up a large share of the **calories from their daily meal,***

*which is cooked over **an open fire** with the collected wood.”*

Gender:

70% of all people living in poverty are women

Type of activity	Time spent Hour/week	Women Share	Percent
Fetch water	10.3	9.3	90
Traditional laundering	1.3	1.1	85
Fuel wood collection	4.5	4.1	91
Feed animals	7.7	3	39
Supply water for animals	6.9	2.3	33
To the nearest Market	15	9.5	63
Beyond their village market	0.3	0.2	67

Mehretu and Mutambira

Women are most likely to suffer the health effects of energy-inefficient appliances.

Their **exclusion** from the decision-making process in many countries has led to the failure of many **poverty alleviation programs**.

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- Environment:
 - Gathering wood for fuel leads to local scarcity and ecological damage in areas of high population density where there is strong demand for wood.
- Energy efficiency:
 - In developing countries, biomass fuels are often burned in inefficient stoves. Wood is much less efficient for cooking than modern fuels, such as kerosene and LPG – its net calorific value is four times lower.
- Health:

*“A shift from cooking with wood to charcoal reduces the overall health risk by **a factor of more than four**. A shift to kerosene results in a reduction by **a factor of six**. Using LPG & electricity reduces the overall health risk by **a factor of more than 100**.”*

- Agricultural productivity
 - Use of biomass *energy reduces agricultural productivity*, because agricultural residues and dung are also widely used as fertilizer.
 - The dung used as fuel in *India* would be worth *\$800 million* per year if it were used as fertilizer.

TRANSITION FROM TRADITIONAL TO MODERN ENERGY

- The three main determinants in the transition from traditional to modern energy use are
 - **fuel availability,**
 - **affordability and**
 - **cultural preferences.**

- If a *modern distribution system* is not in place, households cannot obtain access to modern fuels, even if they can afford them.
- Even when they can afford modern fuels, households may not use them if they are *much more expensive* than traditional biomass.
- In rural areas, biomass is often perceived as something that is *“free”* and readily available.
 - This kind of thinking seriously hampers the switch to modern energy.
 - The Ethiopian Electric Power Corporation had played a major role to shift the traditional injera baking to modern stoves by producing and disseminating at cheapest price to end users. After transposing the knowledge to the private sector the corporation out from that business.

Conservation of biomass in Ethiopia

- The **per capita consumption** of biomass fuels in rural areas is estimated **0.7-1.0 ton**;
- The share of **woody biomass** from the total is about **80%** the rest comes from crop residue and animal dung.
- At this rate of use **annual extraction of wood for fuel alone is 40 to 55 million tons**
- Declining productivity and receding access to woody biomass households forced to **shift crop residues and animal dung**
- Conservation of biomass resources through the development energy efficient biomass stoves has been successfully implemented in rural areas,
- The center disseminated more than a million improved stoves during the past four years.

- Each stove approximately needs 5 kg of wood per injera baking for the average HHS. Each HHS bake twice a week;
- Thus the stove saves nearly 260 kg of wood a year for the average urban hhs;
- Commercial bakers will save 3.5 tones per year
- Another efficient baking stove
 - The stoves energy efficiency is 18%
 - The saving from the stove for injera baking is 57%
 - For all baking and cooking purpose its fuel savings is 25% compared to the traditional one.

- In some cases, traditions determine the fuel choice regardless of fuel availability and income.
 - In India, even very rich households keep a biomass stove to prepare their traditional bread.
 - In Ethiopia Charcoal is very appreciated for coffee ceremony for every household.

WHY SHOULD AFRICA PROMOTE RENEWABLES?

- **Efficient energy use**, sometimes simply called **energy efficiency**, is using less energy to provide the same level of energy service
- **Energy efficiency** and **renewable energy** are said to be the “**twin pillars**” of sustainable energy policy.
- Given the large renewable energy resource potential that already exists in Africa, it is only logical that Africa promotes these indigenous resources.
 - Ethiopia rich in hydro (45,000 MW) wind (10,000 mw) and geothermal more than 3000mw

- The region is endowed with substantial renewable energy resources, such as hydropower, geothermal, significant solar potential and wind mill.
- Another important *reason for Africa* to promote renewable is to enhance the competitiveness of its agricultural commodities.
- For agro-processing industries such as coffee, tea, sugar, sisal and cotton located in remote areas (sometimes away from the grid), embedded renewable-based generation can lower energy costs,
- thereby *making the products competitive* in the world market.

- Last but not least, *increased concerns* over the local, regional and *global environmental impacts* of conventional energy systems are another reason for Africa to promote renewable.
- In addition, *there is a growing volume of grant resources (CDM)* available for appropriate renewable energy systems in Africa that could be taken advantage of.

WHY SHOULD AFRICA PROMOTE ENERGY EFFICIENCY?

There are several reasons for Africa to promote energy efficiency:

- First and foremost, the **rate of energy demand** increase in many **sub-Saharan African** countries appears to be outpacing the rate at which energy **supply is being increased**.
- Therefore, an obvious option is the implementation of energy efficiency measures that would free up supply capacity to meet the rising demand.

- Secondly, *the worsening energy crisis* in the region has served as a “wake-up call” to the region’s policy makers on the importance of energy efficiency.
- Thirdly, *with the gradual withdrawal of donor participation* in the financing of large-scale energy investments, *alternative* financial resources are limited and expensive.
- Fourthly, energy efficiency measures can “shave off” *peak loads* in a power system thereby minimizing the need for huge investments to meet peak demand which lasts for only a few hours in a day.

- Fifthly, energy efficiency measures can *significantly reduce the cost of energy supply*. For example,
 - in Tunisia where a major program of the national utility is promoting solar water heaters, it is estimated that by converting water heating systems to use solar only, it can reduce the utility's cost of electricity supply by **about 20 per cent** (Awerbuch, 2005).
 - In Ethiopia distributing energy efficient lamps at a cost of **10 million USD** saved around 80 MW. Which 100MW hydro power plant requires **20 fold investment cost**.

- Sixthly, the *high cost of energy* in the industrial sector in sub-Saharan African countries is *eroding the competitiveness* of their products in the local, regional and international markets (GEF-KAM, 2005).
- Another reason why Africa should promote energy efficiency is that it can be an important *source of job creation*.
- Lastly, the promotion of energy efficiency in Africa can help in *arresting environmental degradation* such as deforestation and associated soil erosion caused by charcoal production;

- The efficient provision of energy contributes indirectly to poverty reduction *through economic growth*, and is central to the basic human needs of nutrition, health, and education.
- Energy services also have a direct bearing on poverty reduction. Energy production and consumption are inextricably linked with the state of natural resources such as forests on which the poor are directly dependent.
- Poverty is multi-dimensional. *In a wider sense, it is deprivation*, which may be traced to five interrelated clusters of disadvantages:

- physical weakness (lack of strength, under-nutrition, ill health, disability, high ratio of dependants to active adults);
- isolation (physical remoteness, ignorance, lack of access to information or knowledge);
- income poverty (lack of income and wealth);
- vulnerability (increased exposure to contingencies, danger of becoming more deprived); and
- Powerlessness (inability to cope, adapt, and choose).

- *Energy projects can contribute* to poverty reduction at the macro and micro levels with their impact being apparent *at the supply* end or at the *point of consumption*.
- *Energy poverty linkages at the point of energy supply*
 - At the macro level, energy projects contribute to poverty alleviation primarily through resource savings on account of energy efficiency gains, forex savings/earnings and increase in tax revenues due to employment.
 - Projects that promote efficiency in energy supply may also lower the price of energy, making it more affordable.

- At the project site, there will be a direct impact on poverty through employment created during the construction and operation of the project.

Energy poverty linkages at the point of consumption

- Projects that provide energy, increase its reliability, and/or improve its affordability can result in poverty alleviation at a micro level.
- There are four major consumers of energy: households, commercial, industry, and agriculture.
- Each of these sectors depends on energy for a variety of uses, and energy consumption in these sectors can in turn, impact poverty in many ways as discussed below.
- At a macro level, energy consumption indirectly impacts on poverty through the trickle-down effects of energy-induced growth

Energy consumption in households

- Households use energy for a variety of purposes:
 - cooking,
 - lighting,
 - water heating,
 - and space conditioning.
- The provision of superior energy sources such as electricity, has important economic and social implications because they have significant monetary and non-monetary benefits compared to traditional fuels.

Energy consumption in agriculture

- Agriculture is the main source of livelihood for most people in the rural areas of developing countries. The sector's dependence on energy has risen rapidly as agricultural activities have become modernized and mechanized. Energy in agriculture can contribute to poverty reduction directly in at least three ways.
 - It may reduce the cost of energy by making available cheaper, more efficient and convenient options such as electricity, thereby benefiting farmers dependent on groundwater.
 - Second, it may augment farm income through an increase in the gross cropped area either due to an increase in cropping intensity or area (net) under cultivation.
 - Third, farm employment may increase as the gross cropped area goes up. Thus, the landed poor and also the landless benefit as employment opportunities increase. The growth of agro-based industries in rural areas would also create employment opportunities.

Energy consumption in industry

- The industrial sector is the largest consumer of energy; it is the basic input. Providing energy in an energy-deficient area can thus promote industrial growth by encouraging new industries or allowing enhanced capacity utilization in existing industries.
- This will lead to the creation of employment opportunities in the area and also set off a multiplier effect on output and employment throughout the economy.

What to do to maximize energy efficiency?

- *Building codes for residential and commercial building changes:*
 - Improved energy efficiency in buildings, industry and transport could lead to between 17 and 33 percent lower energy use by 2050, according to the International Energy Agency
 - *Individual behavior change:* Individuals can change simple behaviors – such as unplugging computers at night, keeping vehicle tires properly inflated, and adjusting thermostats – and have a significant impact on their personal carbon emissions "footprint".
 - *Industrial processes:* Improving the efficiency of industrial processes with existing technologies and processes offers an opportunity for emissions reductions in the steel, pulp, paper, food processing, cement, chemicals and refining industries

- Efforts to curb energy usage and improve energy efficiency are highly dependent on public policies that provide incentives for efficiency and that reduce market distortions that facilitate wasteful energy use. Many countries have market-distorting policies such as subsidies on fuel and electricity
- Furthermore, some countries offer industry-specific financial incentives for construction and electricity generation and distribution businesses
- policy makers will need to work with consumers and businesses to devise appropriate measures.
 - in the United States, some policy advocates argue that it may make sense to tax gasoline more to encourage consumers to drive less.
 - On the other hand, in countries such as China, it may make more sense to focus policies on high fuel economy standards of new cars since most of the vehicles on the road over the next 15 years will be new.

- Modern energy-efficient appliances, such as refrigerators, freezers, ovens, stoves, dishwashers, and clothes washers and dryers, use significantly less energy than older appliances. Current energy efficient refrigerators, for example, use 40 percent less energy than conventional models did.
- A building's location and surroundings play a key role in regulating its temperature and illumination.
 - Dark roofs may become up to 70°F hotter than the most reflective white surfaces, and they transmit some of this additional heat inside the building.
 - Proper placement of windows and skylights and use of architectural features that reflect light into a building, can reduce the need for artificial lighting.
 - Effective energy-efficient building design can include the use of low cost Passive Infra Reds (PIRs) to switch-off lighting when areas are unoccupied such as toilets, corridors or even office areas out-of-hours.

- Refurbish/and/or replace the old
 - In the power sector, a recent operational review of the largest utilities in 51 developing countries shows a general trend of declining technical efficiency over a 20-year period.
 - Older power plants in many developing countries consume from 18% to 44% more fuel per kilowatt hour of electricity produced than those in developed countries.
- Reduce system loss
 - they suffer transmission and distribution losses two to four times higher.
 - In fact, technical and nontechnical transmission and distribution system losses in the delivery of electricity are commonly greater than 20%--occasionally approaching 40%.

- Transmission and distribution losses represent about 31% of generation in Bangladesh, 28% in Pakistan, and 22% in Thailand and the Philippines. (In the United States only 8% of electricity is lost during transmission, in Japan 7%.)
- These losses, the equivalent of about 75,000 megawatts of capacity and 300 billion kilowatt hours a year, mean a loss to developing countries of about \$30 billion a year through increased supply costs. Worse, by the end of the century, on present trends, the aggregate losses would double.

The World Bank Report

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Thank you