U.S. DEPARTMENT OF ENERGY

Energy for Development
Session 2
Bottom Line - Prospects for Energy Demand

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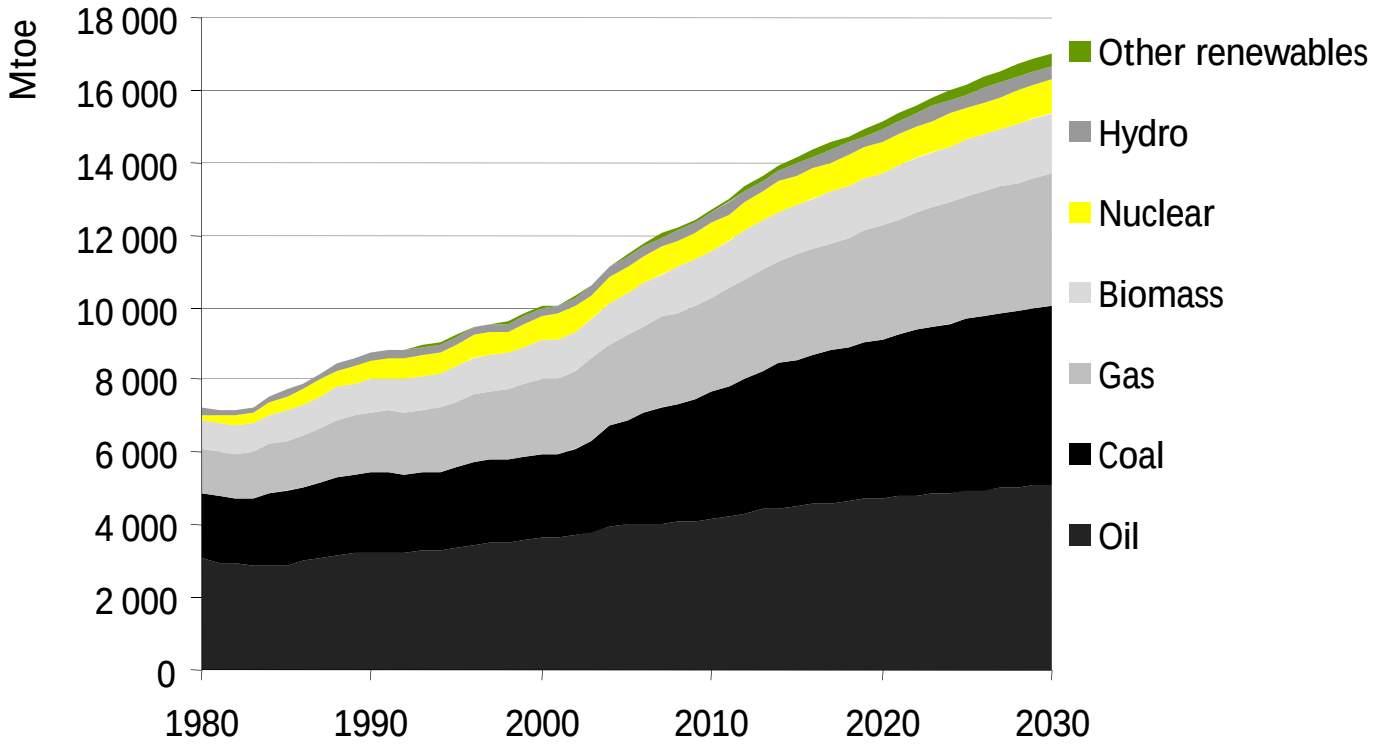
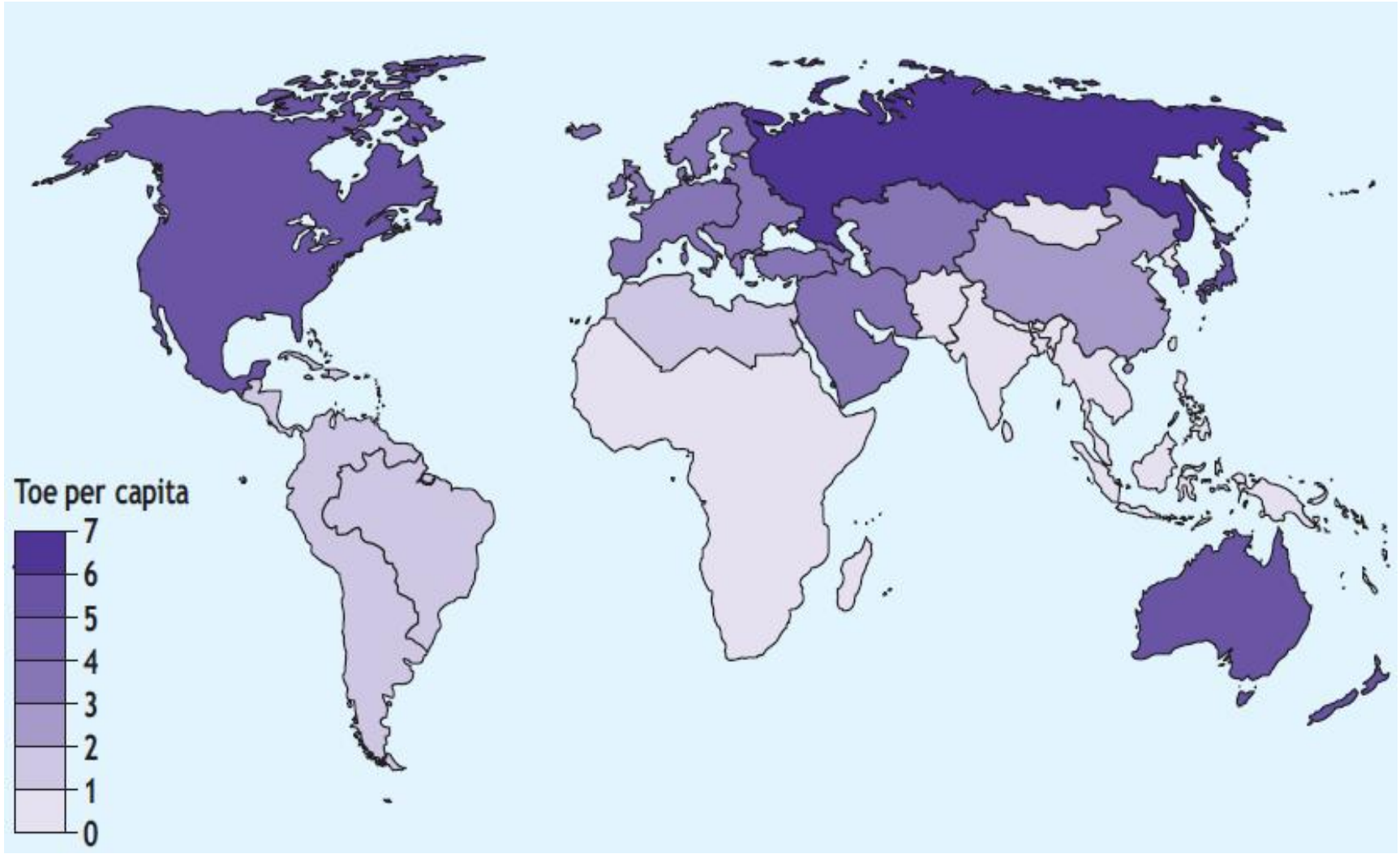
IEA *2008 World Energy Outlook*
Reference Case Energy Demand



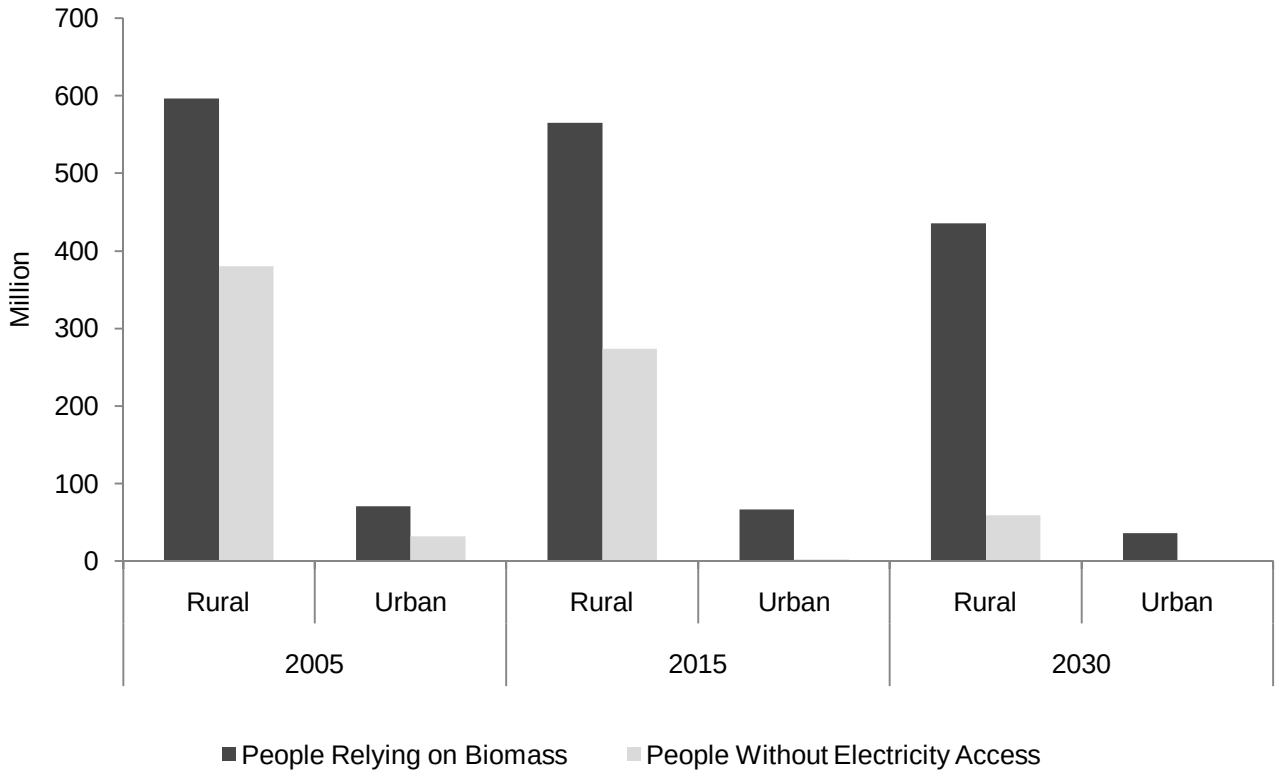
Per-Capita Primary Energy Demand 2030

Source: IEA *2008 World Energy Outlook*



Electricity Access in Urban & Rural Areas in India

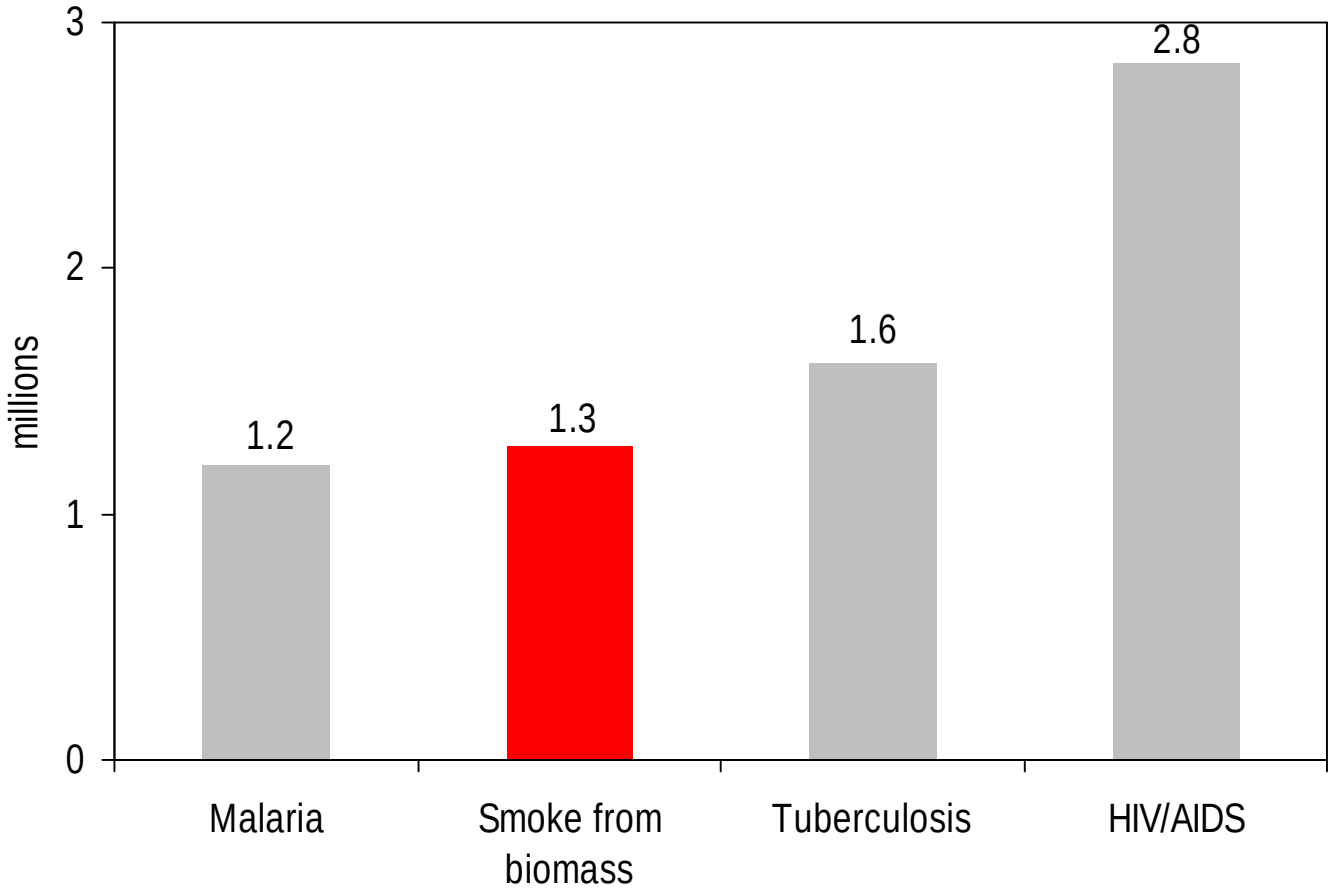
Source: IEA *2008 World Energy Outlook*



In 2030 the electrification rate is 96% but nearly 60 million people in rural areas will still lack access

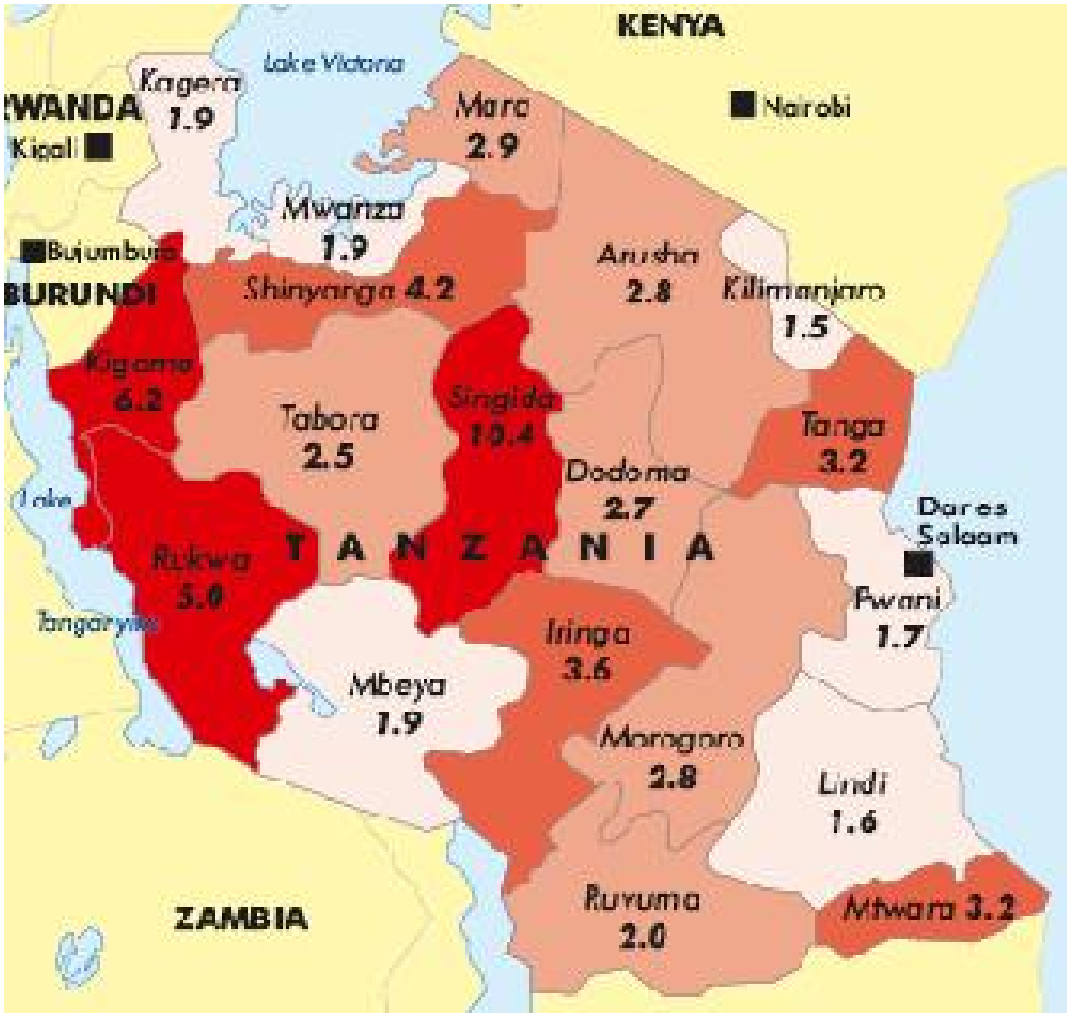
Energy Poverty & Health: Annual Deaths from Indoor Air Pollution

Source: IEA *2008 World Energy Outlook*

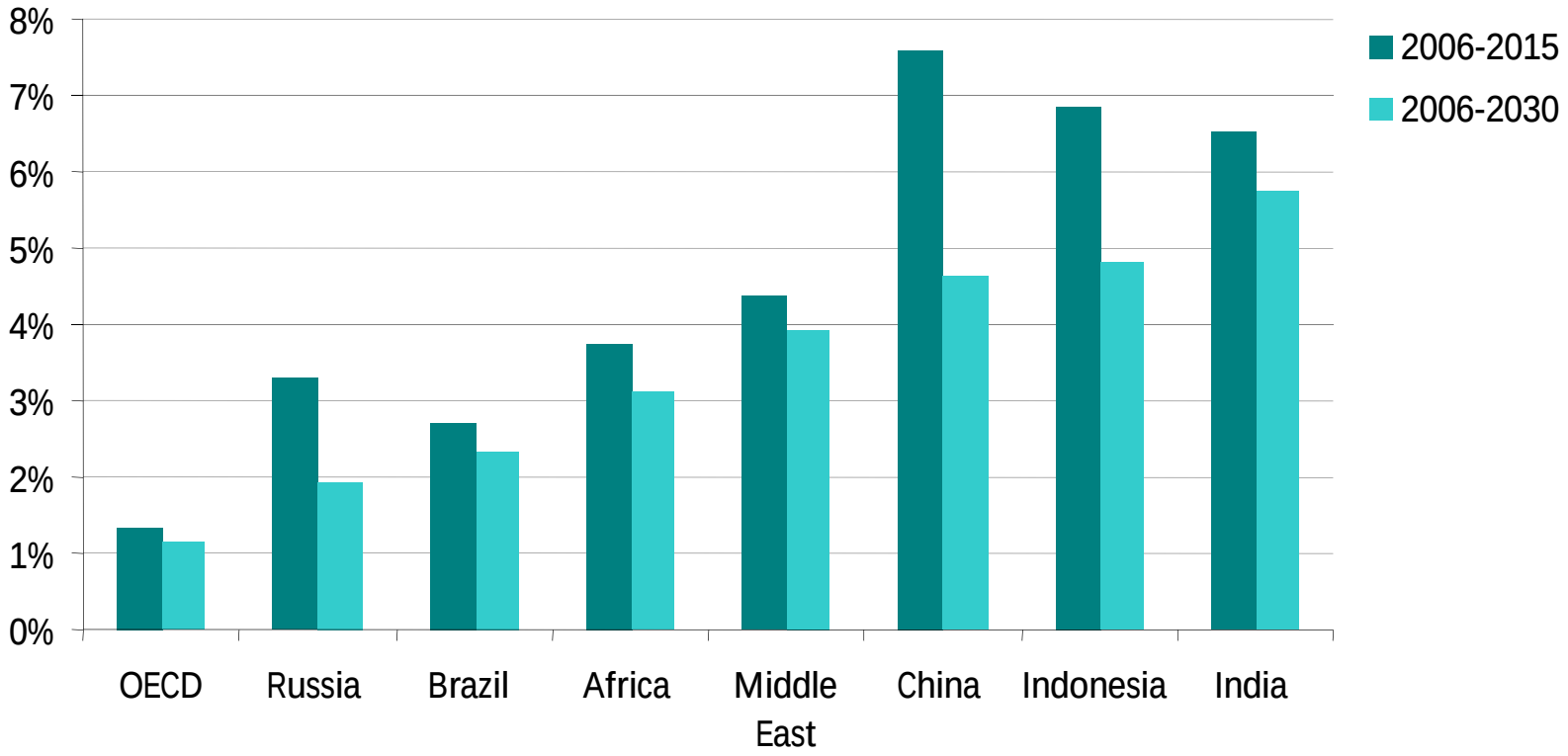


Worldwide 1.3 million premature deaths per year are directly attributable to indoor air pollution from the use of biomass, with more than half of these deaths children under five years of age

Energy Poverty & Women:
Distance Travelled to Collect Fuel wood
Source: IEA *2008 World Energy Outlook*

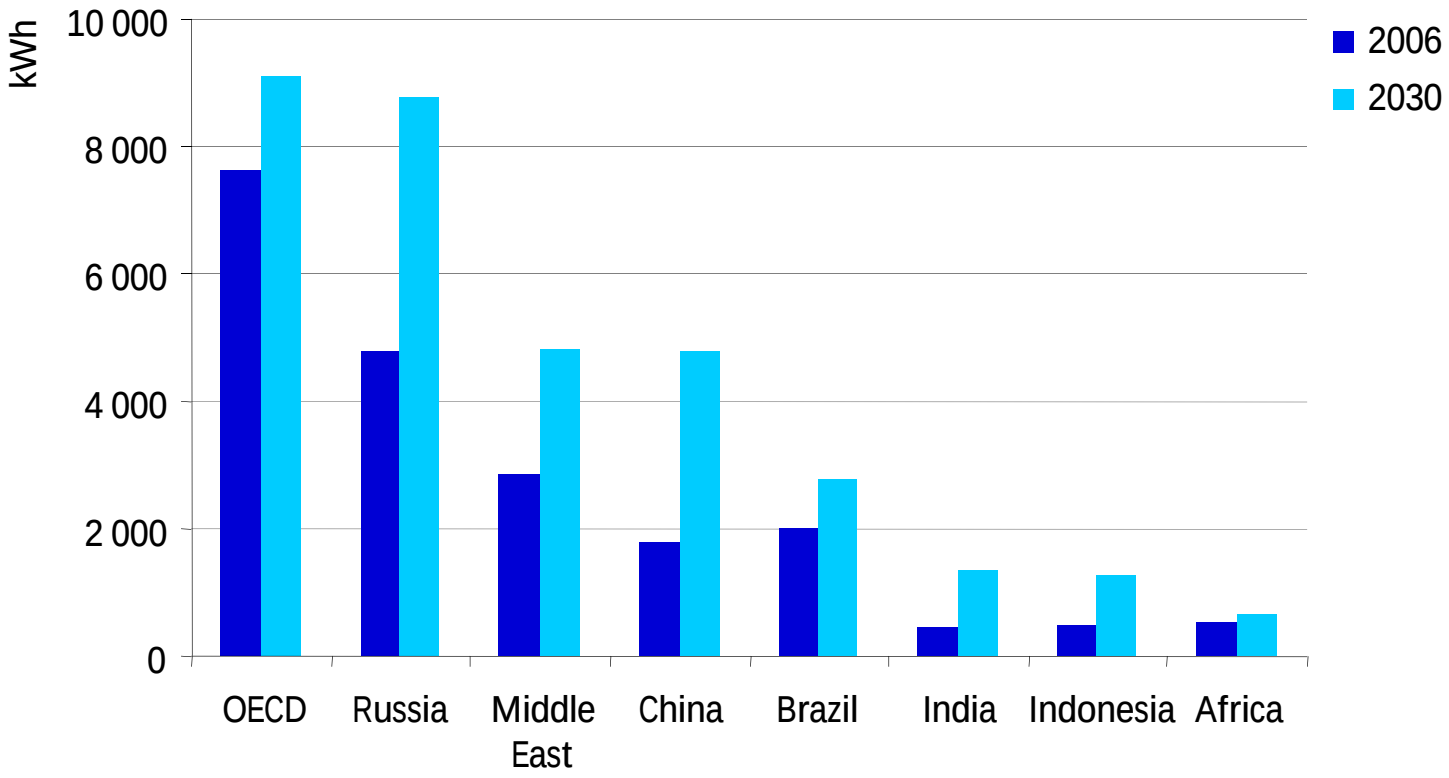


Electricity Demand Annual Growth Rates
Source: IEA *2008 World Energy Outlook* (Reference Scenario)



World electricity demand expands at an average rate of 3.2% per year to 2015, slowing to 2% in 2015-2030, with most of the projected growth coming from non-OECD countries

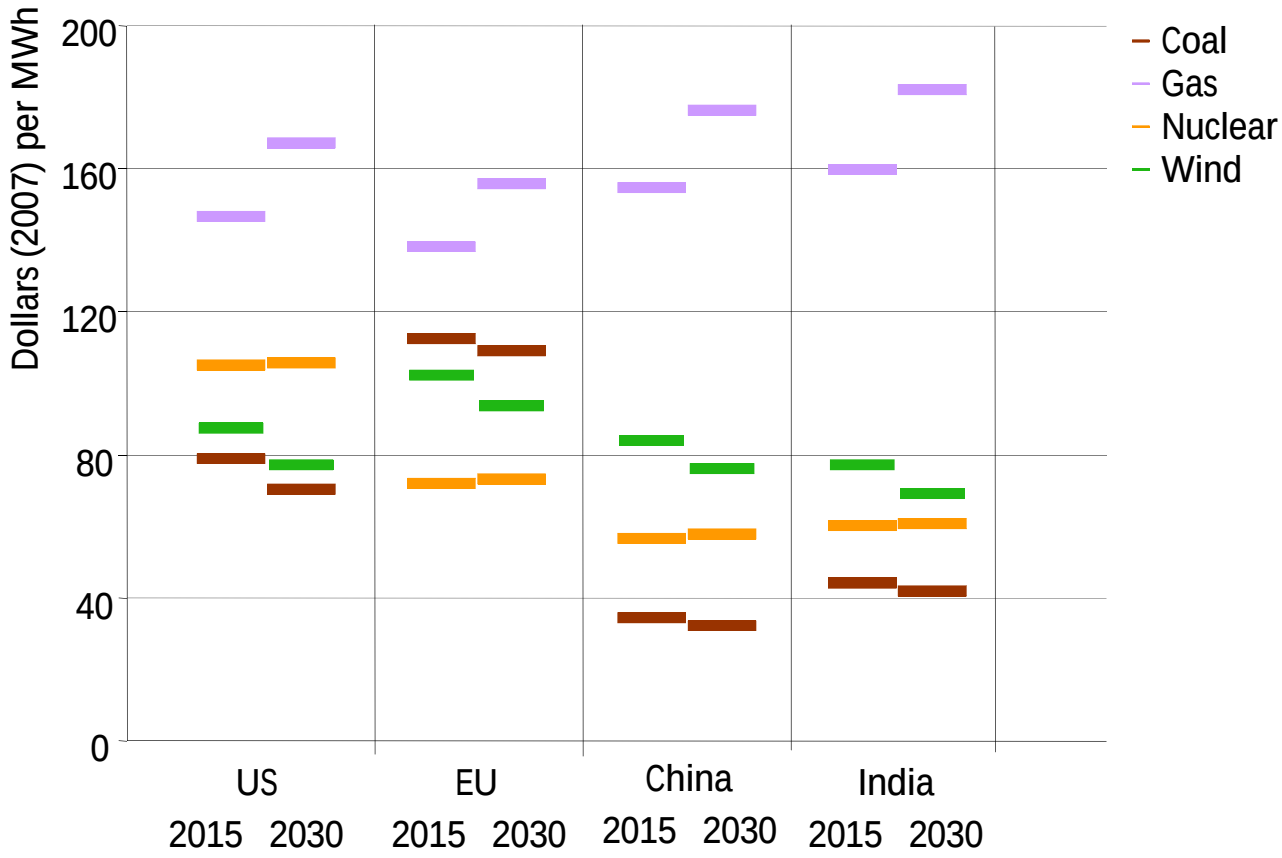
Per-capita Electricity Demand
Source: IEA *2008 World Energy Outlook* (Reference Scenario)



Per-capita electricity use in non-OECD countries doubles by 2030, reaching 2 400 kWh, but remains well below even the current OECD average of 7 641 kWh

Electricity Generating Costs

Source: IEA *2008 World Energy Outlook*



Nuclear power is relatively more competitive outside of the U.S. & EU due to lower financial risk. Coal is the lowest cost (not accounting for climate policy) outside of the EU. Gas is the highest cost in all regions.

Costs of Building Power Plants

- **Commodity prices have been increasing:**
  - **From 2000-2008 the price of**
    - **Iron ore is 4 times higher.**
    - **Steel is 2 times higher.**
    - **Copper is almost 4 times higher.**
- **Component costs have been increasing (2000-2008):**
  - **Main mechanical components up by almost 3x.**
  - **Other mechanicals, cables, transformers up 1.5x.**
- **The world-wide recession has reversed these trends but resumed high growth will again put pressure on materials & construction costs.**

Power Investments Needed

Source IEA *2008 World Energy Outlook* (Reference Scenario)

- **OECD Capacity Additions:**
  - **2007-2015: 500 GW**
  - **2016-2030: 1,100 GW**
- **Non-OECD Capacity Additions:**
  - **2007-2015: 1,200 GW**
  - **2016-2030: 1,700 GW**
- **OECD Investment Needs*:**
  - **2007-2015: $1.9 trillion**
  - **2016-2030: $4.0 trillion**
- **Non-OECD Investment Needs*:**
  - **2007-2015: $3.0 trillion**
  - **2016-2030: $4.8 trillion**

*Includes power generation, transmission & distribution.

Importance of Private Capital

- Private capital could finance much of the needed investment.
- This can be particularly important in many developing countries that might have problems in raising sufficient internal capital.
- However, in order to attract private capital, the investment must have a good chance of being profitable.
- This has been a particular problem in the power sector in many countries.

Electricity, Development & Reform

- **Electricity shortages & poor electricity hurt economic productivity & slow growth.**
- **Technical losses, non-payment of bills & subsidies create a high fiscal cost on developing countries:**
  - **7.5% GDP in Eastern Europe**
  - **5 times the amount of money spent on health & education in Pakistan**
- **Electricity sector reform can be a path to greater economic growth & reduced poverty.**

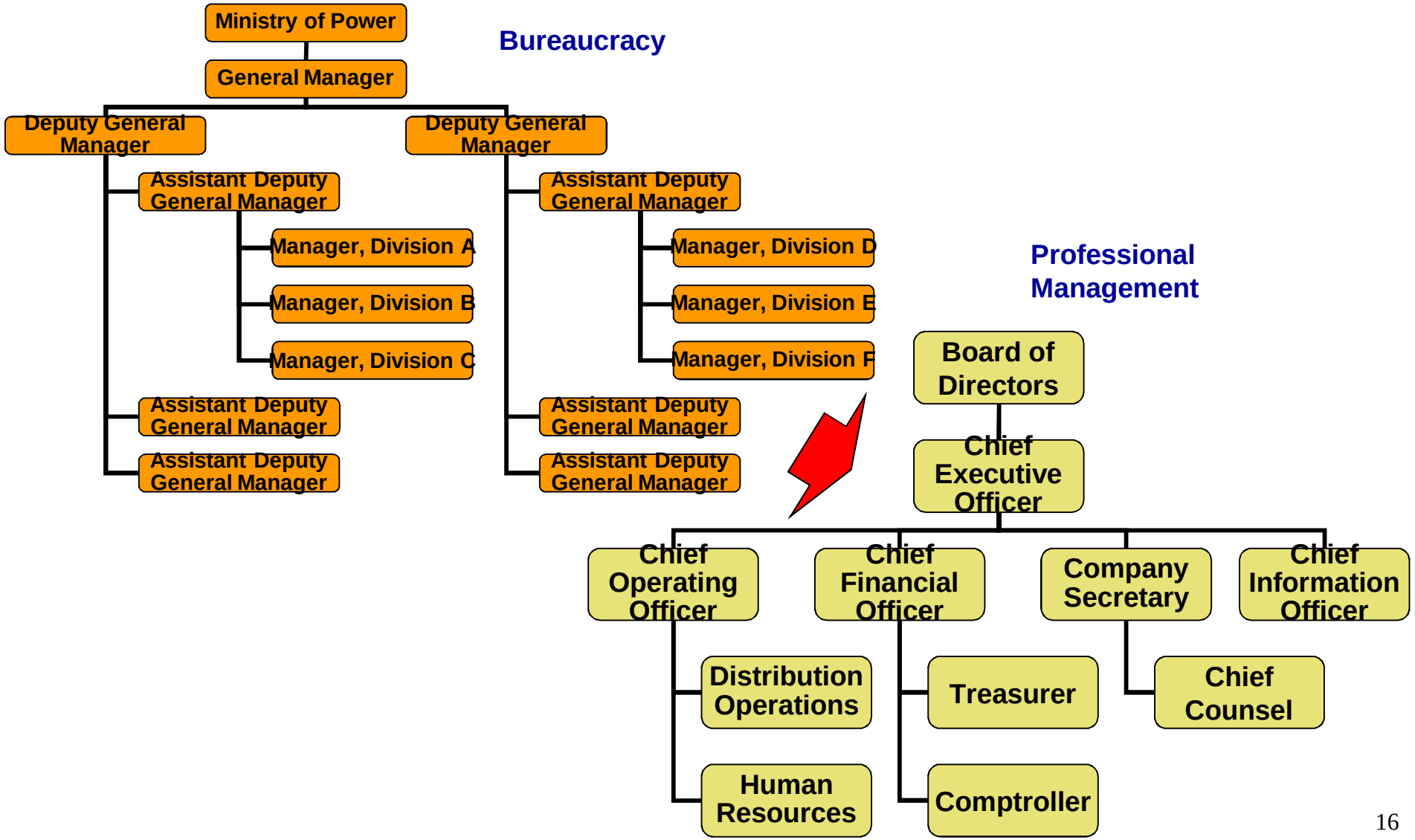
Key Areas of Reform

- **Economic tariff reforms**: making consumers pay the costs to produce & supply them is expected to achieve a better economy-wide use of resources.
- **Private management**: the profit motive gives a stronger incentive for efficient use of inputs, than any incentives offered by an enterprise controlled & managed by a bureaucracy.
- **Competition**: the technical innovations have allowed the unbundling of the electricity supply chain & introduce competition *in* the market in the generation & retail segments, & competition *for* the market, through the introduction of regulation, in the transmission & distribution segments, which are natural monopolies.

Model of Power Sector Reform

1	2	3	4	5	6
Separate electric utility from Ministry & oblige it to operate according to commercial principles	Development of economic regulation of the power market that is applied transparently by an autonomous regulator	IPPs can help to launch the reform process by showing the benefits of private investment & management	Restructuring of the electric power supply chain to enable the introduction of competition	Privatization of the unbundled electricity segments under dispersed ownership	Development of competition in the generation & supply segments by development of power exchanges

Efficiency and Accountability Gains Achieved by Moving from a Bureaucracy to Professional Management

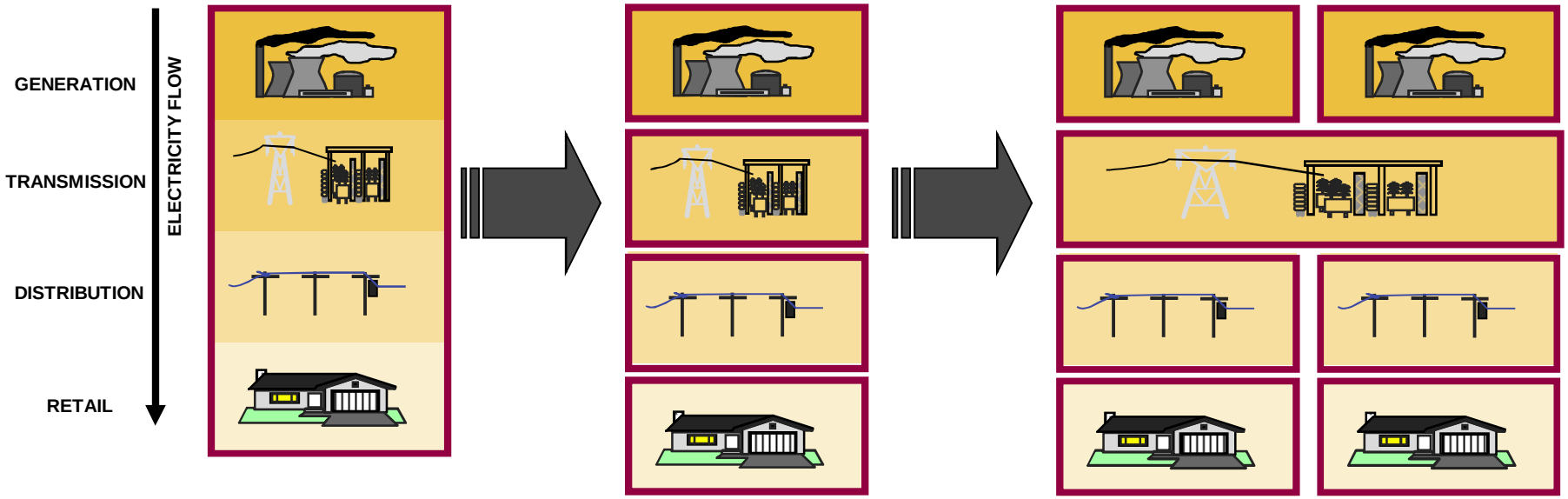


Unbundling as a Path to Competition

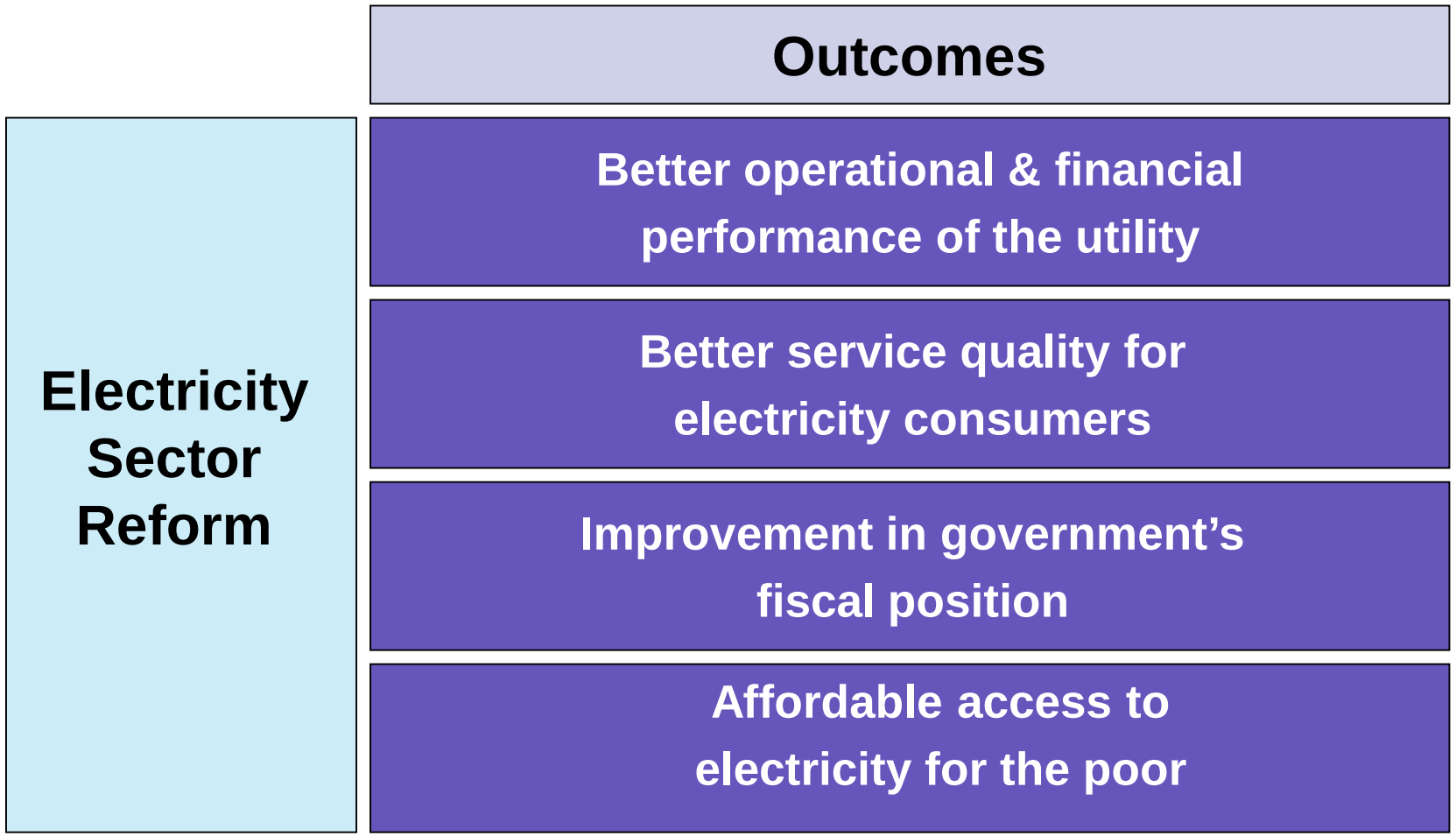
Vertically Integrated

Vertical unbundling isolates sectors of the industry where competitiveness is possible

Horizontal unbundling to increase the number of players in the sector



Expected Outcomes of Electricity Sector Reforms



Examples of Improved Fiscal Conditions Resulting from Reform

- **Bolivia:** Fiscal revenues from the power sector increased by 247% in three years. In addition, debt service of $61 million, which was guaranteed by the government, was transferred to the private company
- **El Salvador:** The sale of 75% of shares in Discos totaling $575 million had a substantial financial impact equivalent to 5.5% of 1996 GDP
- **Panama:** In FY 2000, the privatized power sector companies contributed $70.8 million to the treasury, of which $34.5 million was in income taxes & $36.3 in dividends for the shares still in government hands
- **Peru:** The sector shifted from draining the public treasury of $300 million in 1990 to being a source of fiscal income from $300 million in profits in 1998

Electricity Reform not a Panacea

- **Access:** In a restructured electricity market, profit alone is often an insufficient driver for expanding access to electricity to relatively unprofitable rural customers & the urban poor. Incentive schemes, subsidies, or regulatory mandates may be required.
- **Price:** Electricity reforms are typically associated with pressures to limit subsidies & enhance collection of tariffs. While these changes make for a better functioning sector, the resultant price increases can also cause social hardships & spur political opposition to reforms.
- **Reform May Not Go Smoothly:** Private companies that are not able to maintain a viable commercial enterprise tend to pull out leaving a deadlocked or confused situation in the power sector that may take years to sort out & have a negative effect on other industries.

Electricity Reform not a Panacea (II)

- **Subsidy Alternatives:** While, in theory, other subsidies could be provided *in lieu* of subsidized electricity prices. As a practical matter this is not easily done.
  - Removing or reducing price subsidies is politically difficult.
  - Data bases and bureaucracies for administering alternative subsidy programs may not be available.
  - The alternative subsidy mechanisms may cause misallocation of resources in other areas.
- **Outsider Views Oversimplify:** It is easy to proffer advice, especially when the myriad economic, cultural and governmental complexities of a country are ignored.

One Way or Another, Power Sector Investment Challenges Must be Met

- **Power Sector Investments are Needed to Sustain Growth**
- **Reliable Power: It is difficult to achieve economic productivity without reliable power.**
- **Power at Reasonable Cost: The cost of power is more important than the price of power. An efficient power sector is needed to achieve low cost.**
- **Good Results Can Be Achieved in Different Ways: While a competitive power sector has obvious advantages, this may not be the best solution in all places at all times. Regardless of the structure of the power sector, improved efficiency & sufficient capital investment should be a high developmental priority.**