
# ENERGY 101:

## What we do at the WB energy sector

Sustainable Energy Department
Sustainable Development Network
The World Bank Group

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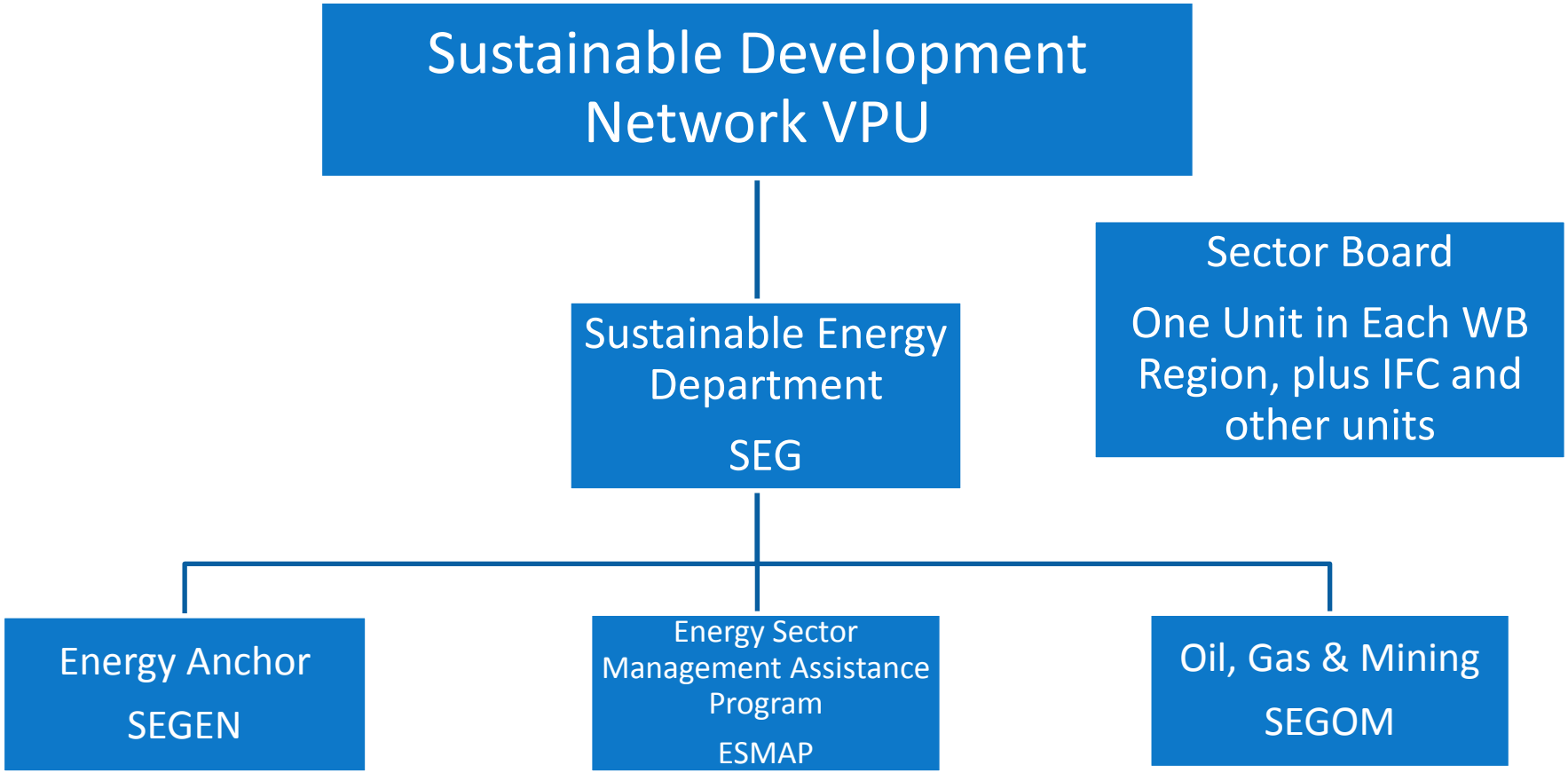
# ENERGY AT THE WORLD BANK

# Sector part of SDN and hosts the Energy Sector Board

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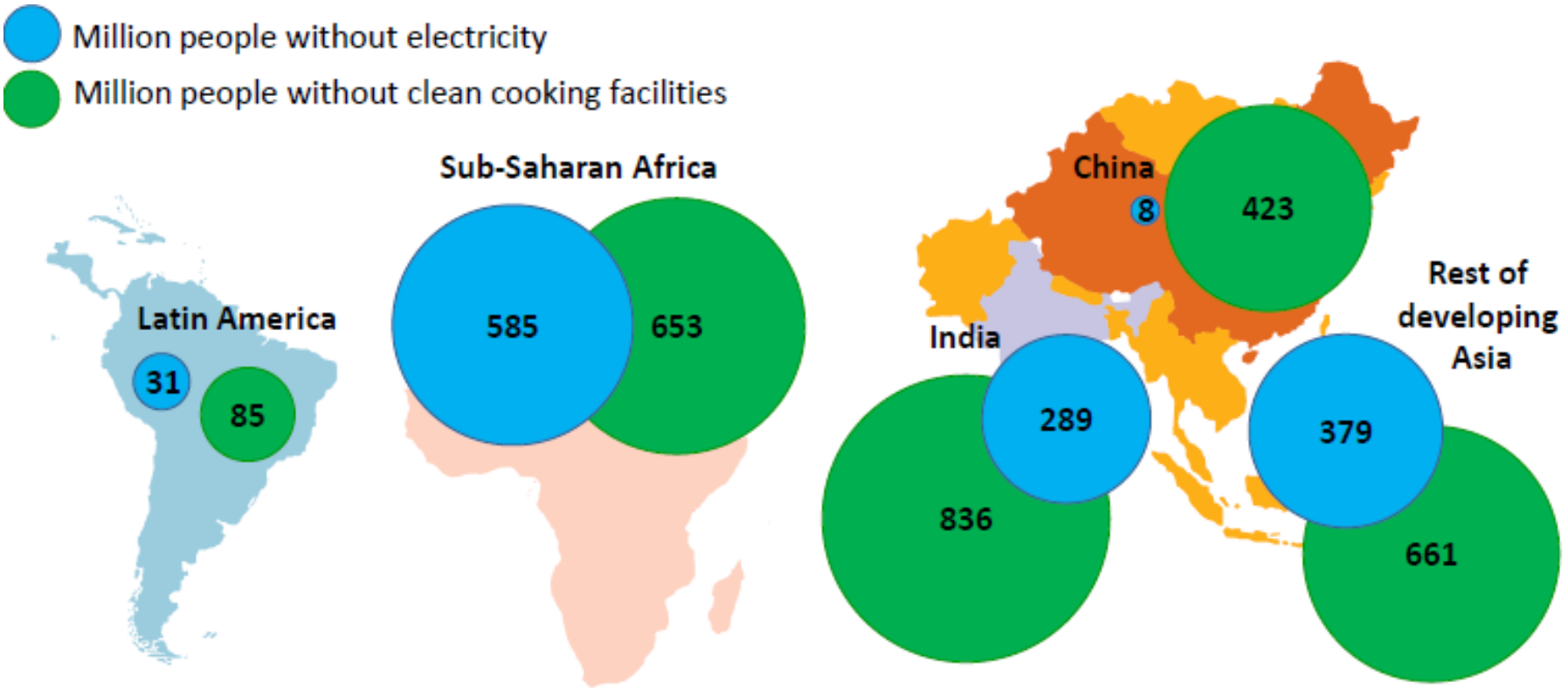
# ENERGY, POVERTY, CLIMATE CHANGE

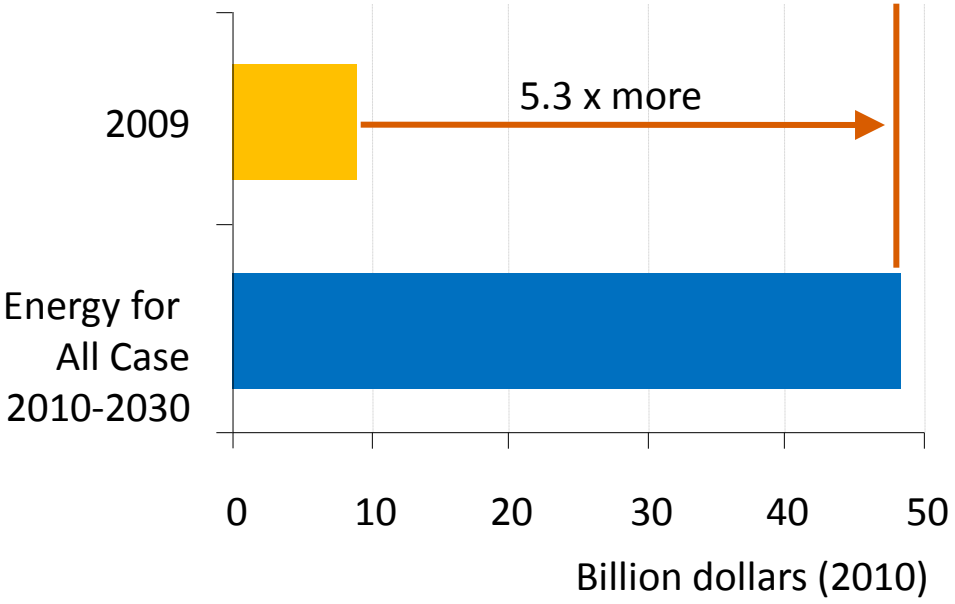
# Energy Access and Energy Poverty

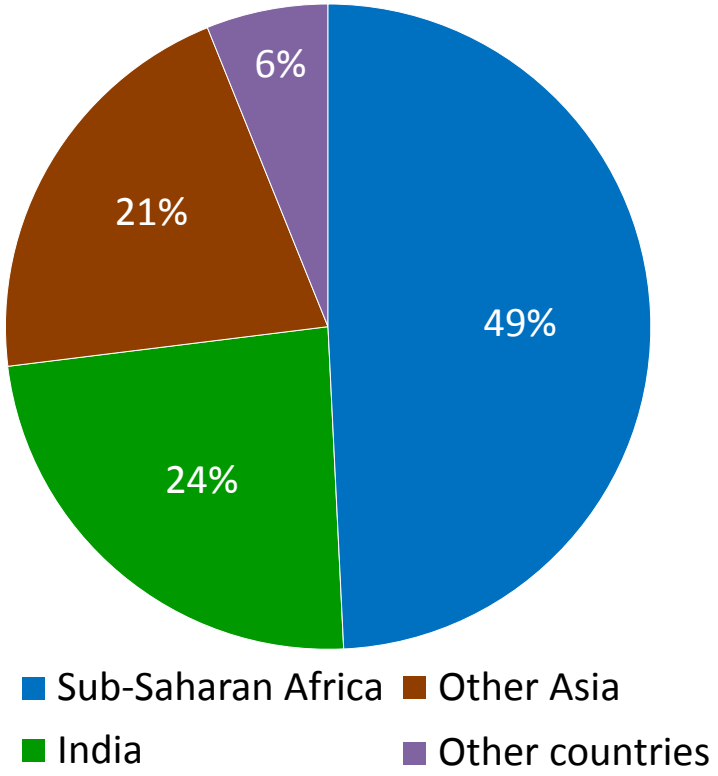
- 1.3 billion without access to electricity
- 2.5 billion use biomass & coal for cooking & heating: nearly two million die per year.
- Power shortages longer, more frequent & more widespread, limiting economic development & poverty reduction.
- Without modern energy, factories and businesses—large and small—cannot function efficiently; hospitals and schools cannot operate fully or safely; basic services that people in rich countries take for granted cannot be offered.

# Energy Poverty By Region



# Annual Investment In Energy Access

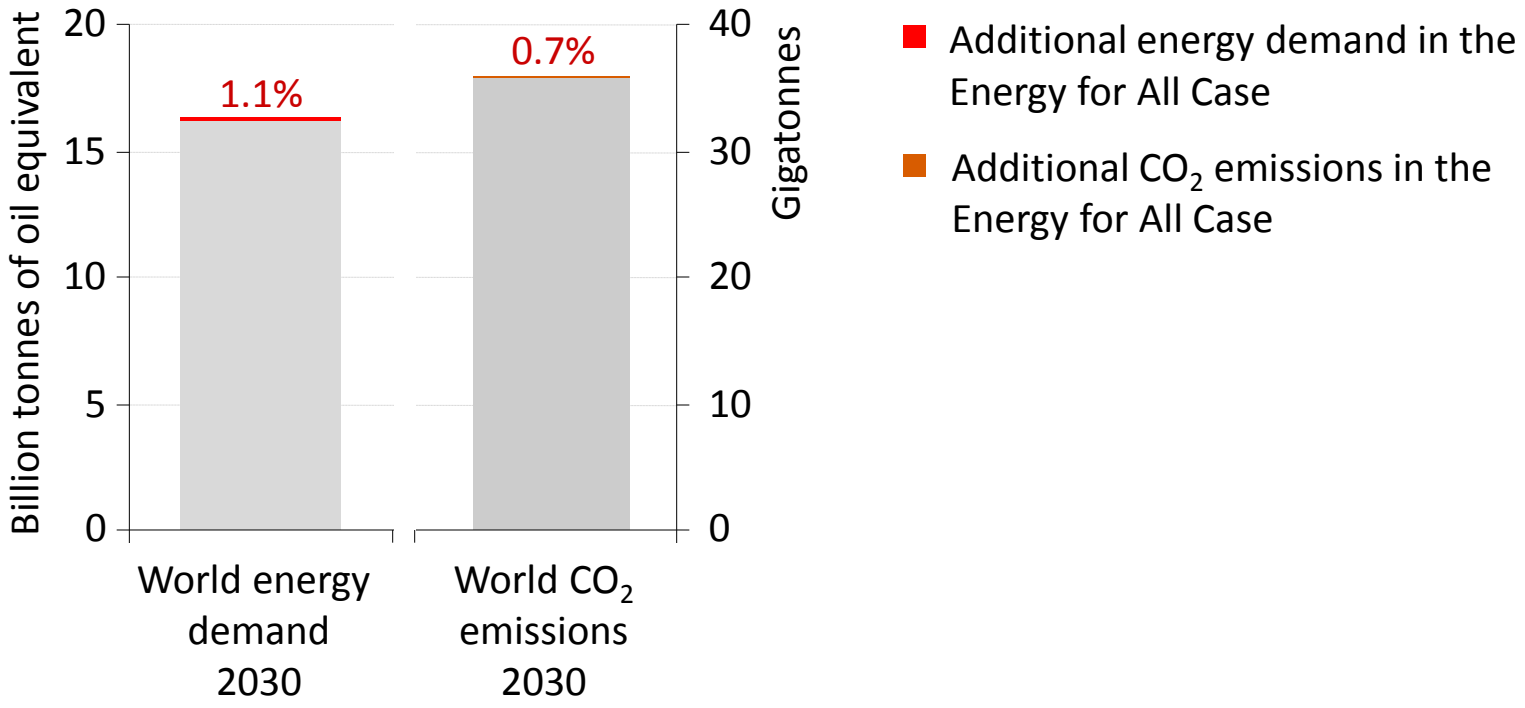



***1. Investment needs to grow by more than <u>five-times</u> to $48 billion a year***
***– equivalent to around 3% of global energy investment.***

***2. Nearly half of the investment is needed in Sub-Saharan Africa.***

# Implications of Modern Energy For All




***Achieving modern energy for all would only have a negligible impact on energy demand at the global level & efforts to combat climate change***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# ELECTRICITY 101

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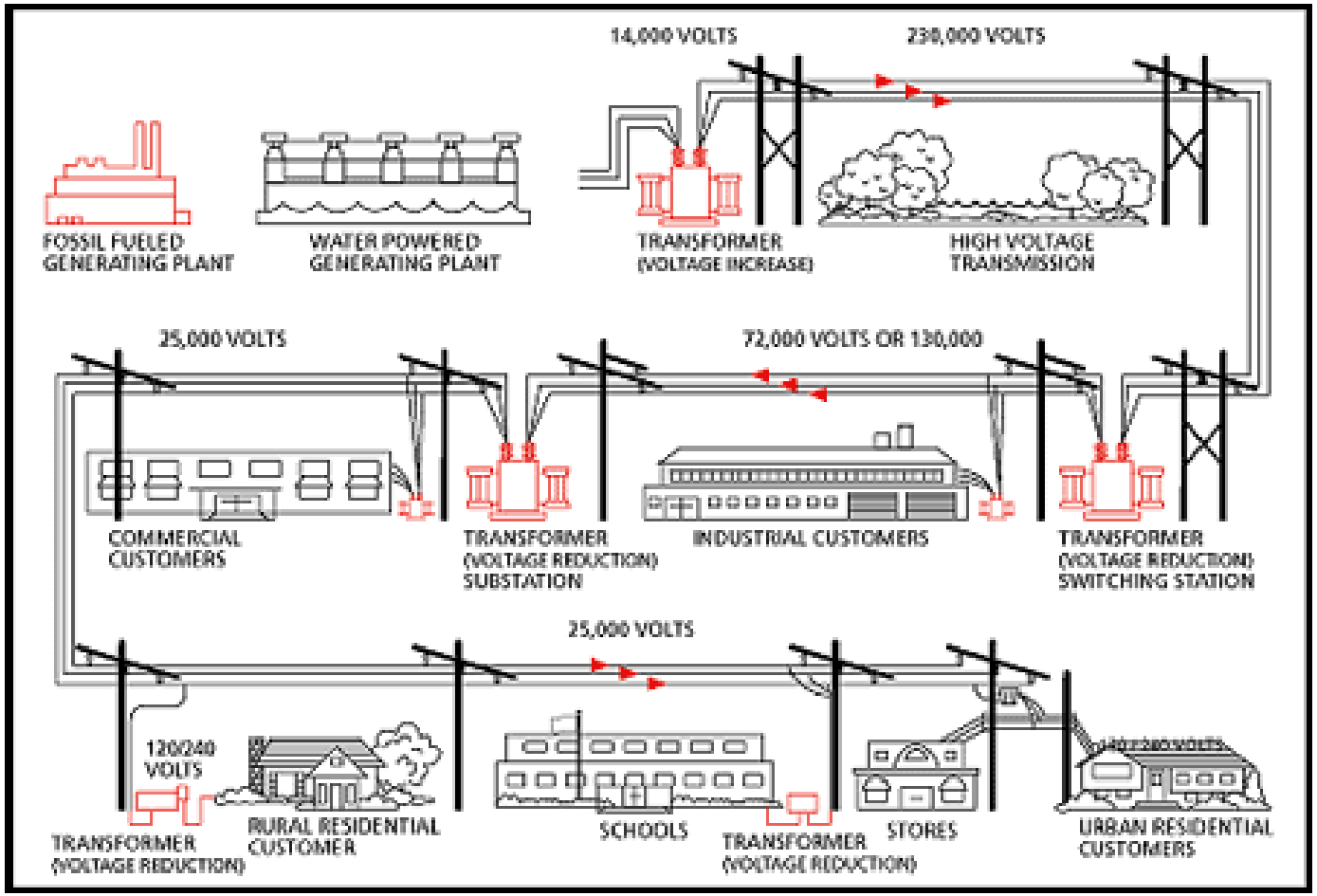
Electricity is produced at the time that it is being used




*Source http://www.saskpower.com*

# ELECTRICITY 101

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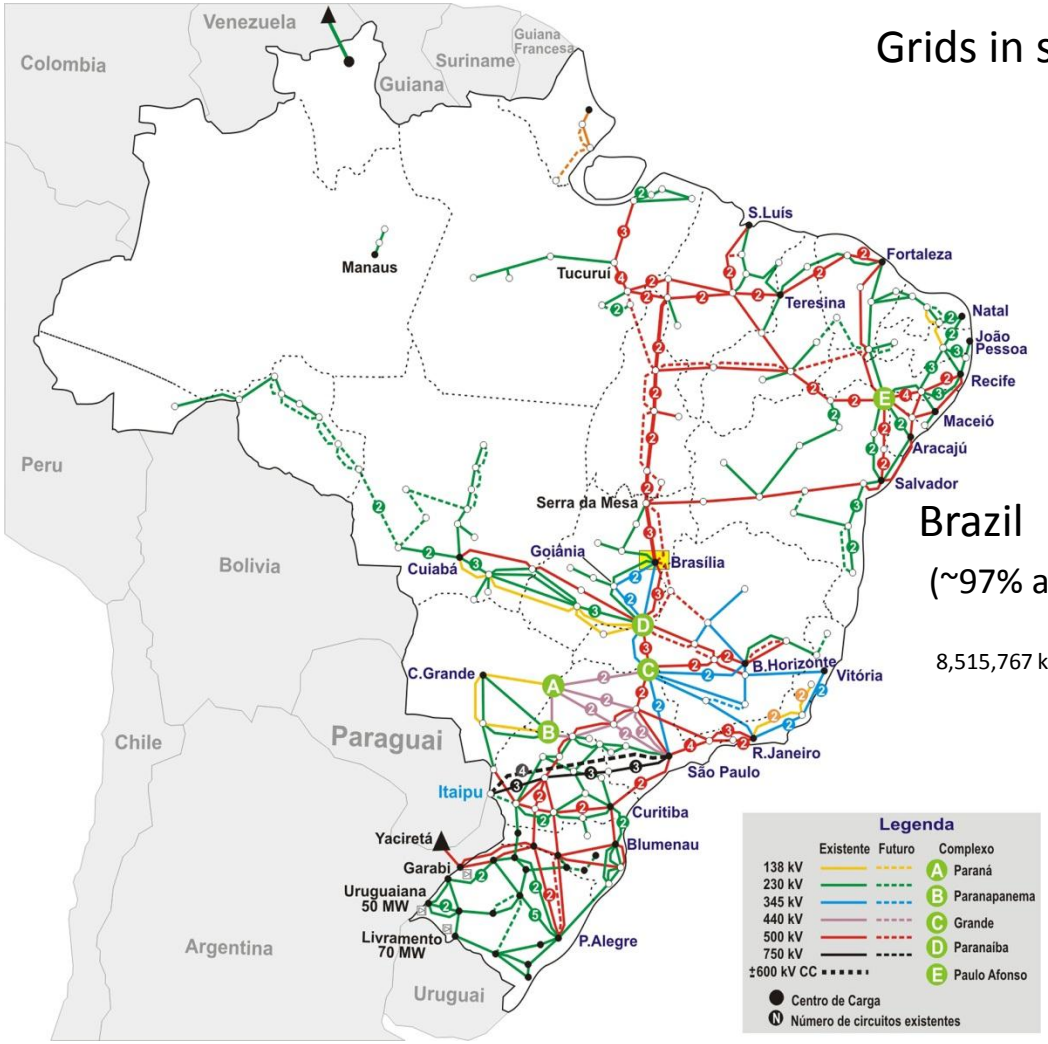
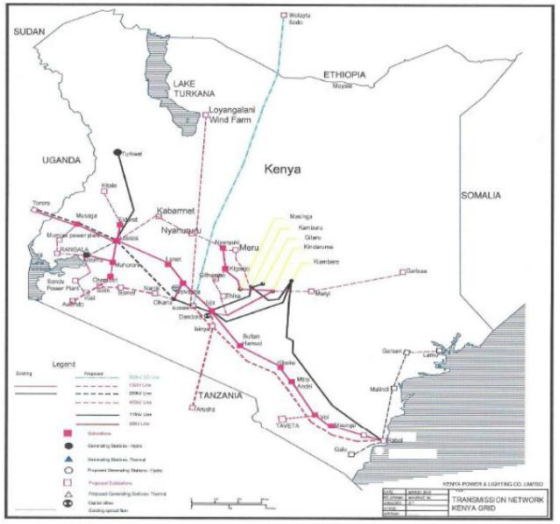
Grids in some countries




Brazil

(~97% access)

8,515,767 km2




Kenya

(~30% access)

582 367 km2

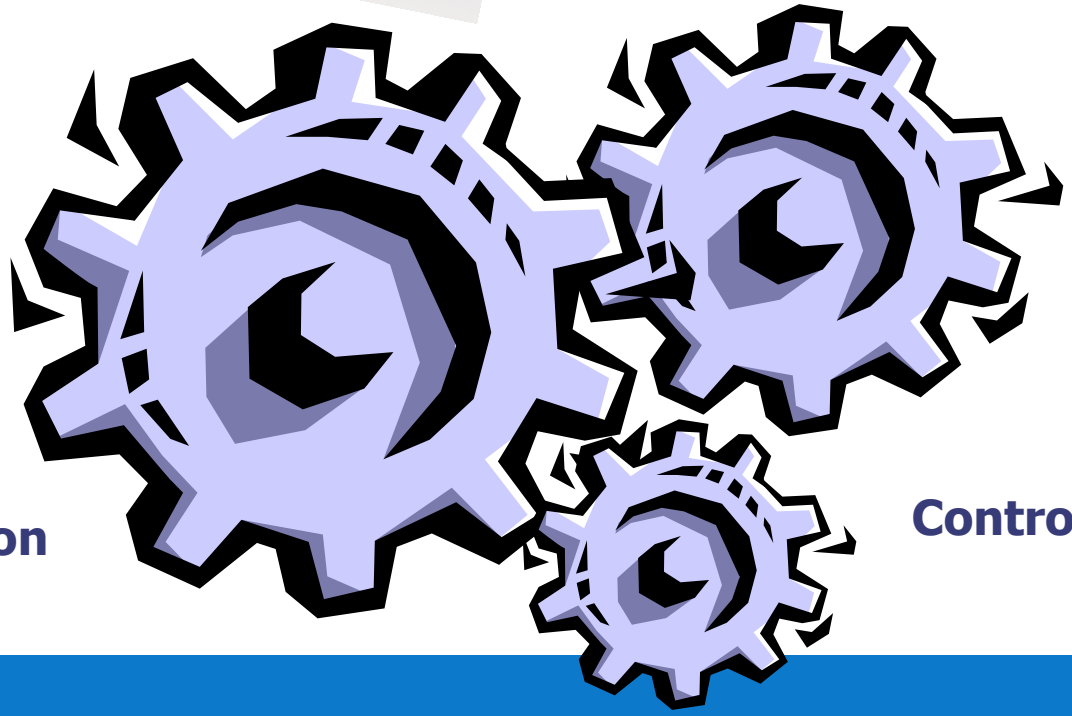
*Source ONS*

# ELECTRICITY 101

**All pieces need to work properly, if any piece falls apart service can fall apart**

**Institutions and Regulations**

- **The ministry** (setting direction, subsidies)
- **The regulator** (tariff setter)
- **The utilities** (building and operating)
- **The consumer** (receiving service and paying the bill)



**Transmission and distribution**

**Generation**

**Control**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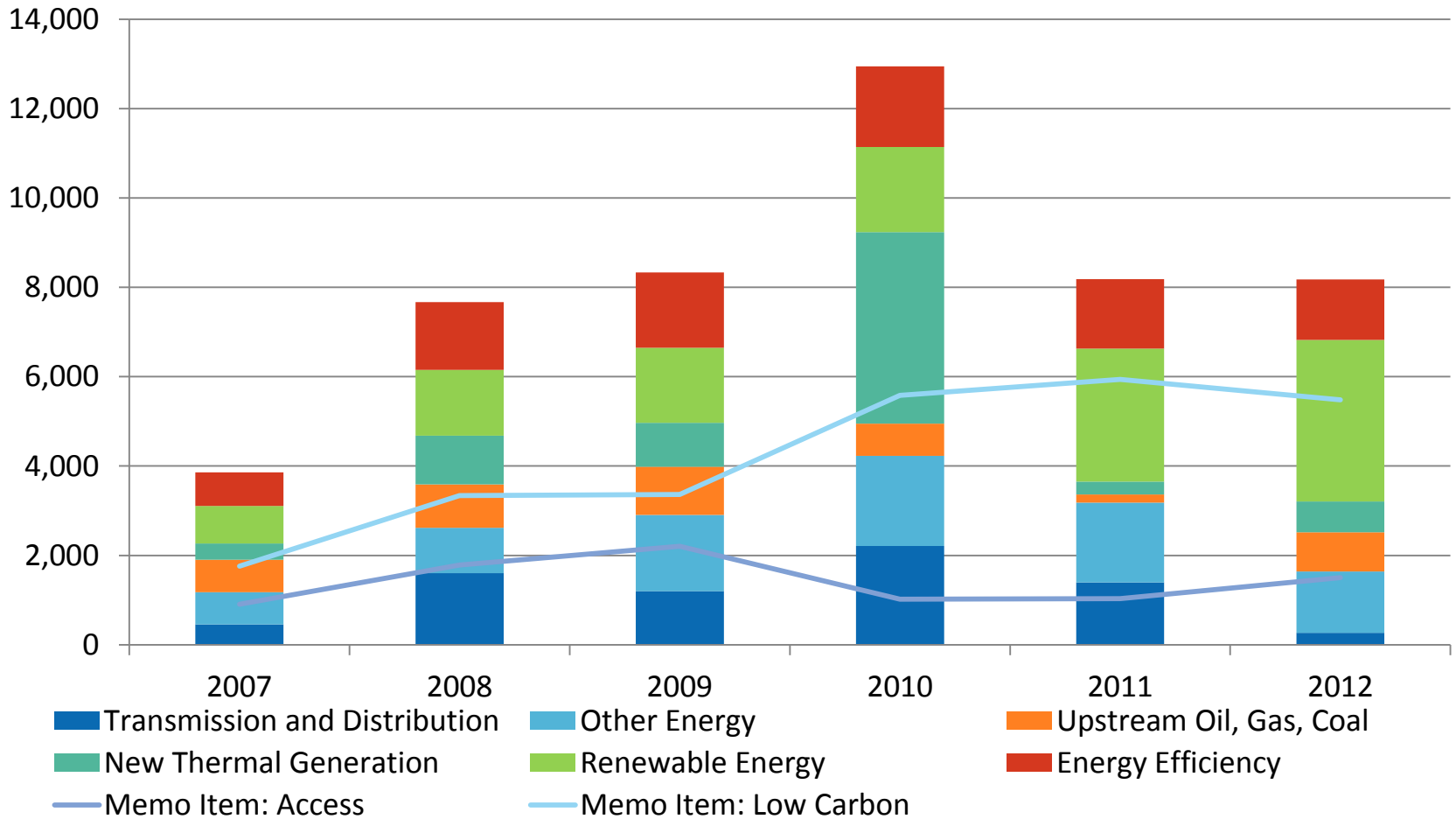
# WBG Energy Portfolio

# Energy Financing by Sub-Sector



# Energy Financing by Sub-Sector

| US$ Millions | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | Total |
|---|---|---|---|---|---|---|---|
| Energy Efficiency | 753 | 1,521 | 1,685 | 1,802 | 1,551 | 1,353 | 8,666 |
| Renewable Energy | 840 | 1,471 | 1,678 | 1,905 | 2,977 | 3,615 | 12,487 |
| New Thermal Generation | 364 | 1,087 | 987 | 4,287 | 290 | 690 | 7,705 |
| Upstream Oil, Gas, Coal | 729 | 972 | 1,076 | 725 | 182 | 880 | 4,564 |
| Other Energy | 717 | 1,015 | 1,702 | 2,019 | 1,783 | 1,369 | 8,605 |
| Transmission and Distribution | 458 | 1,605 | 1,204 | 2,208 | 1,397 | 270 | 7,142 |
| **Total** | **3,862** | **7,670** | **8,332** | **12,947** | **8,181** | **8,177** | **49,168** |
| *Memo Item: Access* | *905* | *1,784* | *2,201* | *1,020* | *1,031* | *1,499* | *8,439* |
| *Memo Item: Low Carbon* | *1,761* | *3,338* | *3,363* | *5,584* | *5,937* | *5,480* | *25,463* |

# WBG Roles

- Build credible regulatory frameworks for power
- Improve governance and financial balance of power utilities
- Facilitate regional energy opportunities
- Accelerate scale-up of electrification
- Strengthen capacity and support preparation of bankable projects
- Leverage private sector resources for power development
- Facilitate transfer of technology and experience (N-S/S-S)
- Tap into Climate Funds to support low carbon energy
- Support preparation of bankable projects
- Collectively apply global standards for project implementation
- Engage with civil society to ensure social sustainability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# PROJECT EXAMPLES

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# NAM THEUN 2 HYDRO PROJECT

Lao PDR

# NAM THEUN 2

- $153 million in WB IDA loans and guarantees + support from 26 other parties, including Electricité de France, helped build and operate hydropower facility providing 1000 MW of power for export to Thailand and an additional 75 MW for domestic consumption
- Nam Theun 2 will deliver $2 billion in revenues for Lao PDR development over 20 years
- Benefits for affected people include improved living conditions for 6,000 resettled villagers & programs for 200 villages downstream; improved road access, job opportunities & protection of biodiversity.

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# Transmission and Distribution Grid Expansion

India

# India Grid Expansion

- A $1 billion IBRD loan has to  expand transmission across India
- 52 billion kWh of additional service
- Increasing India's circuit by 40,000 km to reach 100,000 km
- Raising inter-regional electric power transfer capacity from 21 to 37 GW
- Delivering power to under-served regions

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# RURAL ELECTRIFICATION PROJECT

Vietnam

# VIETNAM RURAL ELECTRIFICATION

- In 1993, more than 70m people and 85% rural households lacked access
- Since then, 5% of GDP has been invested in energy infrastructure
- **World Bank** assistance accounted for 70% of $1 billion program cost
- By 2008, an additional 40m people had gained access
  - Proportion of rural households with access = 95%

# Others: Recent EE Projects

- Brazil: Electrobras Distribution Rehabilitation
- Ukraine: Energy Efficiency On-Lending Scheme
- Mexico: Energy Efficient Lighting and Appliances Project
- Uzbekistan: Advanced Electricity Metering Project
- Ethiopia: Urban Network Rehabilitation
- China: Shandong Energy Efficiency Credit Line
- Africa Region: Heidelberg Cement Plant Efficiency Initiative
- China: Urumqi City District Heating Efficiency Upgrade
- Bangladesh: CFL Distribution Project
- Yemen: Network Rehabilitation


# THANK YOU!

## Questions or comments?

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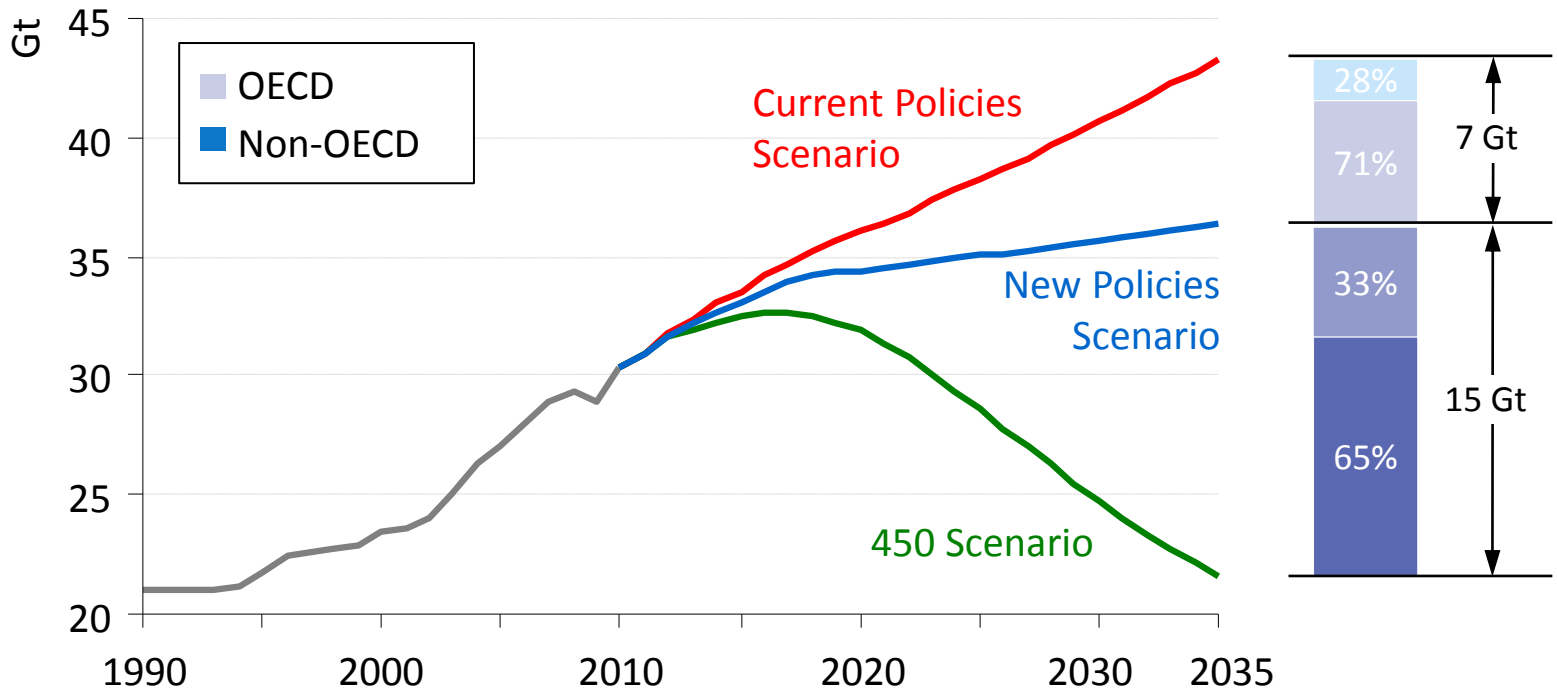
# Balancing Access and Climate Change

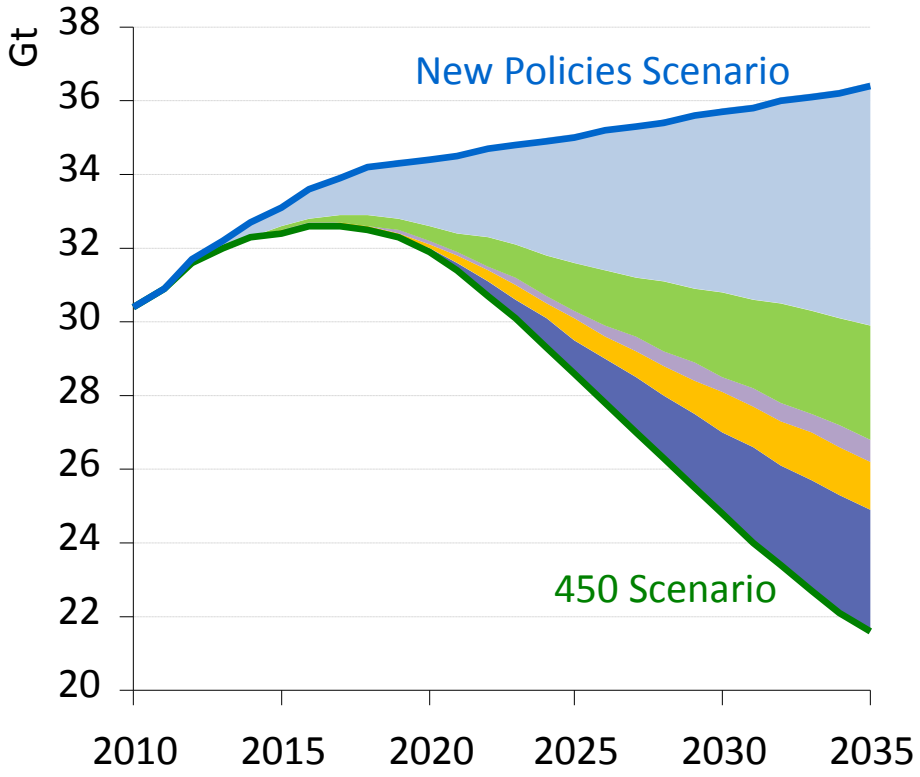
- Global temperature rise over 2$^{o}$ C would cause major disruptions
- 'Business-as-usual' scenarios would double energy-related $CO_2$ emissions by 2050
- Energy generation, processing, and use contribute over 60% of the world's greenhouse gas emissions
- Developing countries, and especially poor people, are disproportionately affected by the impact of climate change

# Energy-Related $CO_2$ Emissions By Scenario




- ***450 Scenario illustrates what the 2°C goal requires***
- ***Restricting the greenhouse-gas concentration to 450 ppm would limit temperature increase to 2°C, compared with 3.5°C in the New Policies Scenario & 6°C in the Current Policies Scenario.***

# $CO_2$ Emissions Abatement in the 450 Scenario Relative to the New Policies Scenario




| | Abatement | |
|---|---|---|
| | 2020 | 2035 |
| Efficiency | 72% | 44% |
| Renewables | 17% | 21% |
| Biofuels | 2% | 4% |
| Nuclear | 5% | 9% |
| CCS | 3% | 22% |
| Total (Gt $CO_2$) | 2.5 | 14.8 |

***Energy efficiency measures – driven by strong policy action across all sectors – account for 50% of the cumulative $CO_2$ abatement.***

# Recent Renewable Energy Projects

- South Africa: ESKOM Renewables Support– Wind, CSP
- Morocco: Ouarzazate Project – CSP
- Indonesia: Geothermal Clean Energy Investment
- Bangladesh: Renewable Energy for Rural Economic Development – Solar PV
- Kenya: Electricity Expansion Project – Geothermal
- India: Vishnugad Pipal Koti Hydro Electric Power Plant
- Pakistan: Tarbela Extension Project – Hydropower
- Vietnam: Trung Son Hydropower
- Peru: Cheves Energy – Hydropower