

# Briefing on International Dimensions of Renewable Energy

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# Bureau of Energy Resources (ENR)

## Sustainable, Affordable, Reliable, Access to Diverse Energy Supplies

### Managing the Geopolitics of Energy

- Wealth/Power/Influence
- Market Dynamics
- Energy Frontiers
- Spare Capacity

### Stimulate Markets for Energy Transformation

- Private and Donor Finance
- Innovation & Investment
- Access to Electricity/  
Regional Interconnection
- Tariffs and Regulations
- Renewable/Efficient/Clean  
Technology

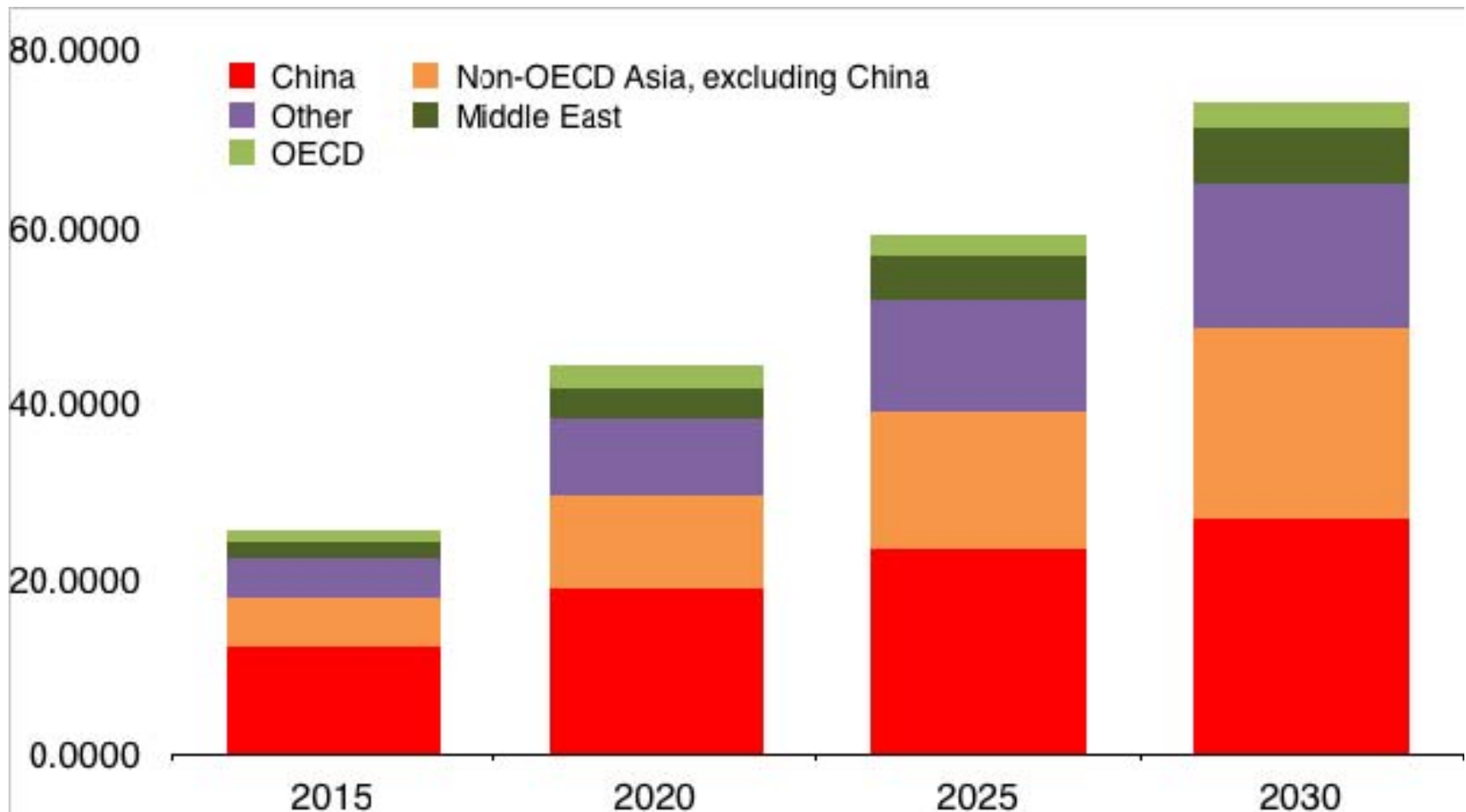
### Transparency, Governance, and Access to Energy

- Resources: Budgets/People
- Energy Poverty
- Markets Amid Poverty
- Entrepreneurship/Innovation

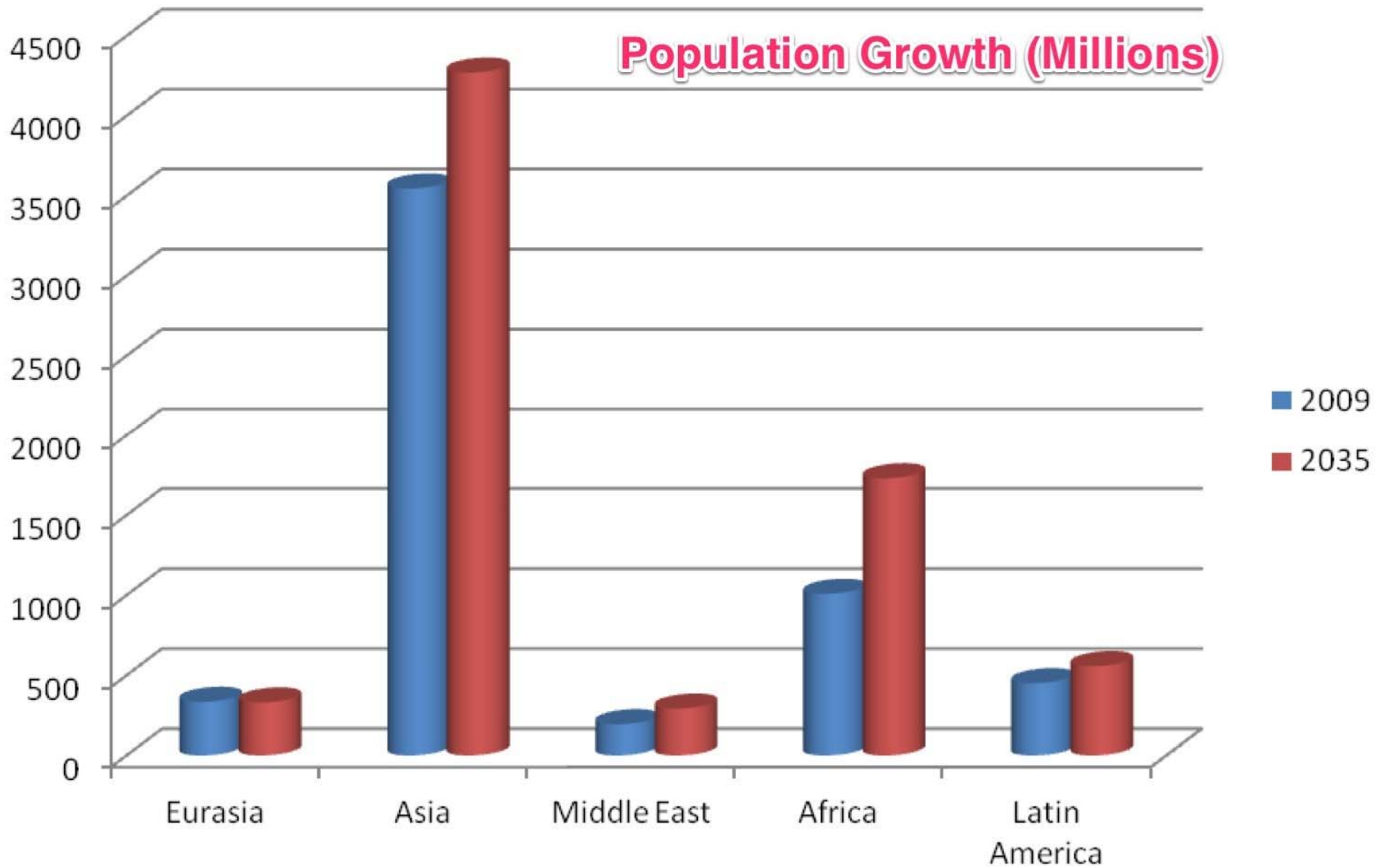


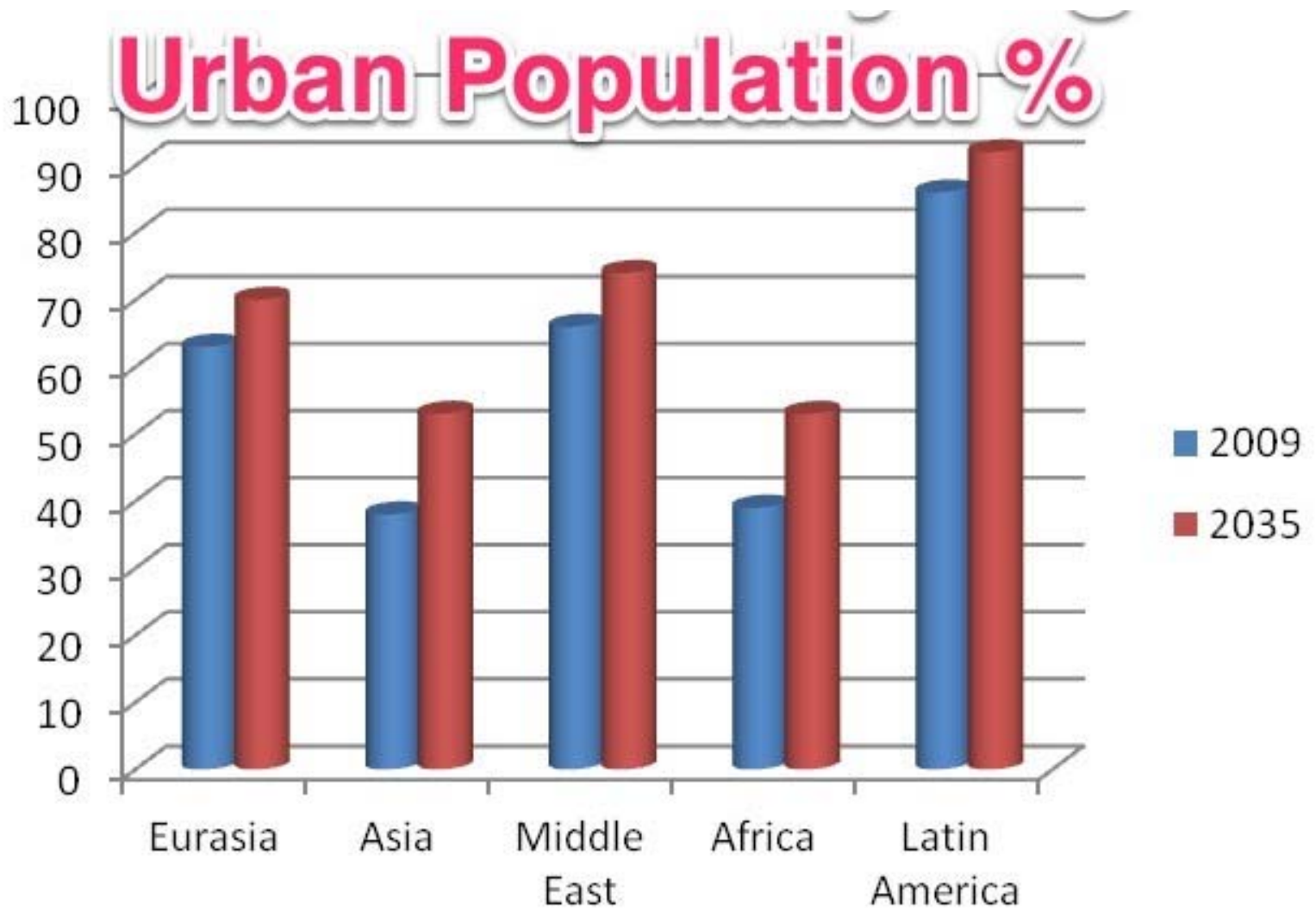
# Growth in Energy Consumption

Cumulative Global Energy Consumption Growth, 2010-2035 (Mboe/d)



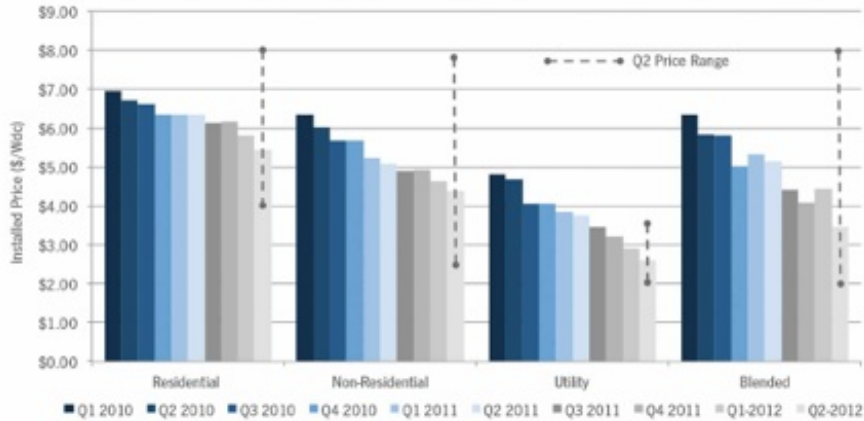
Sources and Notes: IEA 2012 WEO. Tons converted to barrels at approximate conversion factor of 7.33.





# Falling Pricing for Renewables

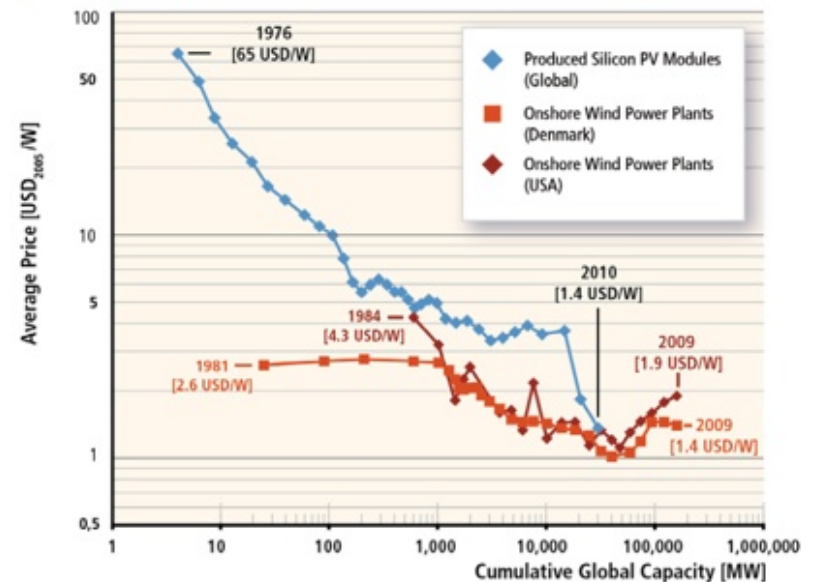
Figure 1. Cost of solar in the US (source: SEIA Q2 market report).



- Current Brazil Wind PPA's below \$0.05/kWh
- China Wind Energy Equipment currently available for <\$600 per installed MW of capacity.

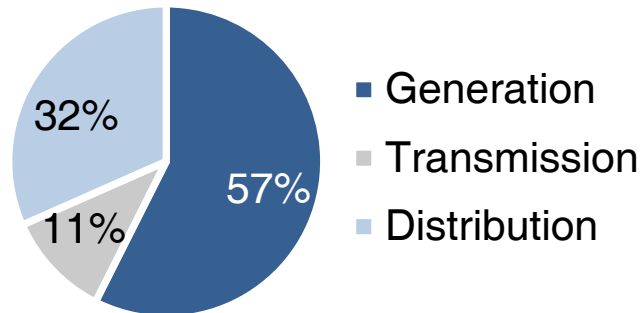
- Current container Load (2MWs) pricing for Solar PV panels below \$0.75/watt ;
- Solar thin film PPA contracts available at \$0.06/kWh

Figure 2. Long-term price trend for solar and wind (source: UN IPCC).



# Global Power Sector Investments

**Power: \$16.9 trillion**



➤ **More than 40% of global investment in the power sector goes to transmission and distribution.**

➤ **60% of investment is in the non-OECD to meet growing demand.**

## New Investment in Electricity Generation, 2012-2035 (\$ billion)

	OECD	Non-OECD	World
Coal	451	1,157	1,608
Gas	436	605	1,041
Oil	16	59	75
<b>Total Fossil</b>	<b>903</b>	<b>1,821</b>	<b>2,724</b>
<b>Total Nuclear</b>	<b>360</b>	<b>583</b>	<b>943</b>
Bio-energy	368	280	648
Hydro	418	1,130	1,548
Wind	1,145	984	2,129
Solar PV	717	542	1,259
Other*	226	208	434
<b>Total Renewable</b>	<b>2,874</b>	<b>3,144</b>	<b>6,018</b>
<b>TOTAL GENERATION</b>	<b>4,137</b>	<b>5,548</b>	<b>9,685</b>

Source: IEA, WEO 2012, New Policies Scenario

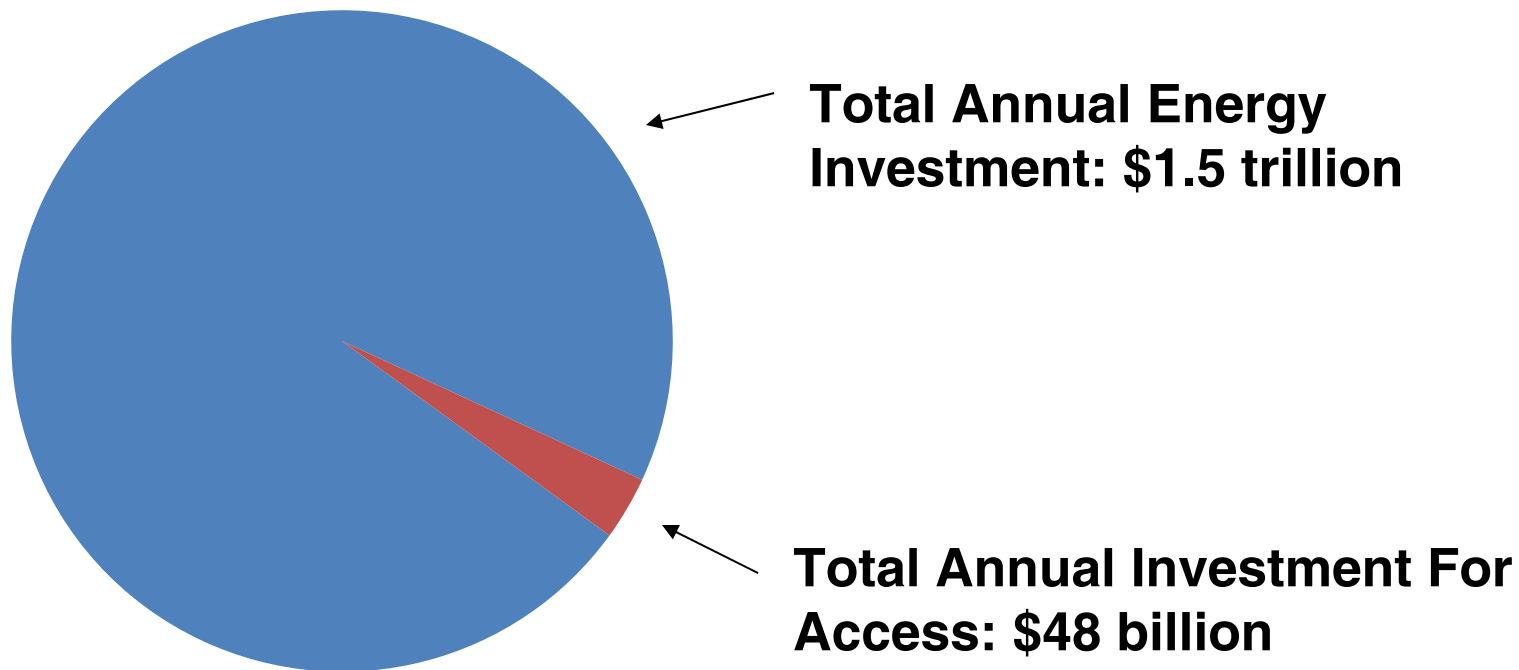
\* Includes geothermal, concentrated solar, and marine

# Investment for Access

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- **1.3 billion people currently lack access to electricity.**
- **Achieving universal electricity access by 2030 requires \$48 billion in annual investment – 3% of the total investment in the energy sector.**





Global/Regional



INVESTMENT FUNDS

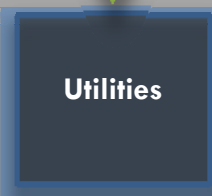
Risk: Currency

National



LARGE PROJECTS

Risk: Power Purchase Agreement



Utilities



LOCAL INTERMEDIARIES

Risk: Capitalization & Capacity

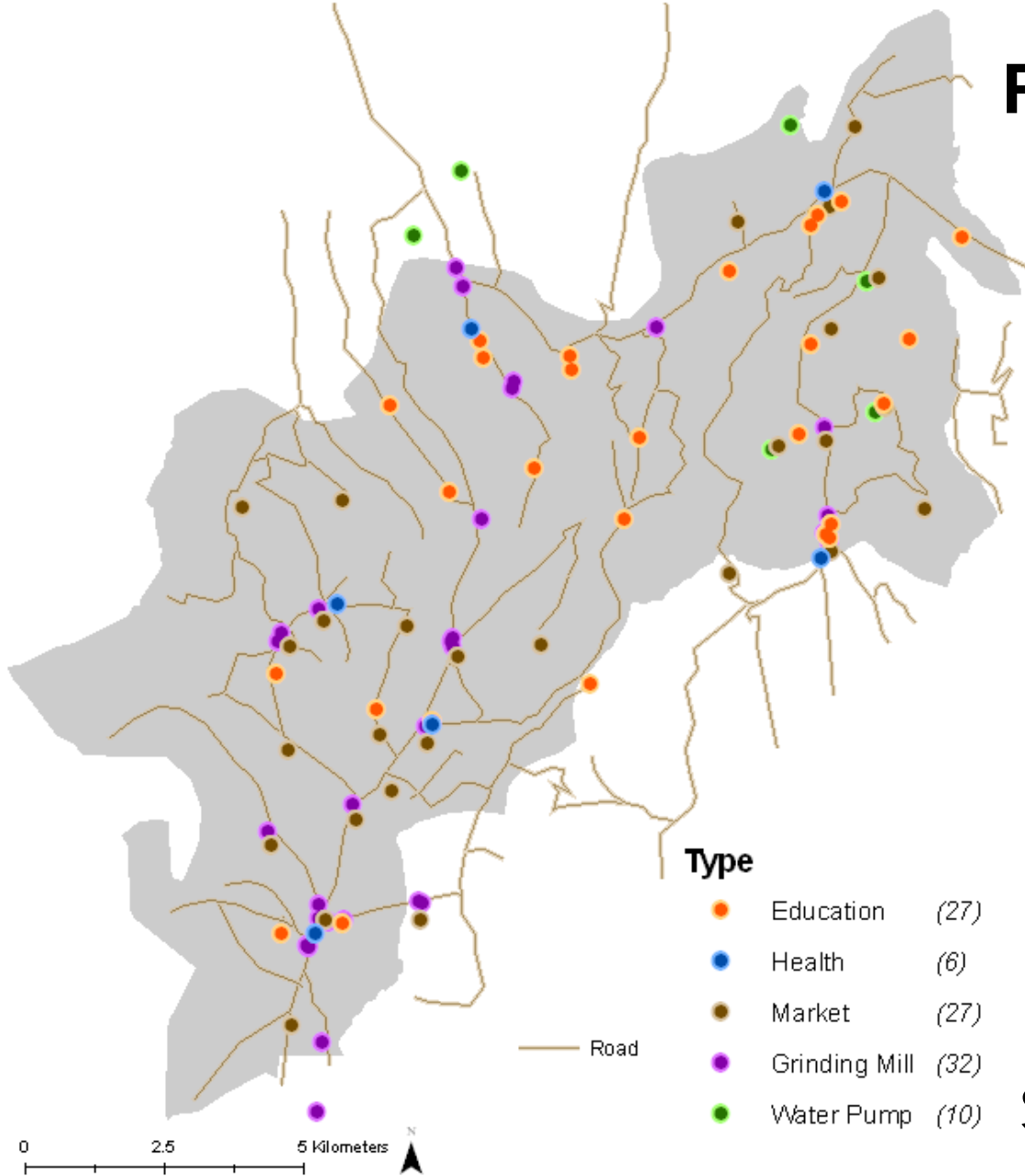
Risk: Repayment



SMALL PROJECTS

Risk: Quality

# RUHIRA, UGANDA

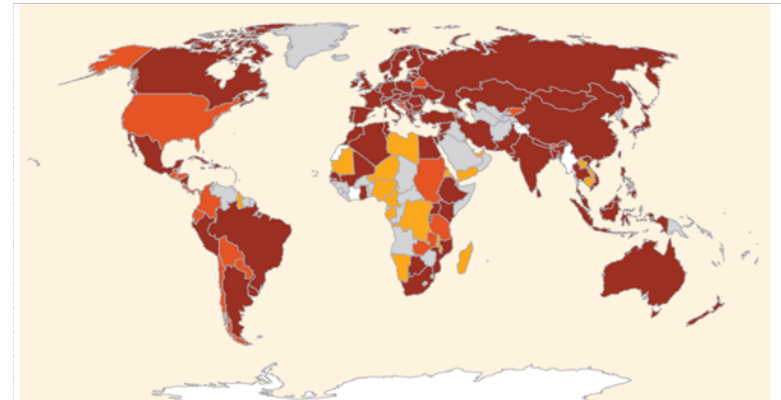


Source: World Bank

# Government Role and Subsidies:

## 2012 Policies:

- Countries with at least one RE-specific Policy and RE Target
- Countries with at least one RE-specific Policy
- Countries with at least one RE Target
- Countries with neither RE-specific Policies nor RE Targets



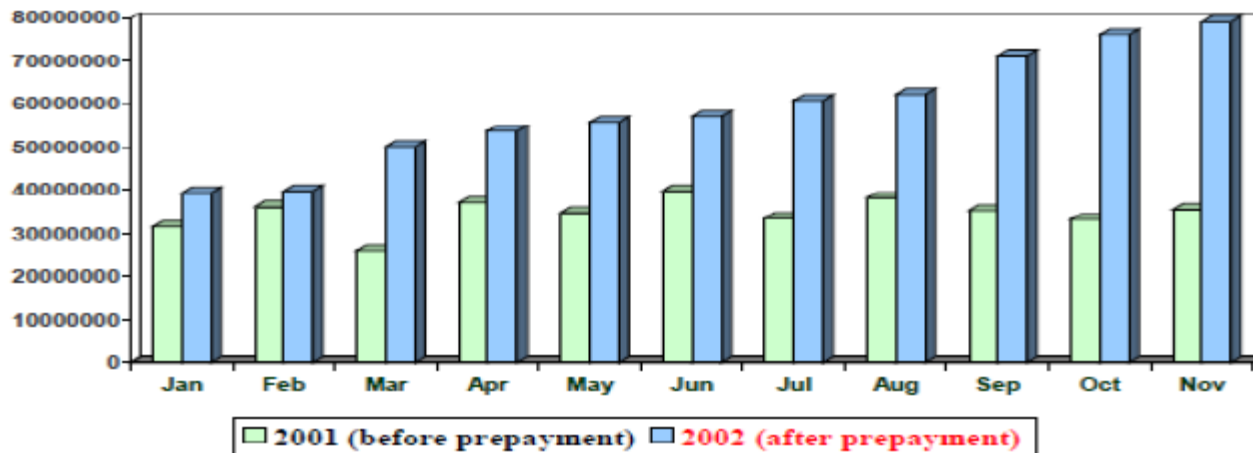
## European Tenders:

Actor	Advantage/Disadvantage
<b>Government/Regulator</b>	<ul style="list-style-type: none"> <li>• <i>Competitive price discovery (prevents overcompensation)</i></li> <li>• <i>Control type, quality and location of renewables installed</i></li> <li>• <i>Possibility to incorporate other criteria (e.g. jobs, environmental impact, etc.)</i></li> </ul>
<b>Developers</b>	<ul style="list-style-type: none"> <li>• <i>Fast response Required (usually about two months)</i></li> <li>• <i>Preference given to large Developers who have resources to apply quickly</i></li> <li>• <i>High Transaction costs (deposit required) and complicated application process</i></li> <li>• <i>Guaranteed prices (or premiums) offer protection from market volatility</i></li> </ul>
<b>Consumers</b>	<ul style="list-style-type: none"> <li>• <i>Controlled impact on electricity prices, known in advance</i></li> </ul>

# Opportunities for distribution utility reform

- **Utility reform** is aimed at reducing the fiscal burden of financing public services
- **Non-technical losses** can be reduced through a variety of solutions, including:
  - Legal and regulatory reform
  - Public outreach
  - Physical configurations and loss-prevention techniques
  - Improved cables
  - Meters, specialized software, and advanced technologies
- **Institutional reform** to strengthen the investment climate can be accomplished through numerous options, including: contracts reform, management reform, or privatization.

## Case Study – split type prepayment meters as a technical solution: Sudan

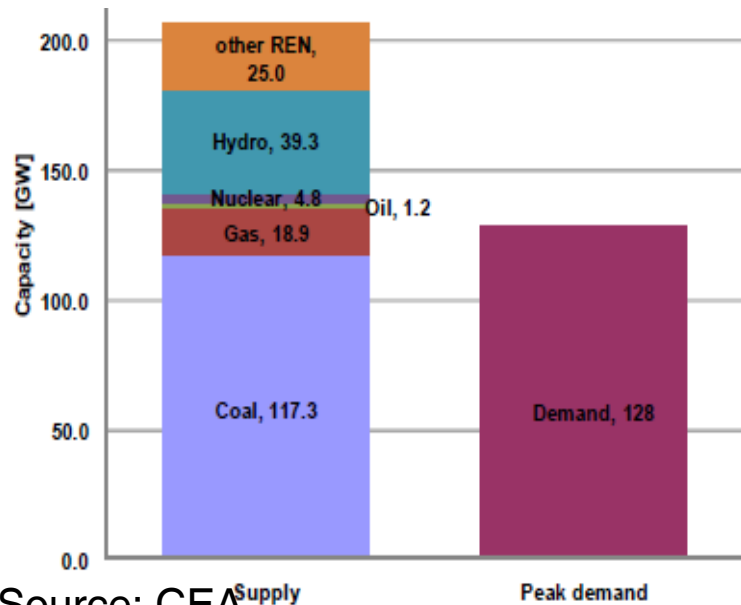
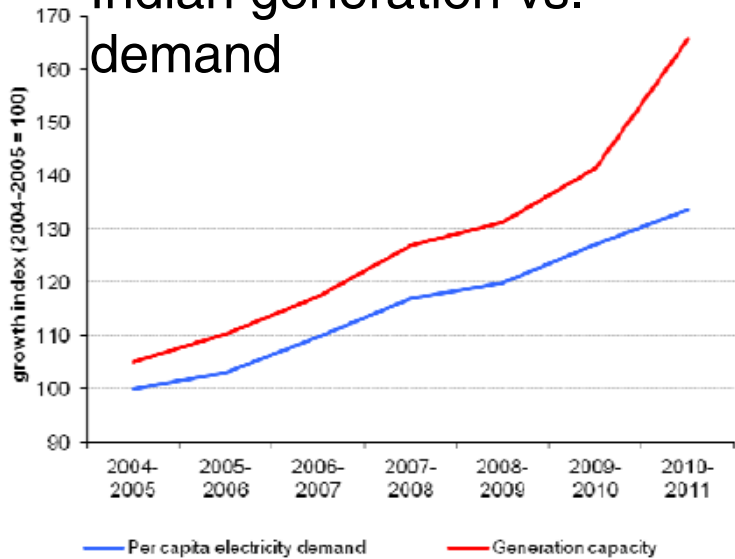


Revenue collections more than doubled in the first year after deployment of pre-pay split-meters

Source: USAID

# Power system stress – more than capacity

Indian generation vs. demand



July 2012 catastrophic power failure



Source: Platts

# System Challenges for Renewables:

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## Connect 2022: A Business Case for Interconnection

**Mexico:** average residential tariff  
**\$.09/kWh** (2010)

**Panama-Colombia:** Central America could save up to \$2.3 mn; marginal *generation* cost of hydro in Colombia is **\$.05/kWh**; *retail* price in Panama **\$.19-22/kWh**

**Central America:** SIEPAC to enter full operation in 2012, with potential **savings of 10-15%** in the average generation cost (IDB)

**Chile:** residential tariff **\$.18/kWh** (2011)

**Caribbean region:** average consumer tariff **\$.20-.50/kWh** (WB 2011)

**Barbados:** consumer tariff **\$.32/kWh** (2010)

**Guadeloupe:** France subsidizes to Paris price of **\$.11/kWh** (2010)

**Jamaica:** Generation costs \$.24/kWh and **\$.39/kWh** residential consumer price (2011)



# Sustainable Energy For All (SE4ALL):

## Three Aspirational Goals by 2030

### ENERGY ACCESS

OVER 1 BILLION PEOPLE WORLDWIDE LACK ACCESS TO ELECTRICITY



### ENERGY EFFICIENCY

GLOBAL ENERGY CONSUMPTION COULD GROW 33% FROM 2010-2035

Global energy-related carbon dioxide emissions could rise 20% by 2035.

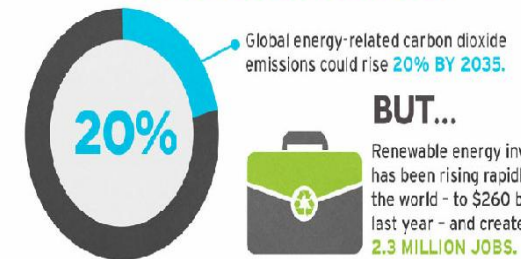


### RENEWABLE ENERGY

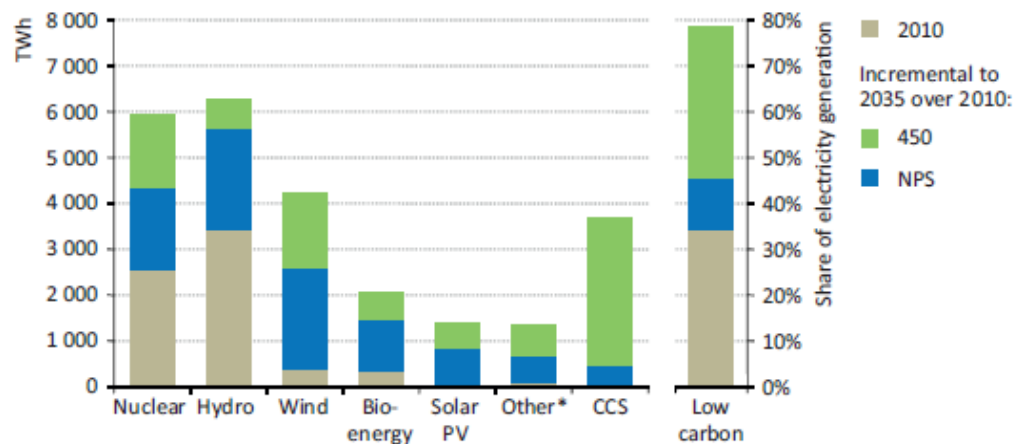
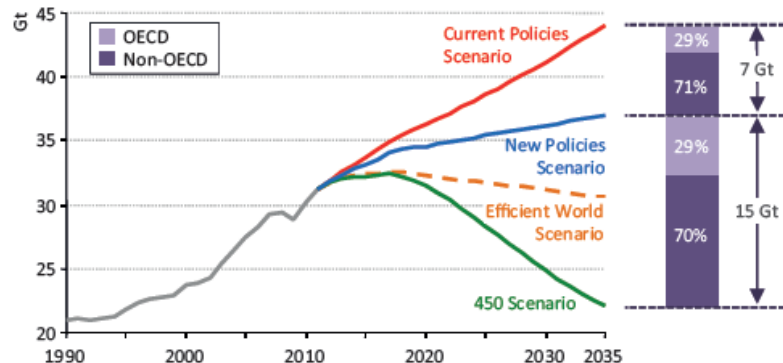
SUSTAINABLE ENERGY POWERS OPPORTUNITY.

IT GROWS ECONOMIES. IT LIGHTS UP HOMES, SCHOOLS AND HOSPITALS. IT EMPOWERS WOMEN AND LOCAL COMMUNITIES. AND IT PAVES A PATH OUT OF POVERTY TO GREATER PROSPERITY FOR ALL.

GLOBAL ENERGY DEMAND WILL GROW UP TO 33% FROM 2010 TO 2035



# Environmental and Climate Change:



Renewable Scenario	By Year	Electricity	Heat	Transport
<i>ExxonMobil (2012)</i>	<b>2040</b>	<b>16%</b>	-	-
<i>IEA WEO (2012) "Existing Policies"</i>	<b>2035</b>	<b>24%</b>	<b>12%</b>	<b>5%</b>
<i>BP (2012)</i>	<b>2030</b>	<b>25%</b>	-	<b>7%</b>
<i>IEA WEO (2012) "New Policies"</i>	<b>2035</b>	<b>31%</b>	<b>14%</b>	<b>6%</b>
<i>IEA WEO (2012) 2 °C. "450 ppm"</i>	<b>2035</b>	<b>48%</b>	<b>19%</b>	<b>14%</b>
<i>IEA Tech. Perspectives (2012) "2 °C."</i>	<b>2050</b>	<b>57%</b>	-	<b>39%</b>
<i>IEA Tech. Perspectives (2012) "2 °C. Hi RE"</i>	<b>2050</b>	<b>71%</b>	-	-