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# **World Energy Issues and Developing Countries**

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# Overview

- Global Energy Overview
  - Role of Renewable Energy
  - Needs and Opportunities
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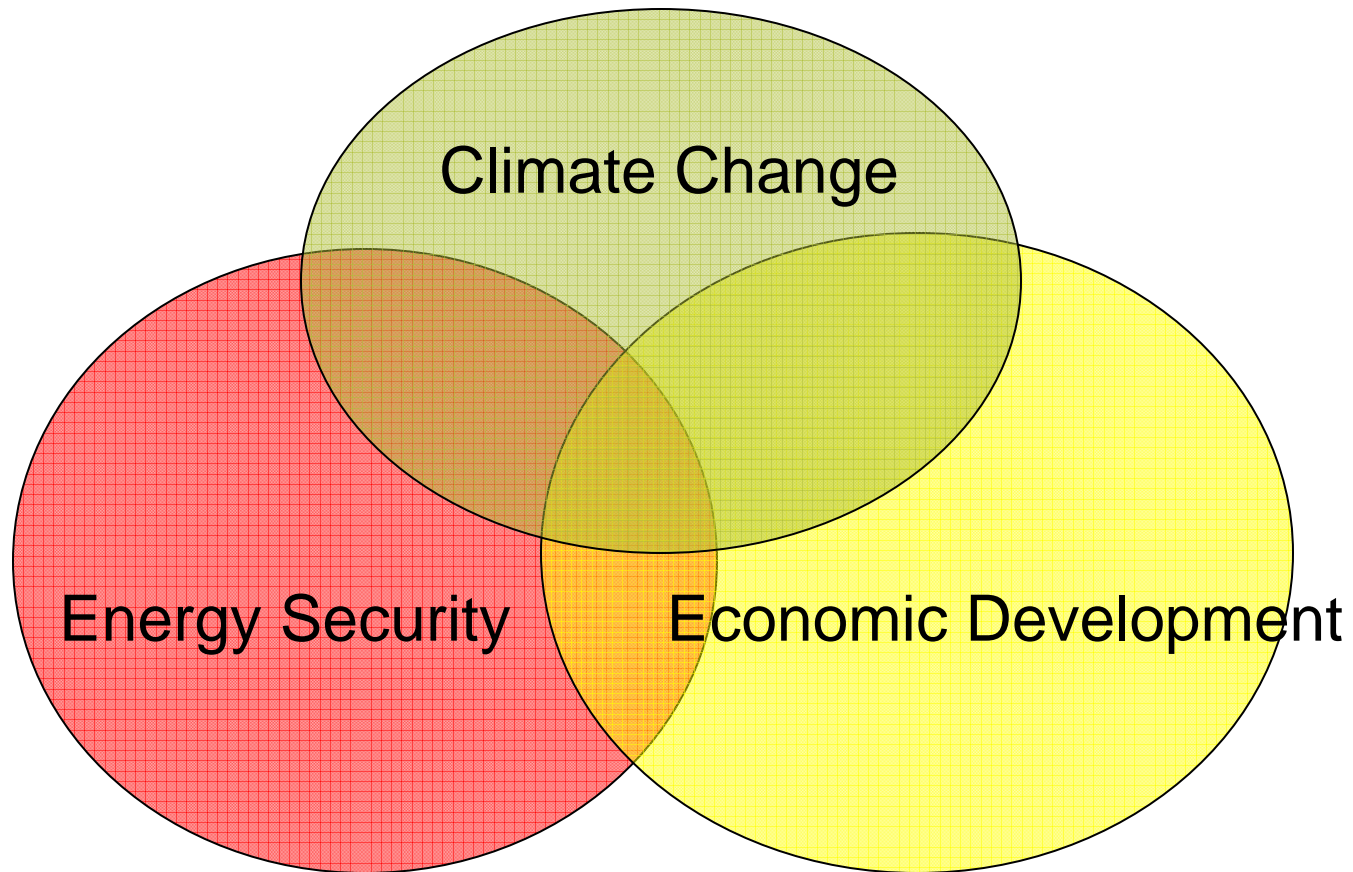
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# Global Energy Markets

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# Key Market Drivers for EnergyWorldwide



# Global Energy Overview

- World primary energy demand in BAU scenario increases 45%, 2006-2030
- Fossil fuels dominate global energy use; 80% of world primary energy mix in 2030
- Fossil fuel prices rising
- Global carbon dioxide to increase > 60%; bulk to come from LDCs
- Modern RE technologies grow most rapidly
  - Average of 7.2%/year thru 2030
  - Hydropower from 1% in 2006 to 4% in 2030

Figure 2.1 • World primary energy demand by fuel in the Reference Scenario

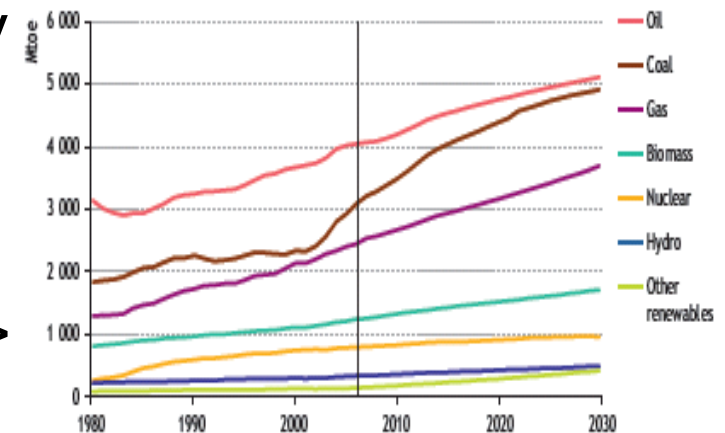
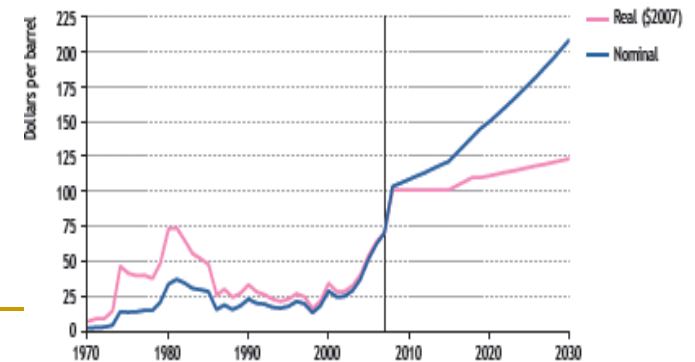
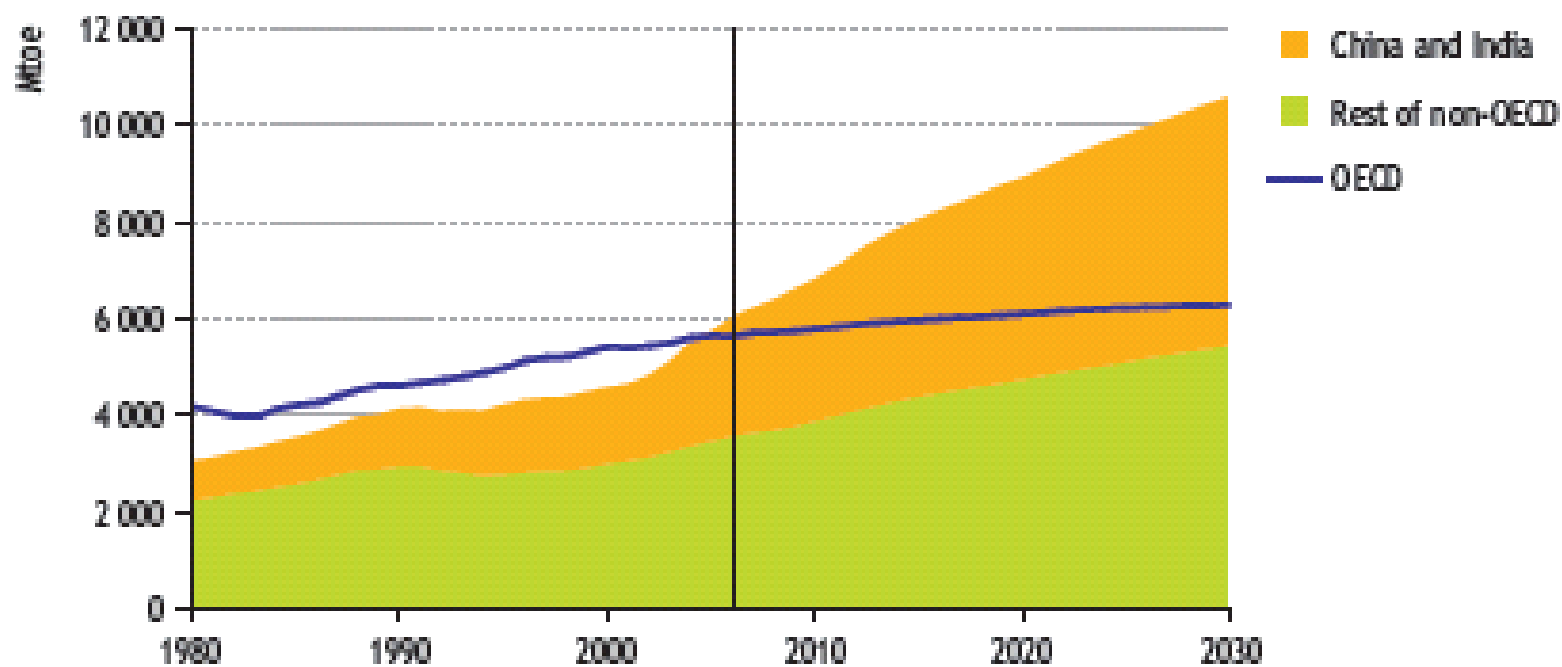


Figure 1.4 • Average IEA crude oil import price (annual data)



**Figure 2.2** ● World primary energy demand by region in the Reference Scenario



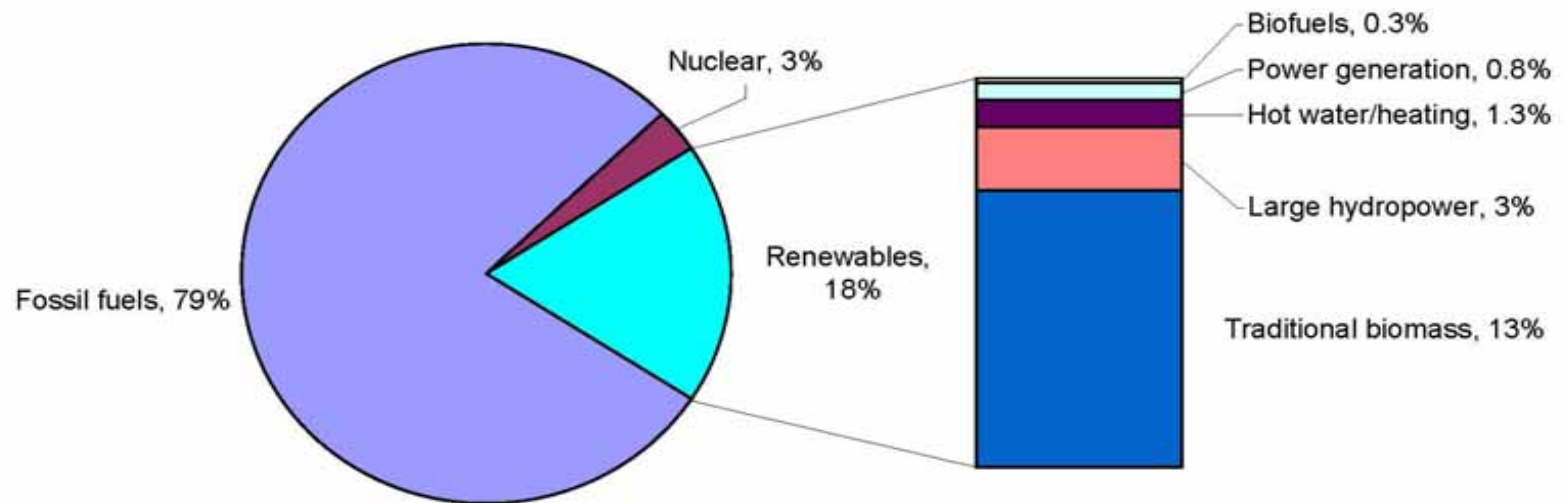


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# **Renewable Energy Status**

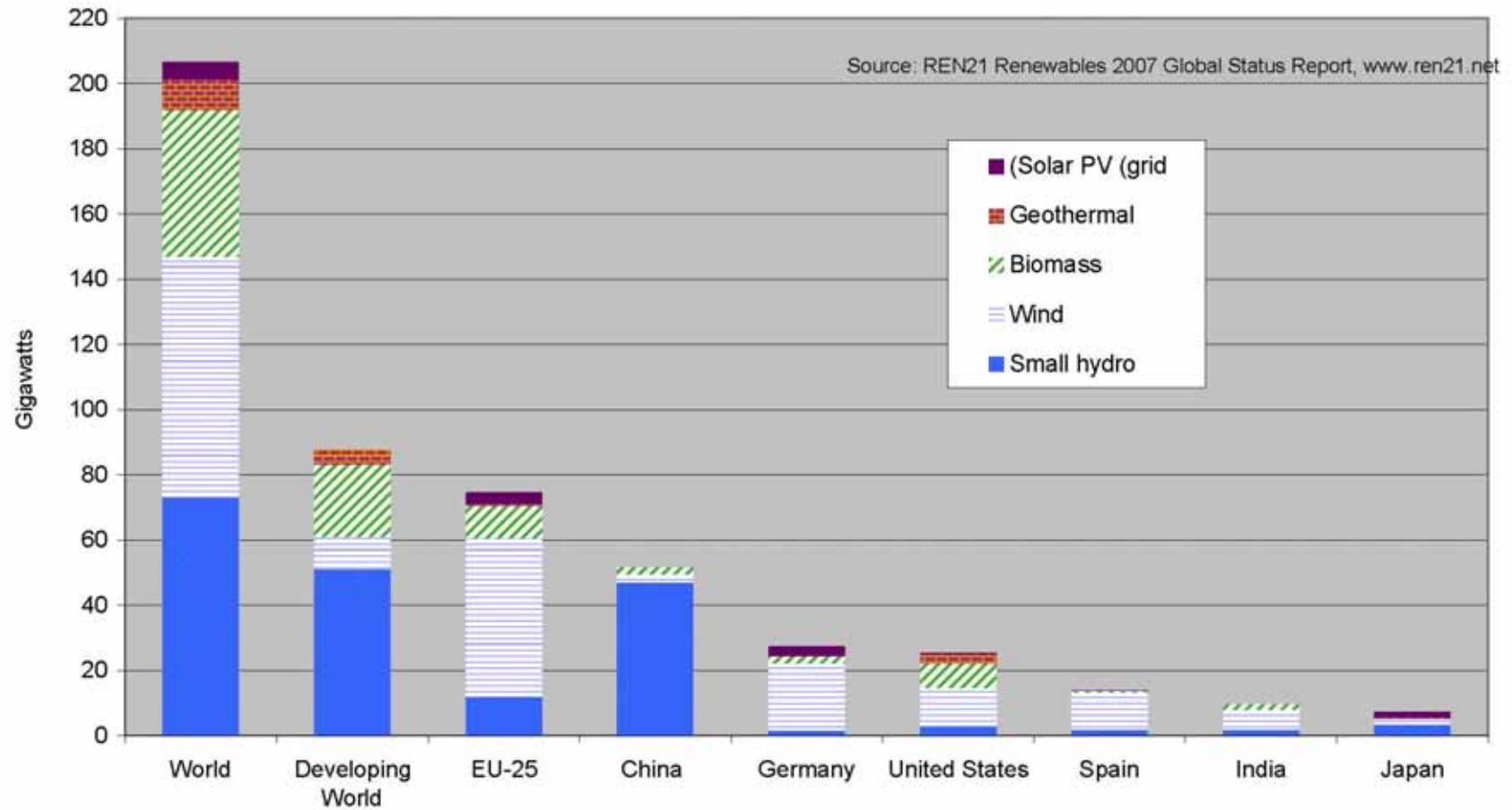
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**Figure 1. Renewable Energy Share of Global Final Energy Consumption, 2006**



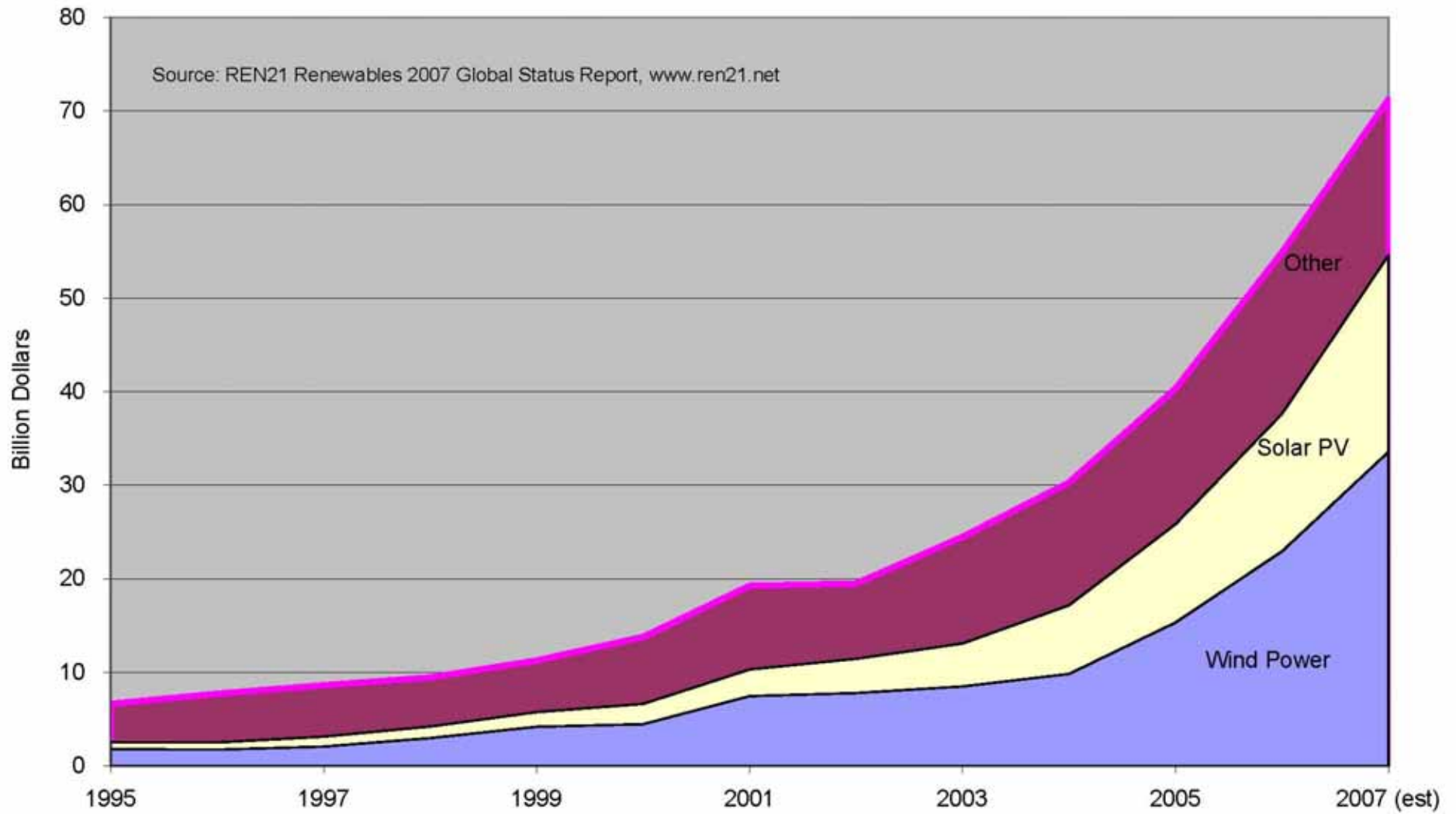
Source: REN21 Renewables 2007 Global Status Report, [www.ren21.net](http://www.ren21.net)

Figure 7. Renewable Power Capacities, Developing World, EU, and Top Six Countries, 2006



Note: Excludes large hydropower

Figure 11. Annual Investment in New Renewable Energy Capacity, 1995–2007



Note: Excludes large hydropower.

Figure 4. Wind Power, Existing World Capacity, 1995–2007

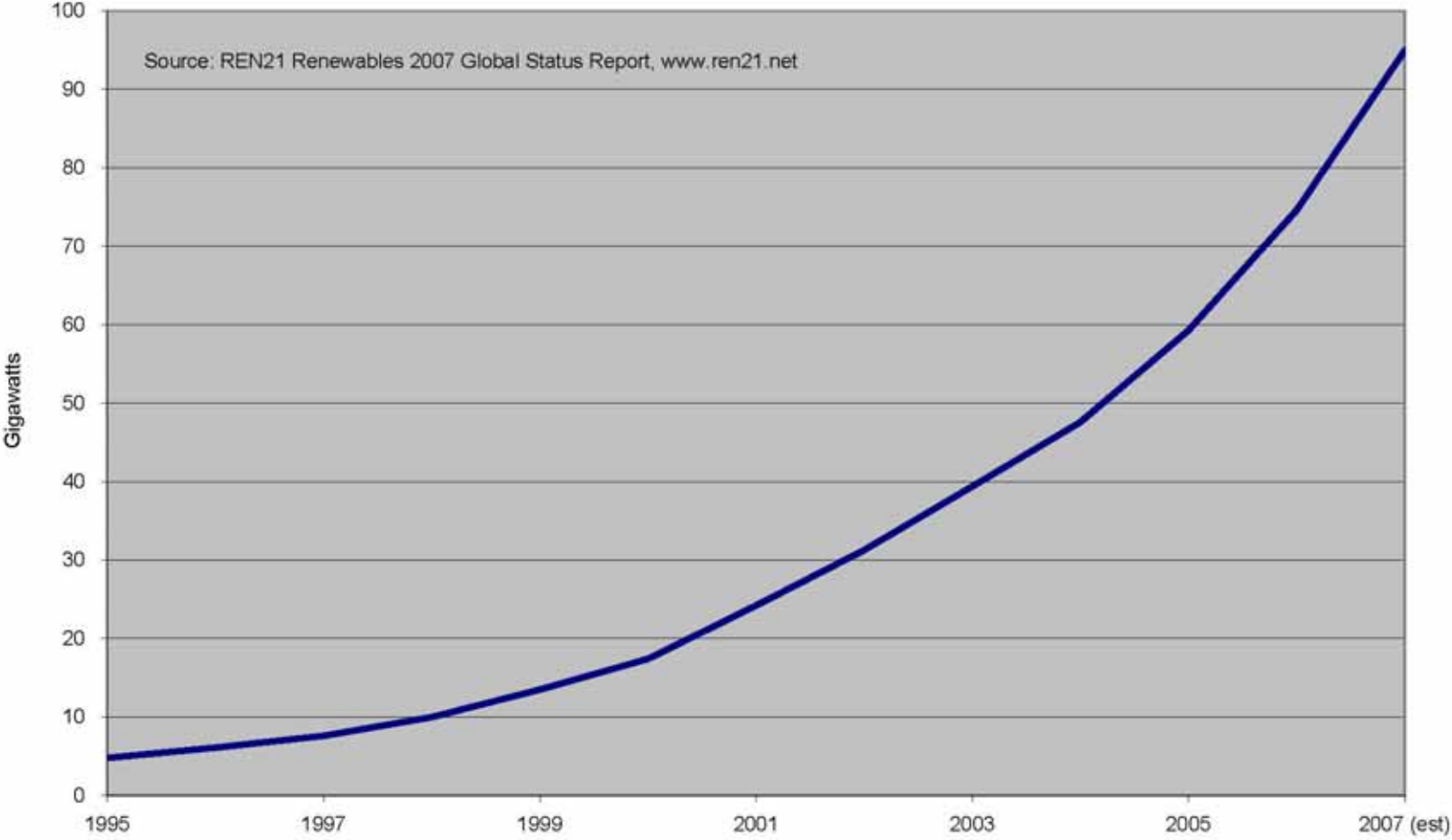


Figure 5. Wind Power Capacity, Top 10 Countries, 2006

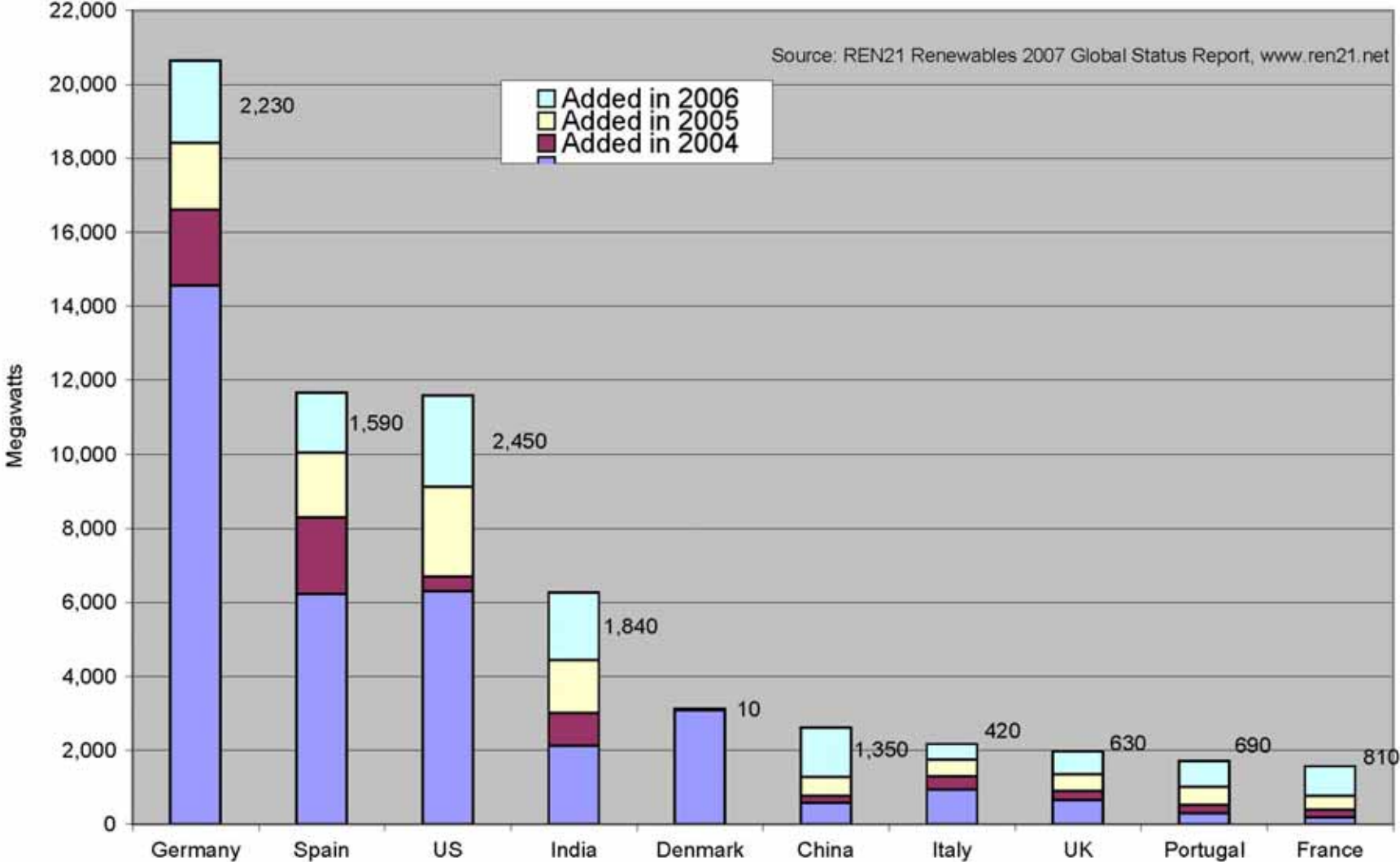


Figure 6. Solar PV, Existing World Capacity, 1995–2007

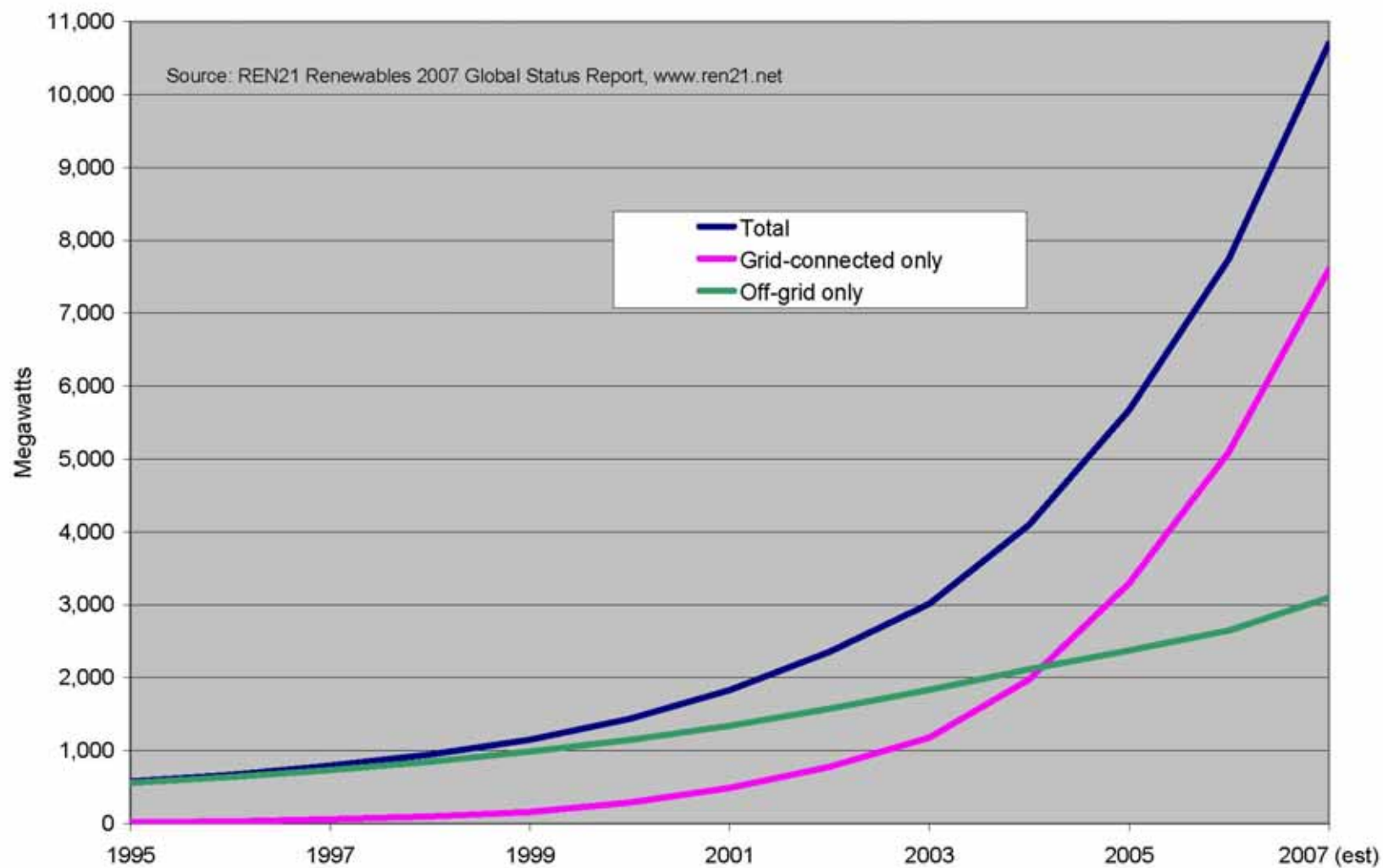
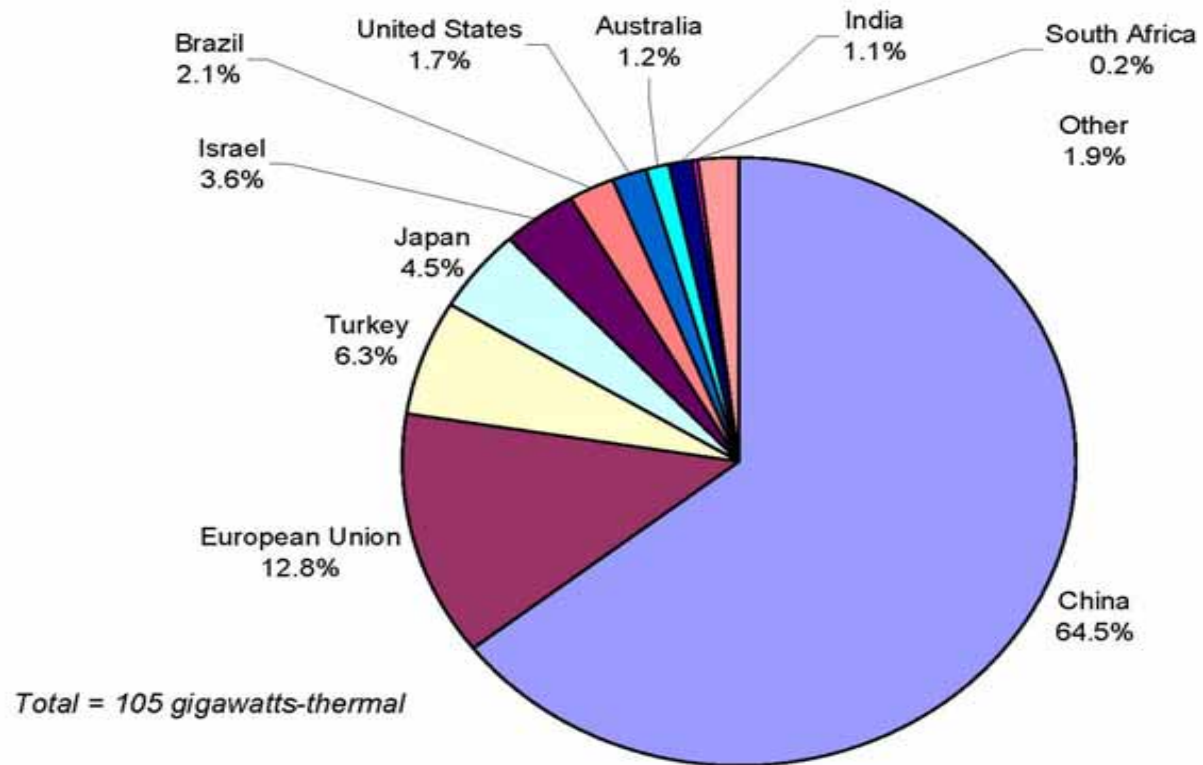
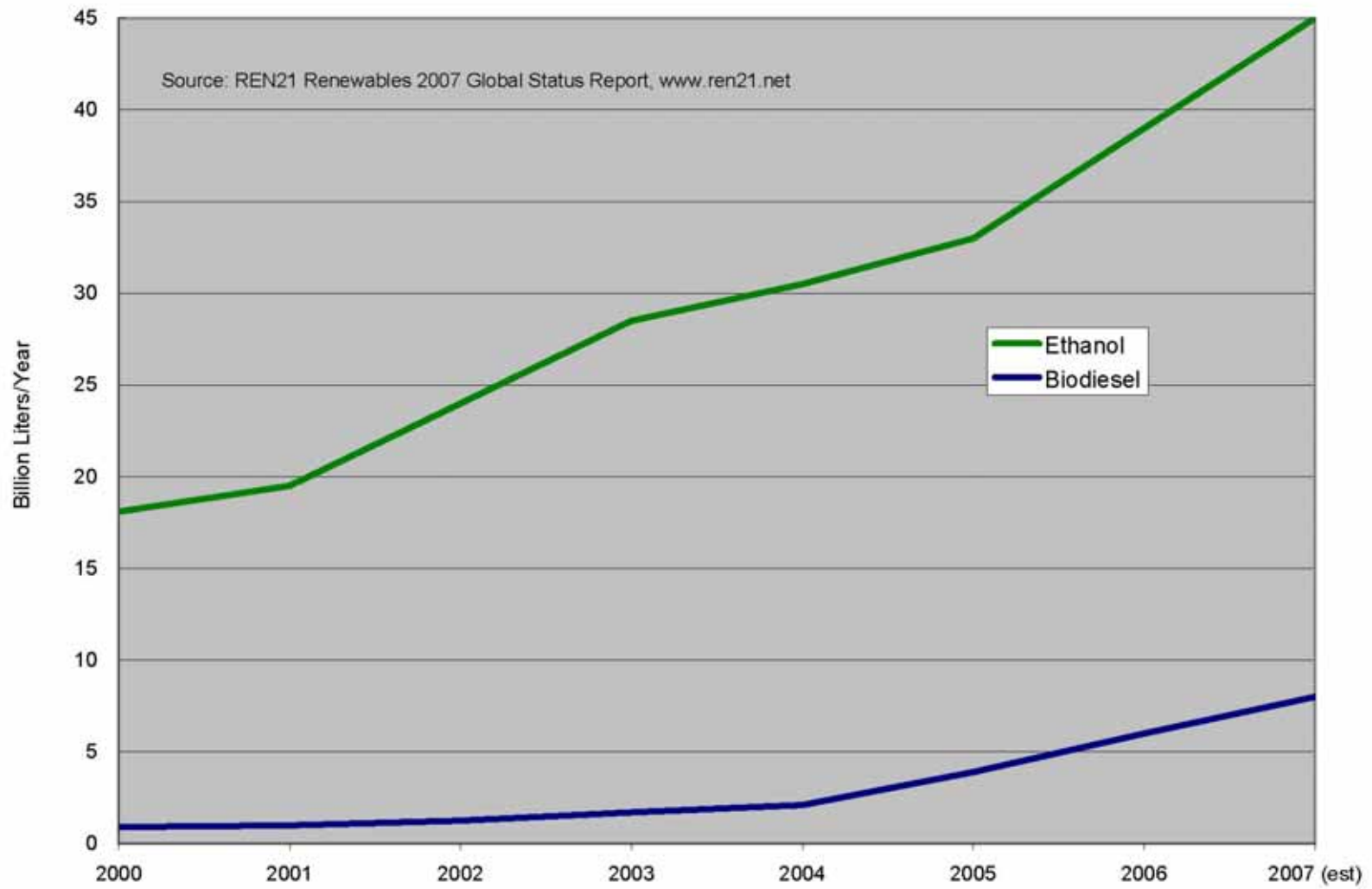


Figure 8. Share of Solar Hot Water/Heating Capacity Existing, Selected Countries, 2006



Source: REN21 Renewables 2007 Global Status Report, [www.ren21.net](http://www.ren21.net)

Figure 10. Ethanol and Biodiesel Production, 2000–2007



# Renewable Energy: Addressing the Barriers

<b>Capacity Building</b>	<ul style="list-style-type: none"><li>- Institutional Capacity Building: individuals/institutions-public, private, NGOs</li><li>- SMEs to source, integrate, install, operate, maintain, and service RE systems</li><li>- Assessment Tools and Performance Specifications</li><li>- Consumer awareness/engagement</li></ul>
<b>Finance</b>	<ul style="list-style-type: none"><li>- High first costs of RE versus competing technologies</li><li>- Funding Support (prefeasibility, feasibility, loans, equity, insurance)</li><li>- Risk perception and investor confidence</li><li>- Attracting Local FIs, MFIs, Carbon Finance; donor coordination</li><li>- Lack of International Investment, risk mitigation, fluctuating currencies</li></ul>
<b>Technology Transfer /R&amp;D</b>	<ul style="list-style-type: none"><li>- Technology Awareness/Development / Cooperation</li><li>- Lack of R&amp;D funding</li><li>- Grid Integration issues; Concerns over aesthetics, noise,</li><li>- Resource Assessment, Product Standardization/, and Harmoni zation</li></ul>
<b>Policy Support</b>	<ul style="list-style-type: none"><li>- Political Support for Consistent RE Policies (long term, reliable, predictable )</li><li>- Immature Regulatory Responses</li><li>- Fossil Fuel Subsidies</li></ul>

**Table 2. Renewable Energy Promotion Policies**

Country	Feed-in tariff	Renewable port-folio standard	Capital subsidies, grants, or rebates	Investment or other tax credits	Sales tax, energy tax, excise tax, or VAT reduction	Tradable renewable energy certificates	Energy production payments or tax credits	Net metering	Public investment, loans, or financing	Public competitive bidding
<b>Developed and transition countries</b>										
Australia		✓	✓			✓			✓	
Austria	✓		✓	✓		✓			✓	
Belgium		✓	✓		✓	✓		✓		
Canada	(*)	(*)	✓	✓	✓			(*)	✓	(*)
Croatia	✓			✓					✓	
Cyprus	✓		✓							
Czech Republic	✓		✓	✓	✓	✓		✓		
Denmark	✓				✓	✓		✓	✓	✓
Estonia	✓				✓					
Finland			✓		✓	✓	✓			
France	✓		✓	✓	✓	✓			✓	✓
Germany	✓		✓	✓	✓				✓	
Greece	✓		✓	✓					✓	
Hungary	✓				✓	✓			✓	
Ireland	✓		✓	✓		✓				✓
Italy	✓	✓	✓	✓		✓		✓		
Israel	✓									
Japan	(*)	✓	✓			✓		✓	✓	
Korea	✓		✓	✓	✓				✓	
Latvia	✓								✓	✓
Lithuania	✓		✓	✓					✓	
Luxembourg	✓		✓	✓						
Malta	✓				✓					
Netherlands	✓		✓	✓		✓	✓			
New Zealand			✓						✓	
Norway			✓	✓		✓				✓
Poland		✓	✓	✓	✓				✓	✓
Portugal	✓		✓	✓	✓					
Romania					✓					
Russia			✓			✓				
Slovak Republic	✓			✓					✓	
Slovenia	✓								✓	
Spain	✓		✓	✓					✓	
Sweden		✓	✓	✓	✓	✓	✓			
Switzerland	✓									
United Kingdom		✓	✓		✓	✓				
United States	(*)	(*)	✓	✓	(*)	(*)	✓	(*)	(*)	(*)

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# What is the Role of Policy Interventions?

- Supportive public policies, legal, and regulatory frameworks:
    - Reduce investor risks
    - Level the playing field for delivery of cost effective, cleaner energy services
    - Contribute to technology scale-up and replication
  - Address policy biases
    - Subsidies for Conventional Fuels
    - Lack of Accounting for External Costs
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# Range of Policy Options Employed

- **Market Push**
    - Tax Incentives
    - Direct Cash Payments
    - Low-Cost Capital Programs
  - **Market Pull**
    - Distributed Resource Policies
    - Customer Choice Opportunities
  - **General Environment Regulations (Push and Pull)**
    - Externality Valuation, emissions taxes, emission caps, etc
  - **Mega Policies**
    - Feed-in Tariffs (price mandated)
    - Renewable Portfolio Standards (quantity mandated)
    - Tendering
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# Top 10 Lessons Learned in RE Policy

- No silver policy bullet for RE: market push & pull approaches
  - Pro-poor, comprehensive rural energy policy; part of broader energy policy
  - Long term policy commitments should address investor risk concerns; industry must be involved in the design
  - Policy making should be bottom-up and top-down, reflect realistic technology solutions for the market, tailored incentives, tied to financing
  - Link energy to poverty alleviation activities; support community mobilization/participation in policy-making
  - Value environmental benefits/externalities of RE
  - Remove market distorting fossil subsidies, pricing, taxation
  - Adopt transparent subsidies for RE if needed with exit strategy
  - Markets should be guided by economics not politics
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# **Prospective Markets for Renewable Energy Worldwide**

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# Latin America

- Brazil
  - Large RE Resources
  - PROINFA: (Grid) 15 year PPA for 3.36 GW RE; \$8B for biomass, small hydro, wind (by 2006); 15% RE annual market growth by 2019
  - Luz para Todos – 2.5 M connections by 2008; 10% from RE
  - Hydro program 17 projects (2800 MW) by 2009
  - Biodiesel Program: blending of 2% by 2008, may go to 5% by 2013
- Mexico
  - Large RE resource base; 12% growth/year
  - New power sector regs for RE
  - Barrier removal for Re
  - NAFTA ratification (duty free)
  - Rural electrification, productive use, education programs for RE
  - Other initiatives in development



# LAC Cont'd - Central American/ Caribbean

- Central America:
  - 160-300 MW annual RE investments
  - Regional. interconnect underway
  - Guatemala: RE Law, incentives, Fund
  - Honduras: RE decree (tax exemptions, incentives, 10% RE premium)
  - El Salvador: Geo interest; rural electrification program in development w/RE
  - Nicaragua: Presidential decree 5% RE (hydro, wind)
  - Panama: 5% premium RE
  - Costa Rica: RE IPP participation
- Caribbean RE targets, support



# Asia

- **China:**
  - Strong RE market growth; RE law
  - 10% new generation from RE (60GW) by 2010
  - 5-fold increase in wind
  - Large market for SHW
  - Village/township PV progs
  - 21,000 MW small hydro, leader in biogas digesters, market for biomass direct combustion & gasification
  
- **India:**
  - 80,000 MW new RE resource
  - Elec Act of 2003: 25,000 remote villages with RE
  - By 2012, 10% of new power generation from RE
  - Range of investment/ PTC
  - IPPs, long term tariffs
  - MNES and IREDA



# Other Countries

- **Mediterranean:**
  - **Egypt/Morocco incentives for wind/solar; Turkey: hydro**
- **E. Asia: Govt support; strong wind, hydro, biomass, geothermal, solar resources**
- **East Africa: Geothermal, solar**
- **South Africa: Govt initiative for biomass/ PV**
- **SubSaharan Africa: biofuels**



# Partners Play Critical Roles

**International/Regional  
Organizations:** UEMOA, UN, FAO,  
IFAD

**Governments:**  
Create enabling  
environment via  
policies/regulations

**Donors:** TA,  
Training, Capacity  
Building, Knowledge  
Sharing

**MDBs:** Financing  
and risk sharing

**Local Businesses/  
Entrepreneurs:**  
Product & service  
design, delivery,  
O&M, credit

**Local Investors,  
Financiers:**  
Financing for  
businesses,  
consumers, and  
projects

**Foundations/NGOs**  
Grants, seed  
capital, policy  
support



**Civil Society**

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# Conclusions

- Tremendous opportunity for support in RE
  - Stay focused on initiative that can deliver results but has replicability
  - Good players/intermediaries in the field to partner with
  - Pleased to help/advise/link with the key players in whatever the group decides to do
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