Renewable Energy Finance: Perspectives From the Global Environment Facility

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Renewable Energy Agenda

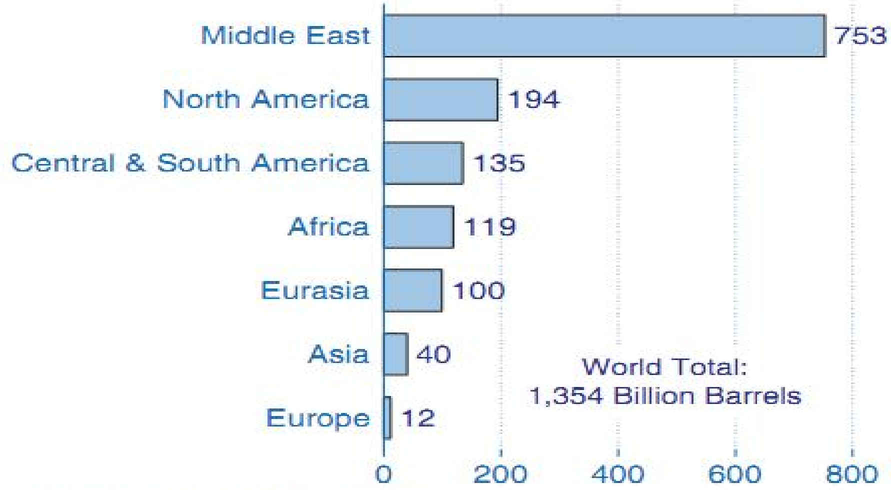
- **Policy Drivers**
- Technology Challenges and Cost Competitiveness
- Finance and Investment
- Leading Companies

Global Policy Drivers

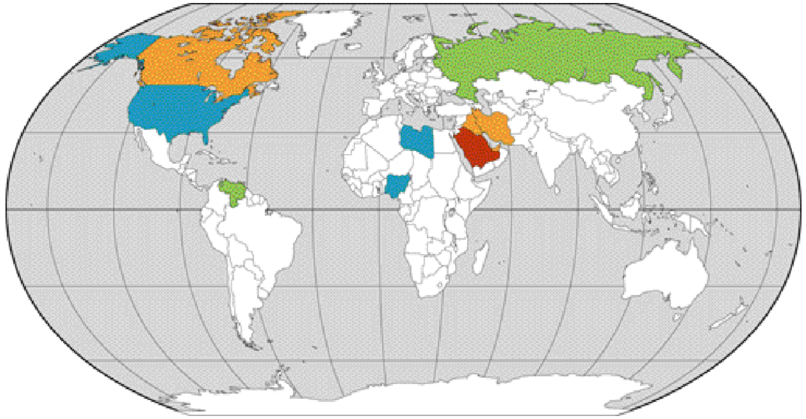
- Energy Security
- Economic Development
- Environmental Protection

Imbalance Between Reserves & Consumption

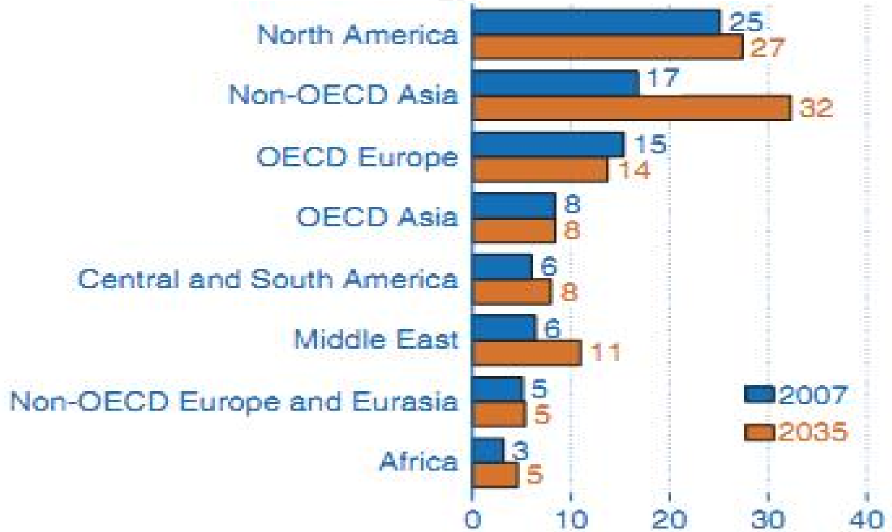
Oil Reserves (Jan 1, 2010, billion barrels)

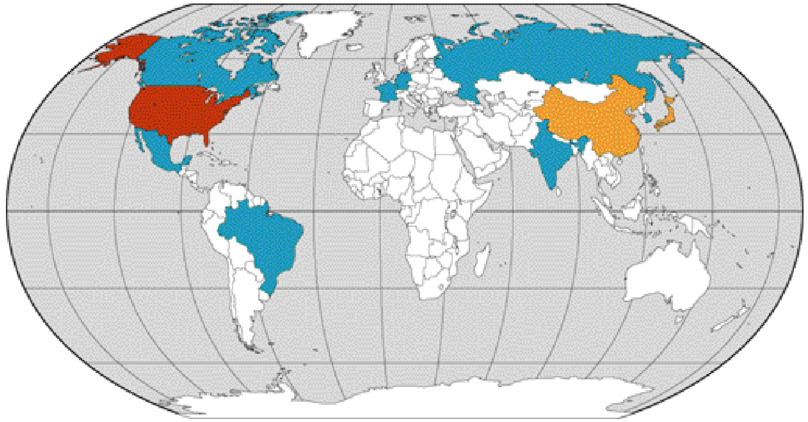


Source: *Oil & Gas Journal*.



World liquid fuel consumption, 2007 and 2035 (million barrels per day)





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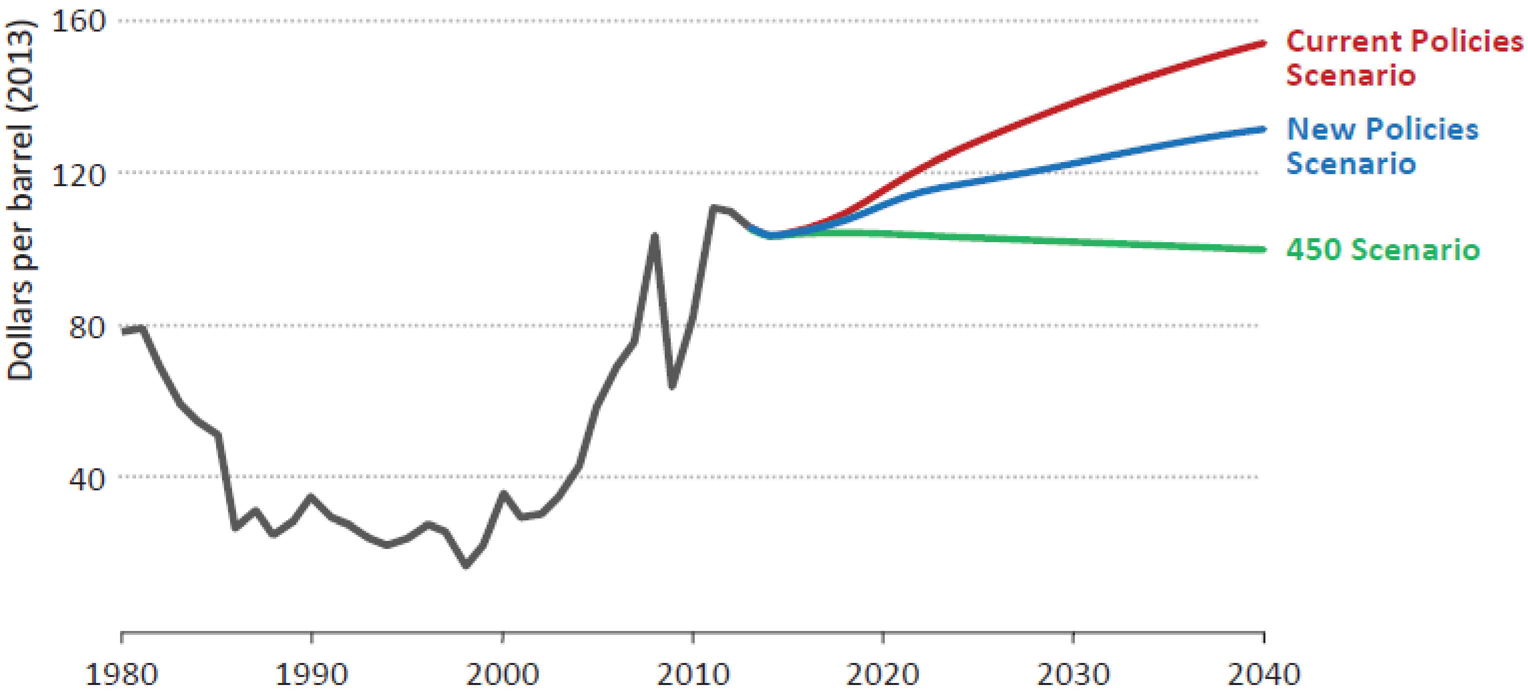
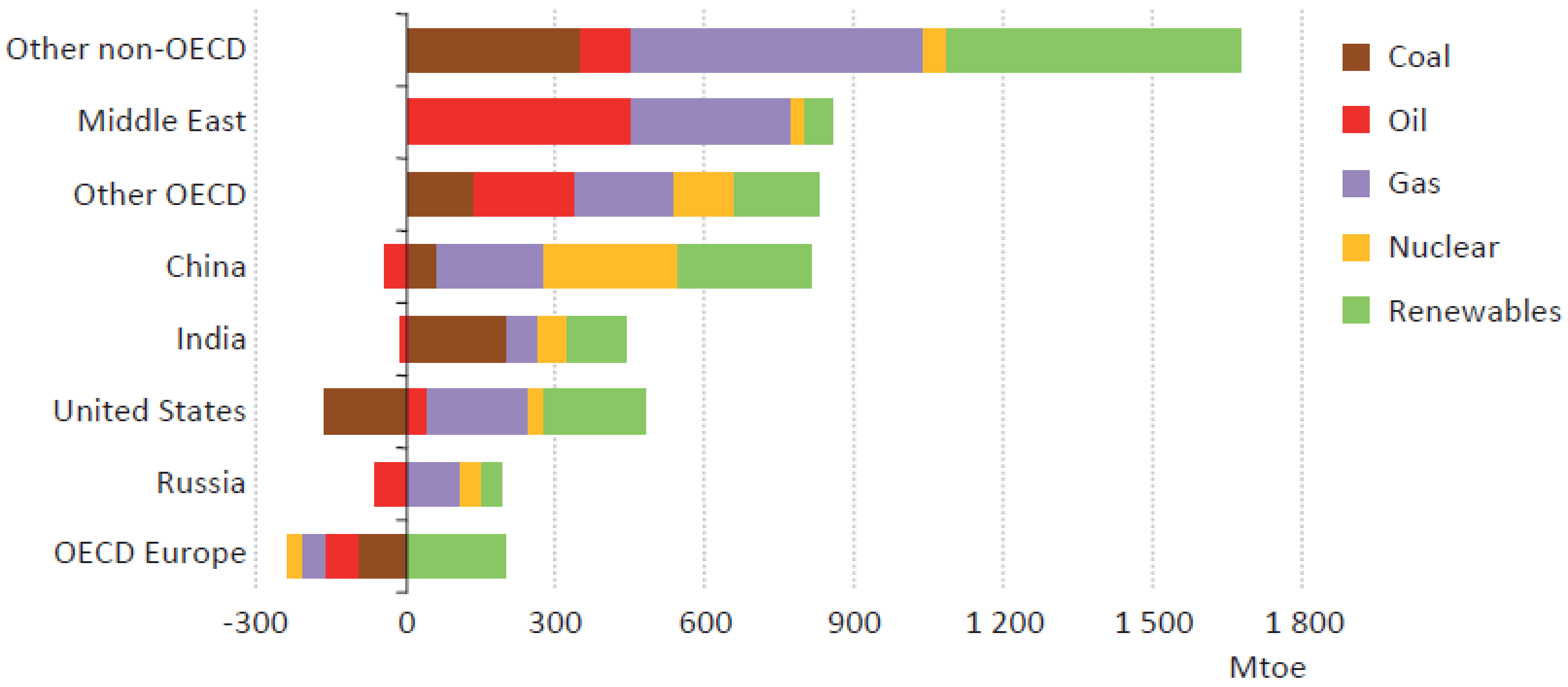
Source: International Energy Outlook 2010, EIA

International Oil Price Assumptions



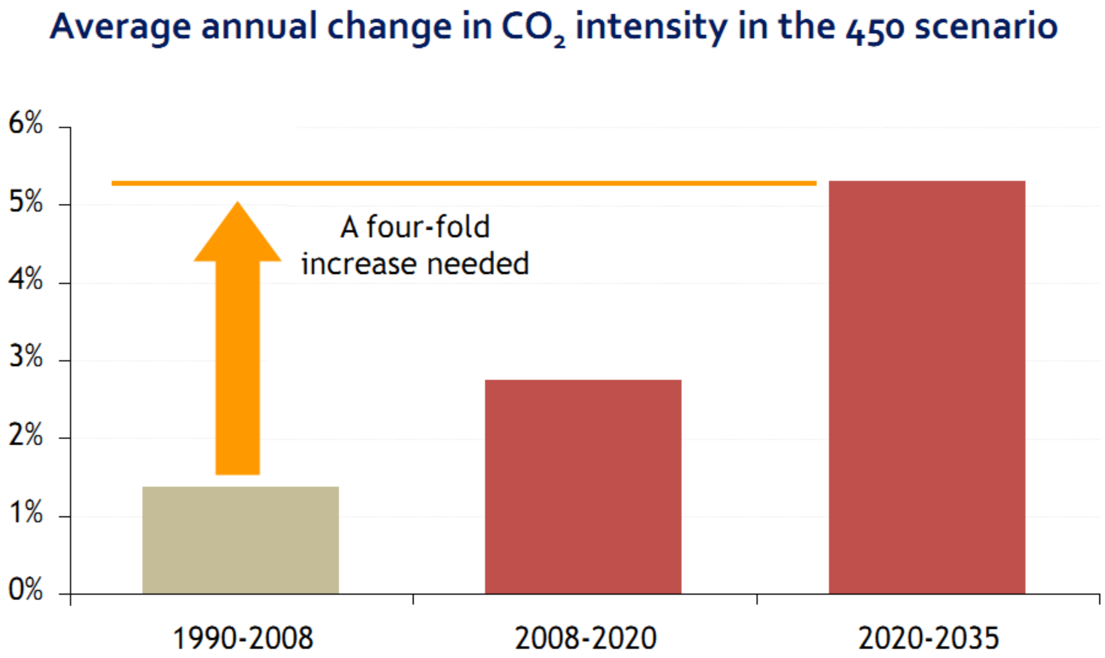
Source: IEA, World Energy Outlook 2014, Scenario assumptions for the following slides.

Change in energy production by region in the New Policies Scenario, 2012-2040



Source: IEA, World Energy Outlook, 2014

Achieving the 2°C goal requires rapid decarbonisation of global energy



Carbon intensity would have to fall at twice the rate of 1990-2008 in the period 2008-2020 & almost four times faster in 2020-2035

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The Technology Challenge

Vehicles: Efficiency, Bio- fuels, Hydrogen Fuel Cells

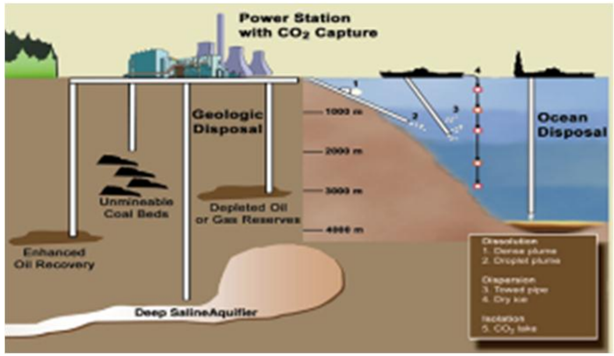
Zero Net Emission Bldgs., Industrial Efficiency, CHP

Nuclear Power Generation IV

No single technology or policy can do it all

Different

- regions
- markets
- scale-up requirements
- resources
- preferences
- technology timing
- infrastructures



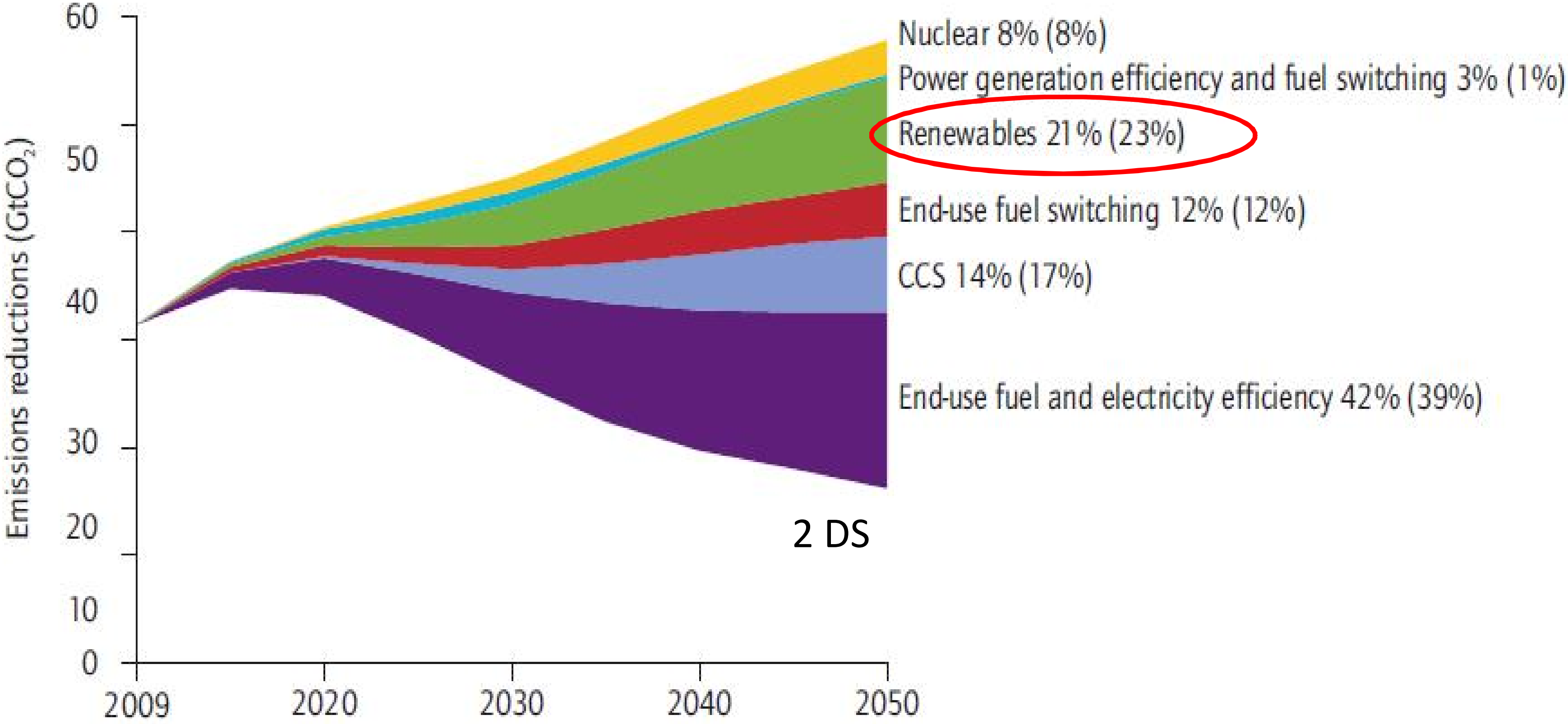
Carbon (CO_2) Sequestration

Renewable Energy Technologies

Bio-Fuels and Power

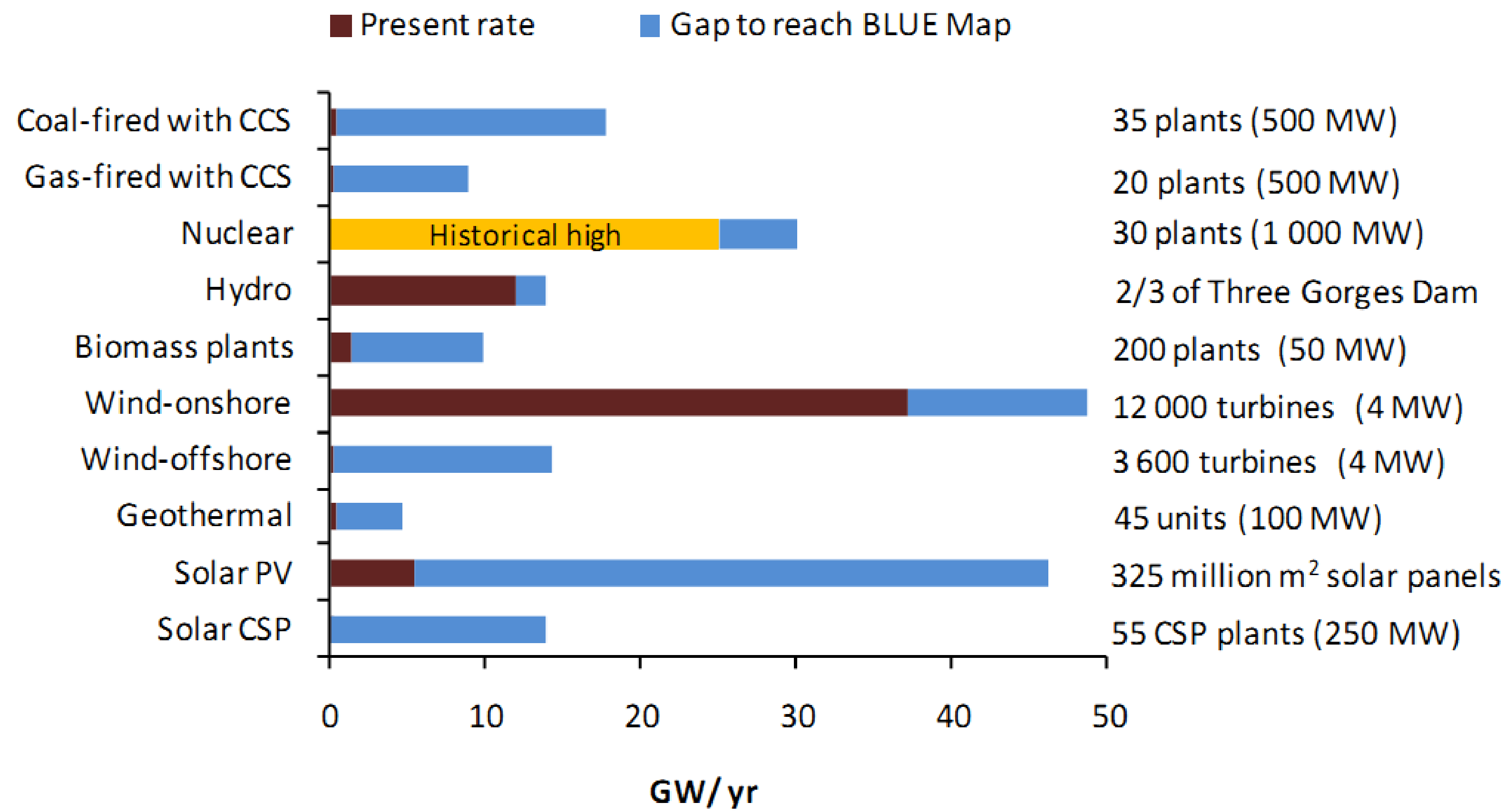
Advanced Power Grids

Key technologies for reducing global CO2 emissions



Numbers in brackets are shares in 2050. For example, 14% is the share of CCS in cumulative emission reductions through 2050. (IEA, 2012c.)

Average annual electricity capacity additions to 2050 needed to achieve goals



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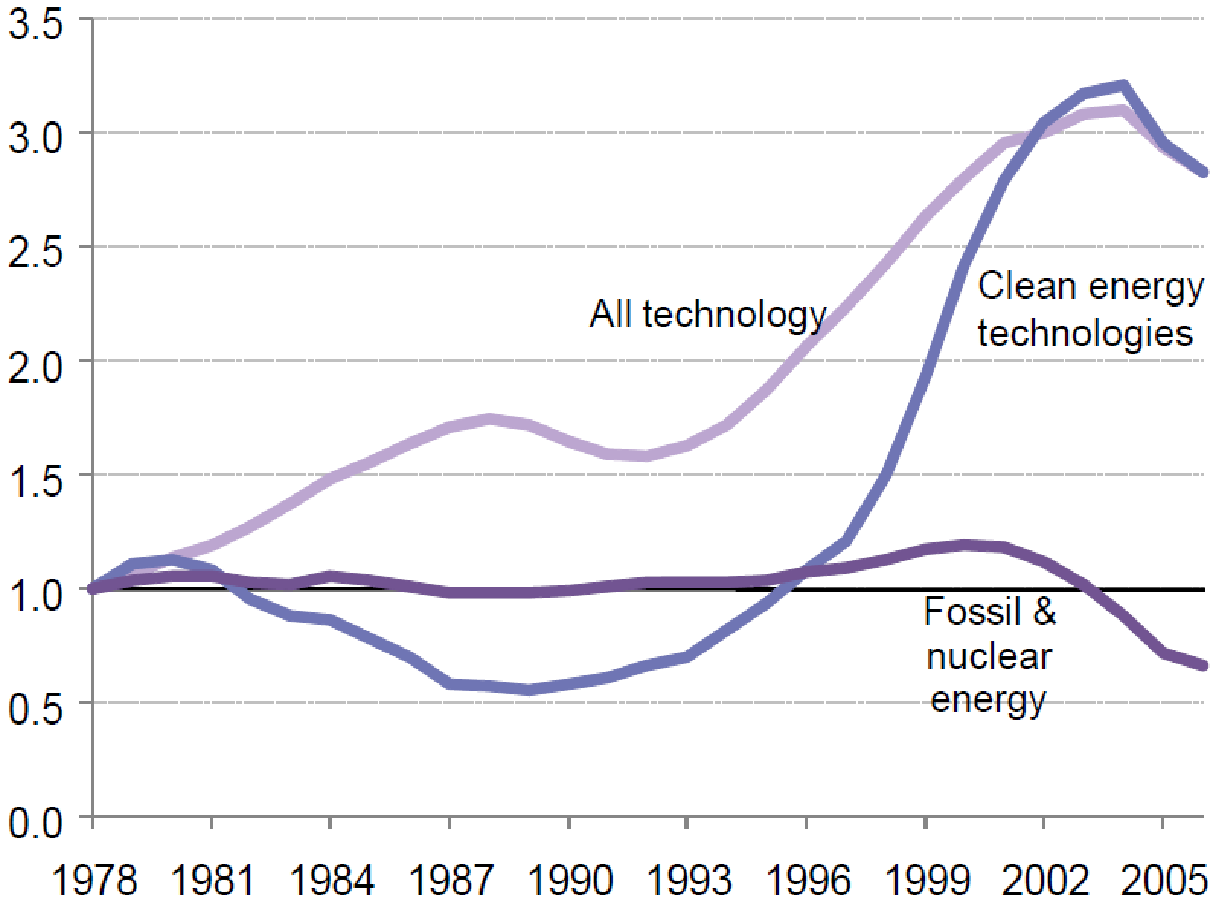
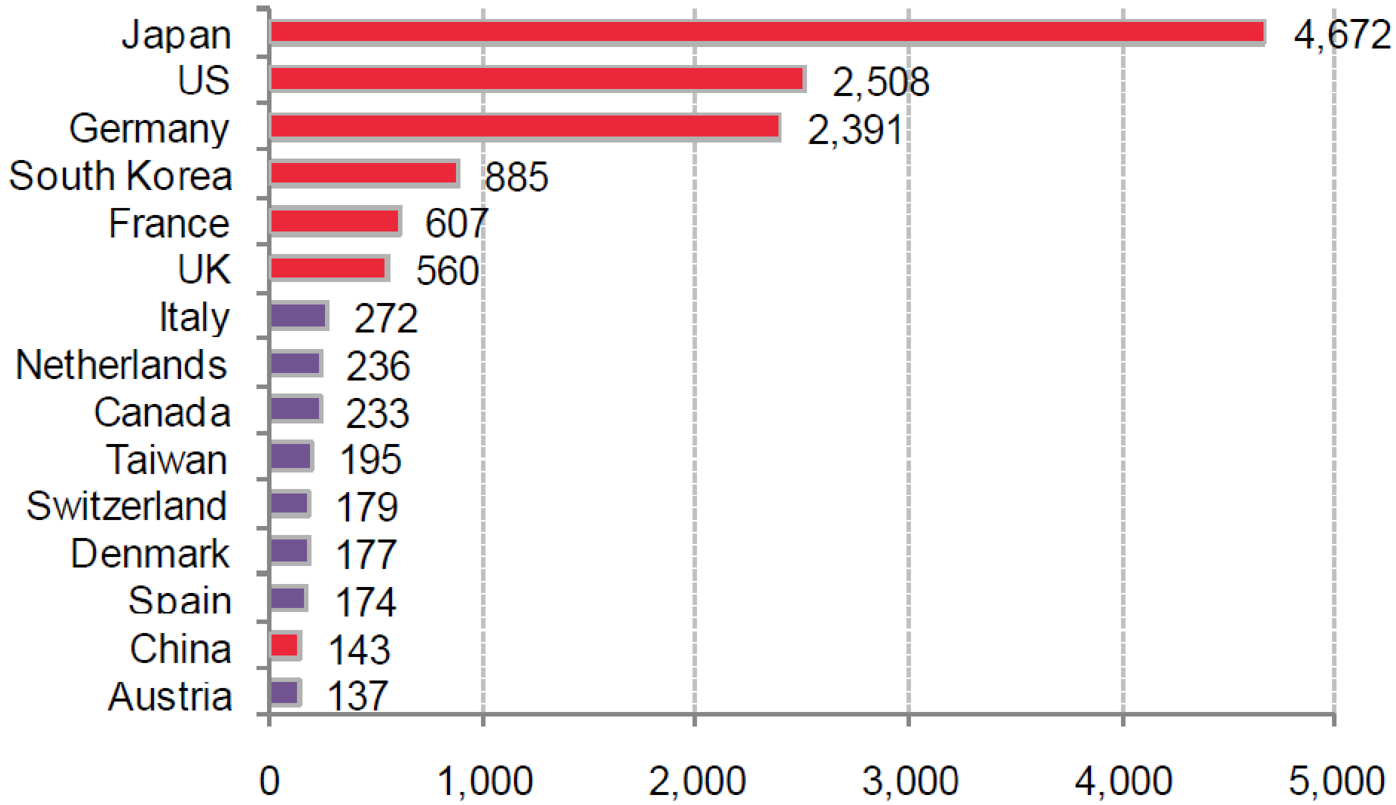
International Patents Worldwide, 1978-2006



Source: UNEP-EPO-ICTSD Report, Bloomberg New Energy Finance

Note: Three-year moving average, normalised to 1.0 in 1978

International Clean Energy Patents, 1978-2006, Top 15 Countries by No. Patents



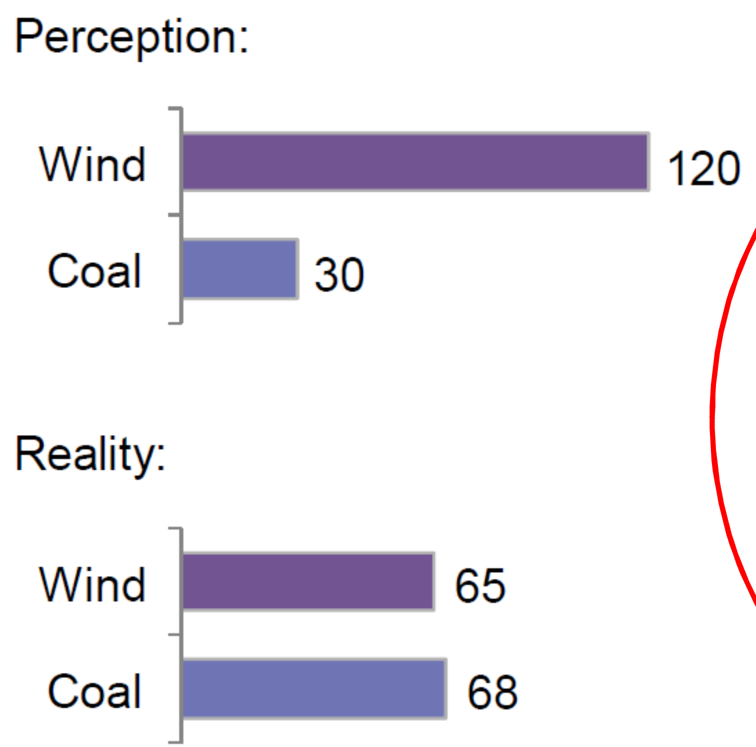
Source: UNEP-EPO-ICTSD Report, Bloomberg New Energy Finance

Note: Patents ordered by country of invention

Cost competitiveness?

Think about levelized cost!

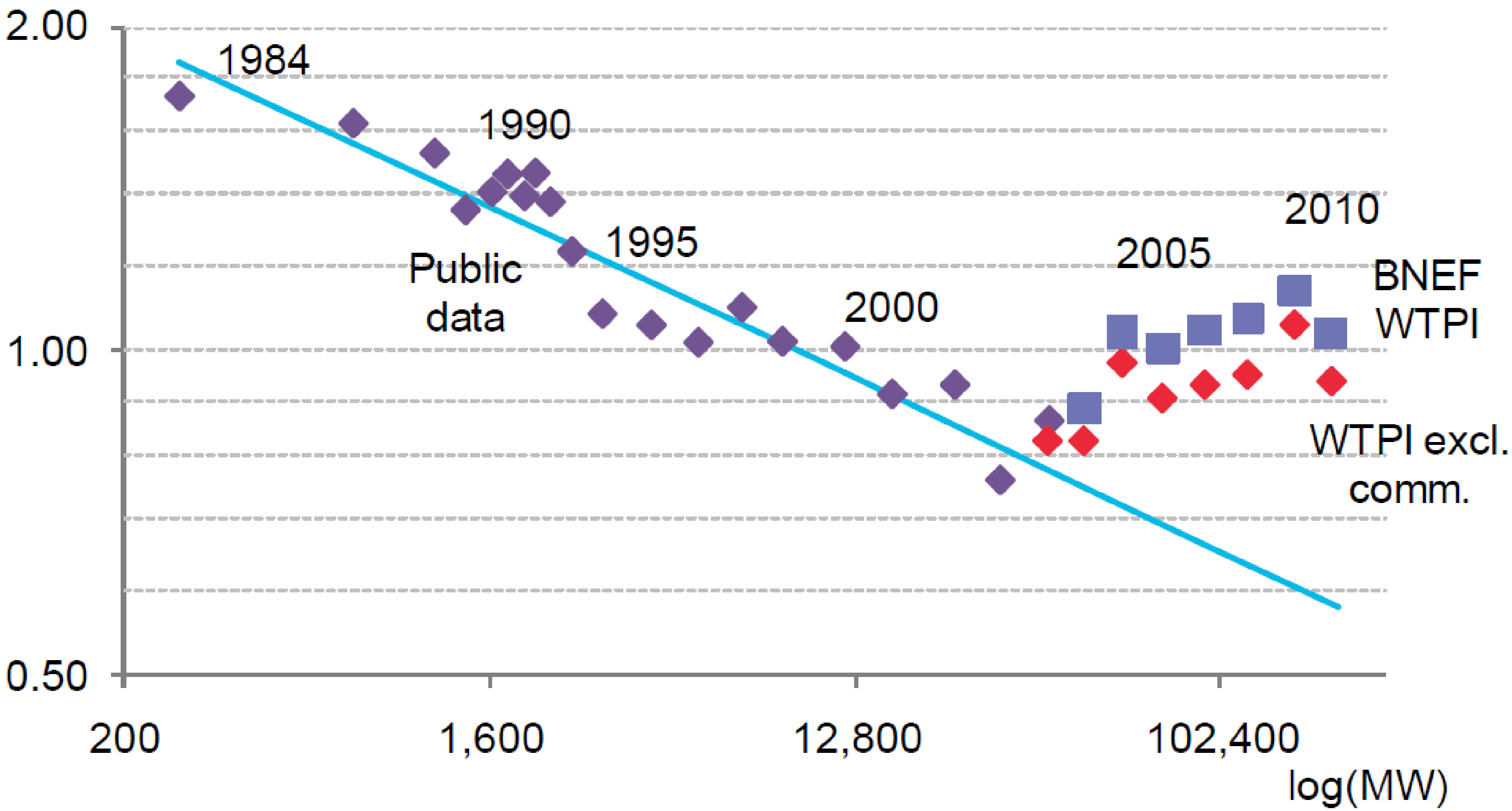
Levelized Costs: Best New Wind VS New Coal ($/MWh)



- New coal must cover cost of capital
- New coal requires advanced pollution control
- Wind turbines back to 2005 prices, but now perform much better
- Wind bankability has driven down cost of capital
- Coal suffers from carbon price risk

Source: Bloomberg New Energy Finance

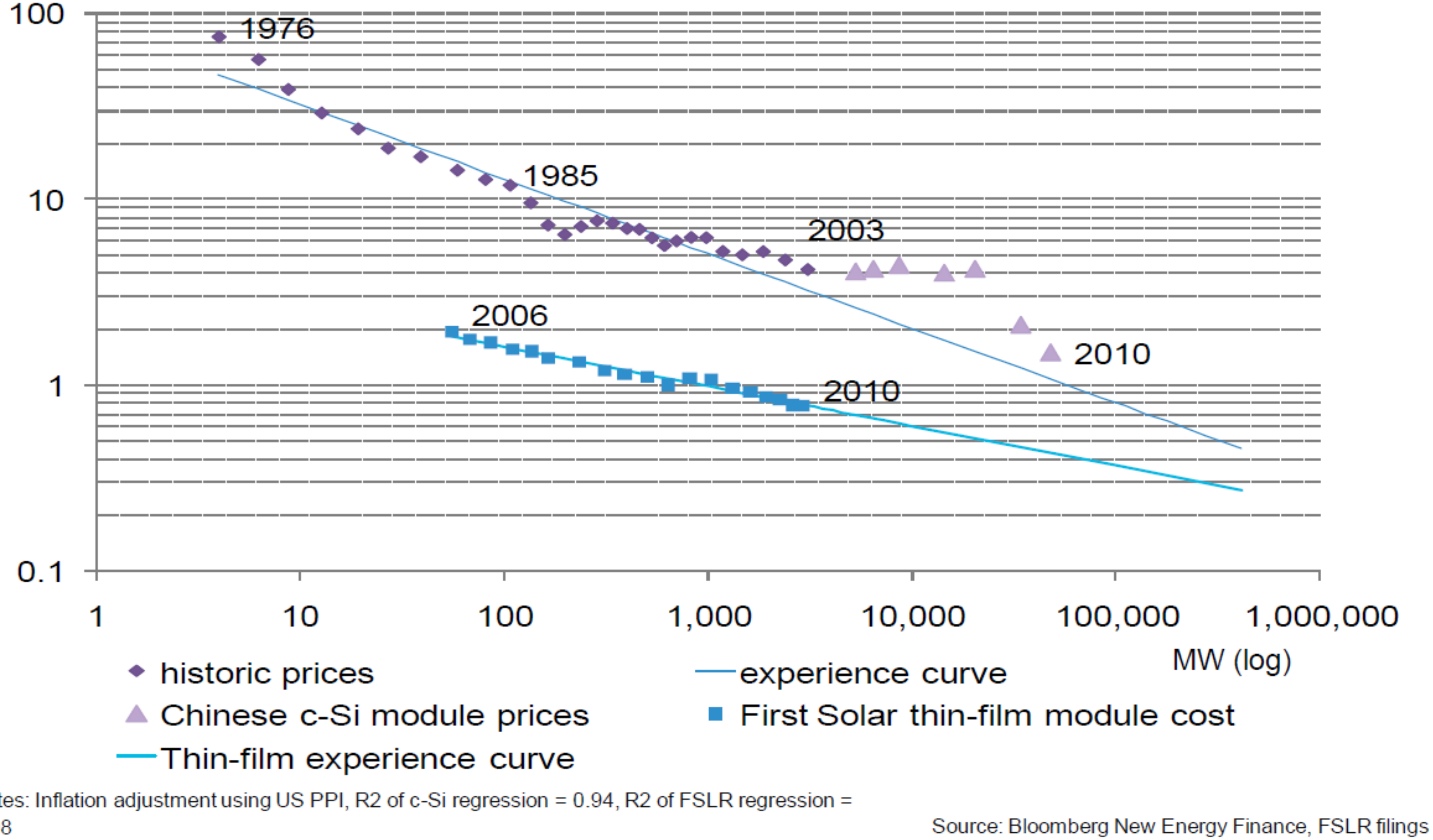
Wind Turbine Price Index (EUR M/MW)



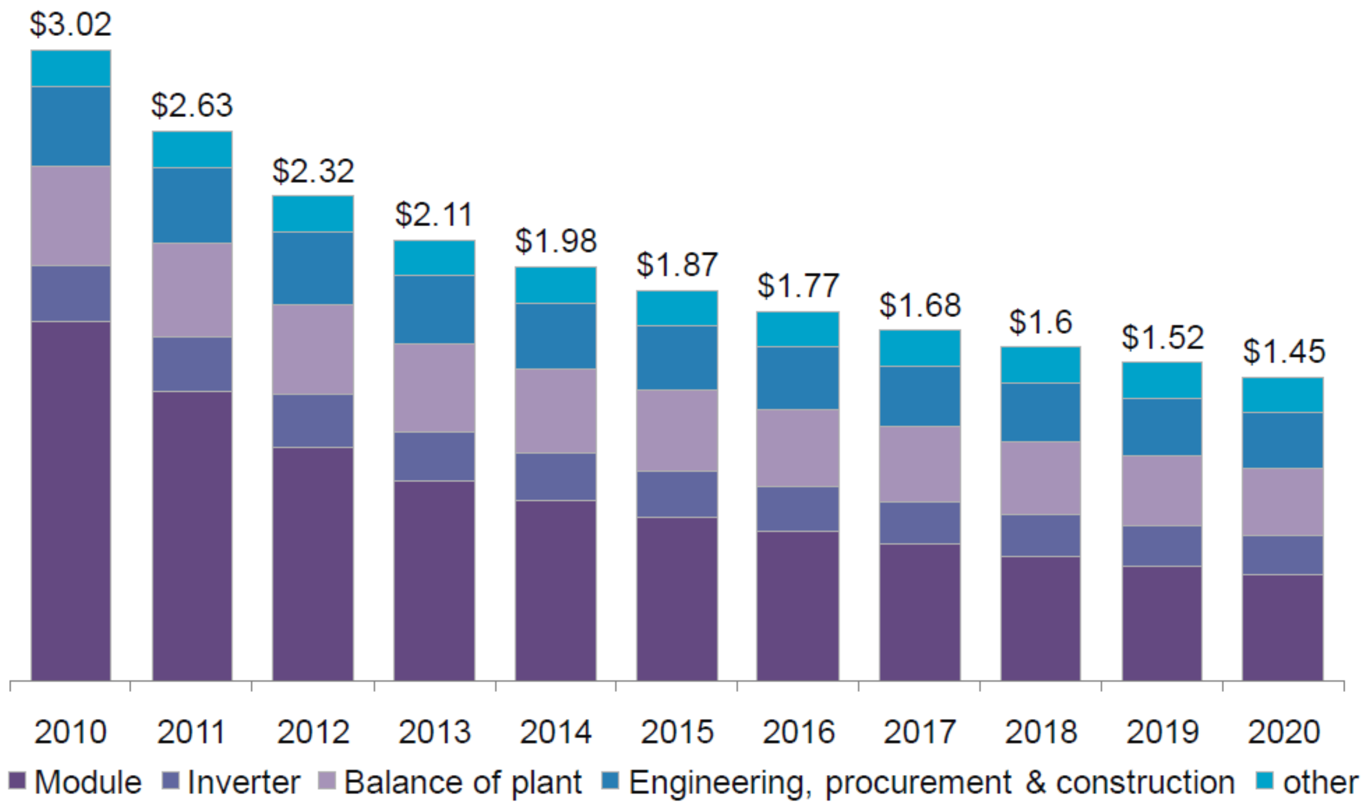
Note: WTPI is wind turbine price index, WTPI excl. comm. is adjusted for commodity prices 2002–10.

Source: Bloomberg New Energy Finance, Extool, Lawrence Berkeley Laboratory

PV Module Experience Curve ($/W)



Forecast Large PV Project Capital Cost, 2010-20 ($/W)



Note: Based on historical experience curves for crystalline silicon modules and other components, and the prices in the mature German market. 2010 dollars. Assumes Bloomberg New Energy Finance short-term build forecasts to 2013, 20% new build growth after that.

Source: Bloomberg New Energy Financ

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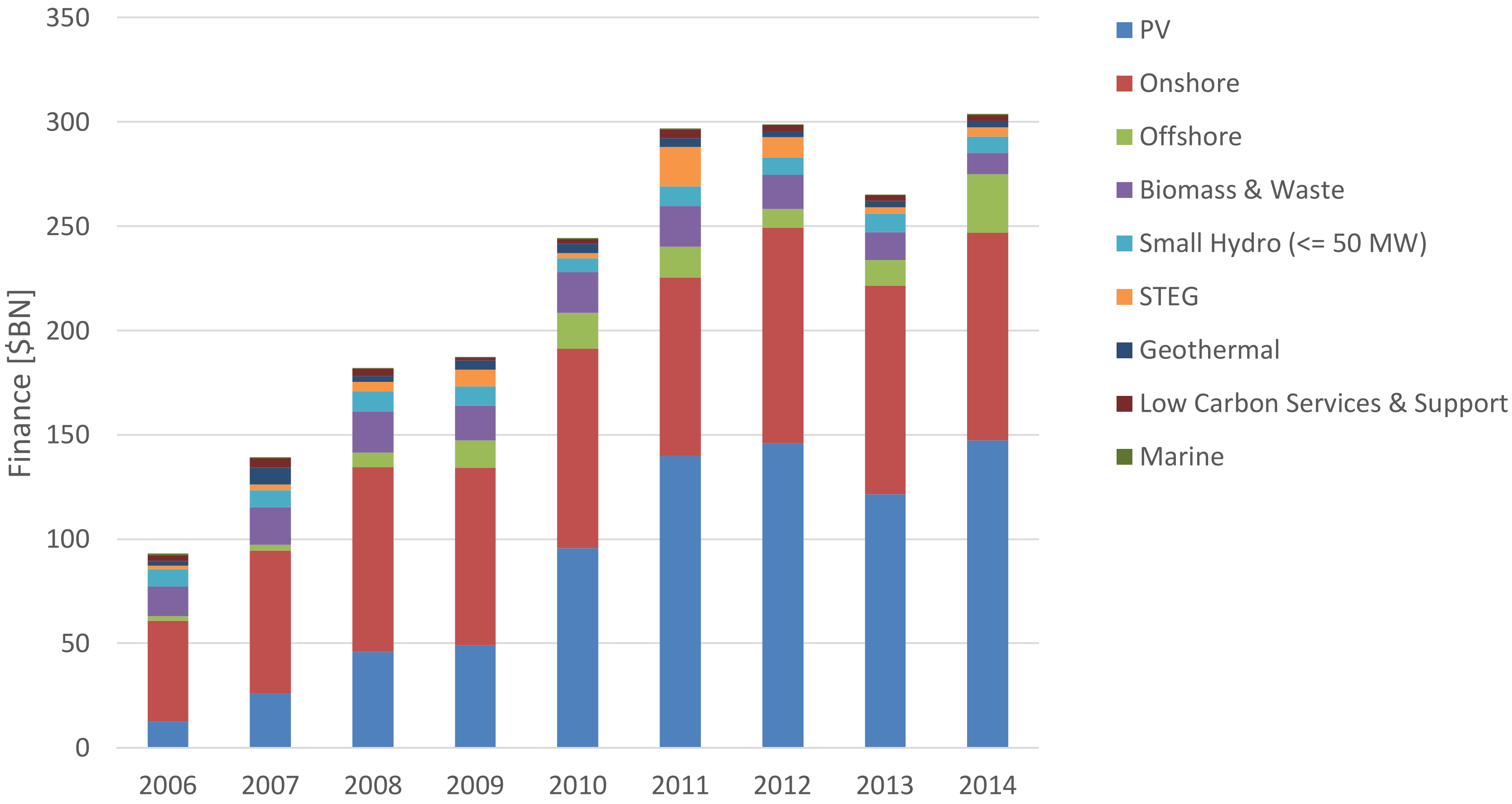
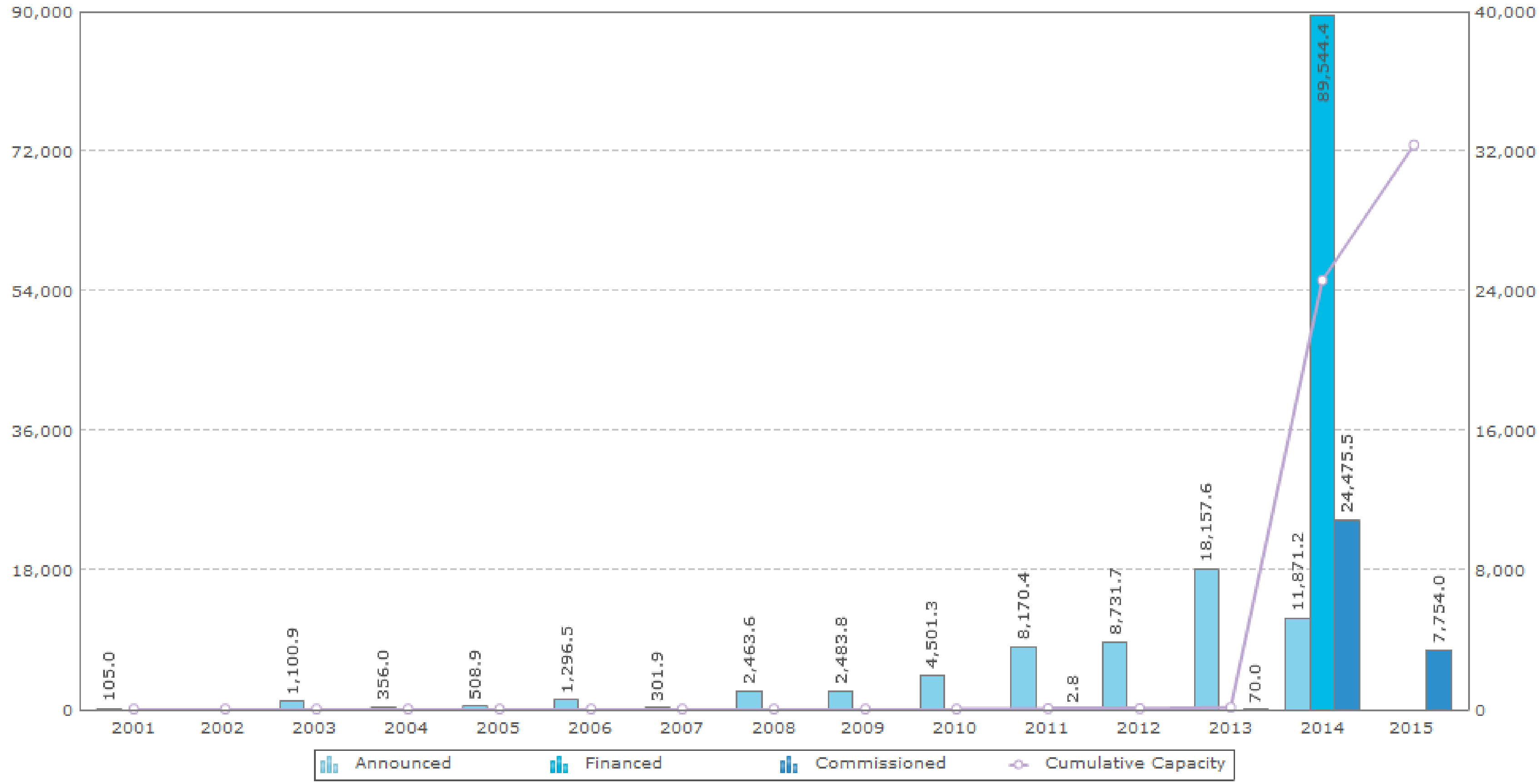
Global Asset finance of renewable energy, ($BN)



Source: Bloomberg New Energy Finance

Renewable projects overview financed in 2014 (MW)



Source: Bloomberg New Energy Finance

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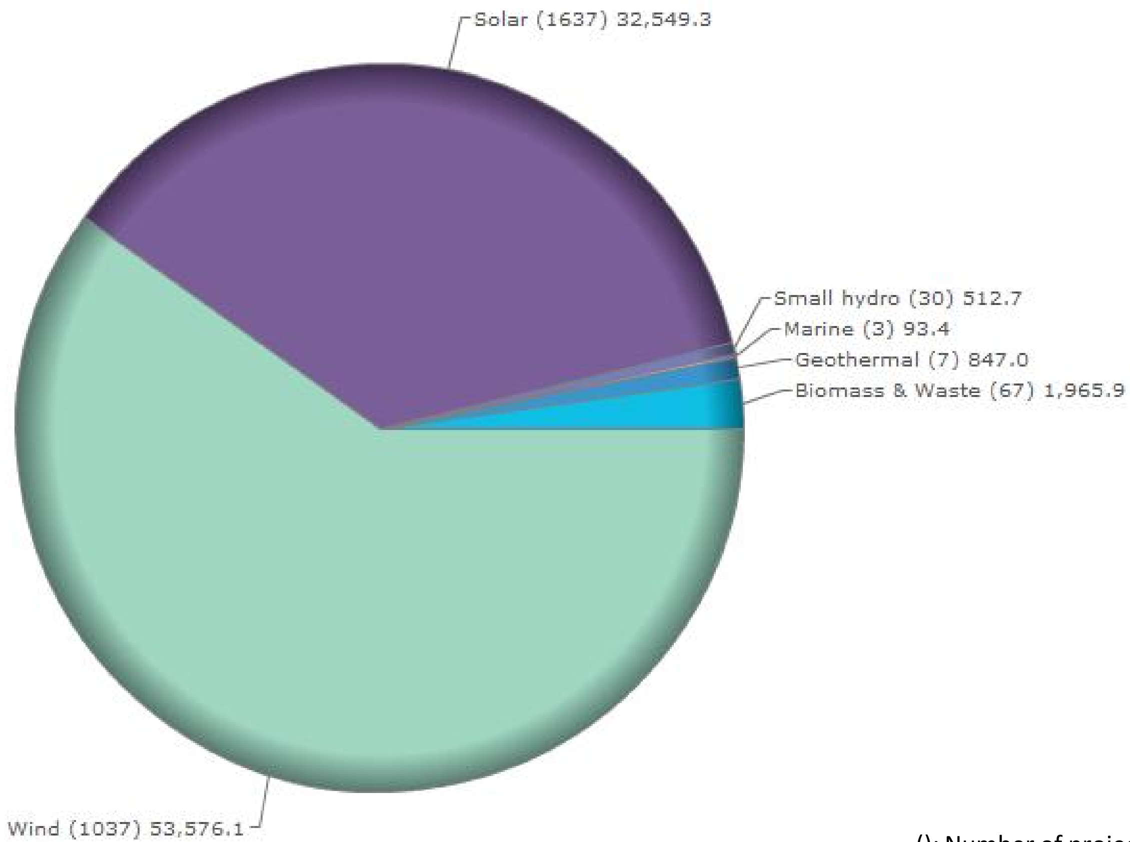
Renewable projects sector breakdown financed in 2014 (MW)



(): Number of projects

Source: Bloomberg New Energy Finance

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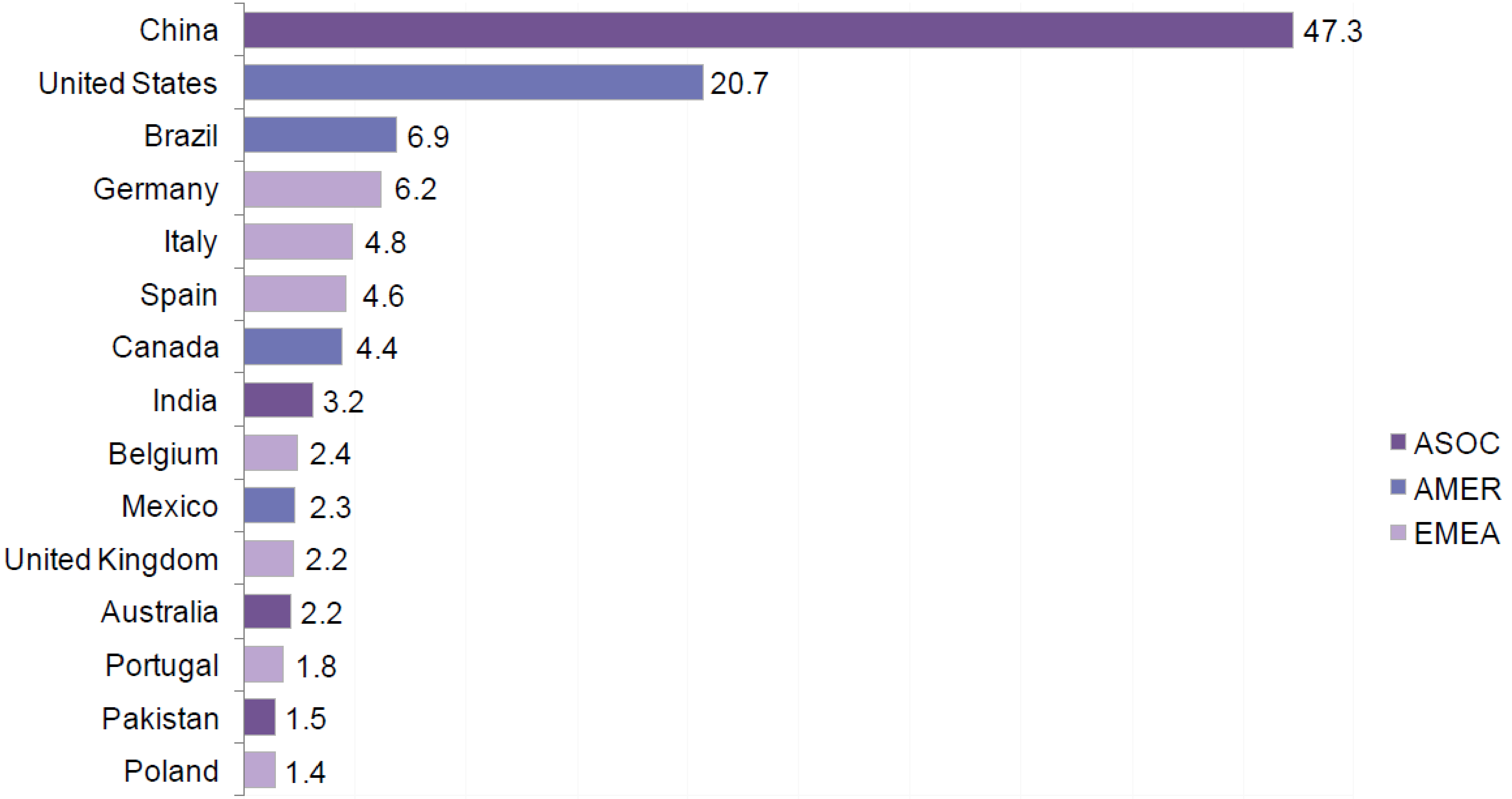
China Renewable Energy Scaling-Up Program

- Initiated in 2014 (a four year project)
- GEF \$27.2 million
- Co-financing \$444.1 million
- Targeted GHG emission reduction: 78 million tonnes of CO_2eq

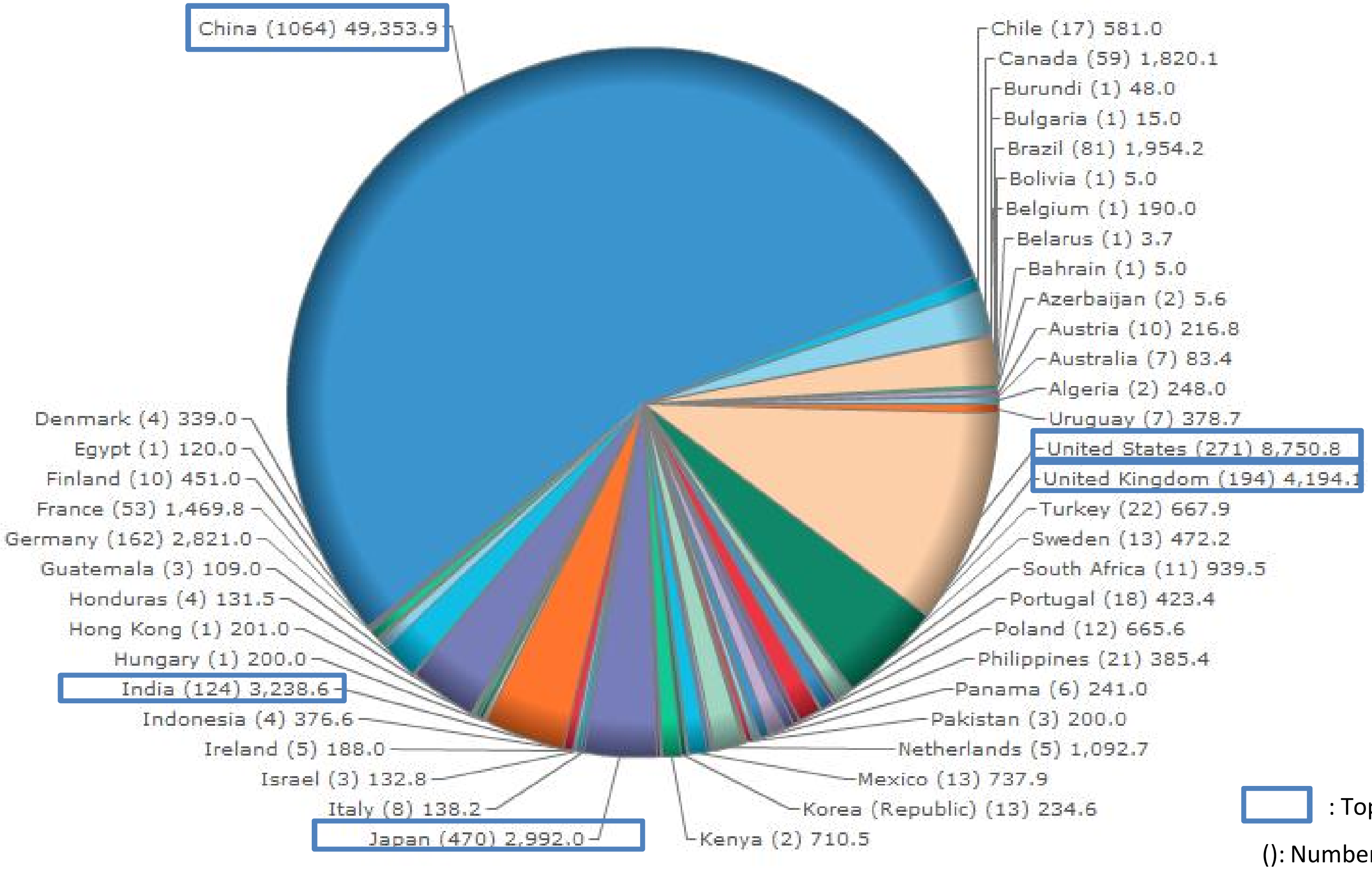
Asset Finance For New Build Clean Energy – Top 15 Countries, 2010 ($BN)



Note: Total values include estimates for undisclosed deals

Source: Bloomberg New Energy Finance

Renewable projects country breakdown financed in 2014 (MW)



Source: Bloomberg New Energy Finance

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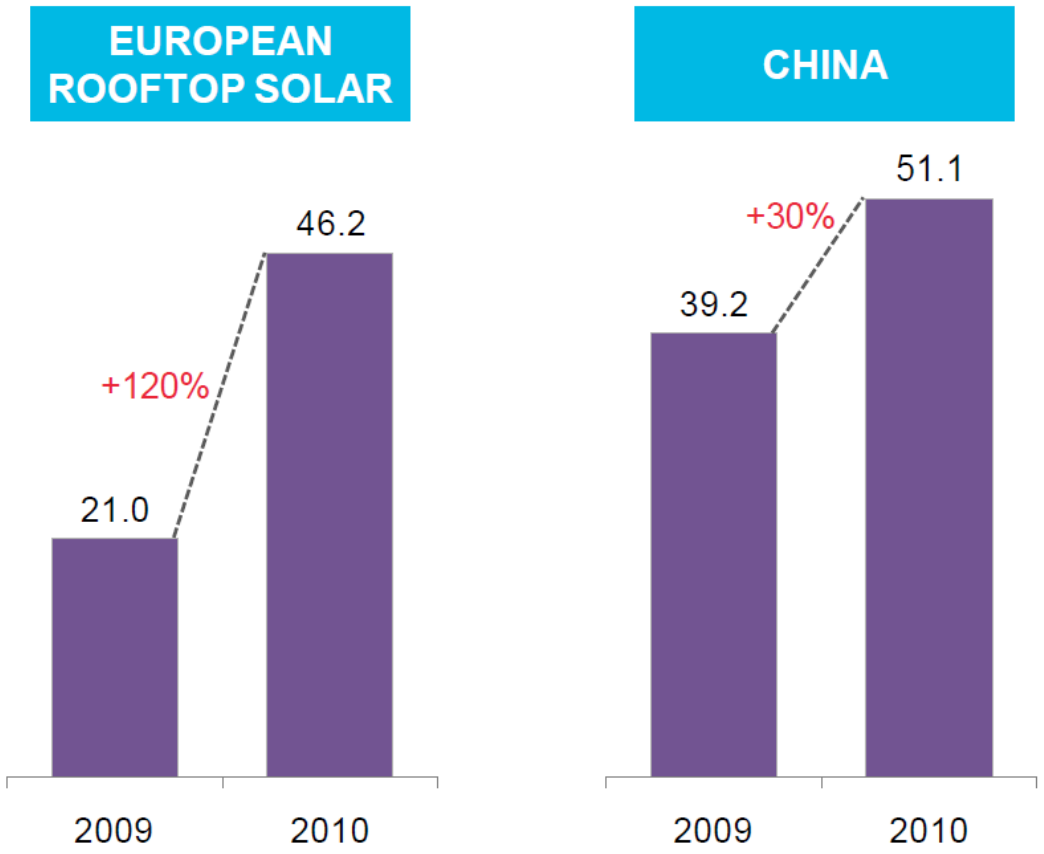
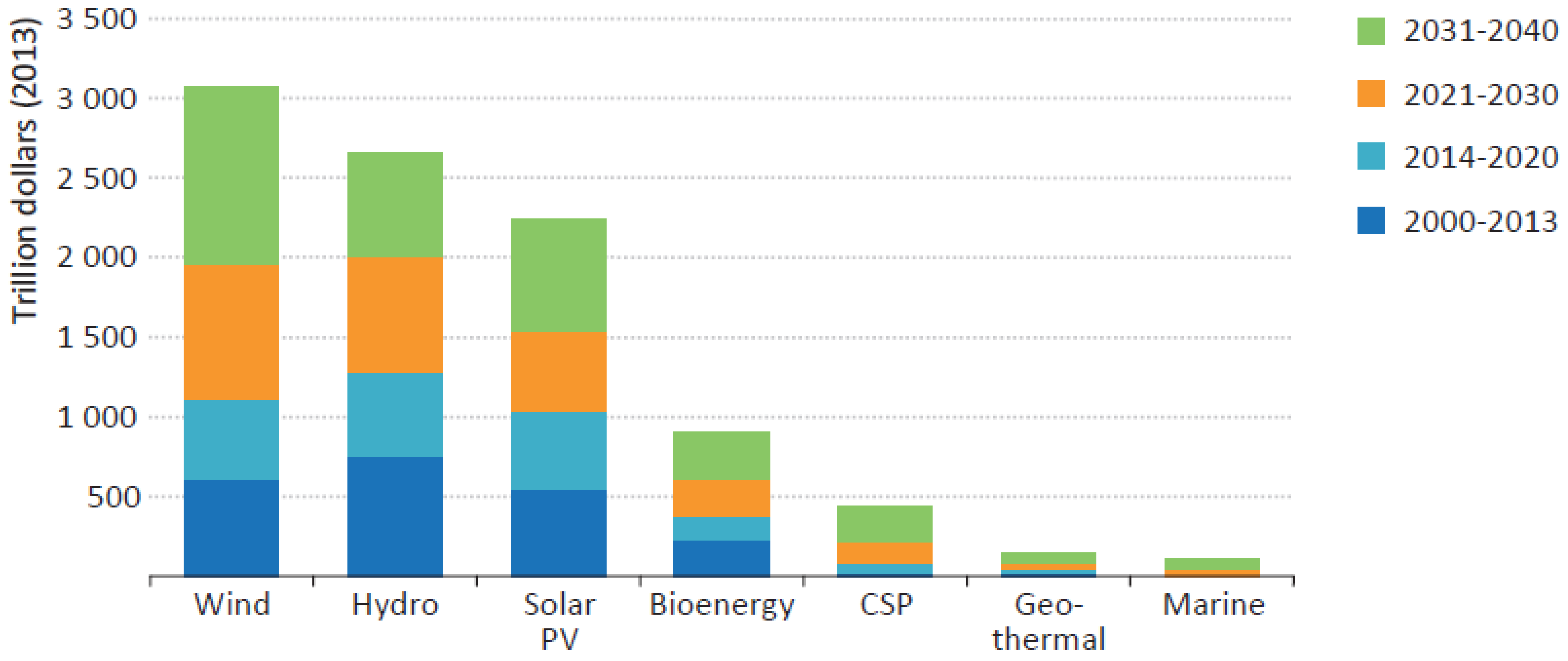
Drivers of Solar Investment Growth, ($BN)



Source: Bloomberg New Energy Finance

Global investment in renewables-based power capacity by source



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Top 10 Global PV Cell Manufacturers 2006, 2010 (By Capacity)

+46% per year

2006

Company	Country	Capacity (MW)
1. Sharp	Japan	500
2. Q-Cells	Germany	420
3. Suntech	China	270
4. Motech	Taiwan	240
5. Solarworld	Germany	200
6. China Sunergy	China	180
7. Kyocera	Japan	180
8. Isofoton	Spain	130
9. Schott	Germany	121
10. Sanyo Electric	Japan	115

2010

Company	Country	Capacity (MW)
1. JA Solar	China	1,900
2. Suntech	China	1,620
3. First Solar (TF)	US	1,502
4. Yingli	China	1,100
5. Trina Solar	China	1,000
6. Q-Cells	Germany	1,000
7. Canadian Solar	China	800
8. Motech	Taiwan	600
9. Gintech	Taiwan	600
10. JinkoSolar	China	600

Europe US China Other Asia

Note: 'Capacity' counted as either crystalline silicon cell or thin film module.
TF is thin film

Source: Bloomberg New Energy Finance, company announcements

Top 10 Global Wind Manufacturers 2005, 2010 (By Production)

+25% per year

2005 Company	Country	Production (GW)	2010 Company	Country	Production (GW)
1. Vestas	Denmark	3.2	1. Vestas	Denmark	6.3
2. Enercon	Germany	2.7	2. GE Wind	US	6.0
3. Gamesa	Spain	1.9	3. Sinovel	China	5.3
4. GE Wind	US	1.3	4. Gamesa	Spain	4.4
5. Siemens	Denmark	1.1	5. Goldwind	China	3.6
6. Suzlon	India	0.9	6. Suzlon	India	3.5
7. Repower	Germany	0.9	7. Enercon	Germany	3.4
8. Goldwind	China	0.7	8. Dongfang	China	3.0
9. Nordex	Germany	0.5	9. Repower	Germany	2.9
10. Ecotecnica	Spain	0.3	9. Siemens	Denmark	2.9

Europe | US | China | Other Asia

Source: Bloomberg New Energy Finance

New Energy Pioneers

Company	Brief Intro
BrightSourceEnergy	designs, develops, builds and sells large-scale solar thermal power systems
green biologics	developed an advanced fermentation process to convert readily available waste and agricultural by-product feedstocks into high value chemicals and biofuels.
Metabolix Bio-industrial Evolution	has pioneered the creation of Polyhydroxyalkanoate (PHA)-based plastics and chemicals, which will enable the displacement of petroleum-based feedstocks.
winafrique	is an end-to-end renewable energy solutions integrator. The company is commercializing off-grid power systems through small-scale hybrid renewable energy storage using flow batteries.

The 2011 New Energy Pioneers were unveiled on the opening day of the New Energy Finance Summit in New York, themed ôInnovationô

Thank You!

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