

Low-Carbon Energy Roadmaps



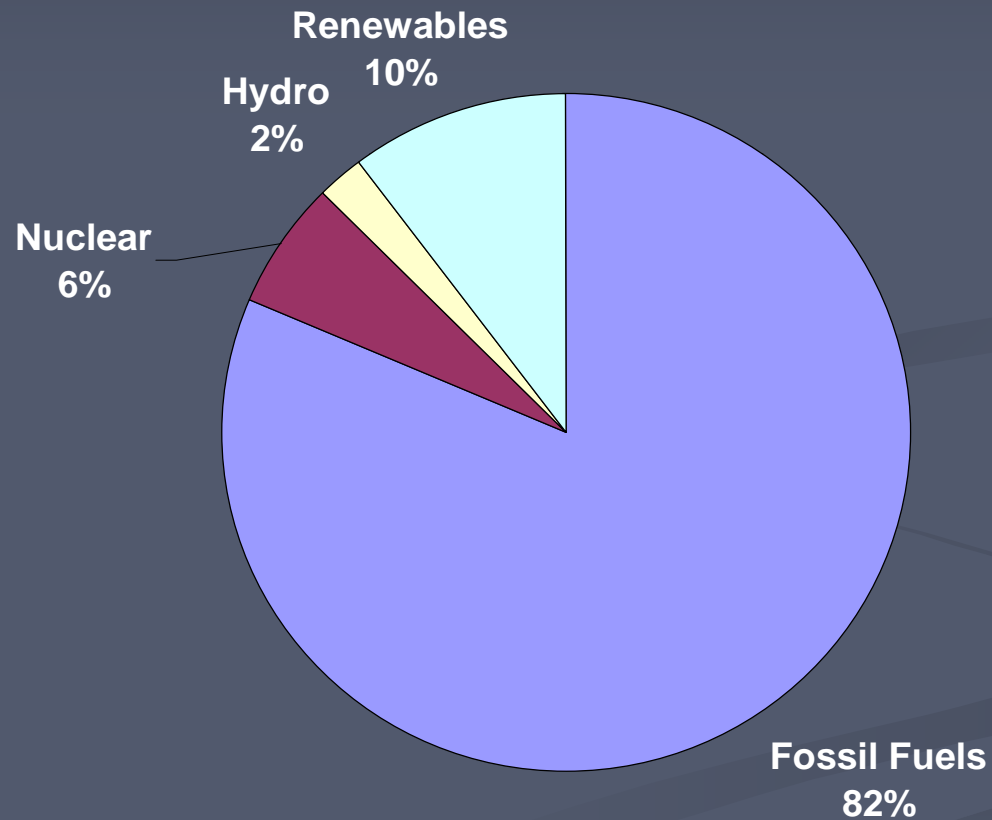
Alexander Ochs, Worldwatch Institute

ECF Side Event, COP 16

EU Pavilion, Cancun

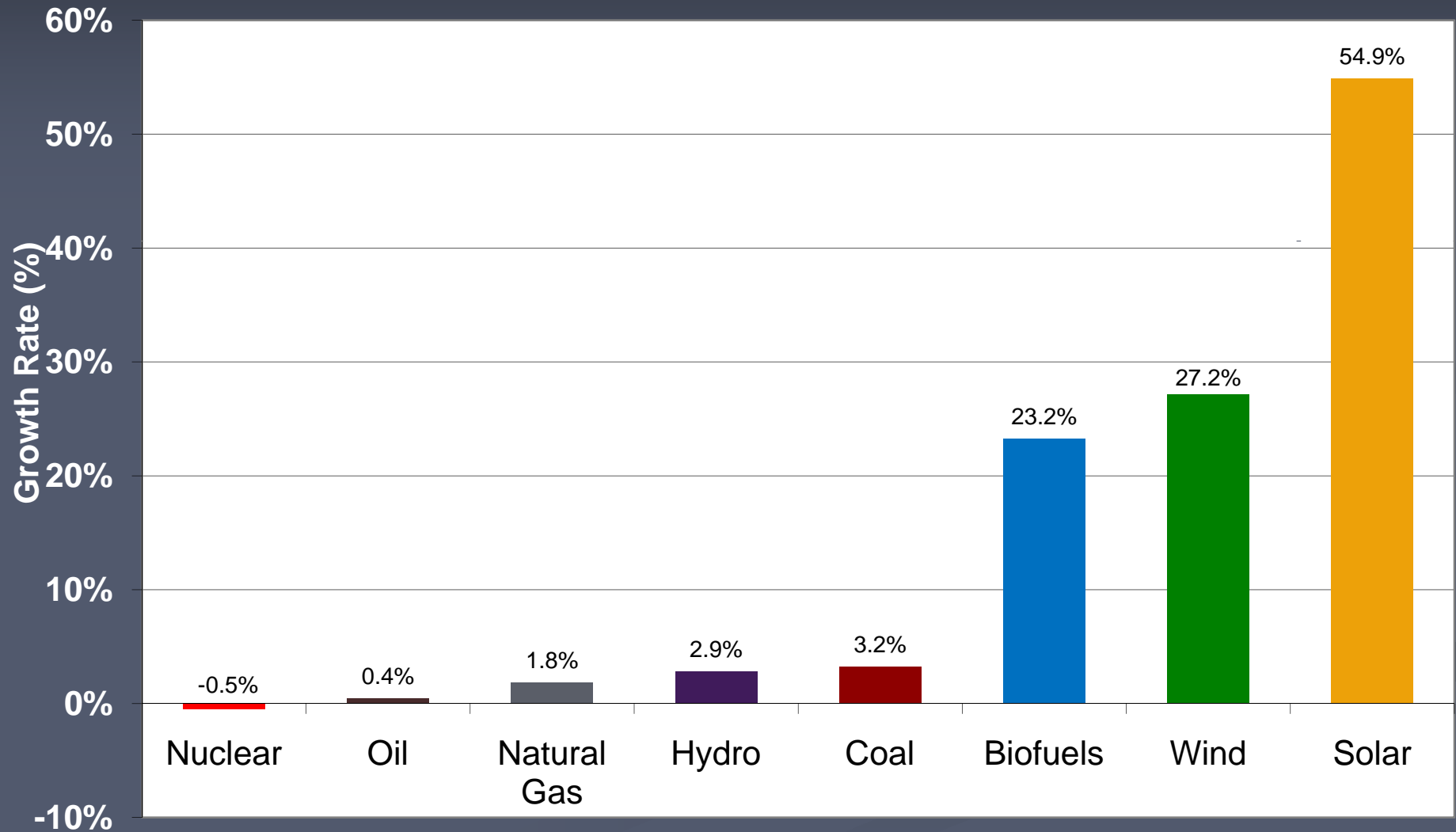
2 December 2010

Global Primary Energy Supply by Source: 2007



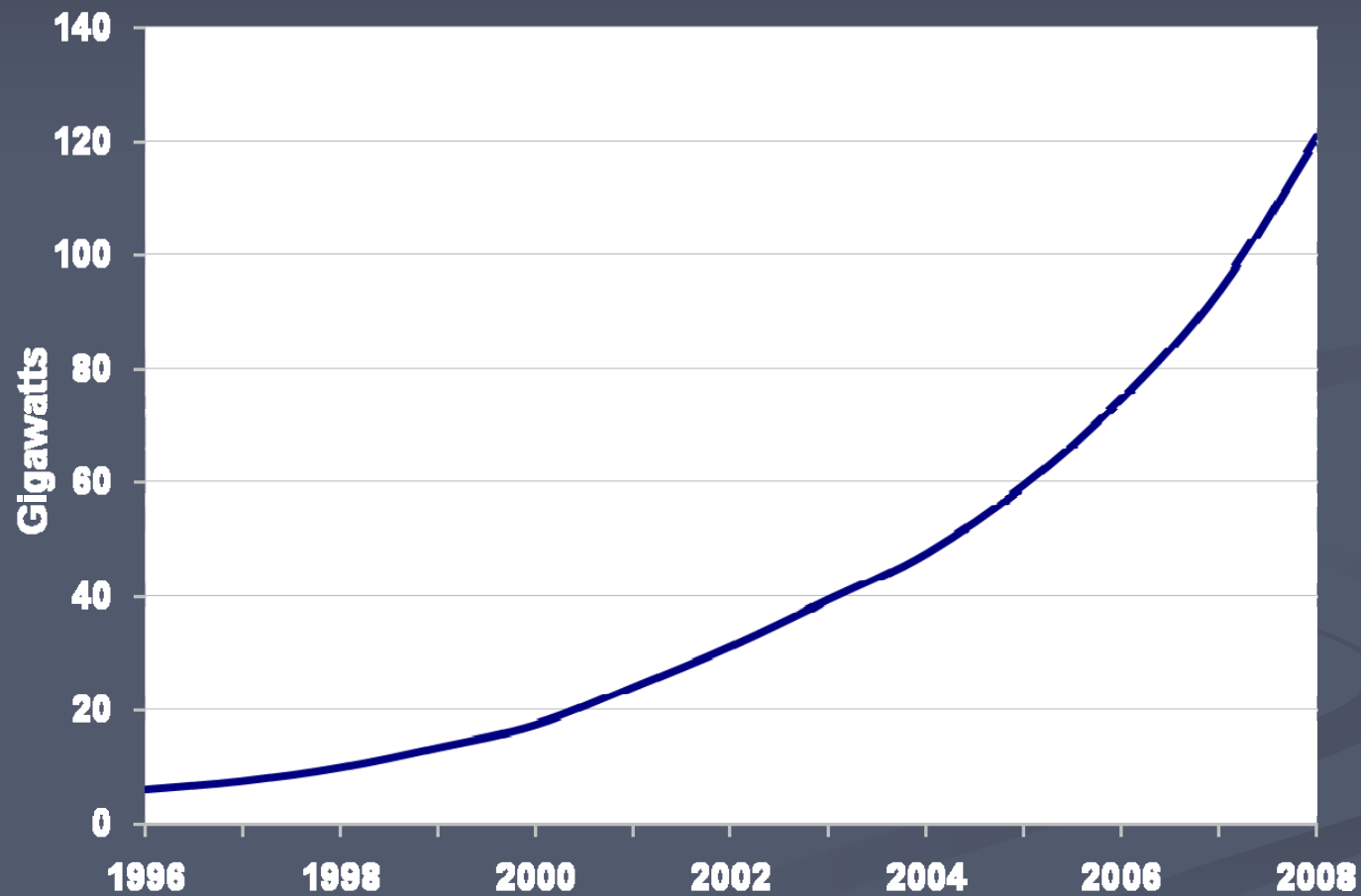
Source: IEA.

Average Global Growth Rates by Energy Source, 2004-2009



Source: Worldwatch, BP.

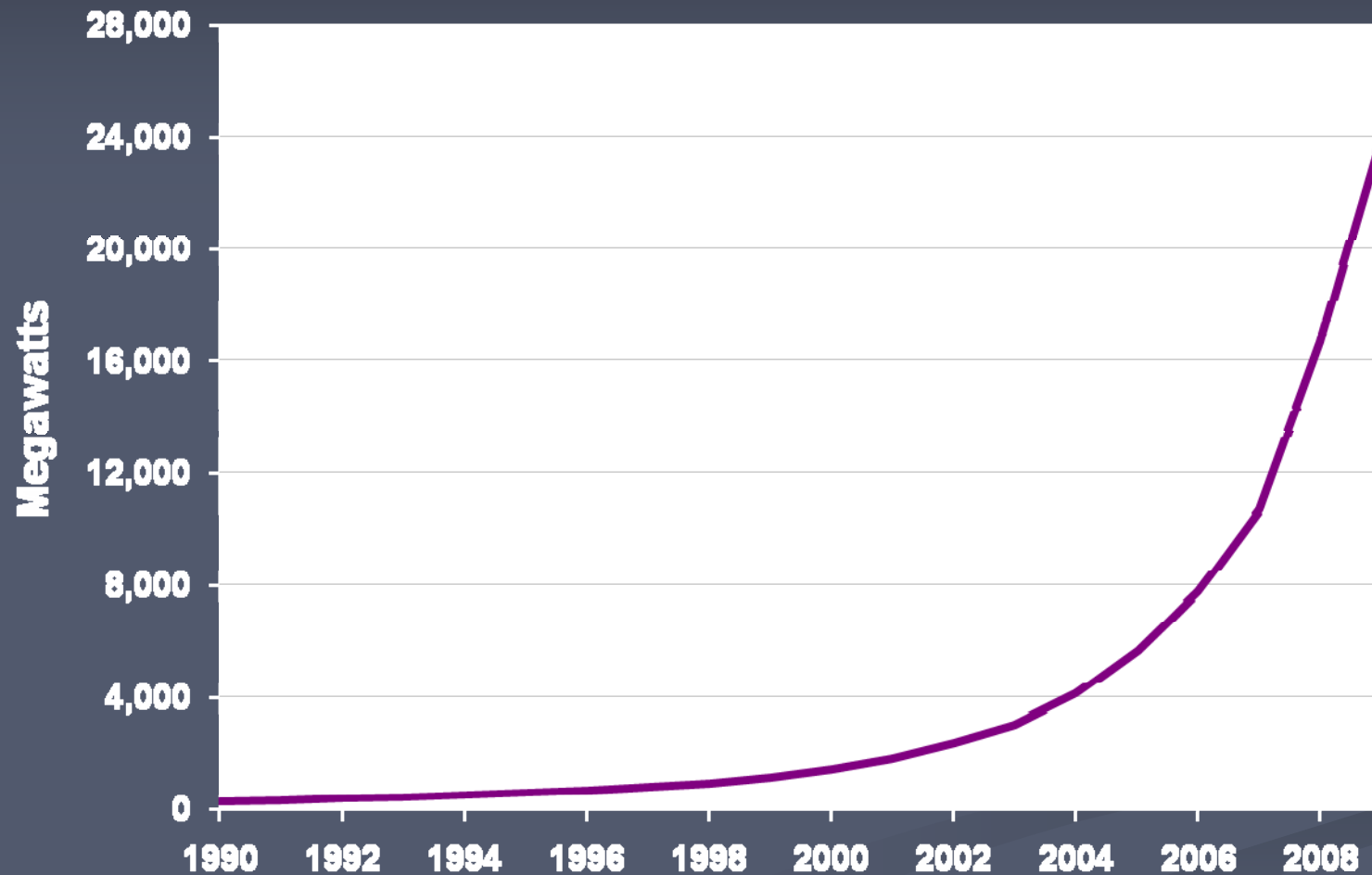
World Wind Capacity 1996-2008



Source: REN21 2009



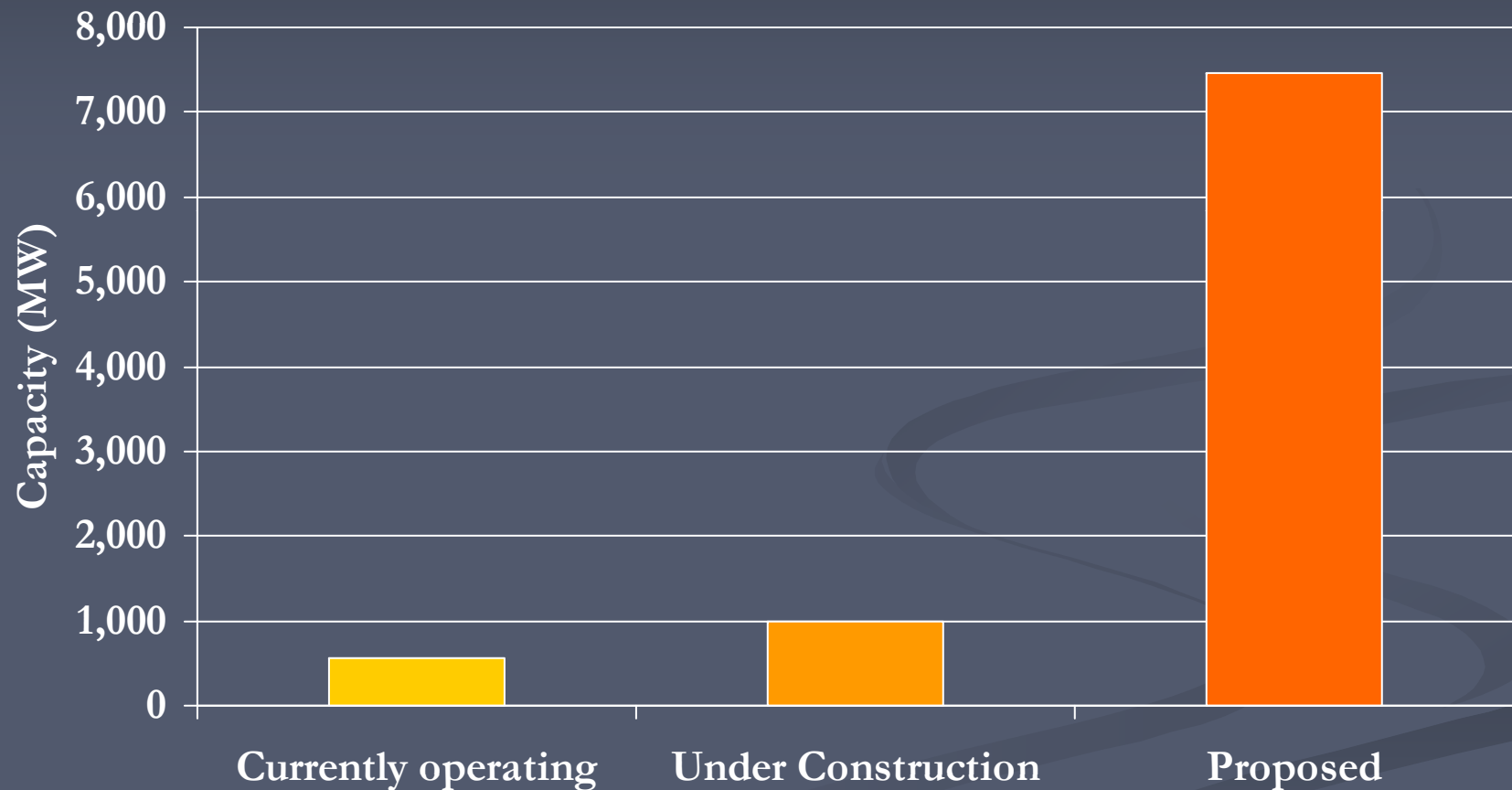
World Solar PV Capacity 1990-2009



Source: REN21 2010

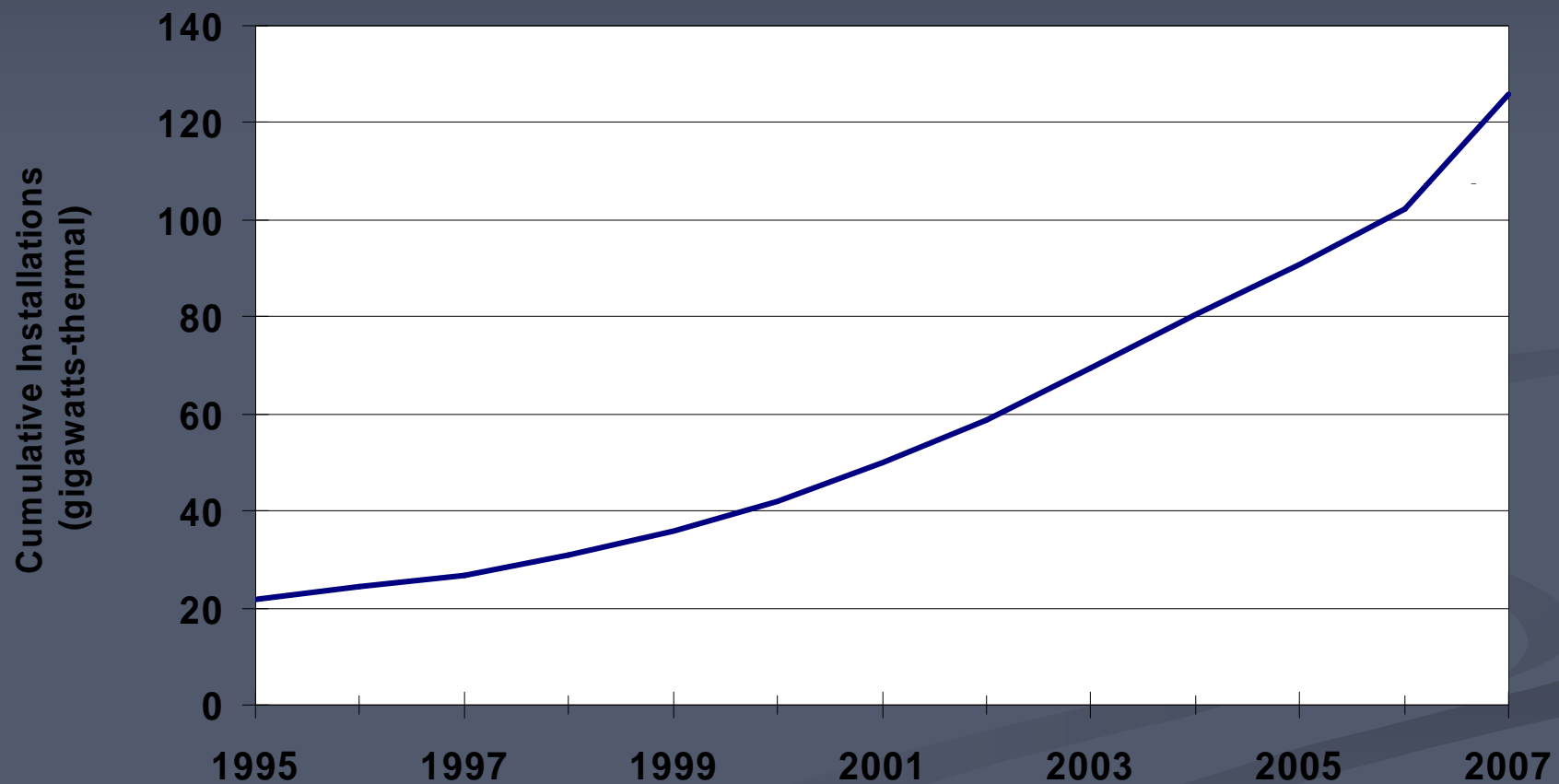


Concentrating Solar Power (CSP) 2009



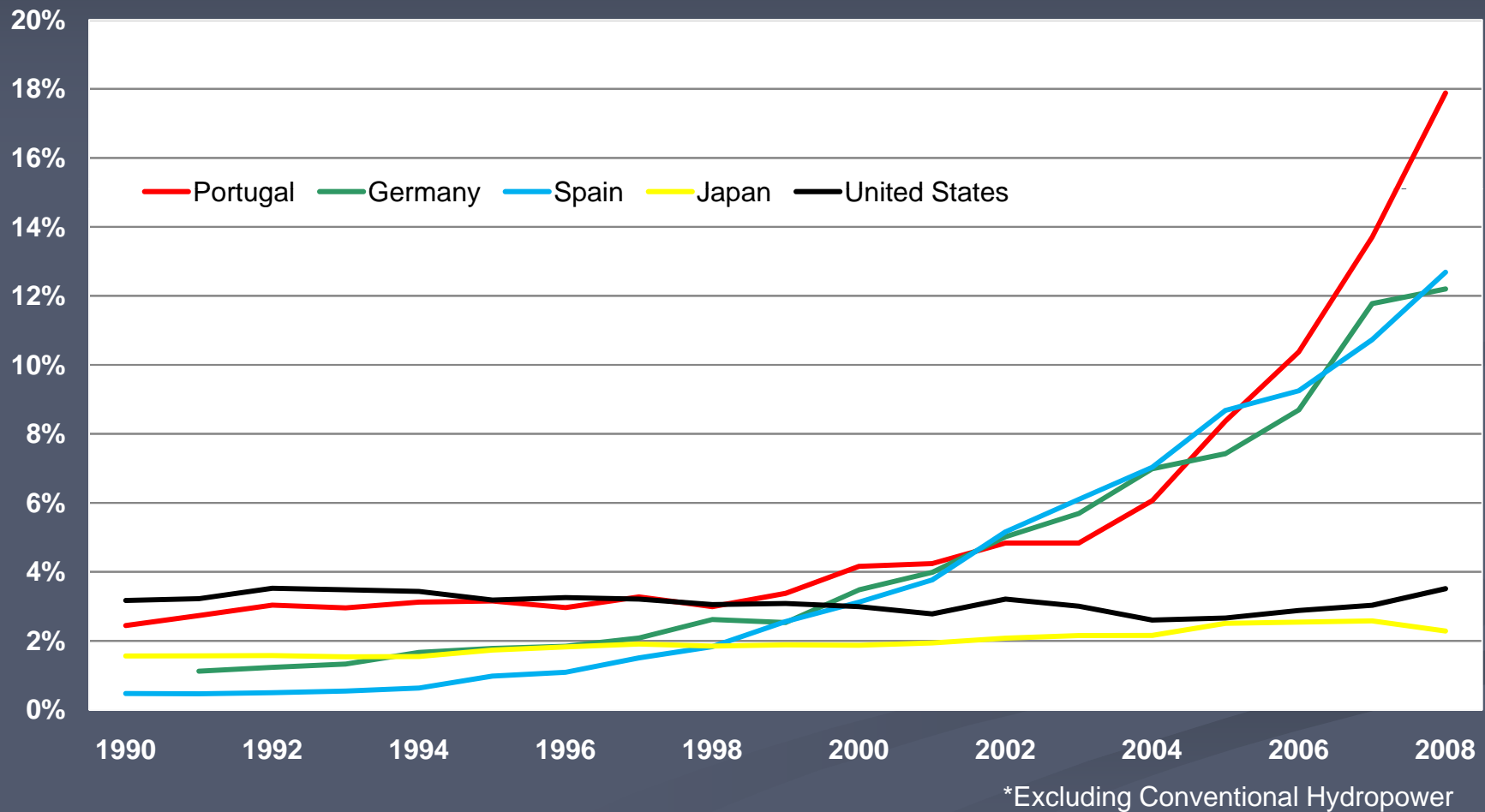
Source: Greenpeace International/SolarPACES/ESTELA (2009).

World Solar Water Heating Capacity 1995-2007

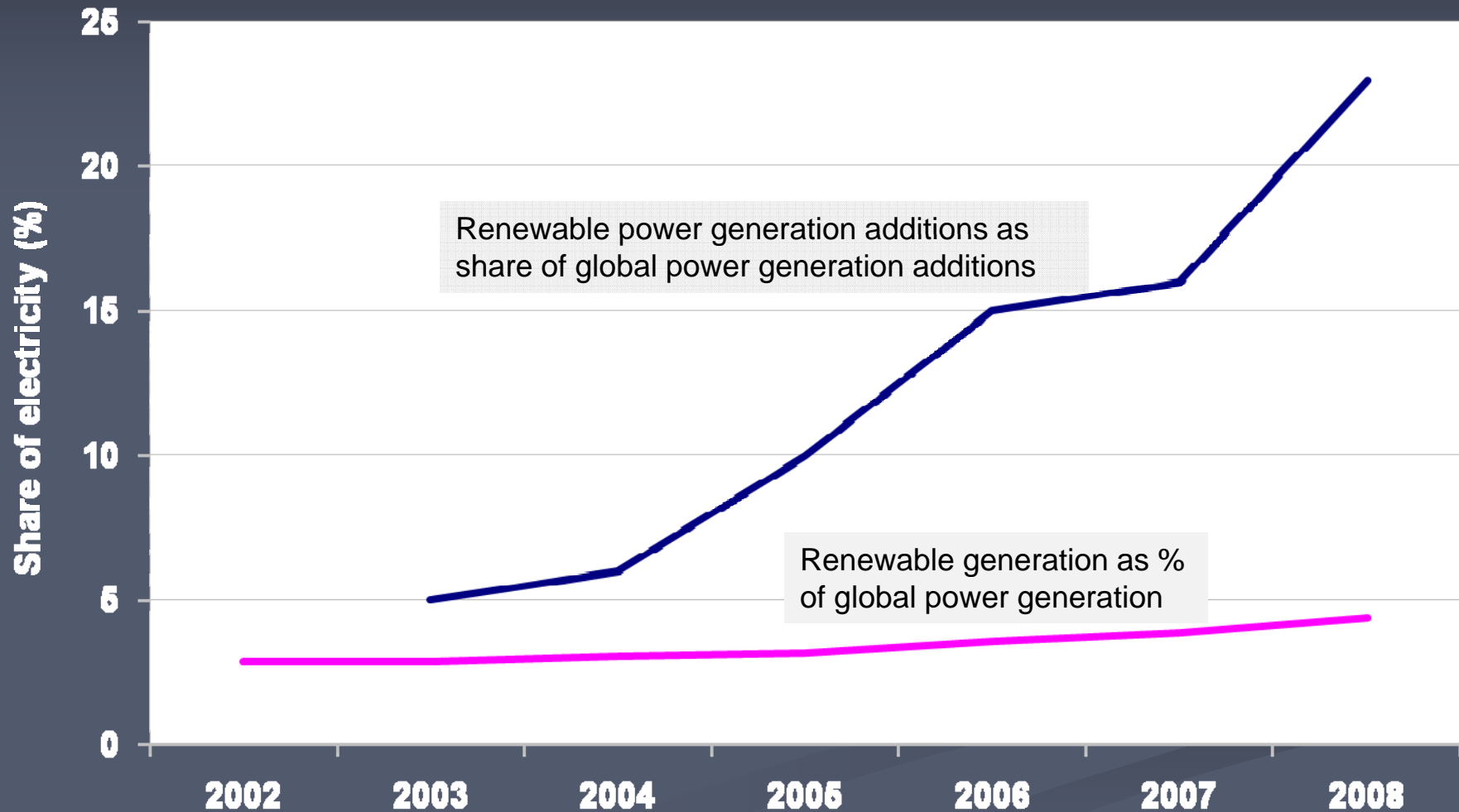


Source: IEA, REN21

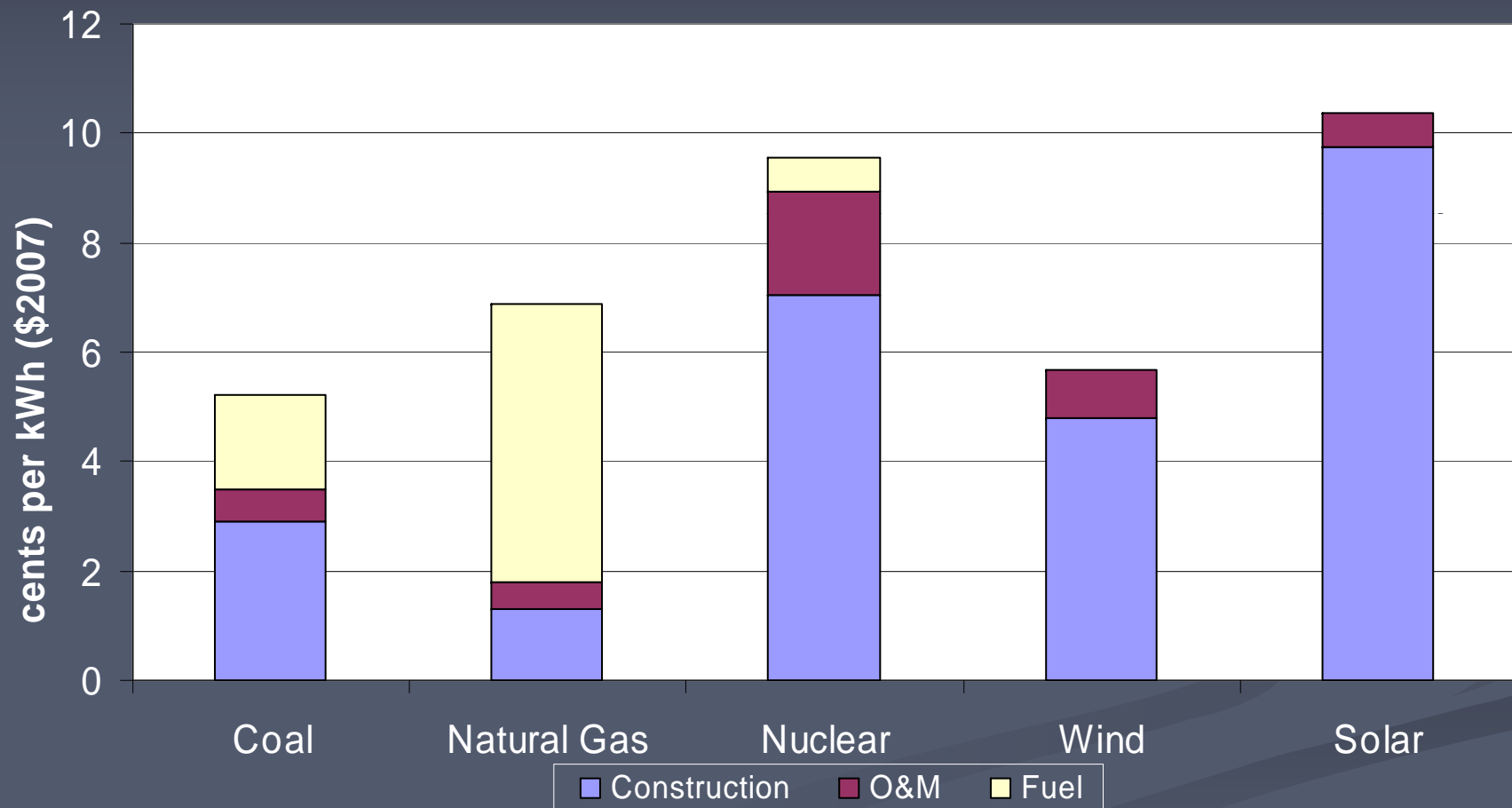
Renewables as a Share of Electricity Generation, 1990-2008*



Global Electricity from Renewables 2002-2008

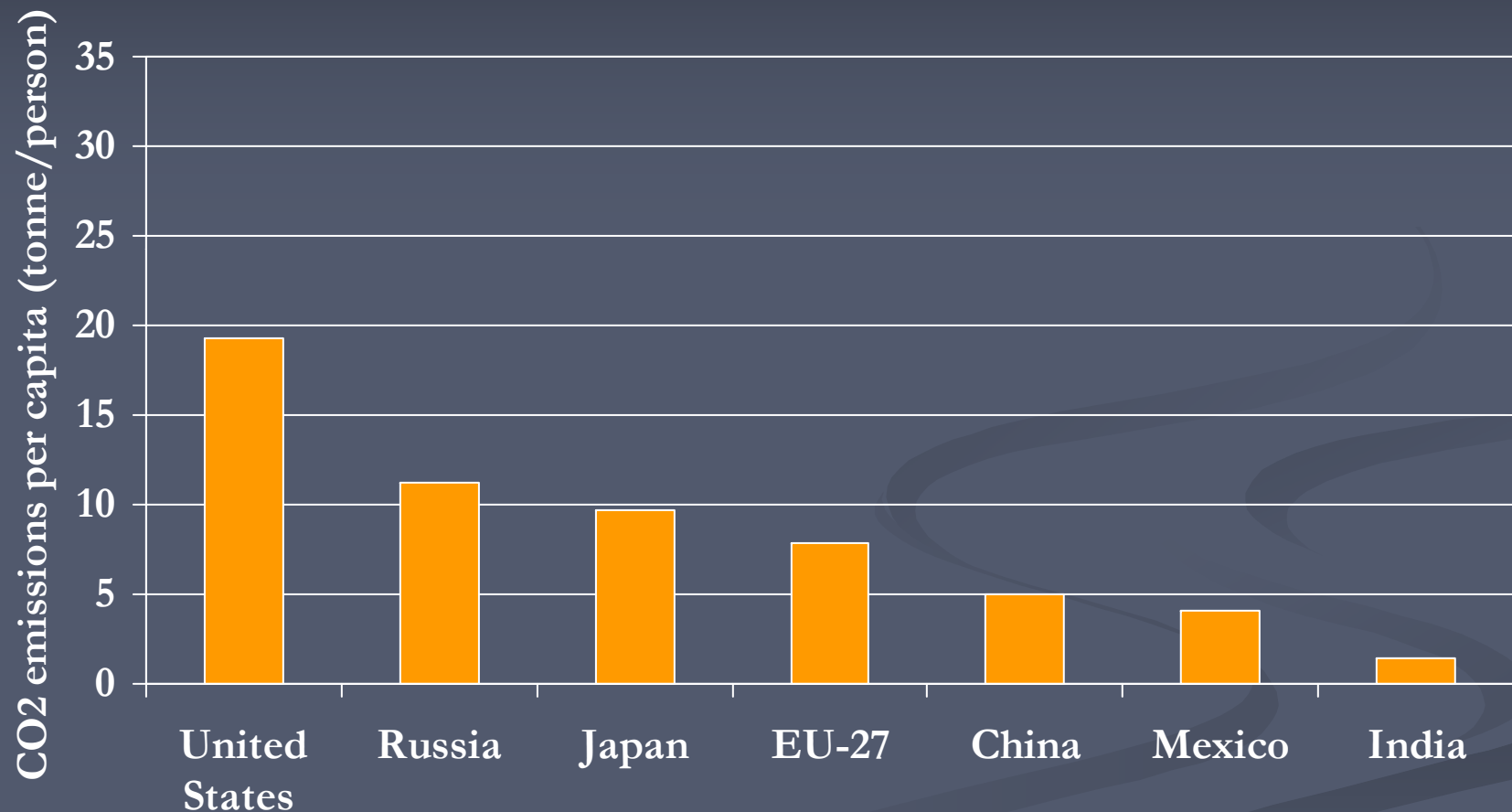


Cost of New U.S. Power Generation, 2008

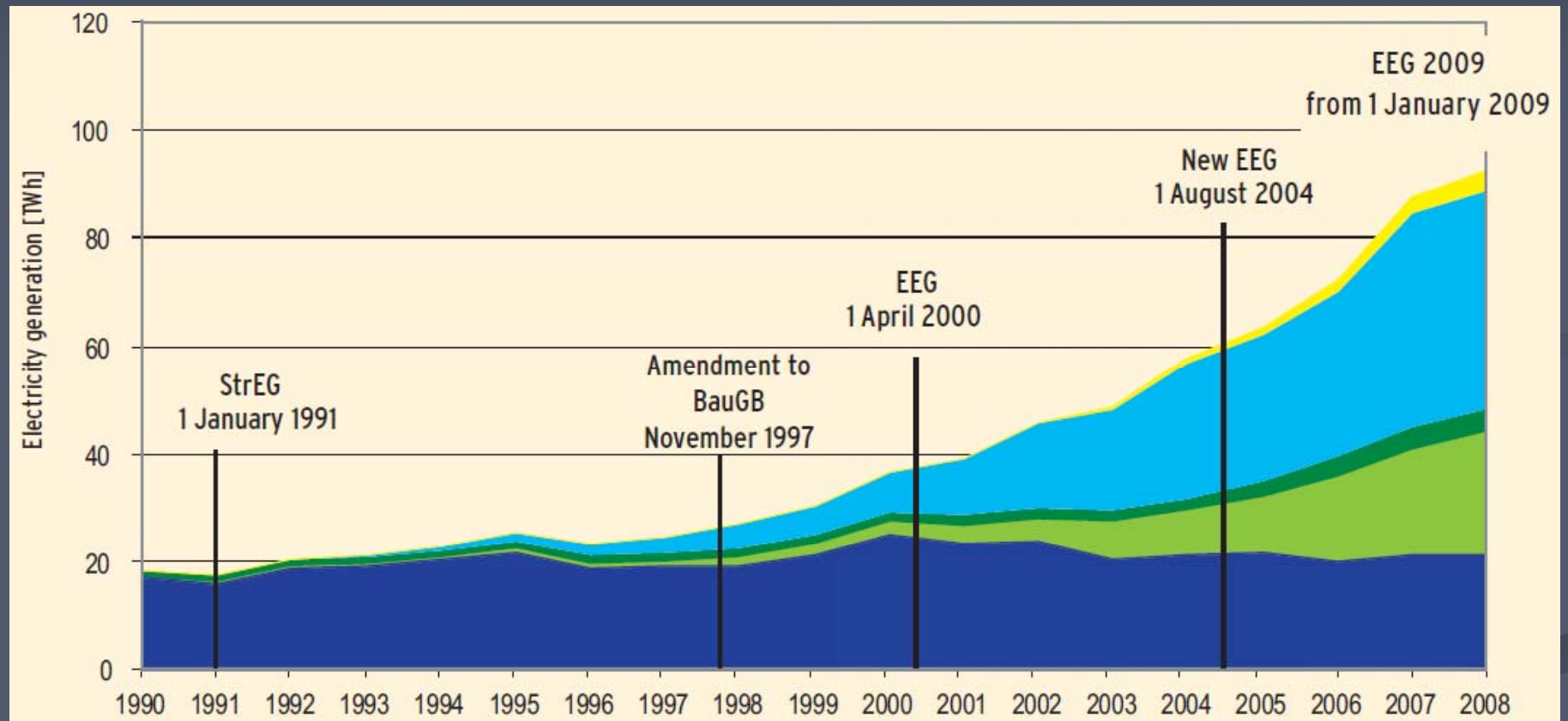


Source: Black & Veatch (2007), EIA (2008), Keystone Center (2007), IEER (2008), E3 (2008).

CO₂ Emissions per capita, select countries



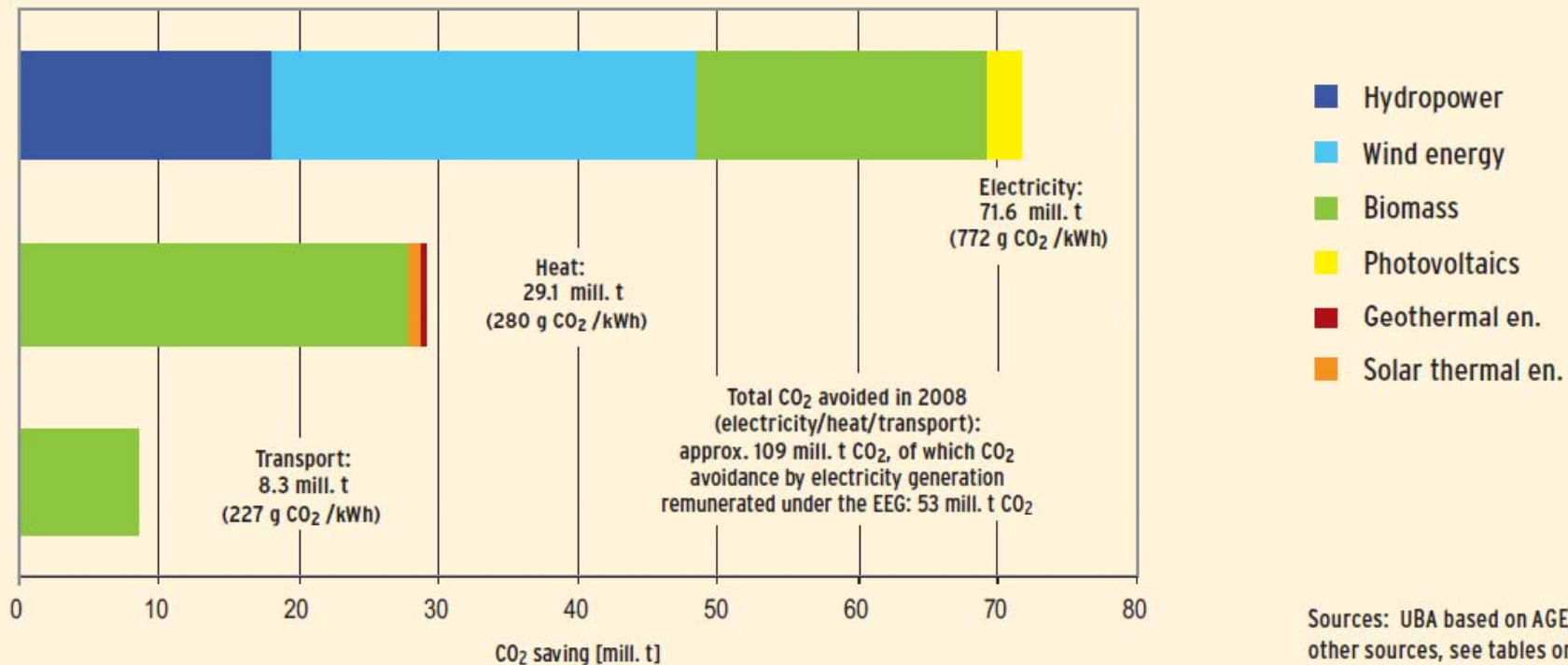
Renewable Electricity in Germany 1990 - 2007



Source: BMU 2009.

CO₂ Emissions Avoided with Renewable Energy in Germany

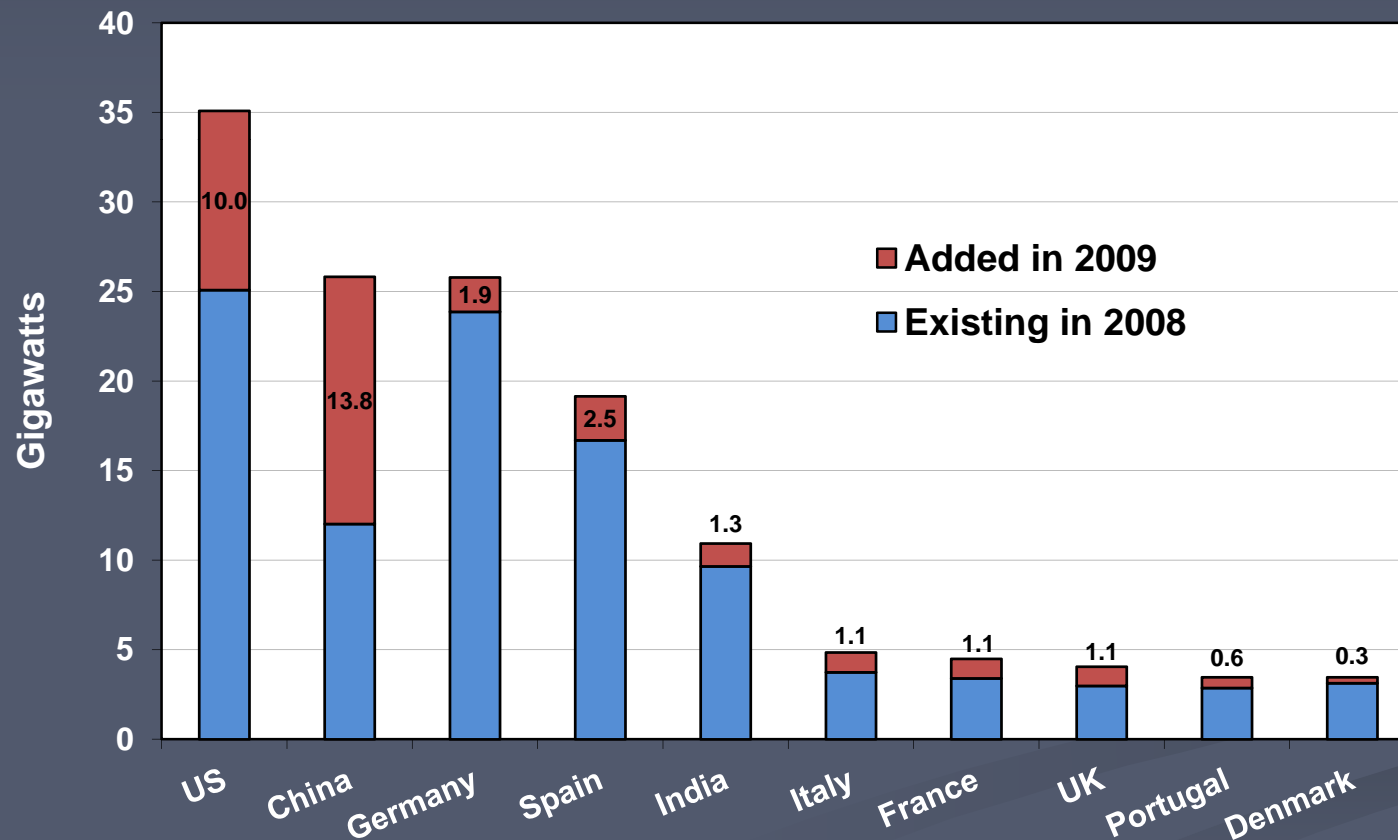
Total CO₂ avoidance via the use of renewable energy sources in Germany, 2008



2008 energy sector emissions: 748 million t CO₂

2008 CO₂ avoidance: 109 million t CO₂

Wind Capacity, Top 10 Countries, 2009



Source: REN21 2010



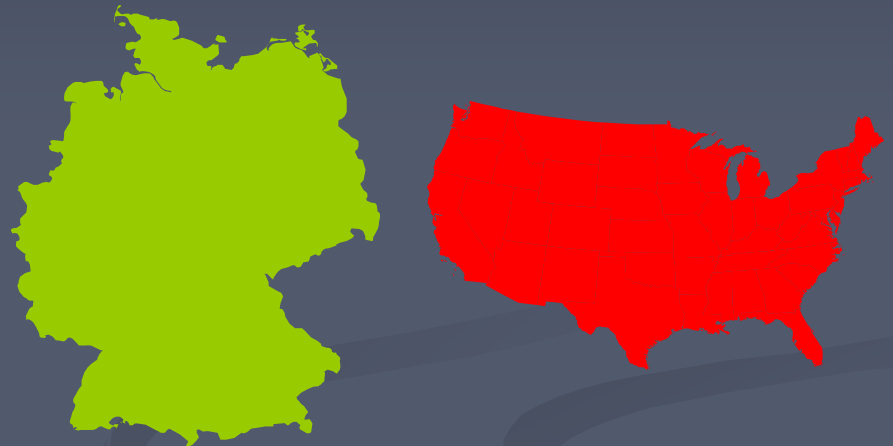
Landmass vs. Wind Capacity (MW) Germany and Continental U.S. (2007)



Area

Germany: 357,030 km²
US*: 8,154,157 km²

*23 times larger, without Alaska

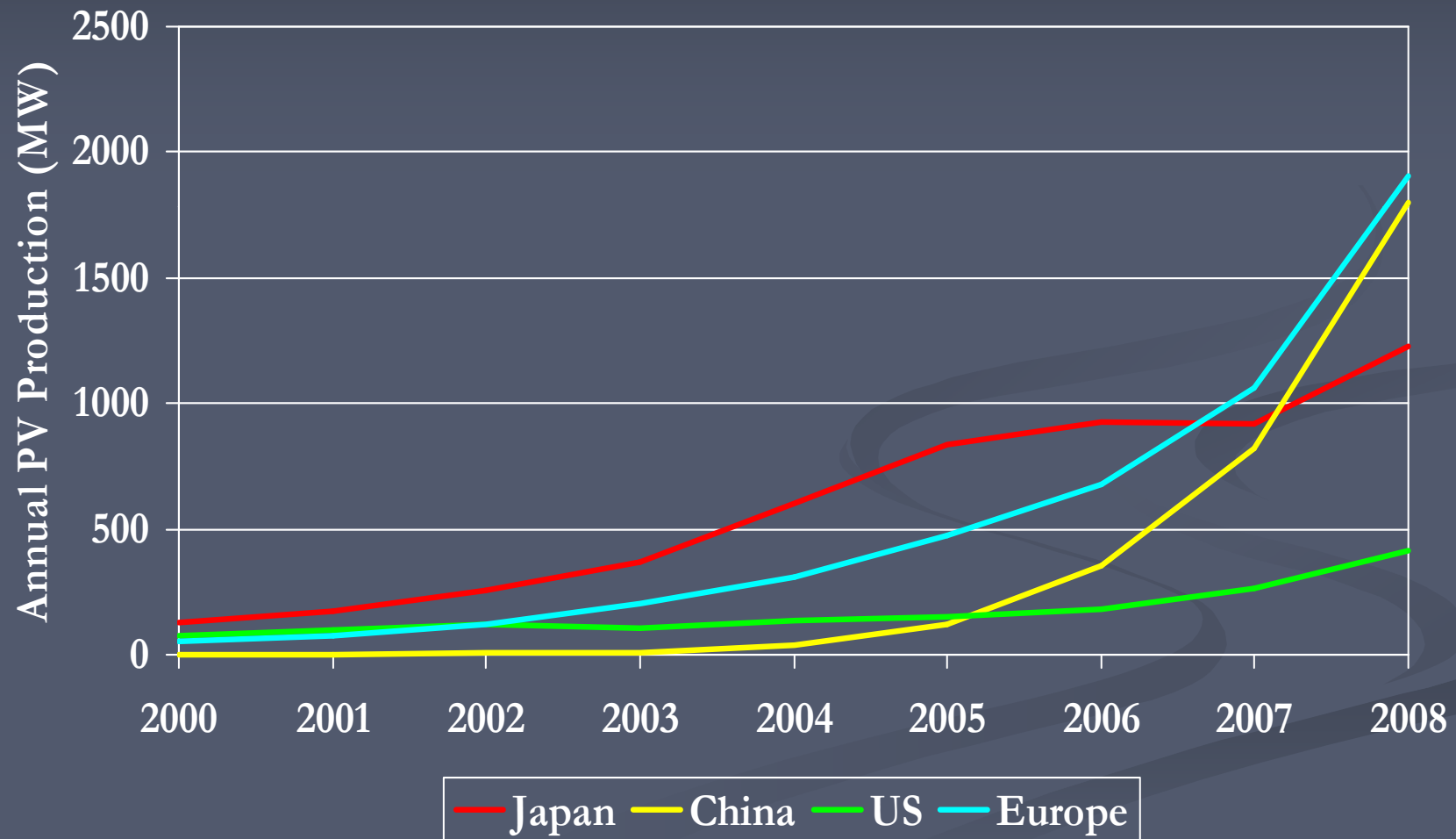


Installed Capacity

Germany*: 22,247 MW
US: 16,818 MW

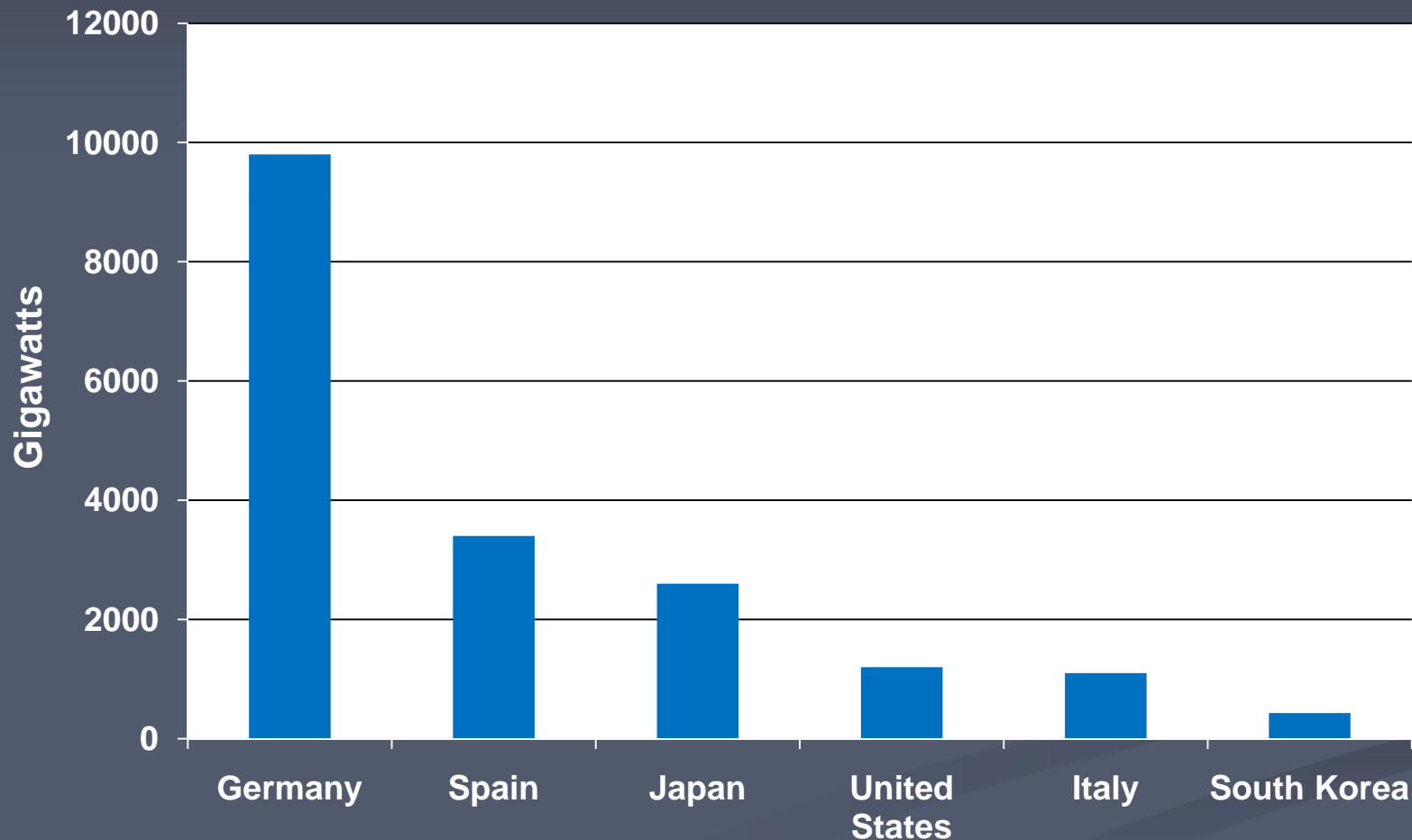
*1.3 times larger

Solar PV Production by Country/Region 2000-2008



Source: Maycock, Prometheus Institute, CREIA, Bradford.

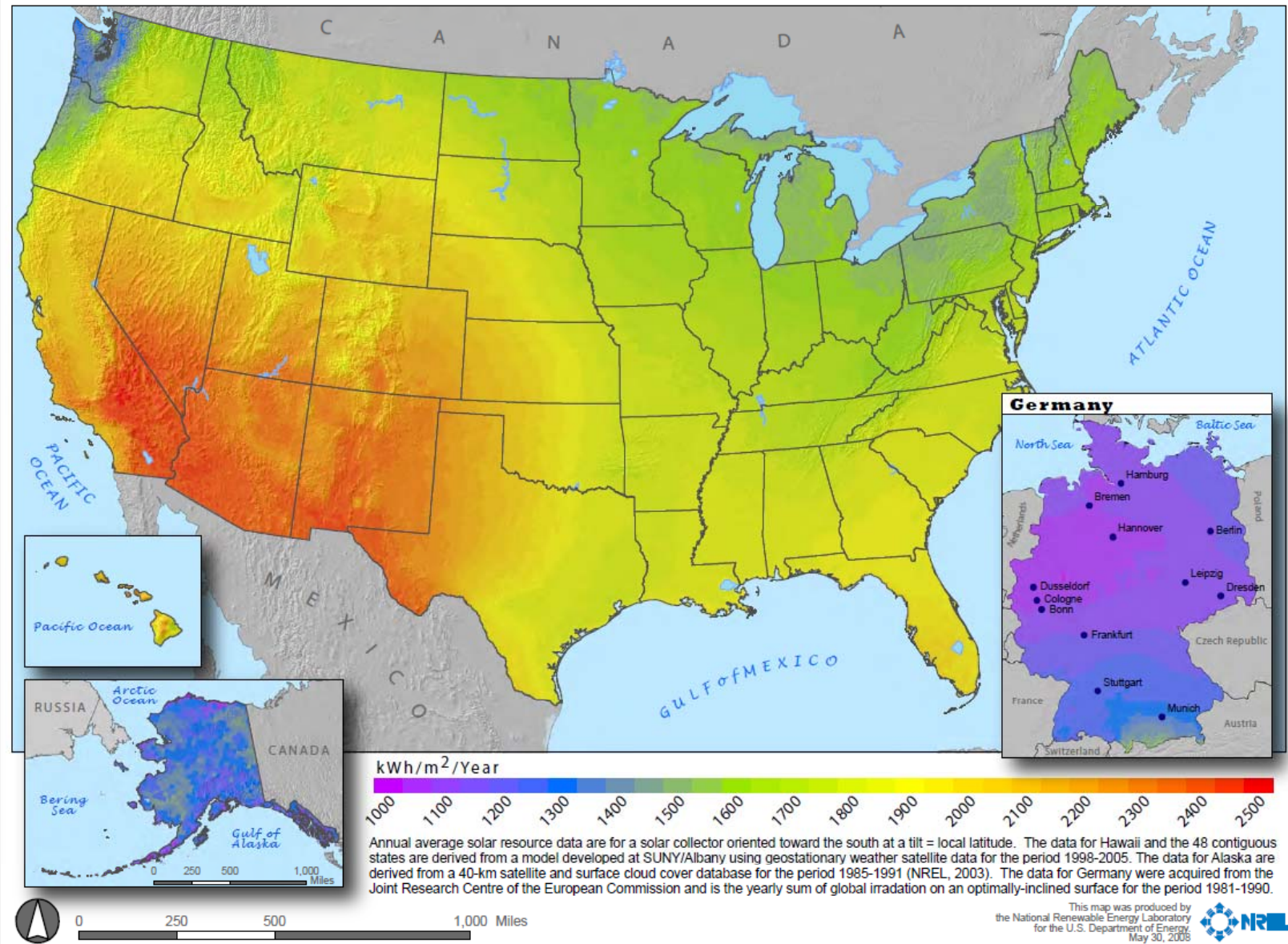
Solar PV Capacity, Top Six Countries, 2009



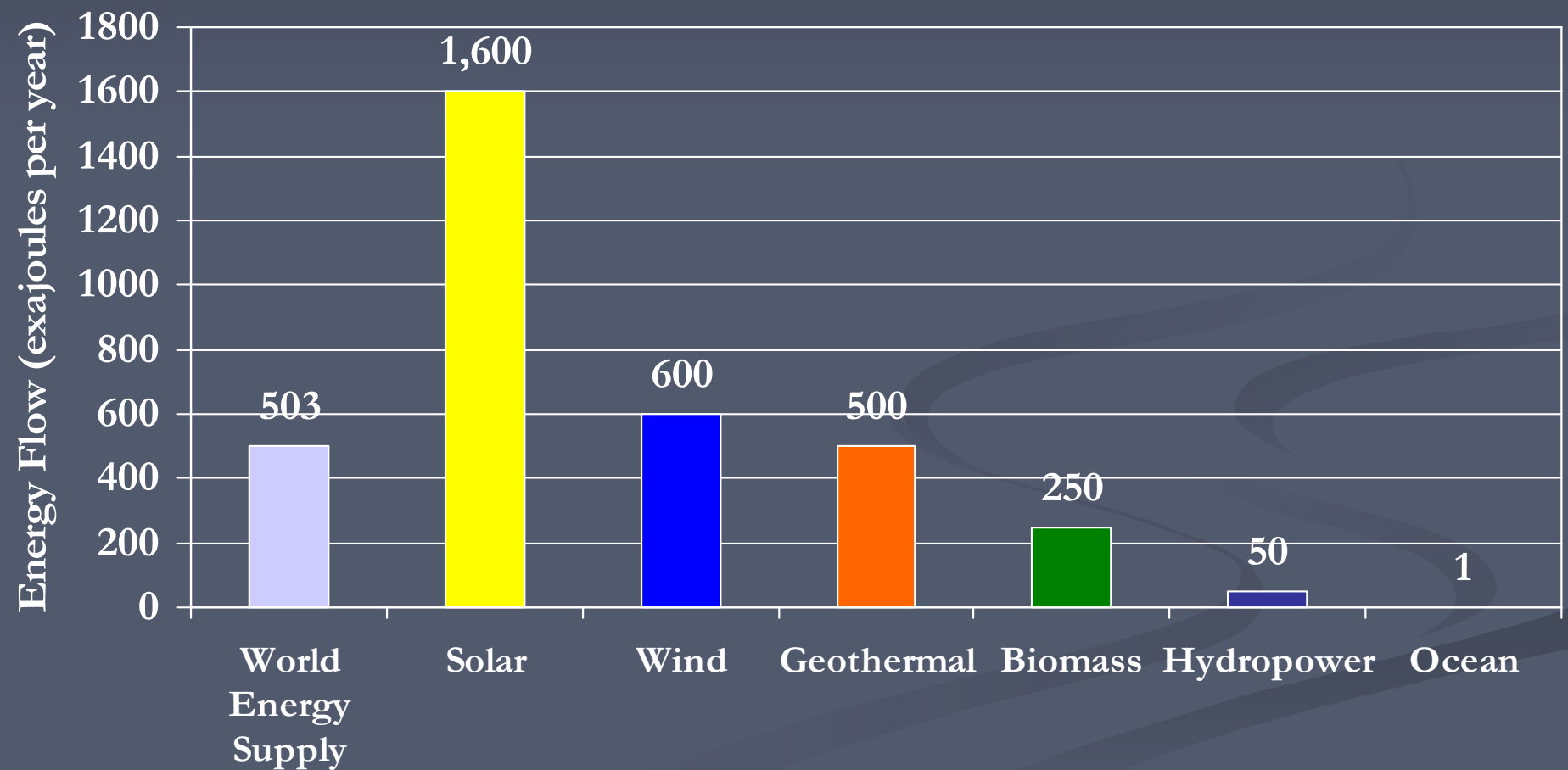
Source: REN21 2010



Photovoltaic Solar Resource : United States and Germany



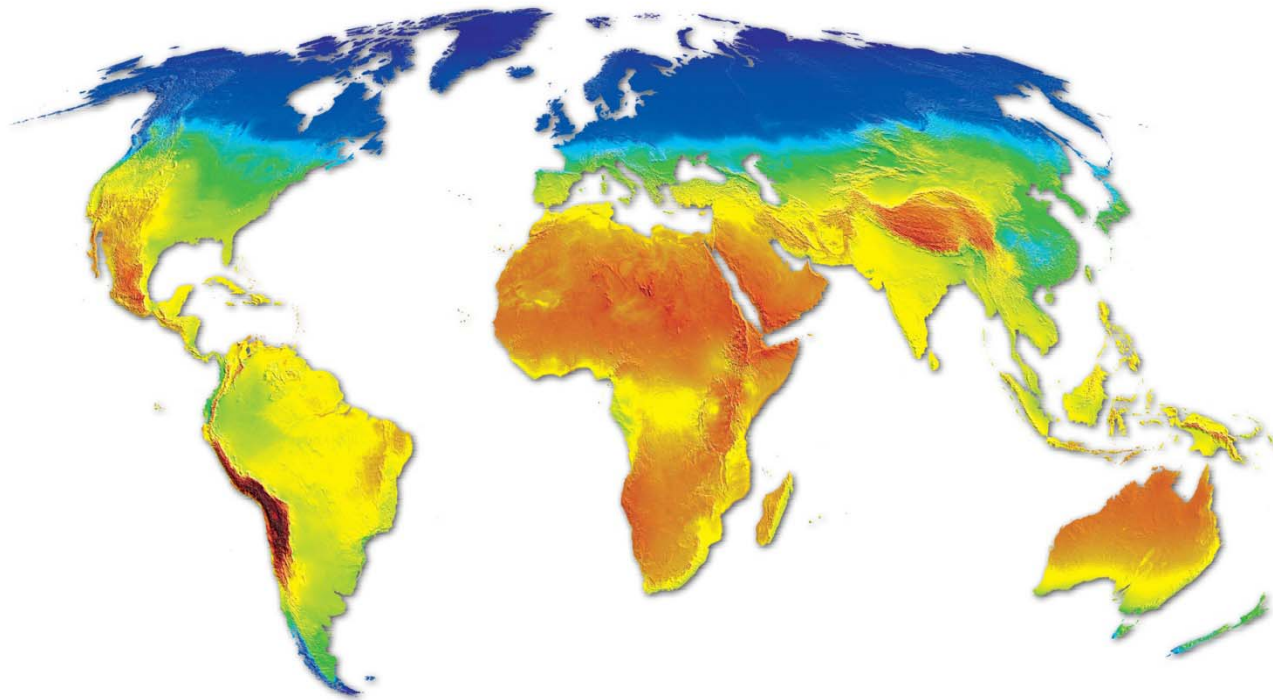
Global Potential of Renewable Resources



Source: IEA, Johansson et al.

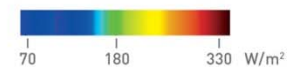
Solar Potential

Global Solar Irradiance

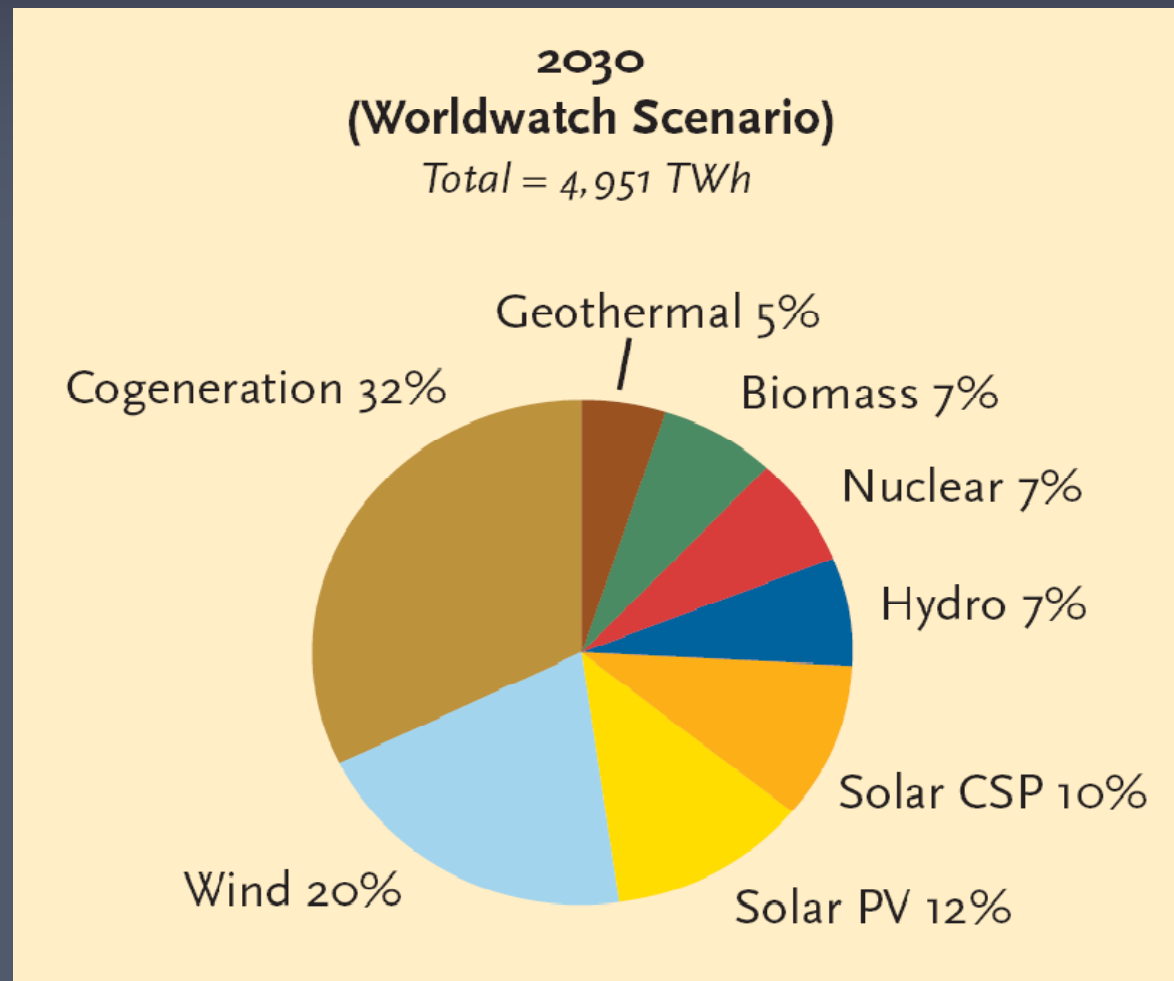


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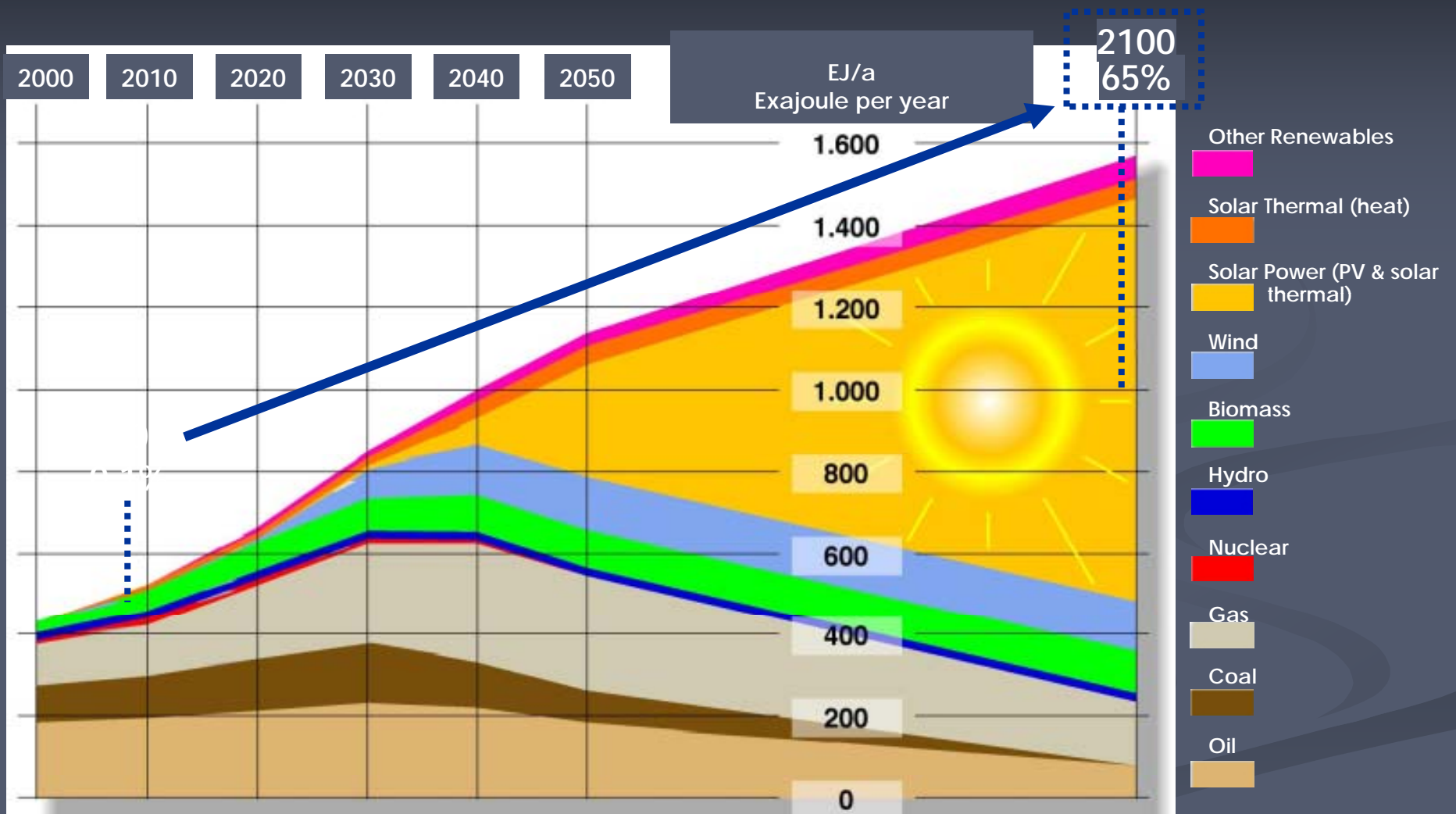
Global Horizontal Irradiance



U.S. Electricity Generation by Source: Worldwatch Scenario 2030



Energy Transitions: 2000 - 2100



Global primary energy scenario: Renewables 80% of primary energy by 2100

Worldwatch 5-Phase Design of Low-Carbon Growth Strategies

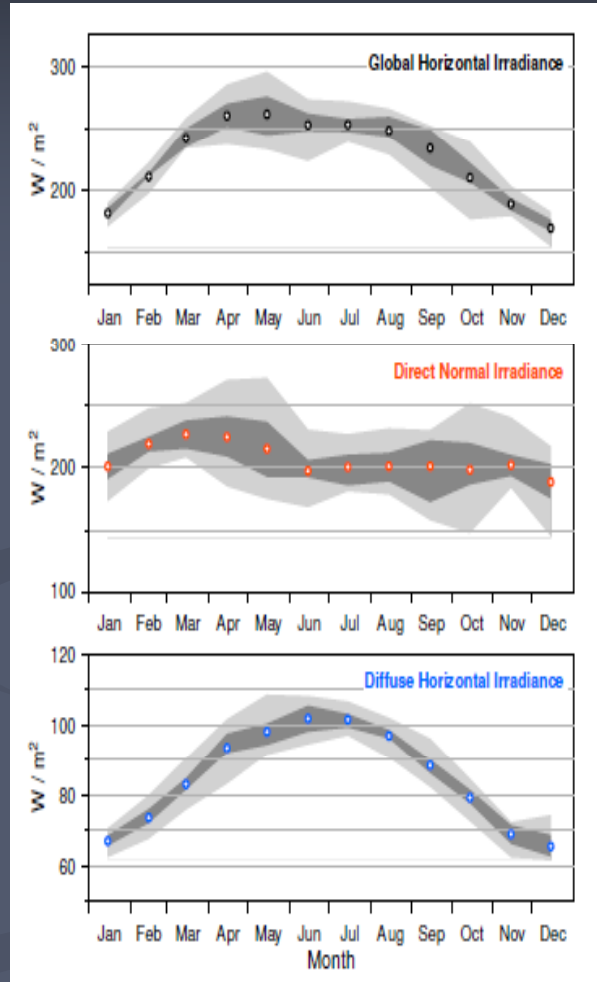
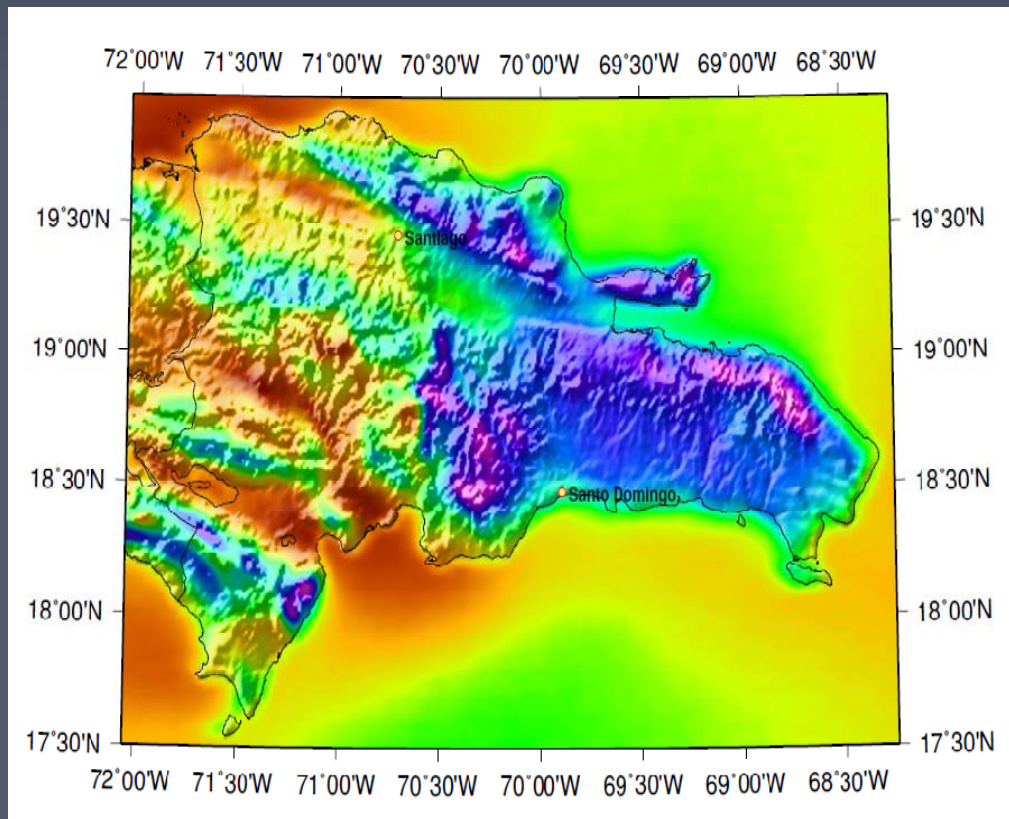
- Assess Low-Carbon Potentials
- Assess Full Economics
- Identify Institutional and Regulatory Barriers
- Propose New Policy Frameworks
- Identify Sources of Finance and Investment

Worldwatch's Energy Roadmaps

- Multi-stage approach
 - Detailed and comprehensive resource mapping (solar, wind, biomass, small hydro)
 - Combined w/ layers incl. transmission & consumption
 - Assessments of socio-economic and policy environment
 - In-depth analysis of specific sites for each technology examining barriers to grid integration and extension
 - Creation of a possible policy framework
 - Training of policymakers and stakeholders in working with roadmaps
 - Suggesting concrete recommendations through workshops and continuous collaboration

Worldwatch's Energy Roadmaps

■ Example: Dominican Republic

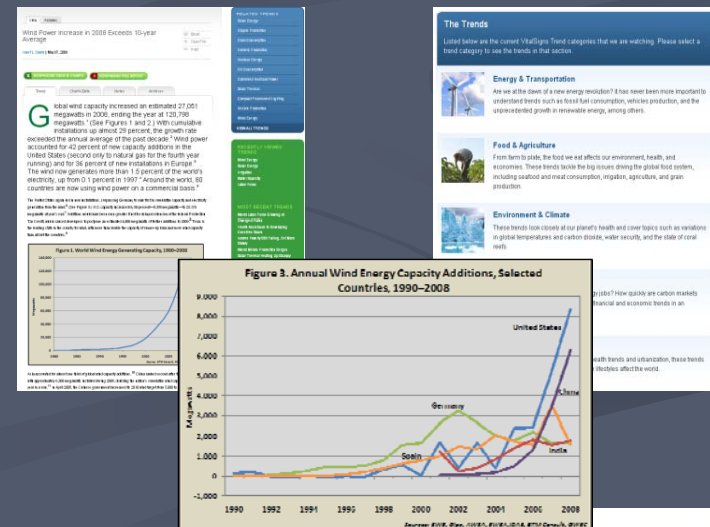


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Low-Carbon Energy: A Road Map

American Energy

Powering China's Development

Renewables Global Status
Report

The logo for reVOLT. It features the word "re" in white lowercase letters, followed by a yellow lightning bolt symbol, and then the word "VOLT" in white uppercase letters, all set against a green background.