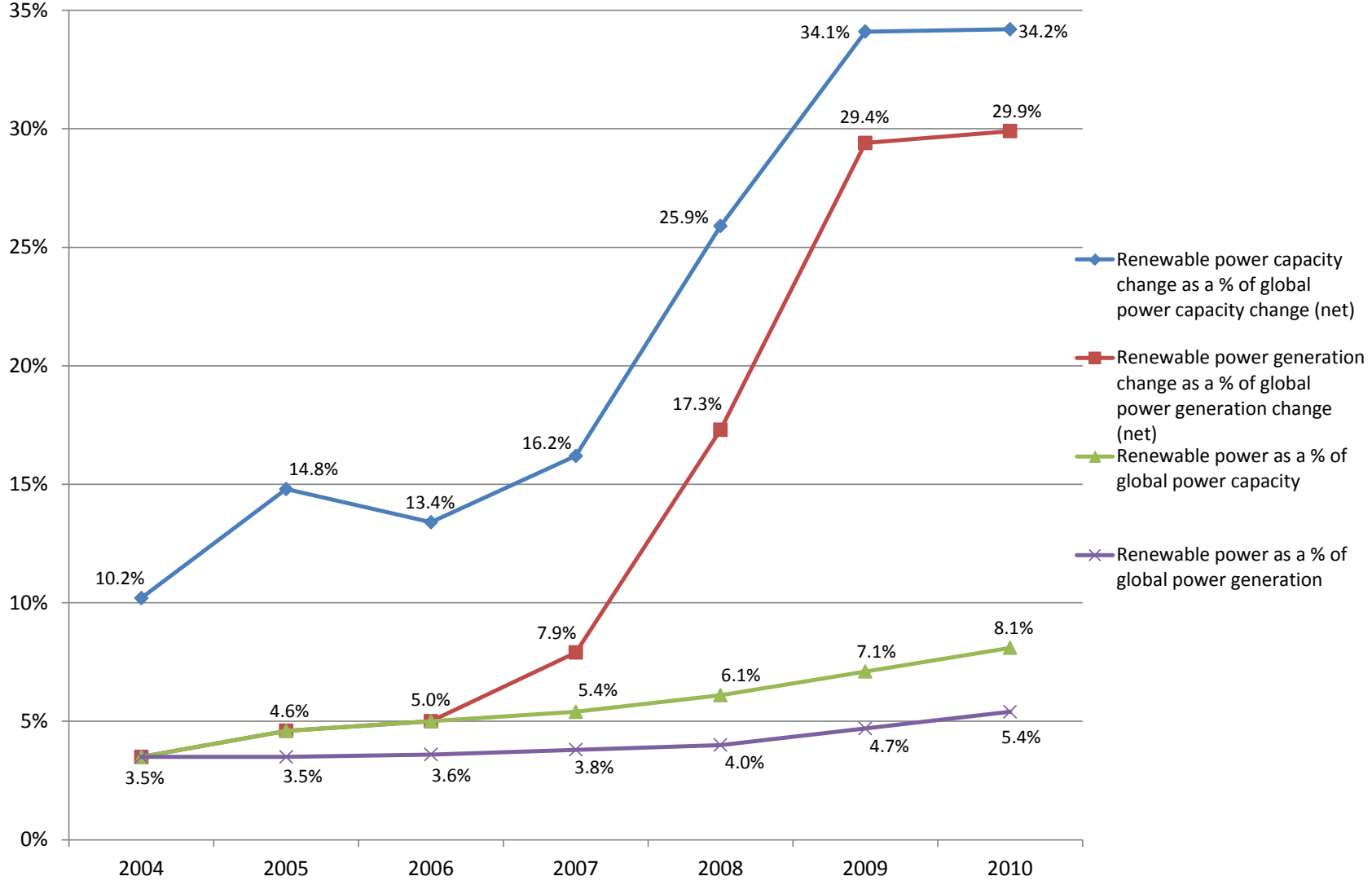
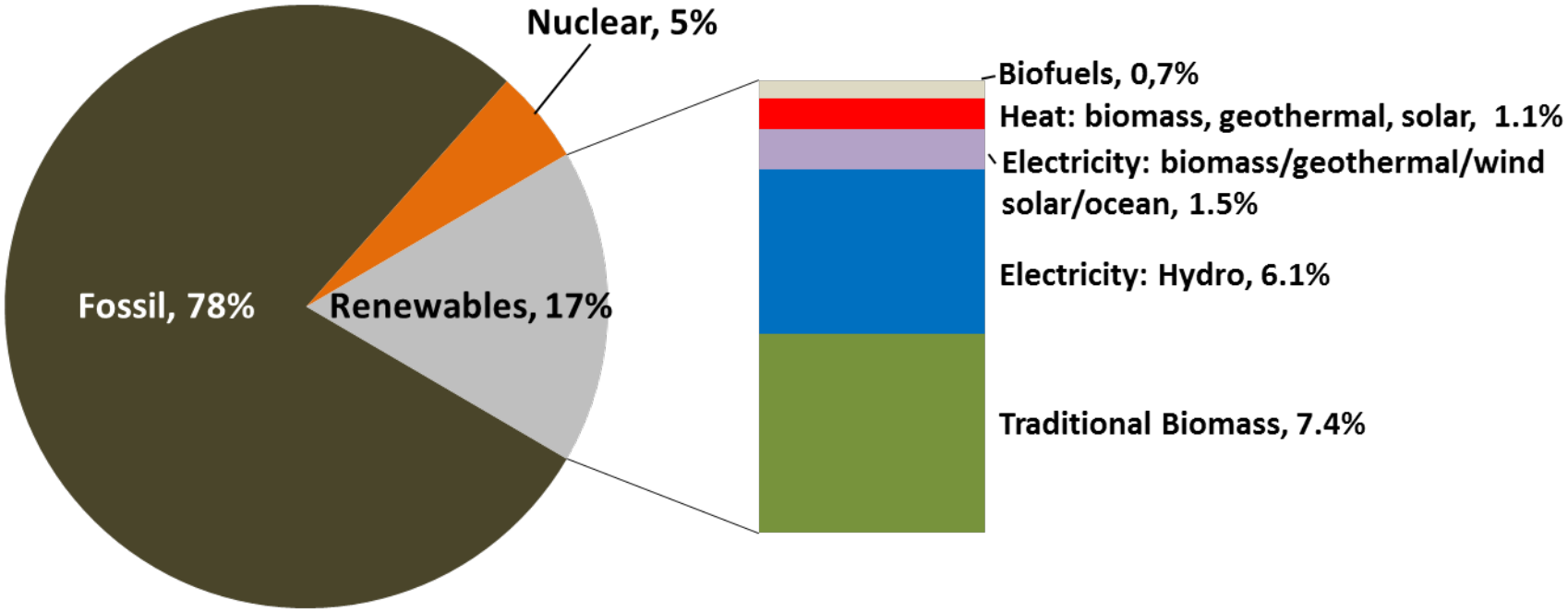
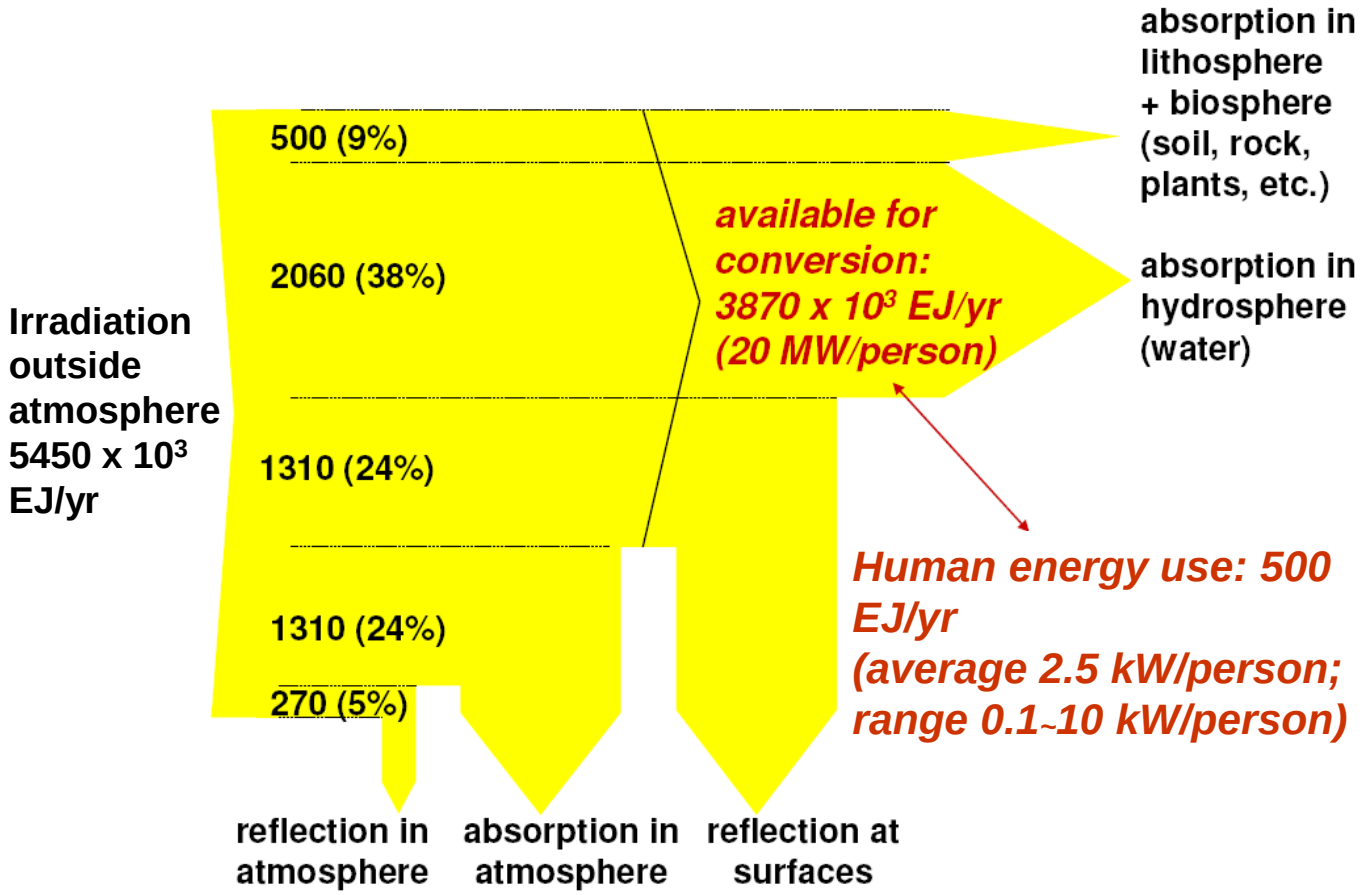
Generating Power and Capacity of Non-Hydro Renewables



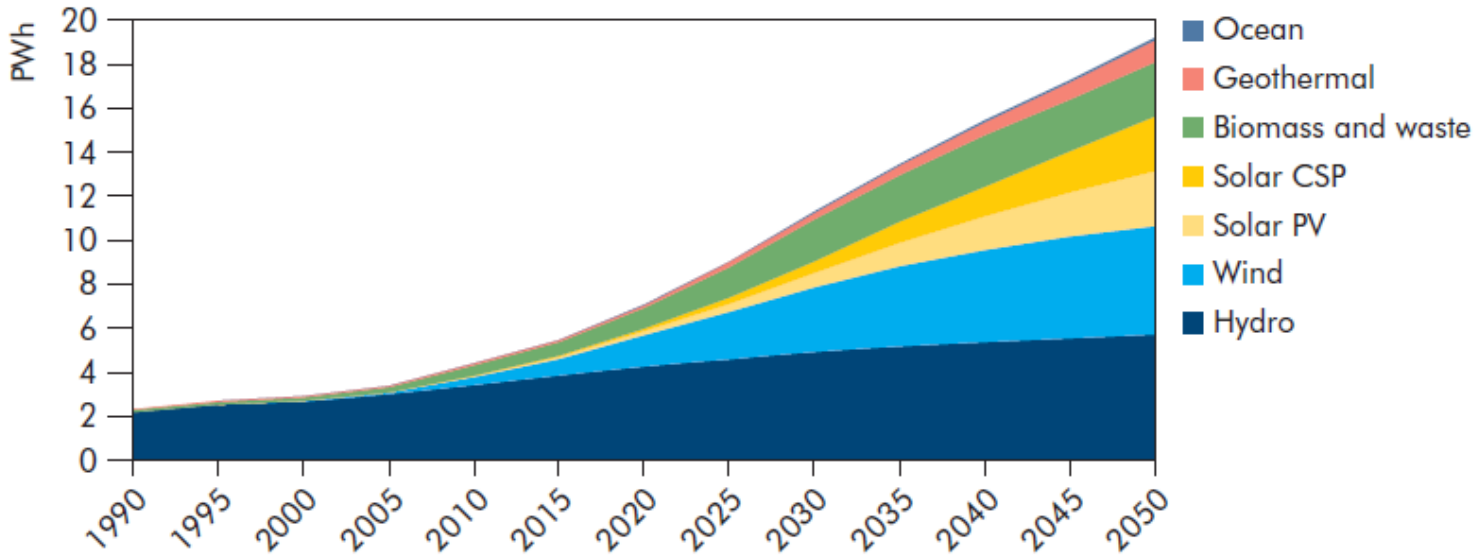
Renewable Share of Primary Energy in 2009



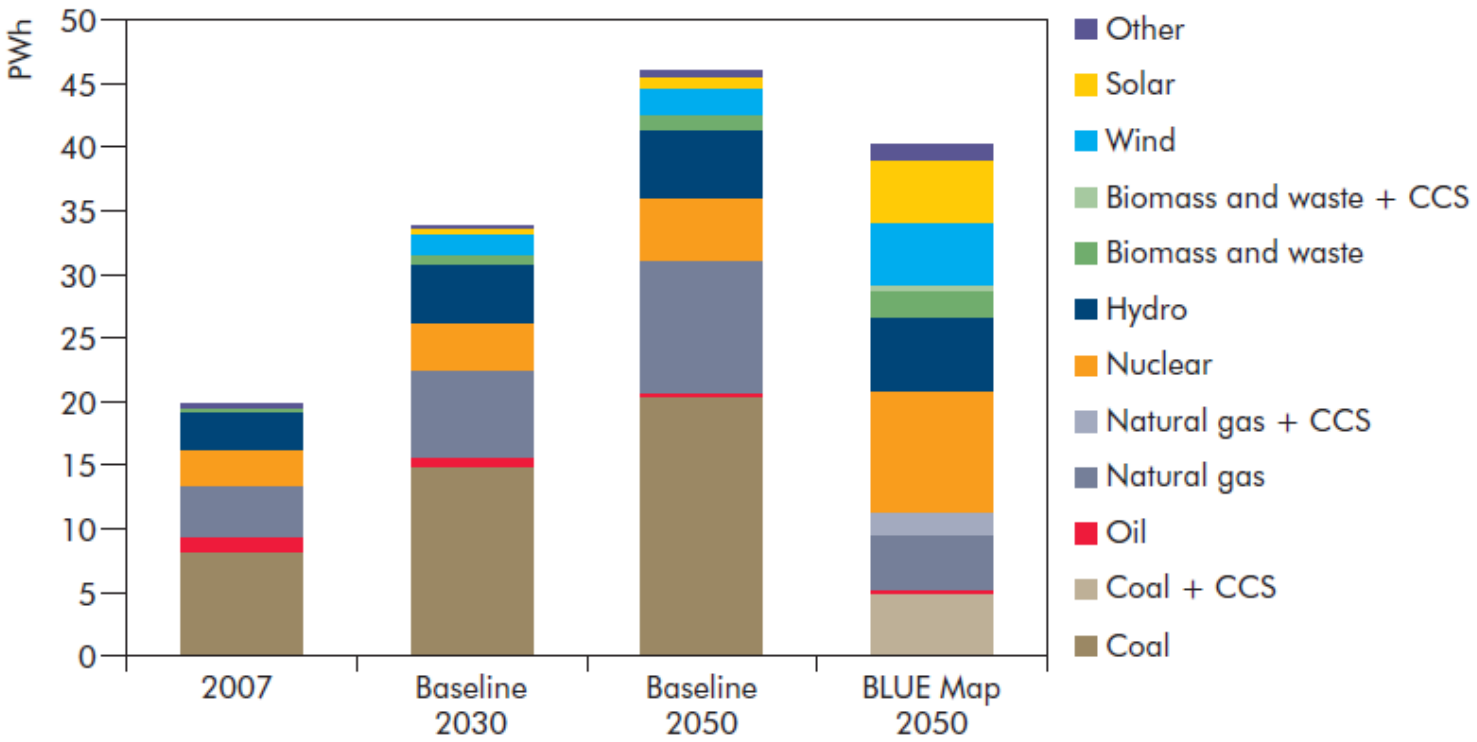
The Solar Resource and its Flows on Earth



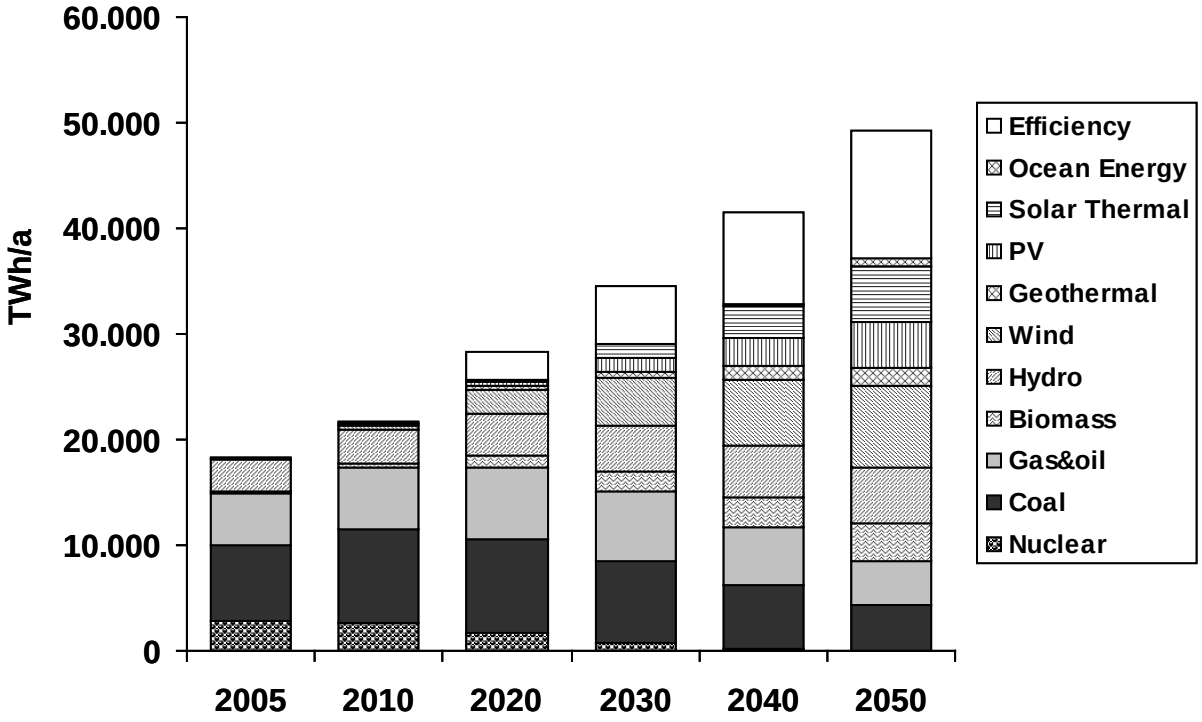
Historical and Projected Contribution to Global Electricity Generation



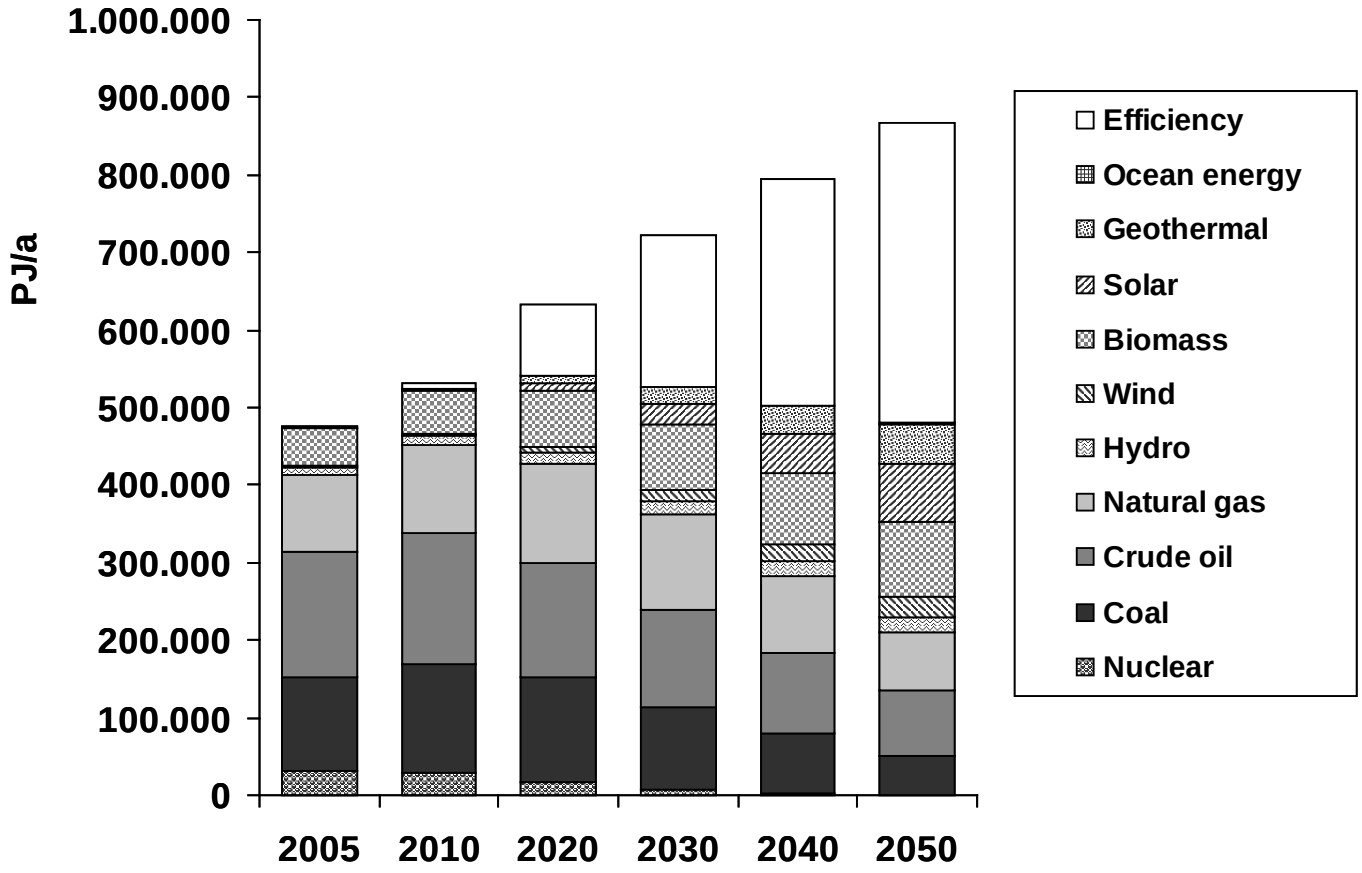
Electricity Generation by Source



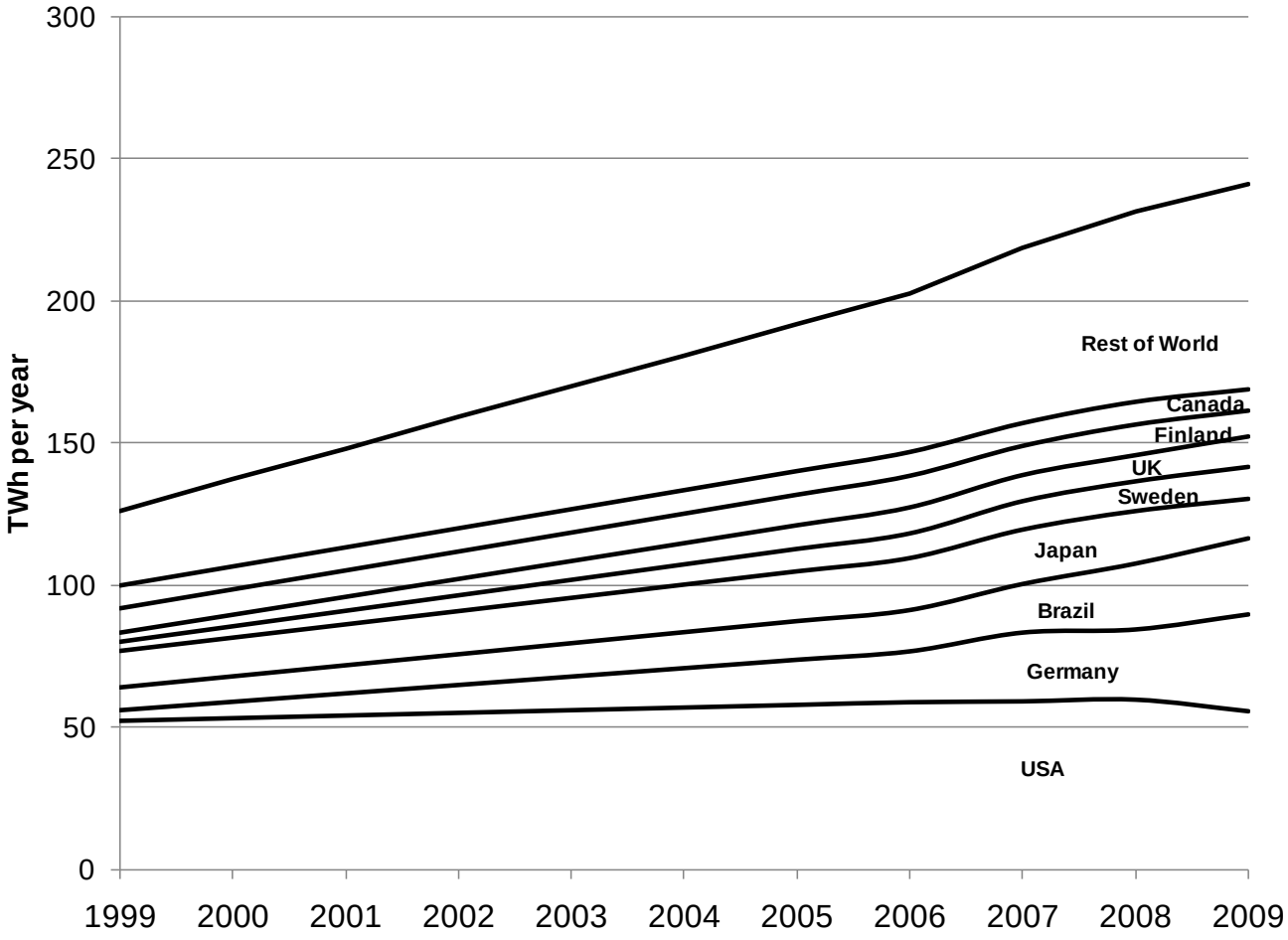
Global Electricity Generation in the Energy [R]evolution Scenario



Primary Energy Use in the Energy [R]evolution Scenario

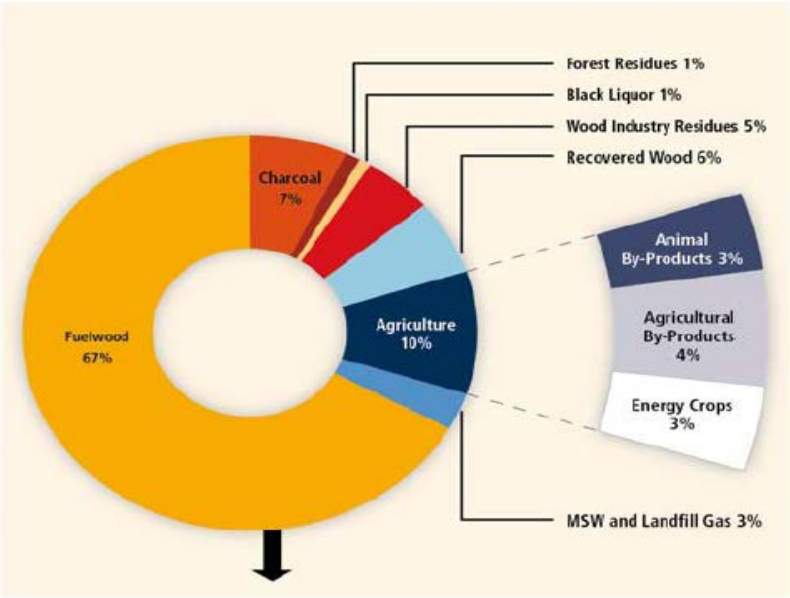


Electricity Generation from Biomass, Select Countries in 2007

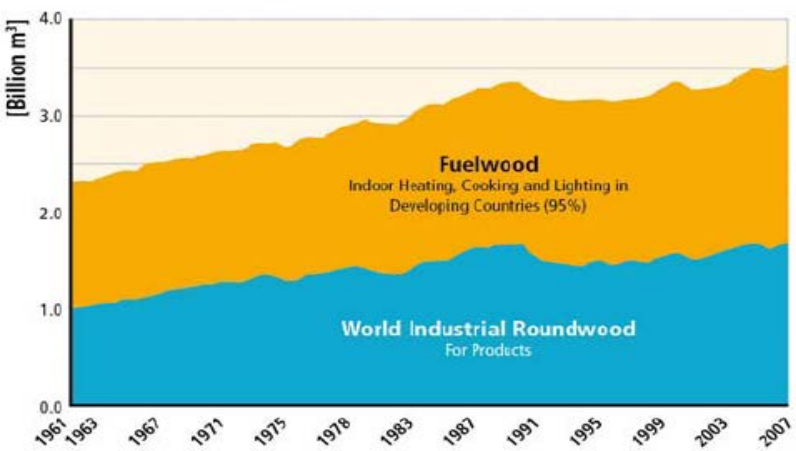


Primary Biomass Sources and Use of Fuelwood and Roundwood

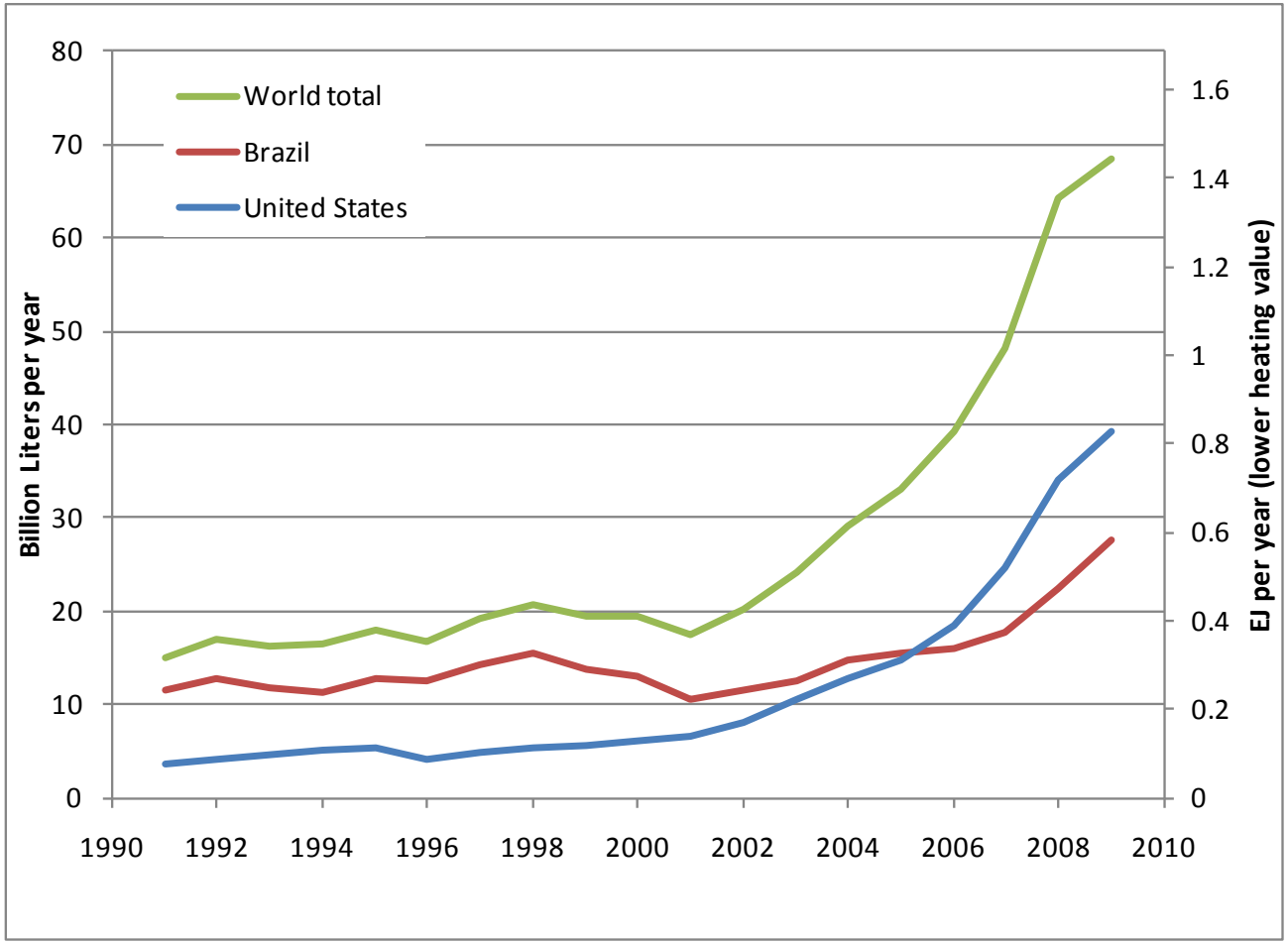
(a)



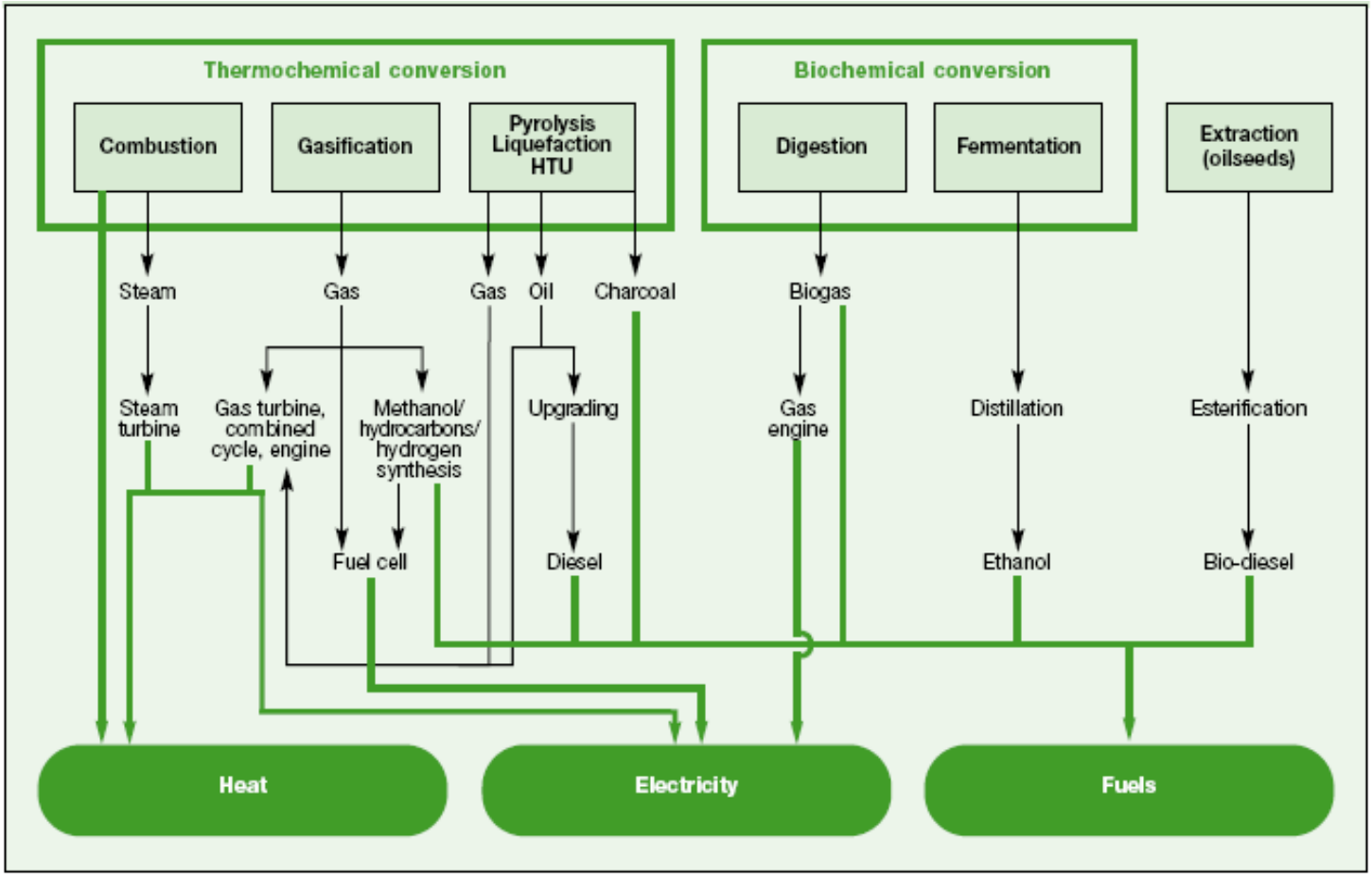
(b)



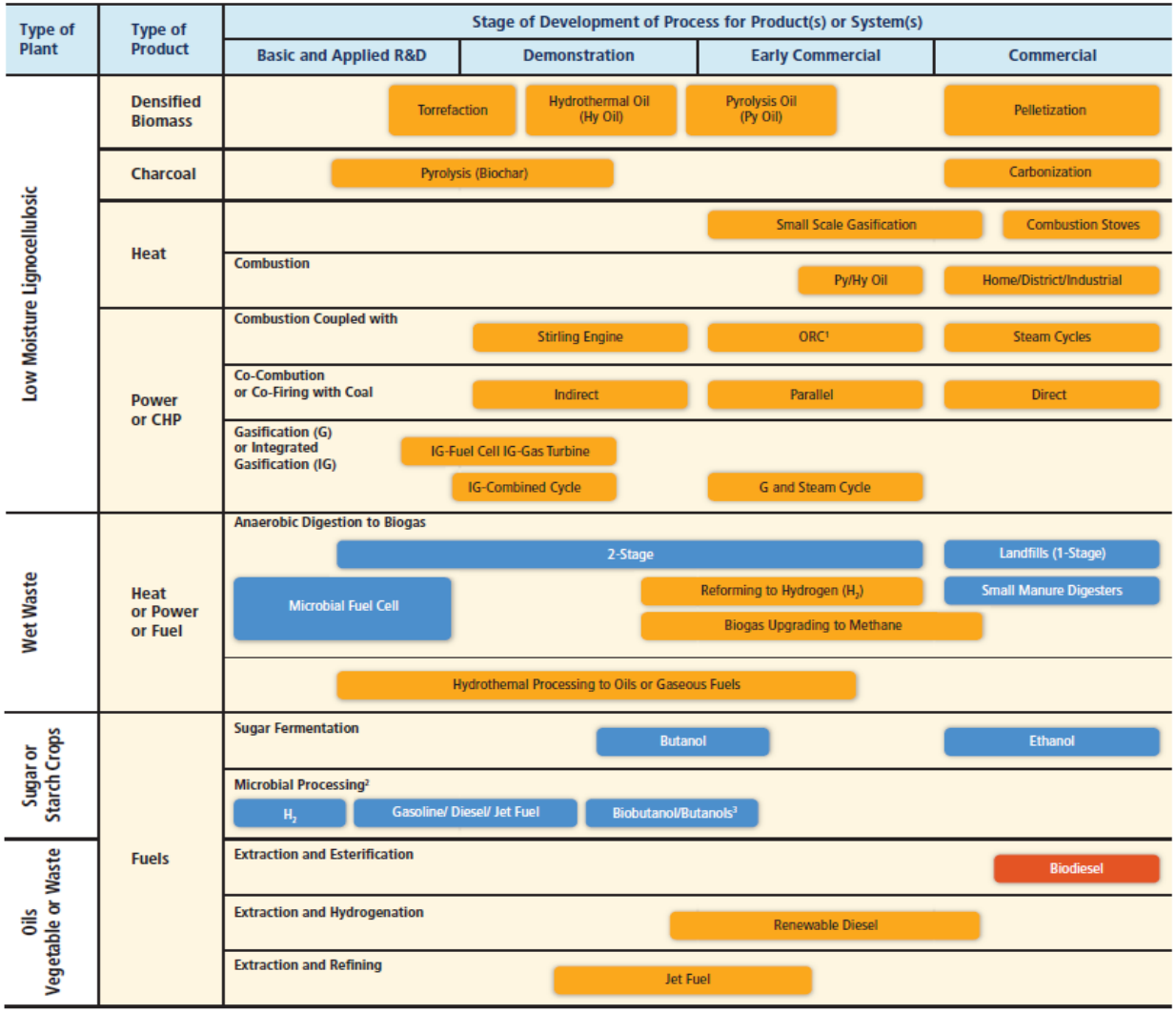
Ethanol Production from Sugar and Starch Crops



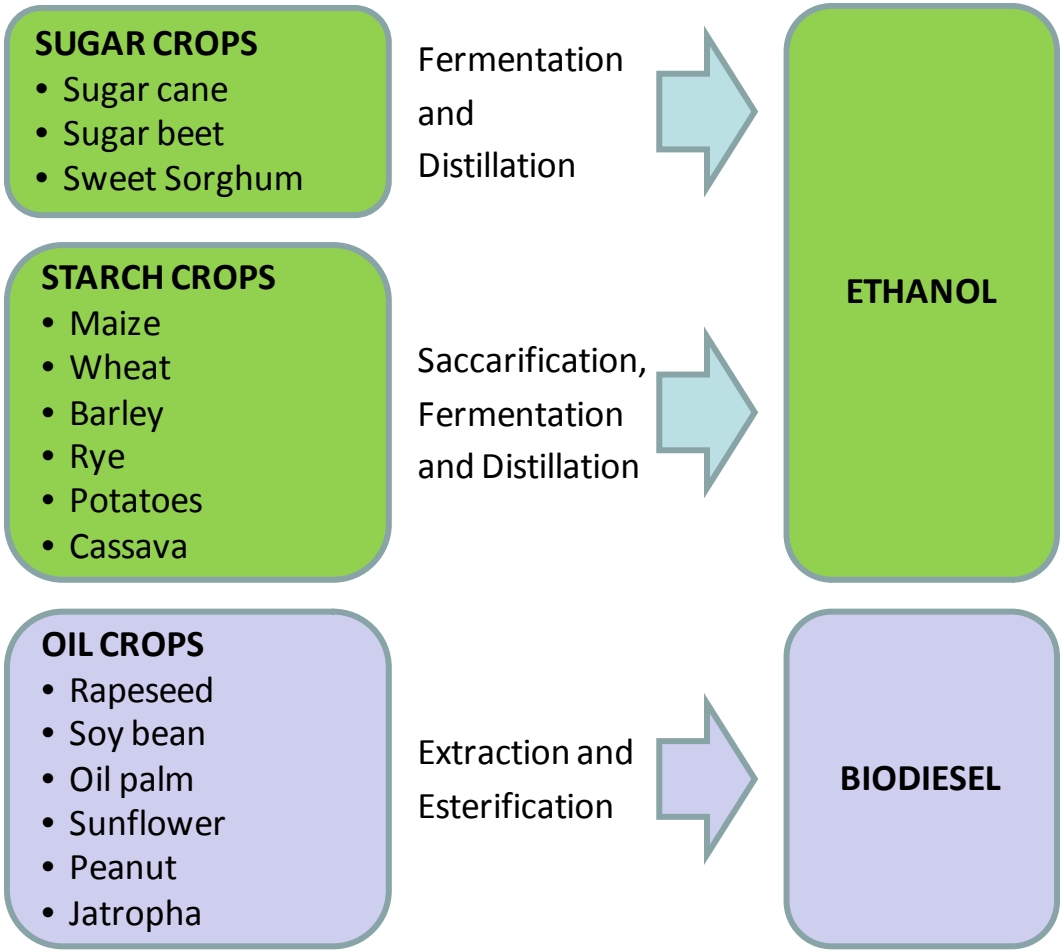
Main Conversions Routes for Biomass to Secondary Energy Carriers



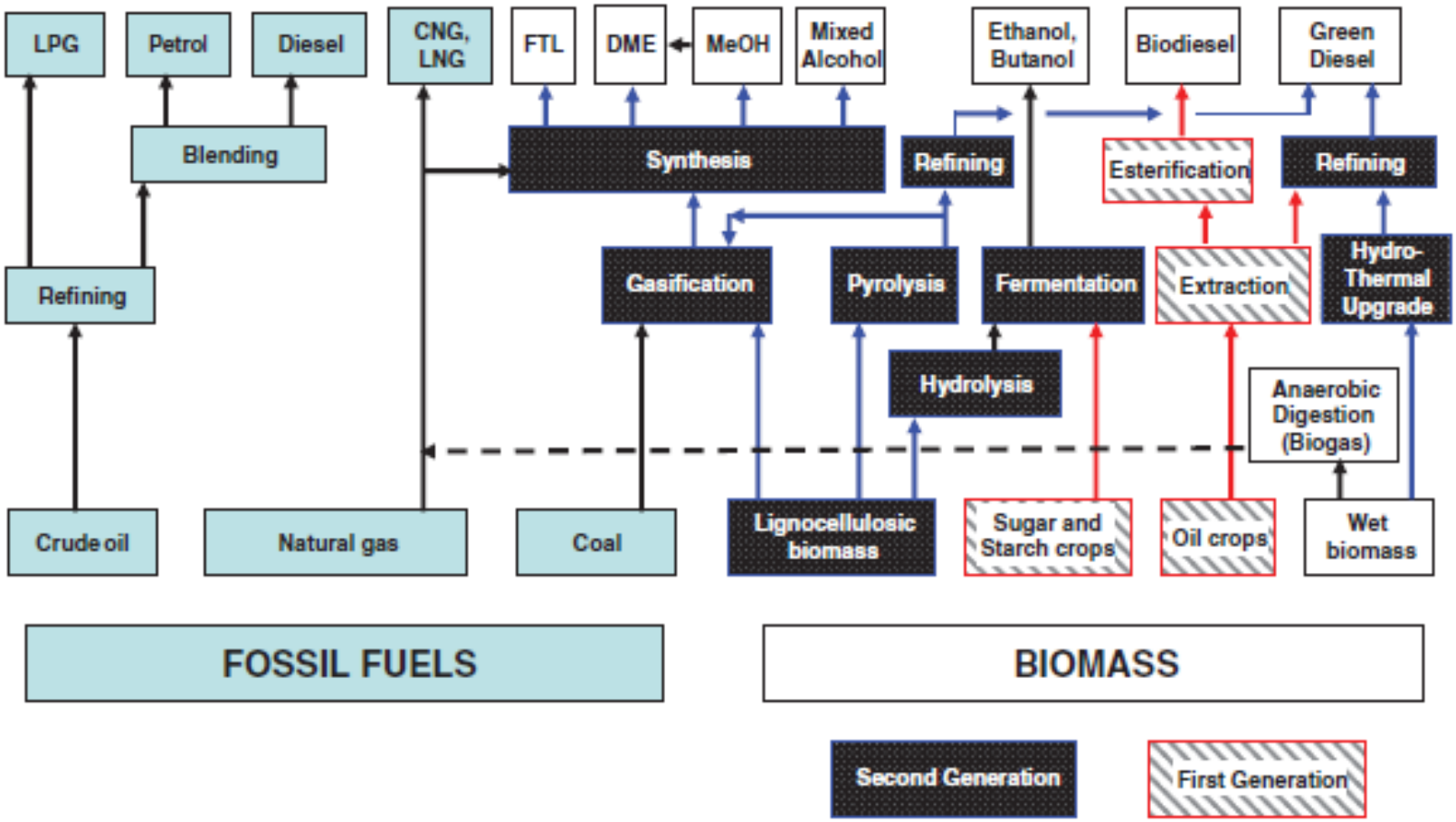
Stages of Development of Bioenergy



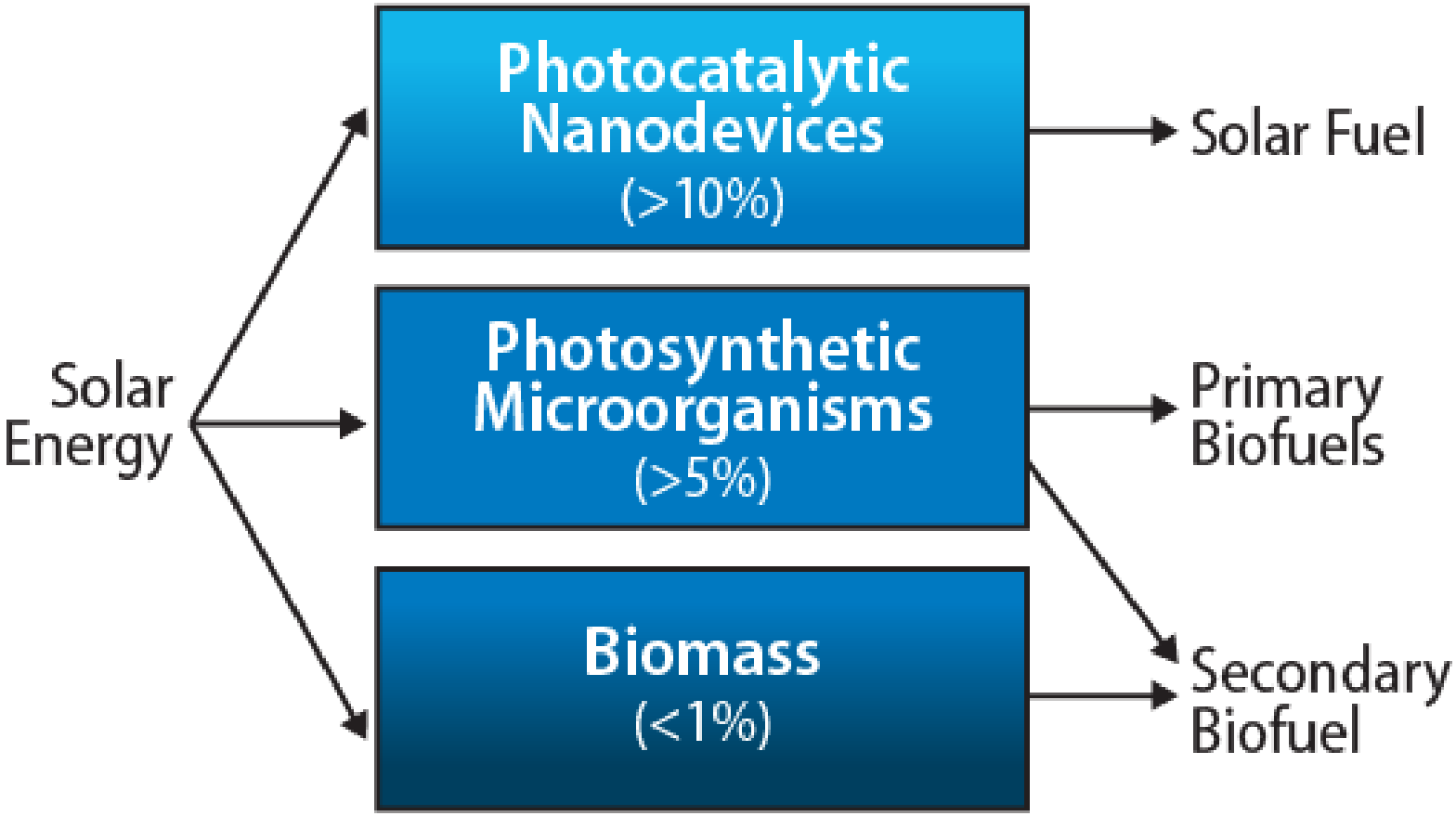
Main Feedstocks and Conversion Steps for First-Generation Biofuels



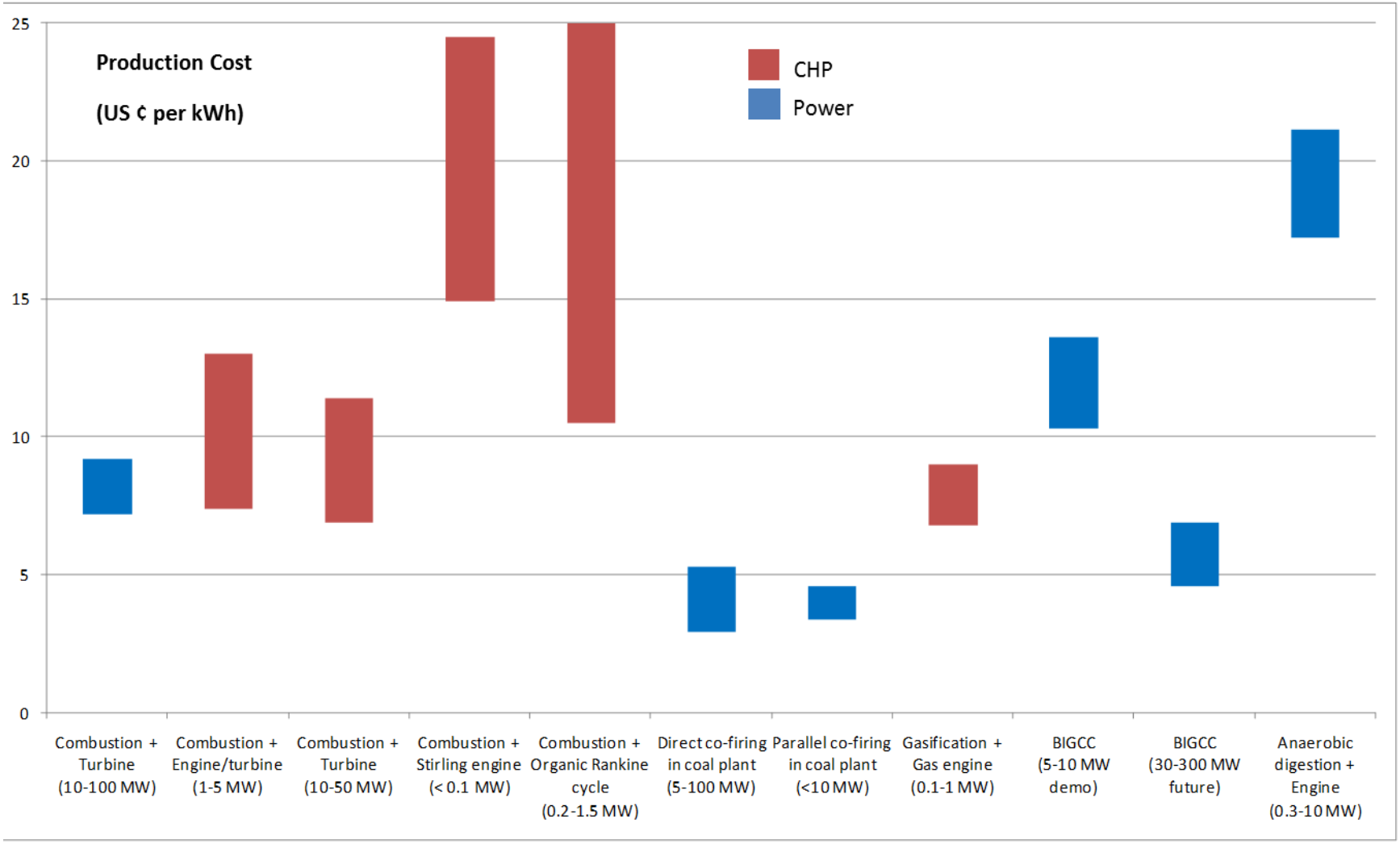
Production Paths to Liquid Fuels from Biomass and Fossil Fuels



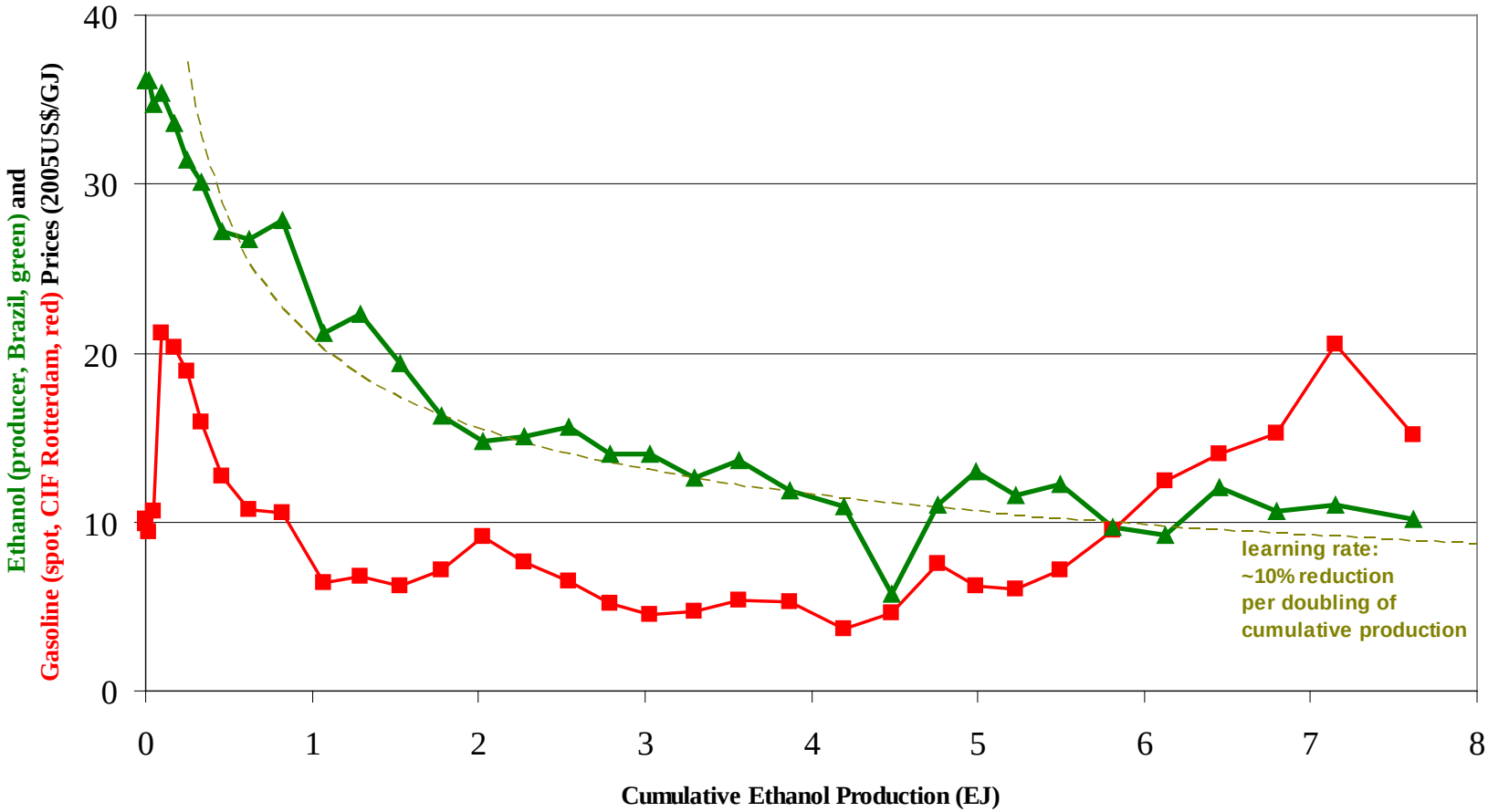
Third-Generation Biofuels



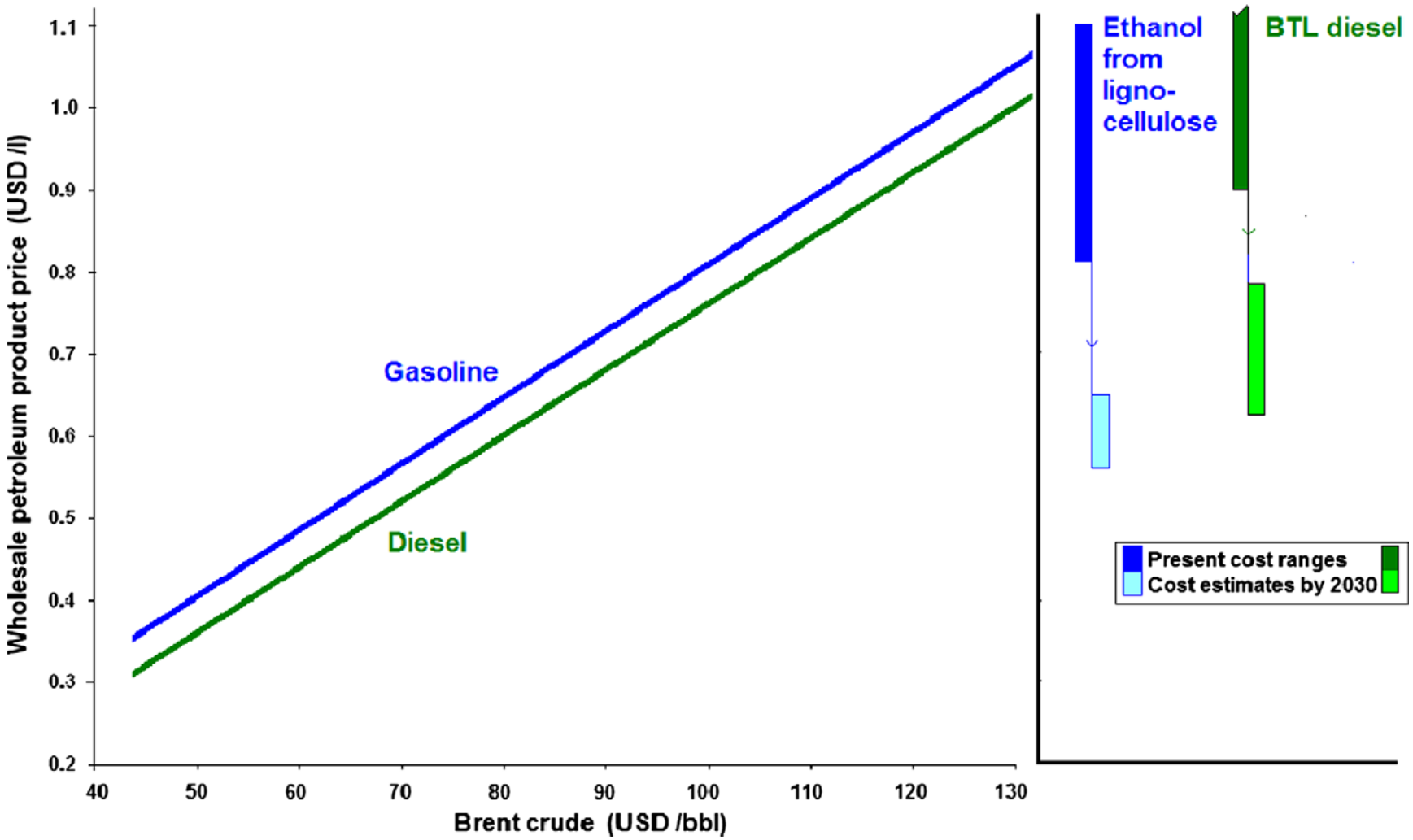
Projected Production Costs for Biomass to Power and CHP



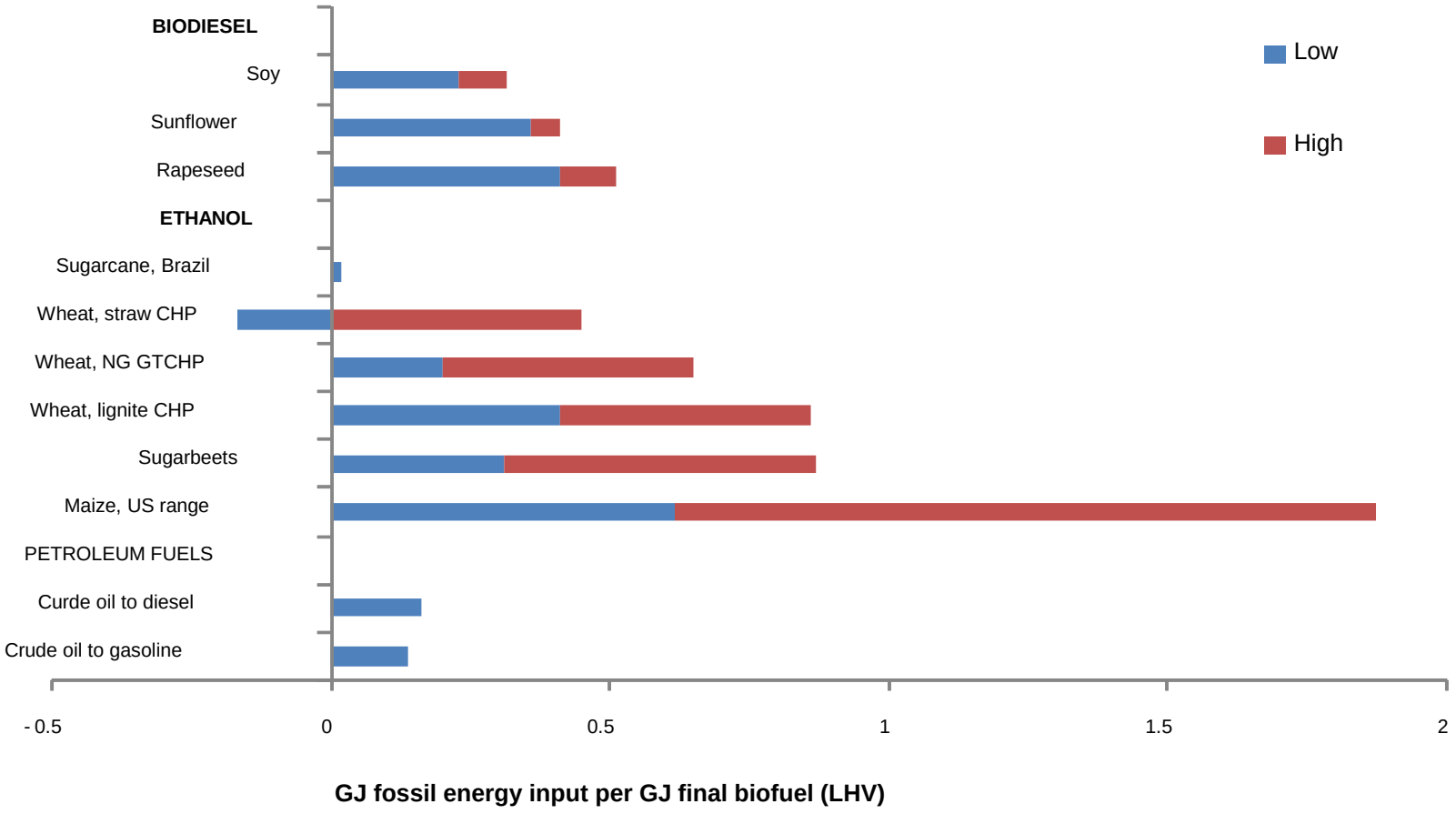
Selling Price for Ethanol in Brazil versus Cumulative Production



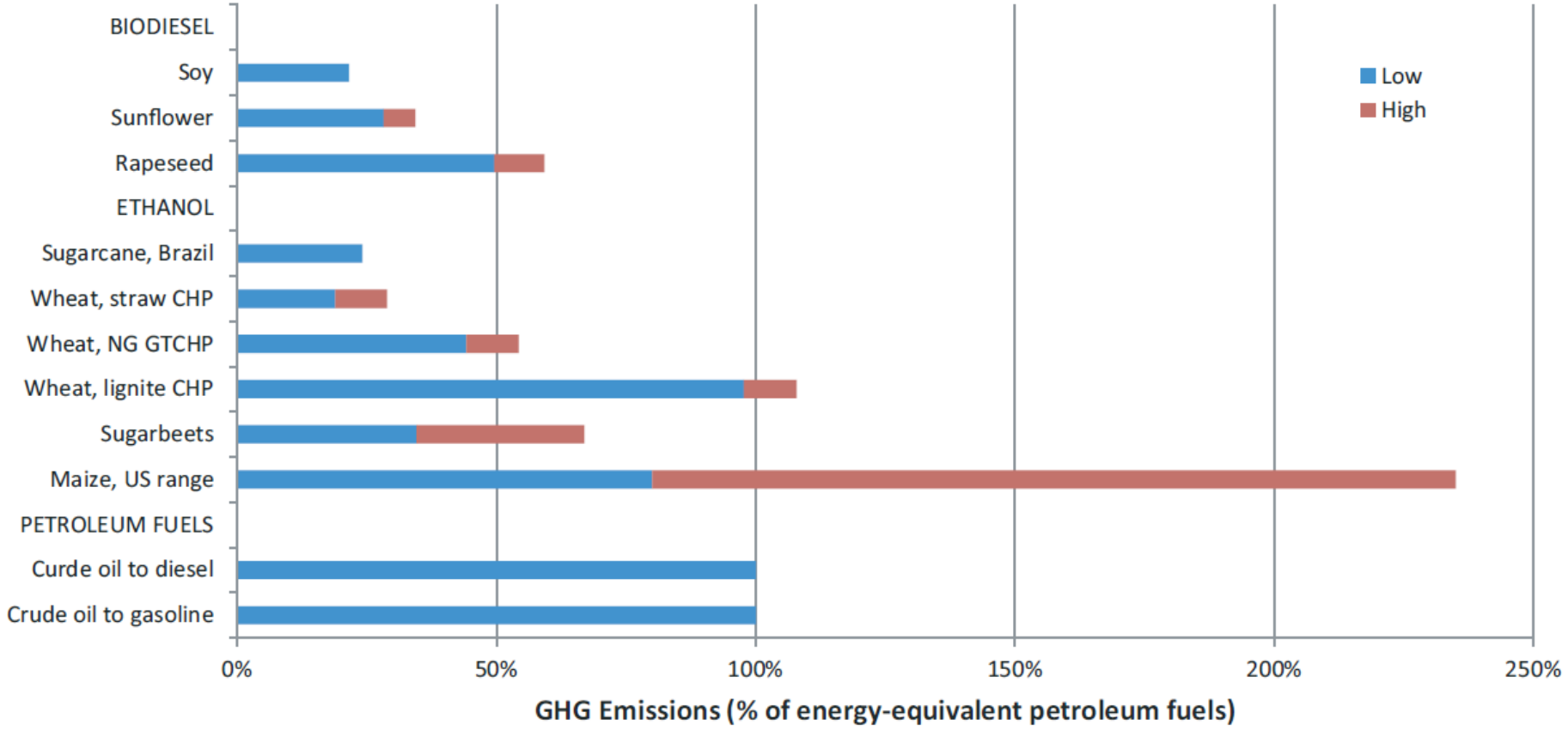
Range of Production Cost Estimates for Second-generation Biofuels



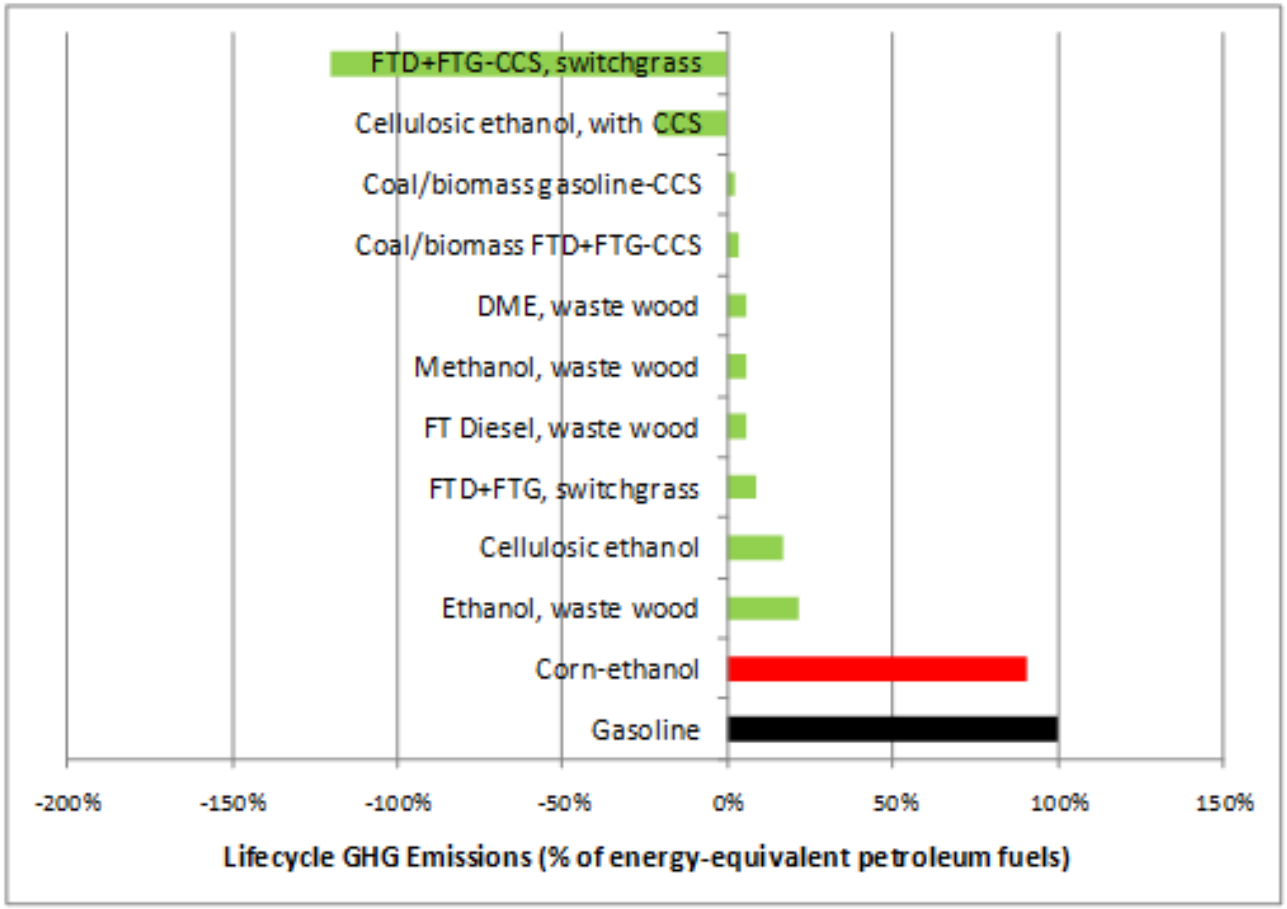
Lifecycle Fossil Energy Use Estimates in Production of Several Biofuels



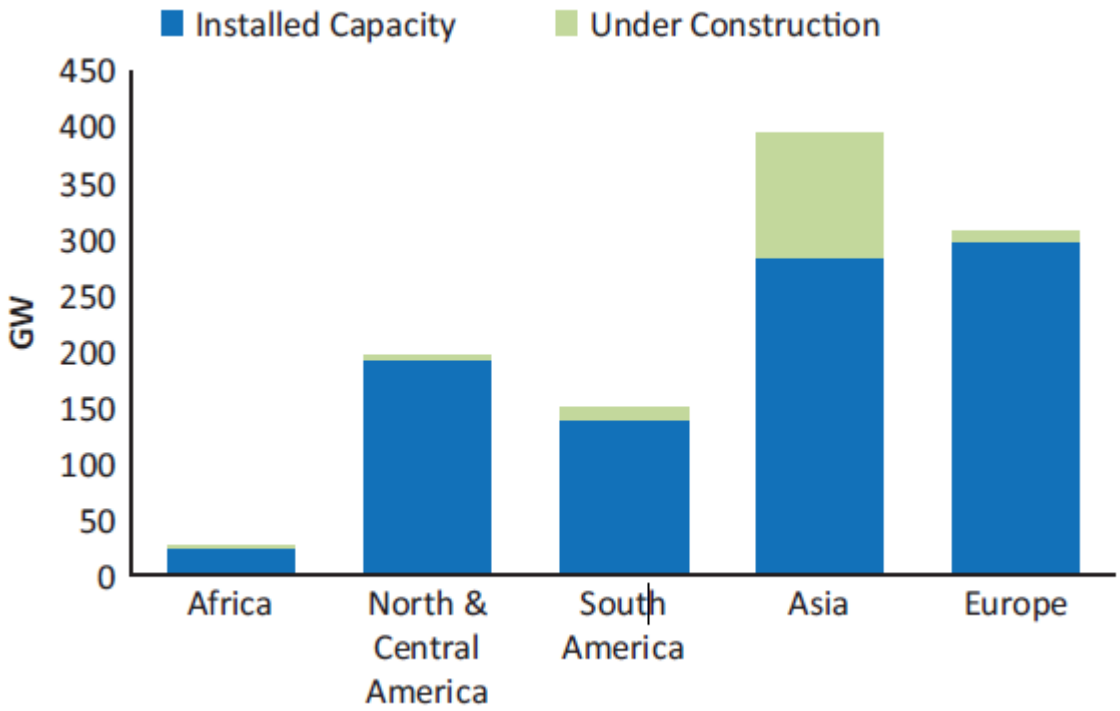
Estimated Life-cycle GHG Emissions for First-generation Biofuels



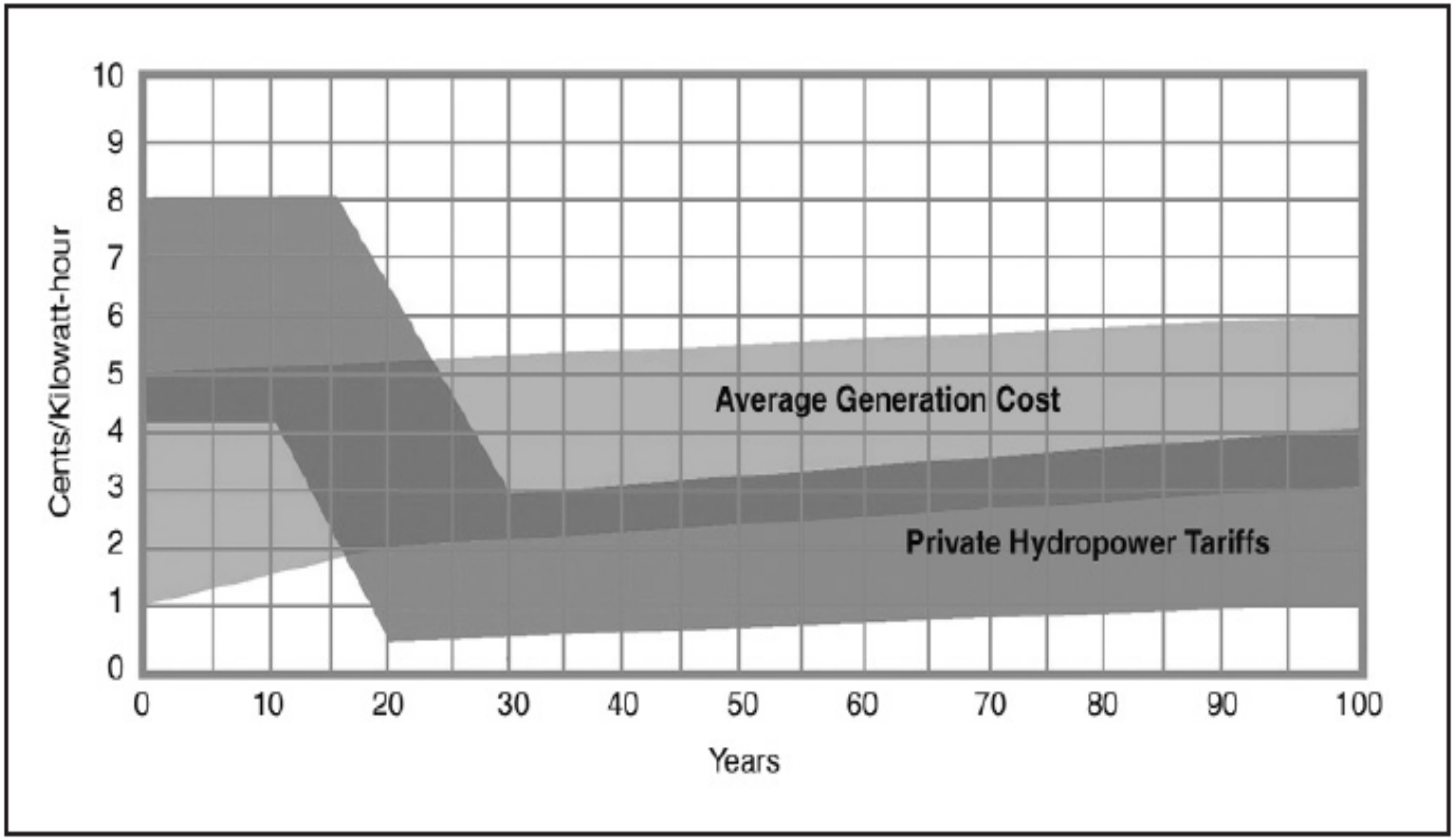
Estimated Life-cycle GHG Emissions for Second-generation Biofuels



Global Installed Hydropower Capacity in 2009



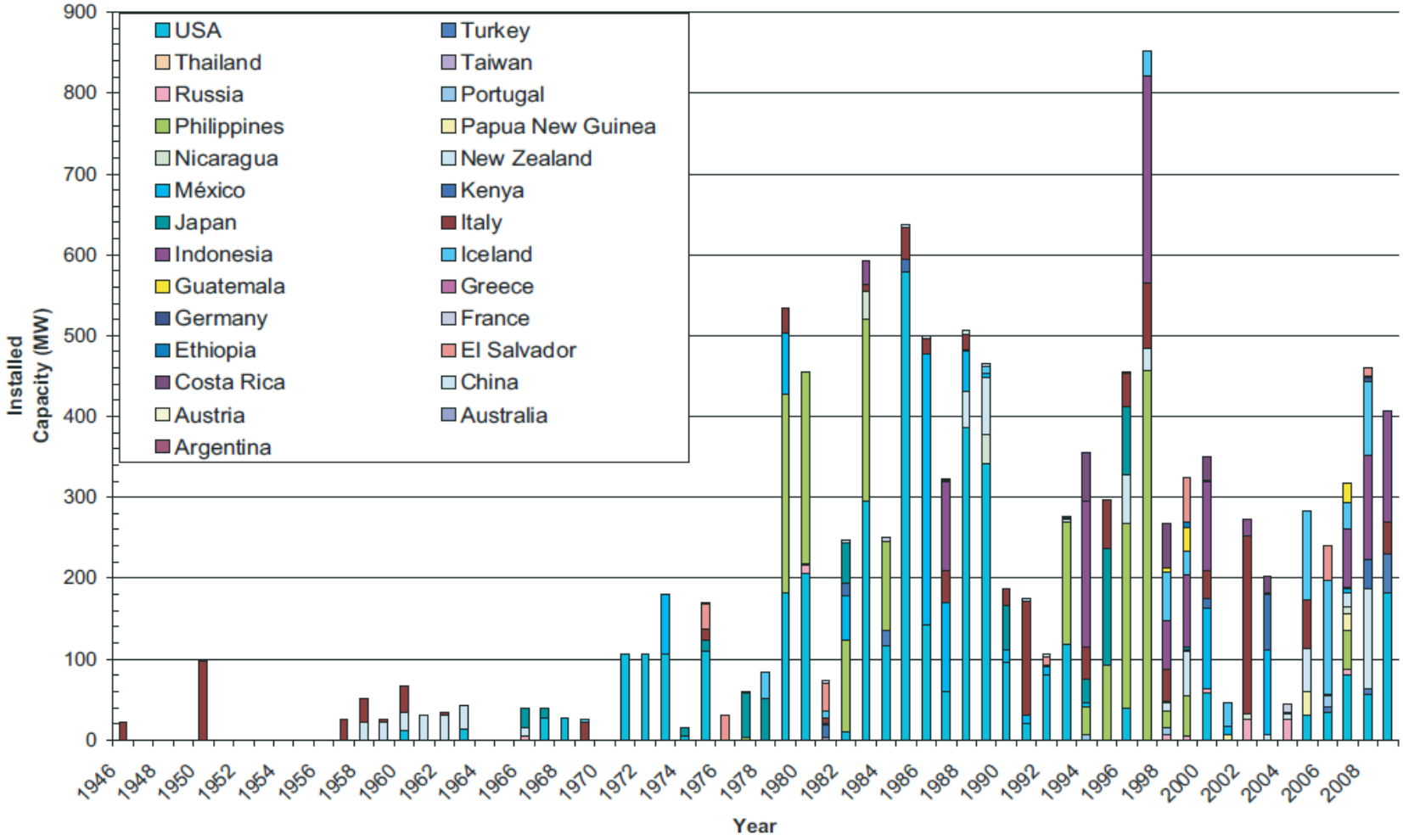
Hydropower Tariff Versus Average Electricity Generation Costs



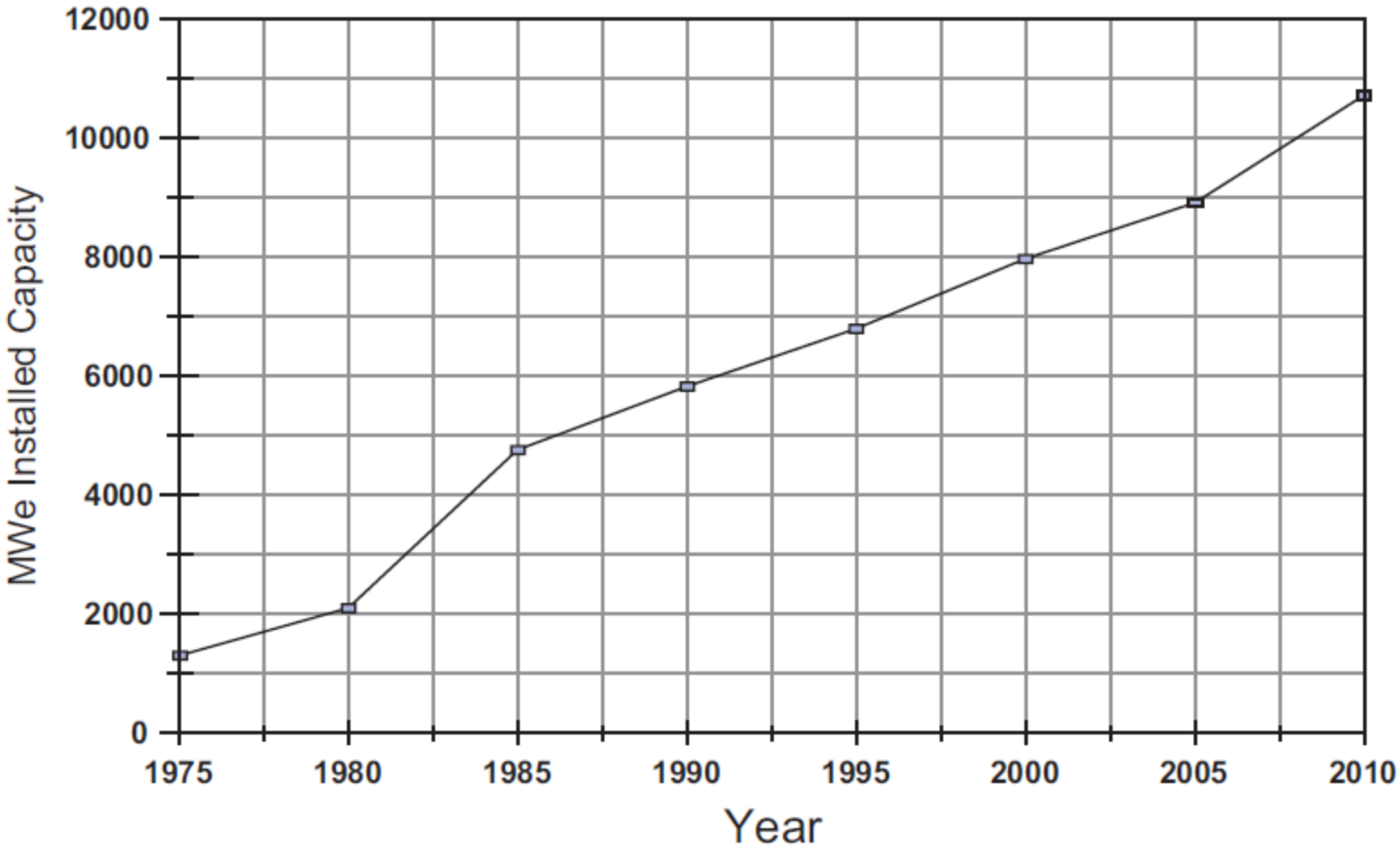
IHA Sustainability Assessment Protocol Assessment Tools

ES - Early Stage	P - Preparation	I - Implementation	O - Operation
ES-1 Demonstrated Need	P-1 Communications & Consultation	I-1 Communications & Consultation	O-1 Communications & Consultation
ES-2 Options Assessment	P-2 Governance	I-2 Governance	O-2 Governance
ES-3 Policies & Plans	P-3 Demonstrated Need & Strategic Fit		
ES-4 Political Risks	P-4 Siting & Design		
ES-5 Institutional Capacity	P-5 Environmental & Social Impact Assessment & Mgmt	I-3 Environmental & Social Issues Mgmt	O-3 Environmental & Social Issues Mgmt
ES-6 Technical Issues & Risks	P-6 Integrated Project Management	I-4 Integrated Project Management	
ES-7 Social Issues & Risks	P-7 Hydrological Resource		O-4 Hydrological Resource
ES-8 Environmental Issues & Risks			O-5 Asset Reliability & Efficiency
ES-9 Economic & Financial Issues & Risks	P-8 Infrastructure Safety	I-5 Infrastructure Safety	O-6 Infrastructure Safety
	P-9 Financial Viability	I-6 Financial Viability	O-7 Financial Viability
	P-10 Project Benefits	I-7 Project Benefits	O-8 Project Benefits
	P-11 Economic Viability		
	P-12 Procurement	I-8 Procurement	
	P-13 Project Affected Communities & Livelihoods	I-9 Project Affected Communities & Livelihoods	O-9 Project Affected Communities & Livelihoods
	P-14 Resettlement	I-10 Resettlement	O-10 Resettlement
	P-15 Indigenous Peoples	I-11 Indigenous Peoples	O-11 Indigenous Peoples
	P-16 Labour & Working Conditions	I-12 Labour & Working Conditions	O-12 Labour & Working Conditions
	P-17 Cultural Heritage	I-13 Cultural Heritage	O-13 Cultural Heritage
	P-18 Public Health	I-14 Public Health	O-14 Public Health
	P-19 Biodiversity & Invasive Species	I-15 Biodiversity & Invasive Species	O-15 Biodiversity & Invasive Species
	P-20 Erosion & Sedimentation	I-16 Erosion & Sedimentation	O-16 Erosion & Sedimentation
	P-21 Water Quality	I-17 Water Quality	O-17 Water Quality
		I-18 Waste, Noise & Air Quality	
	P-22 Reservoir Planning	I-19 Reservoir Preparation & Filling	O-18 Reservoir Management
	P-23 Downstream Flow Regimes	I-20 Downstream Flow Regimes	O-19 Downstream Flow Regime

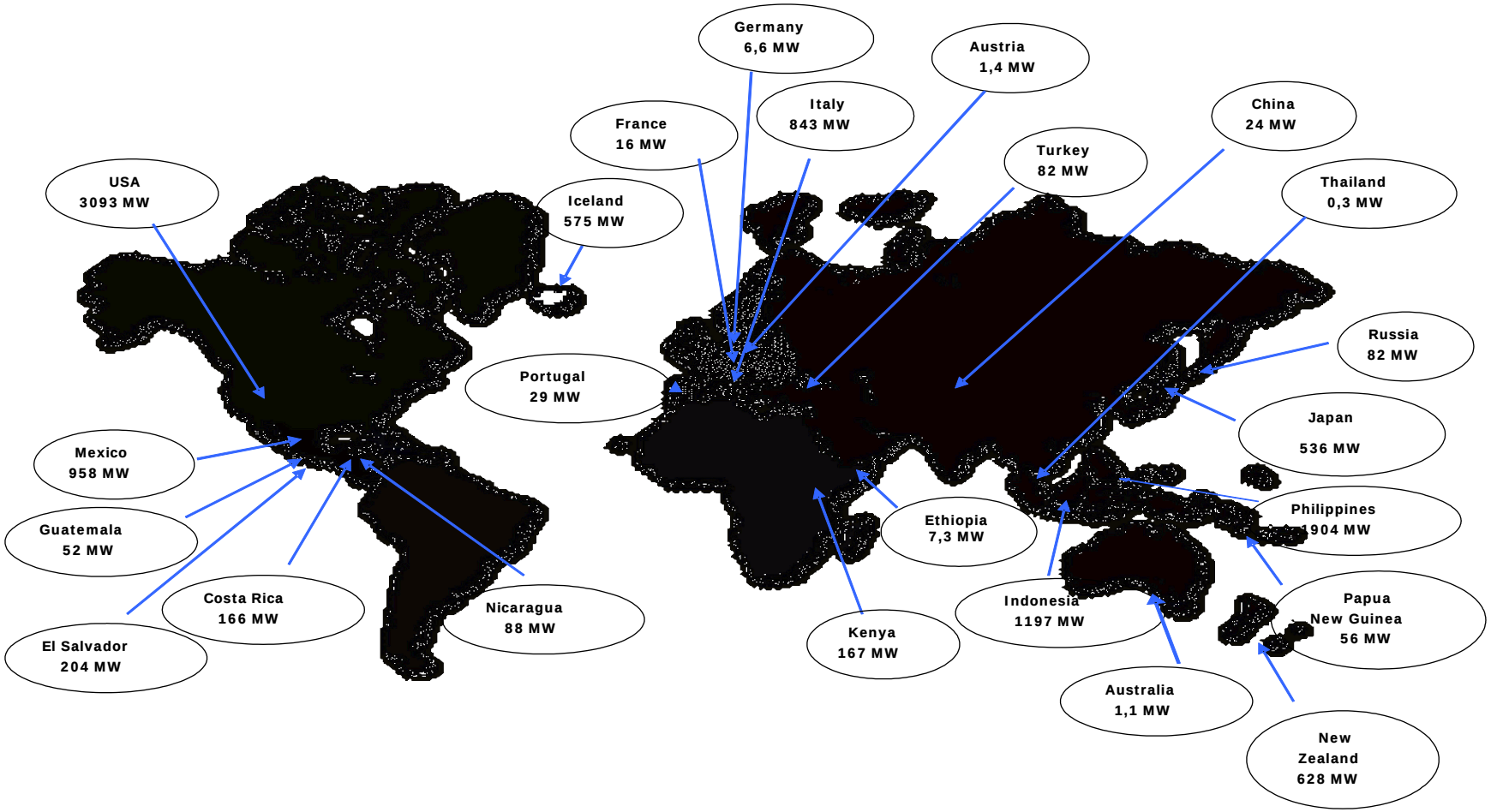
Installed Geothermal Electricity Capacity



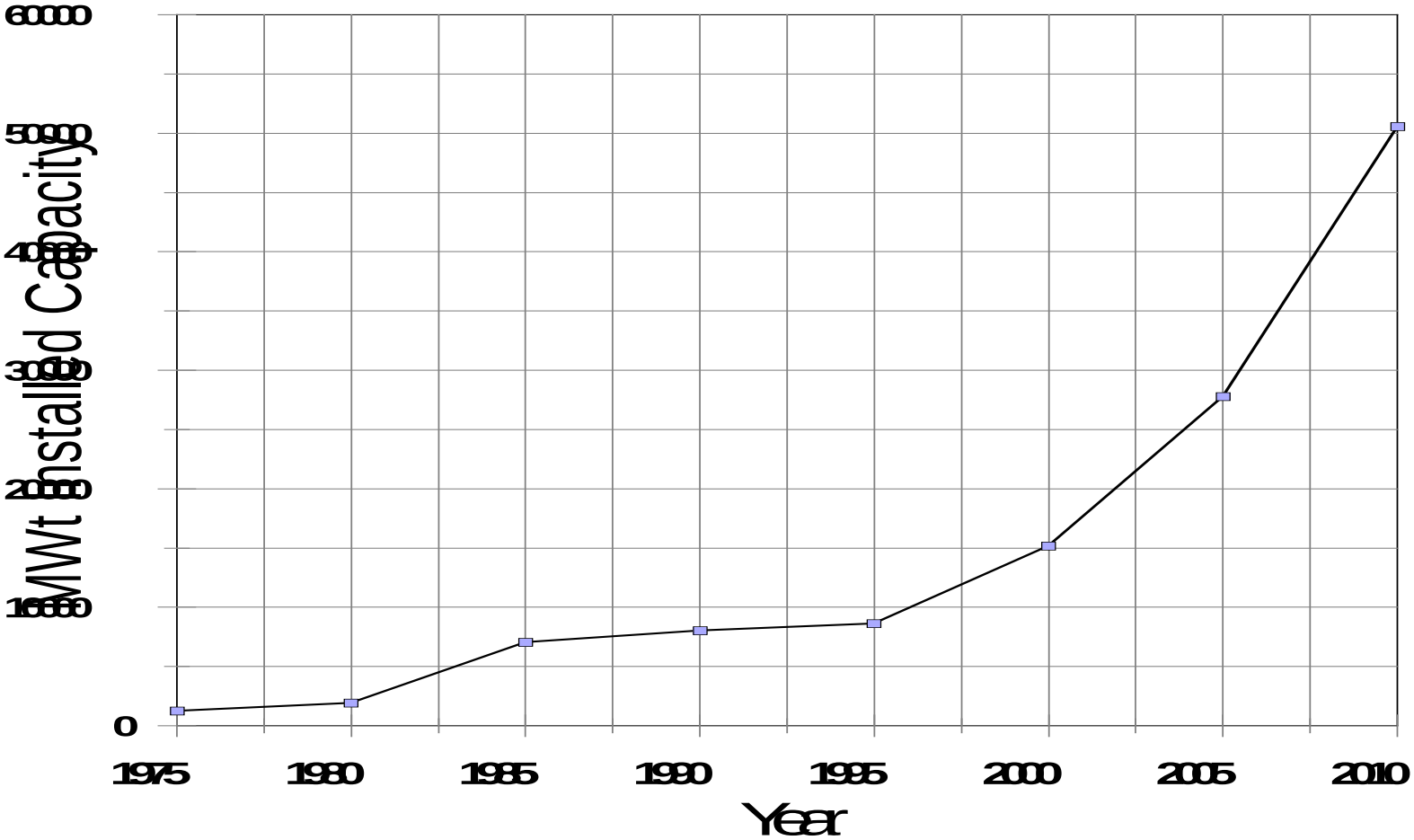
Growth of the Globally Installed Capacity of Geothermal Power Production



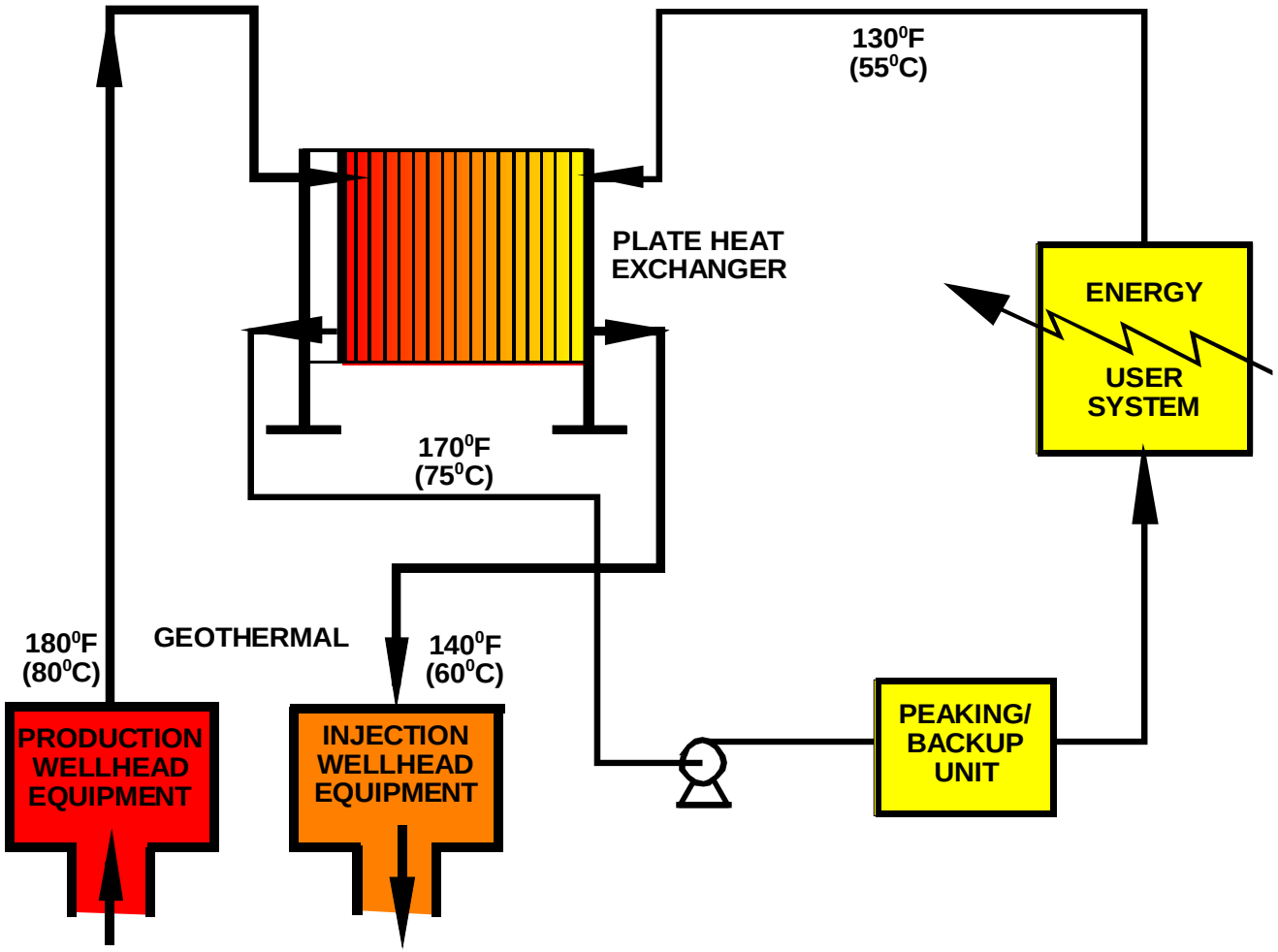
Installed Geothermal Electric Capacity in 2009



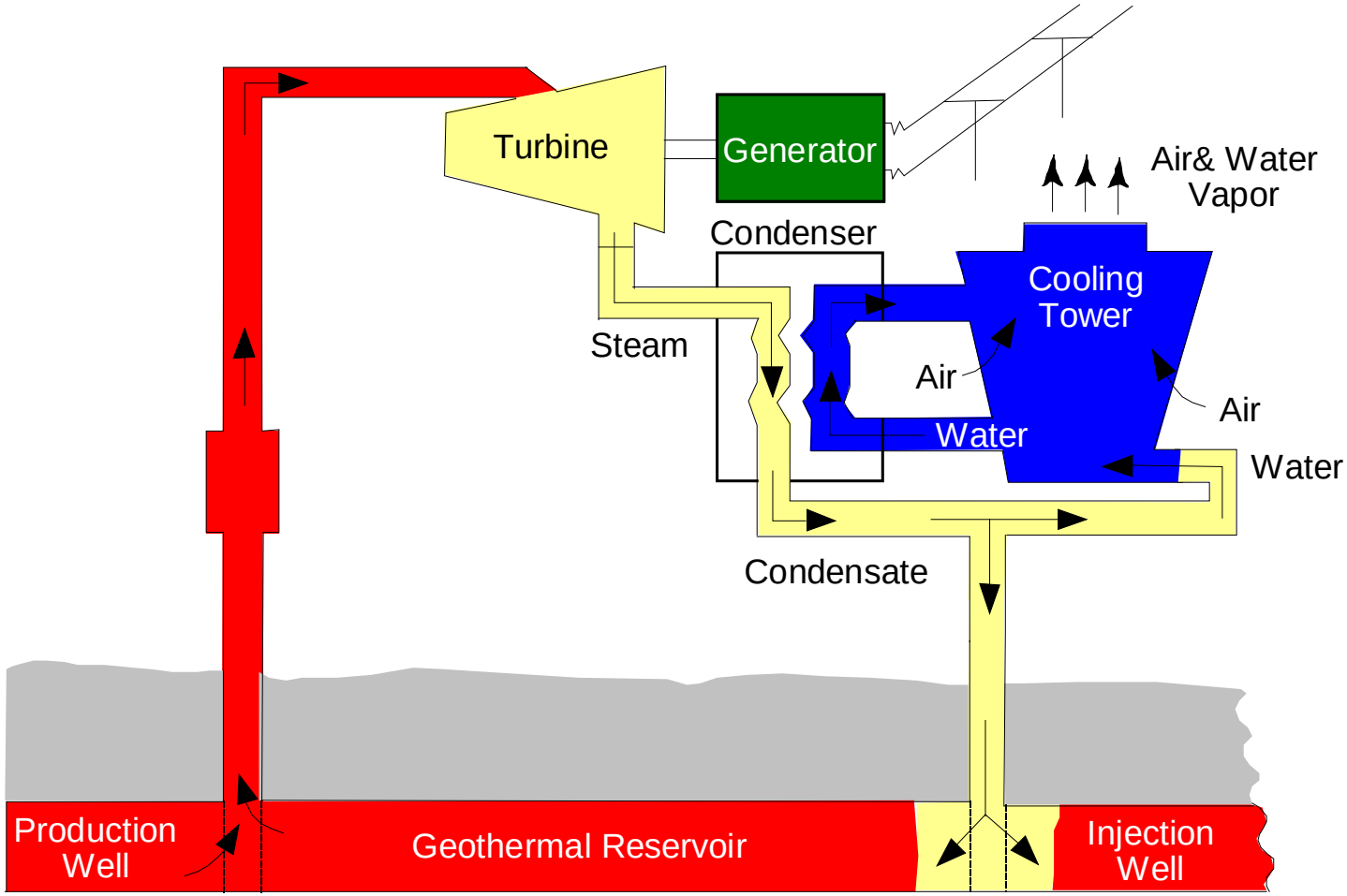
Worldwide Growth of Installed Capacity of Geothermal Direct Use



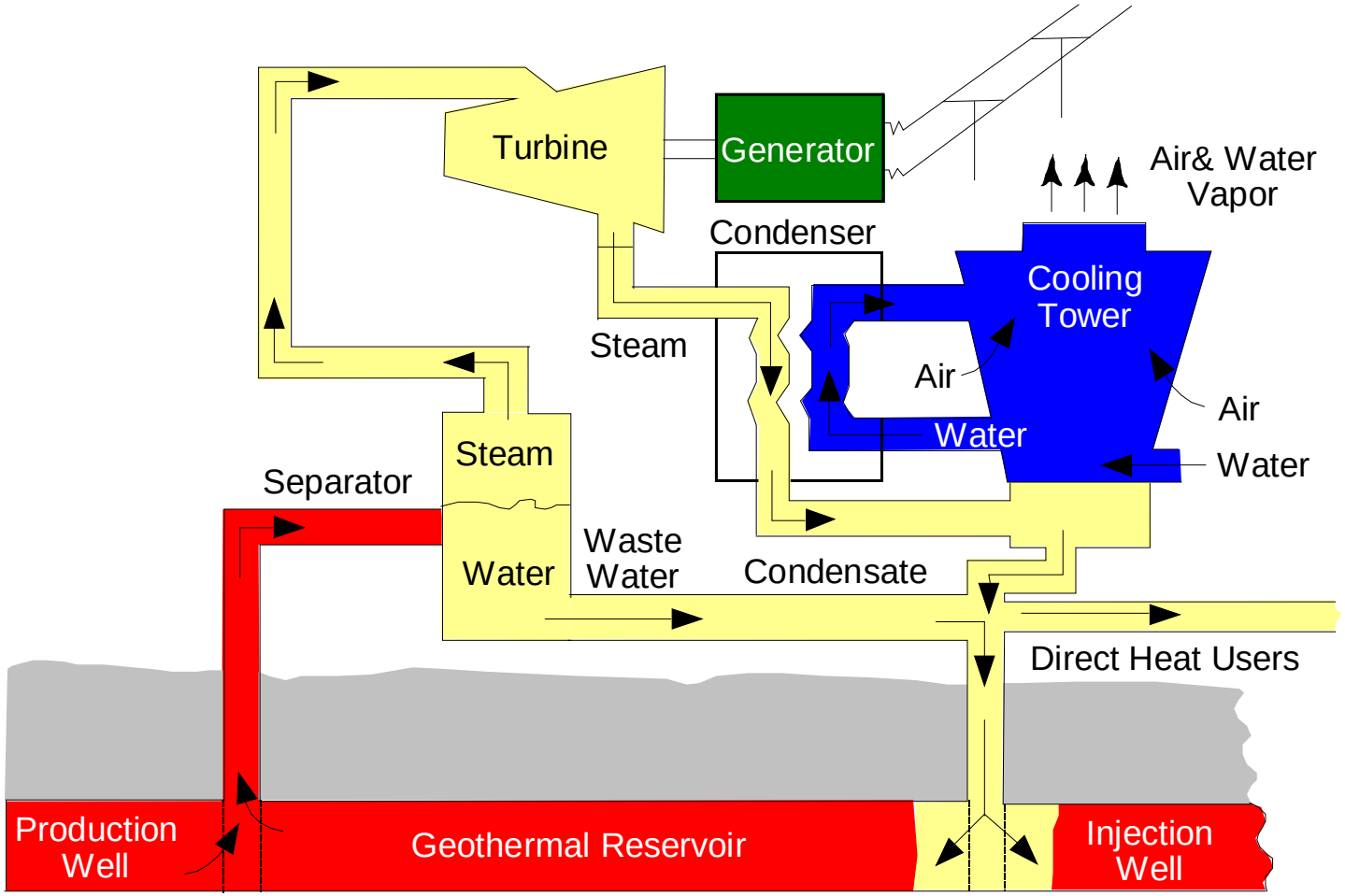
Typical Direct Use Geothermal Heating System Configuration



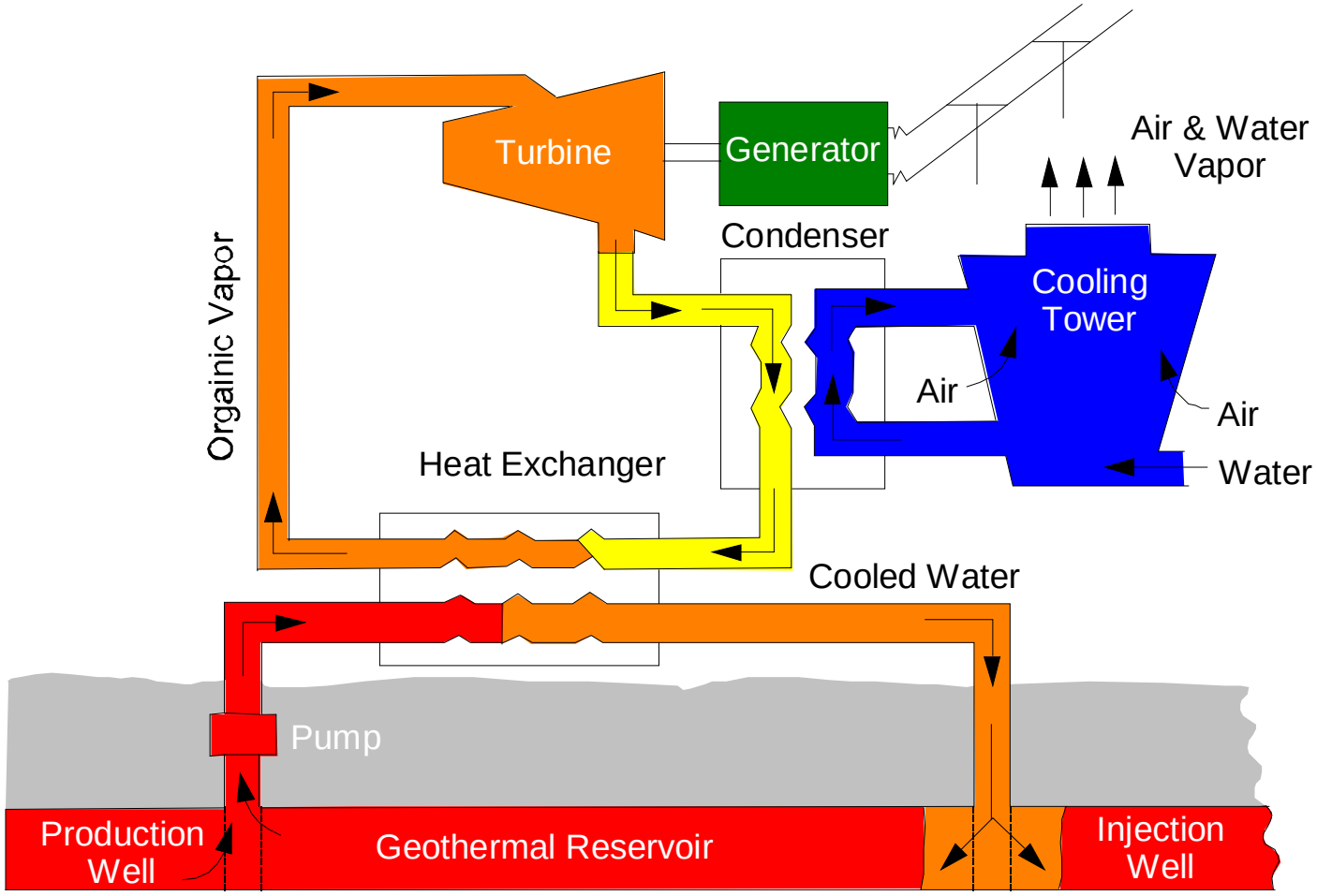
Steam Plant Using a Vapor or Dry Steam Dominated Geothermal Resource



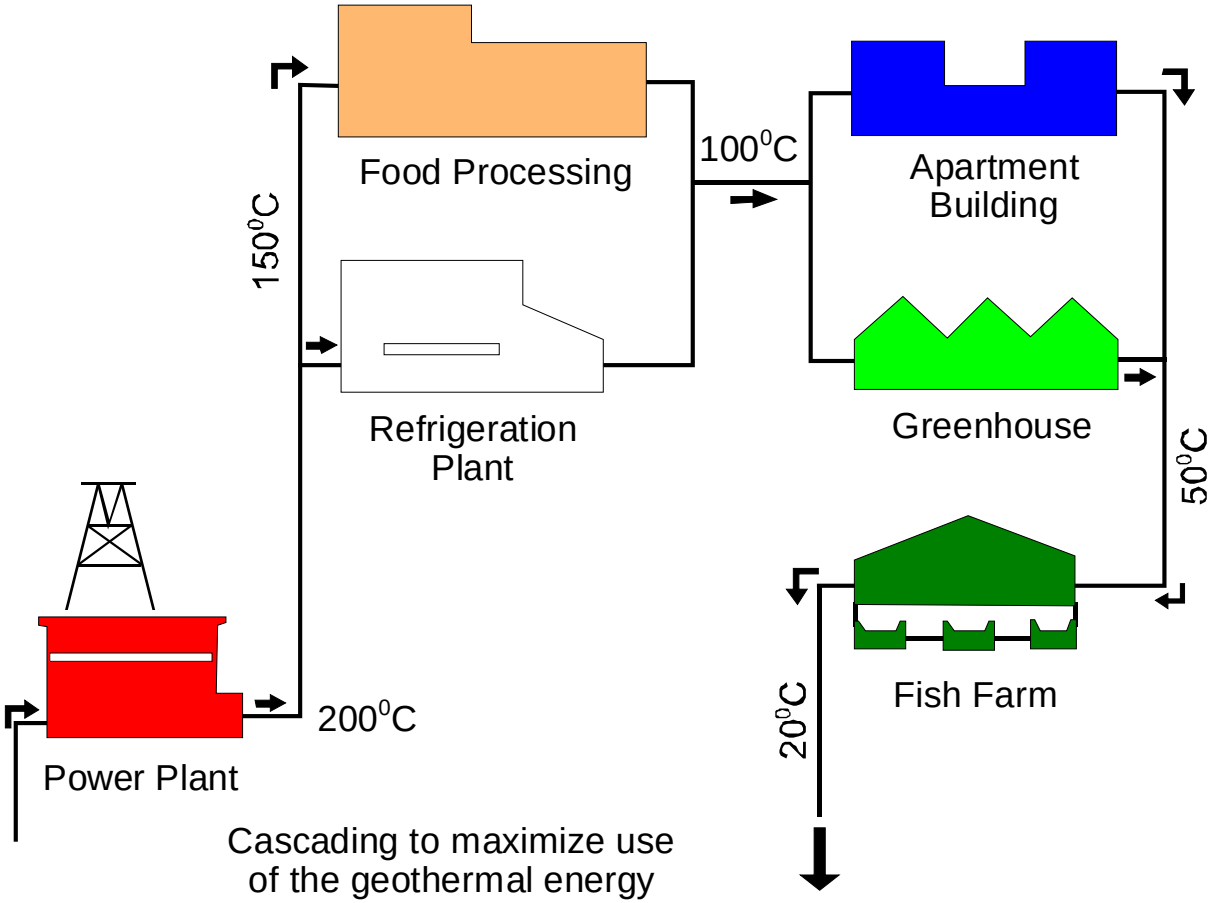
Single-stage Flash Steam Plant Using a Water-dominated Geothermal Resource with a Separator to Produce Steam



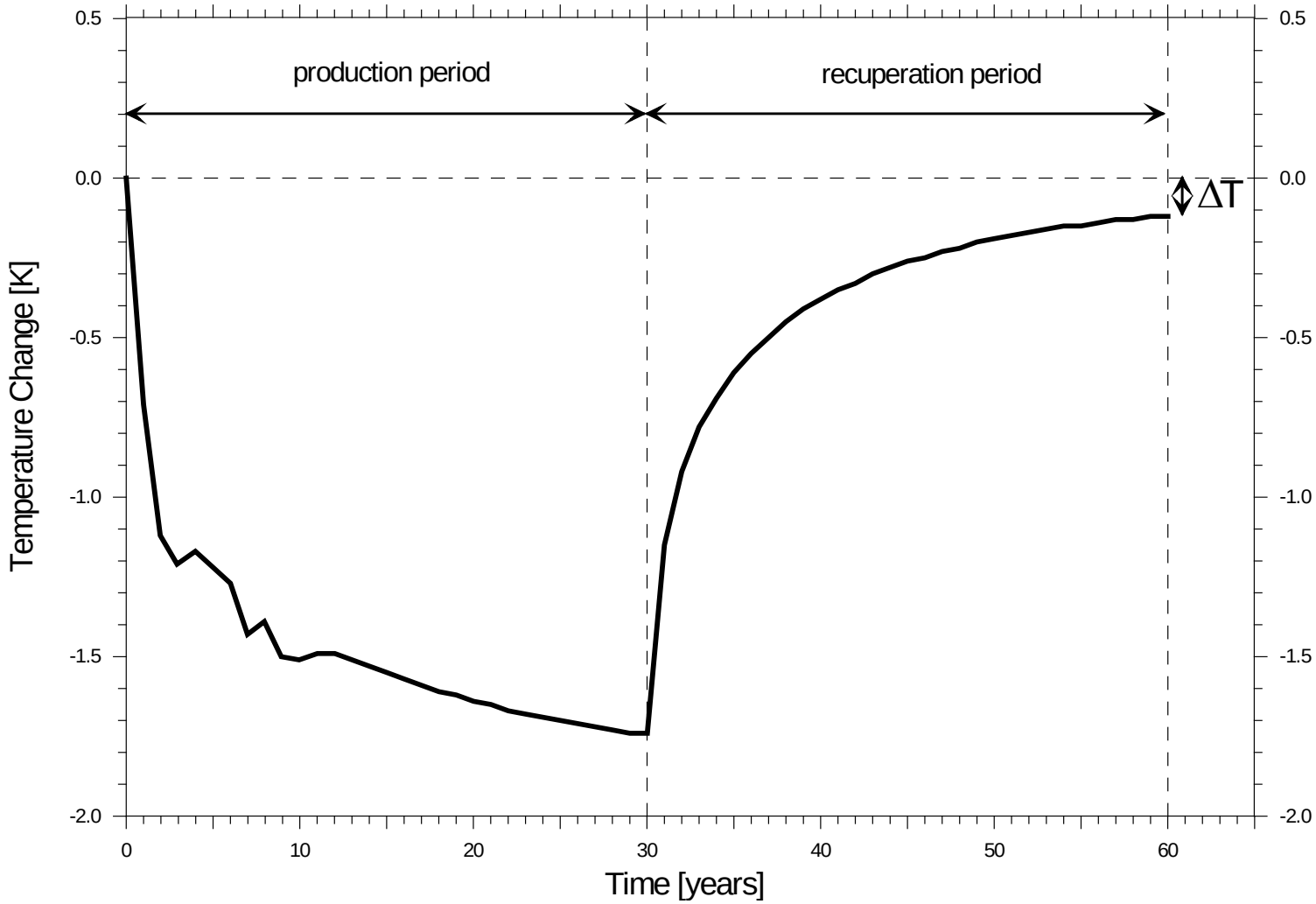
Organic Rankine Cycle Plant using a Low Temperature Geothermal Resource



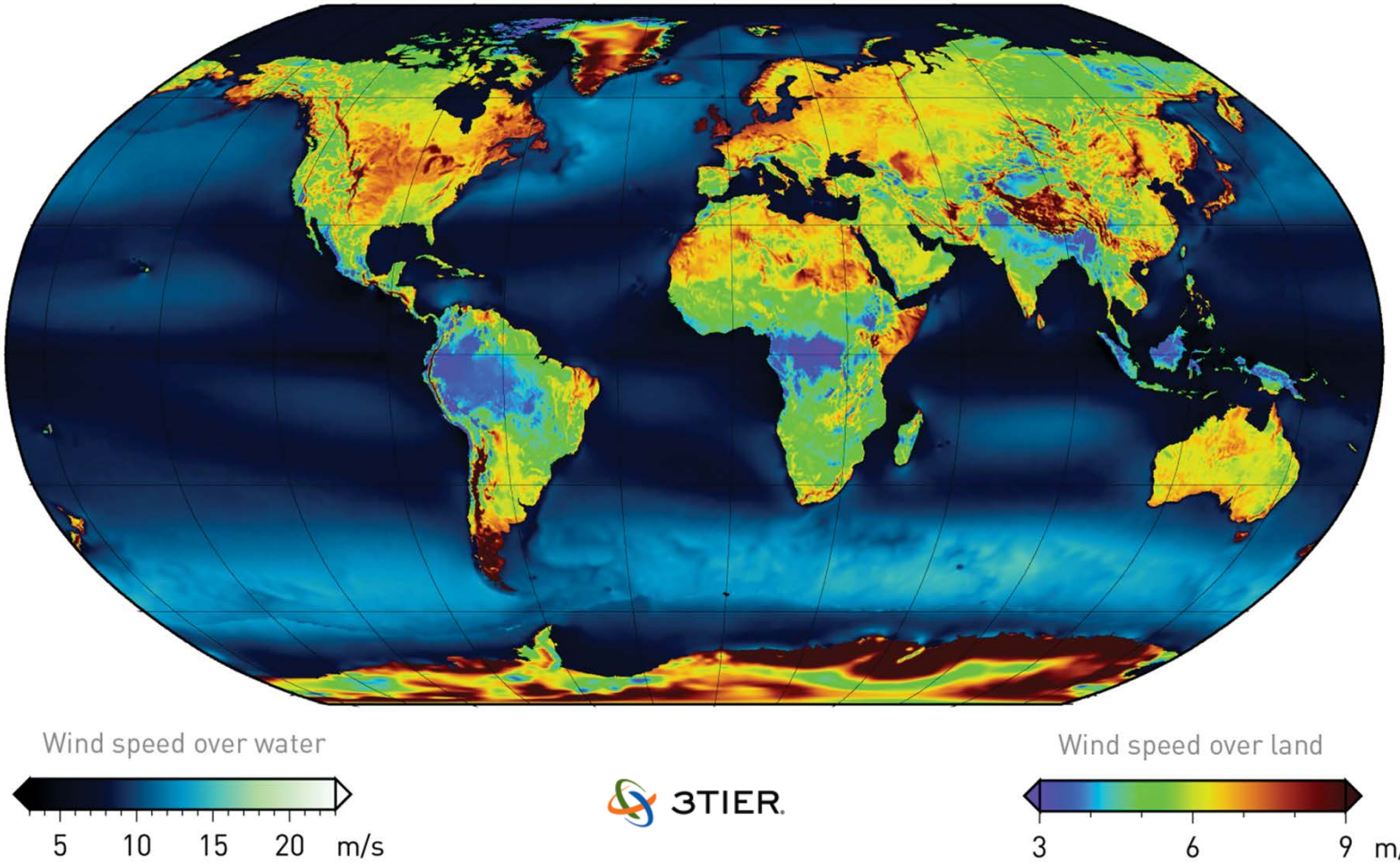
Cascading the use of a Geothermal Resource for Multiple Applications



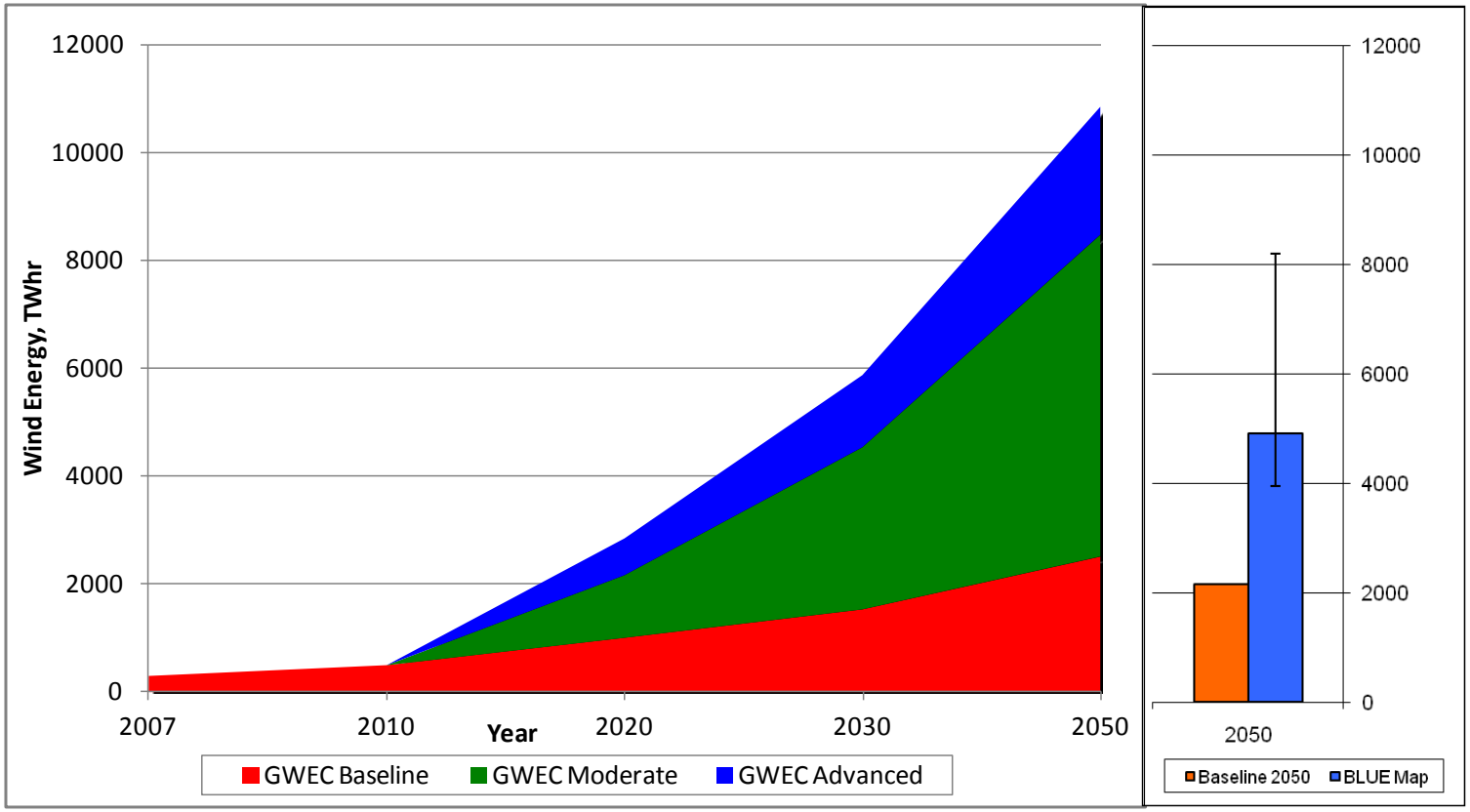
Calculated Ground Temperature Change



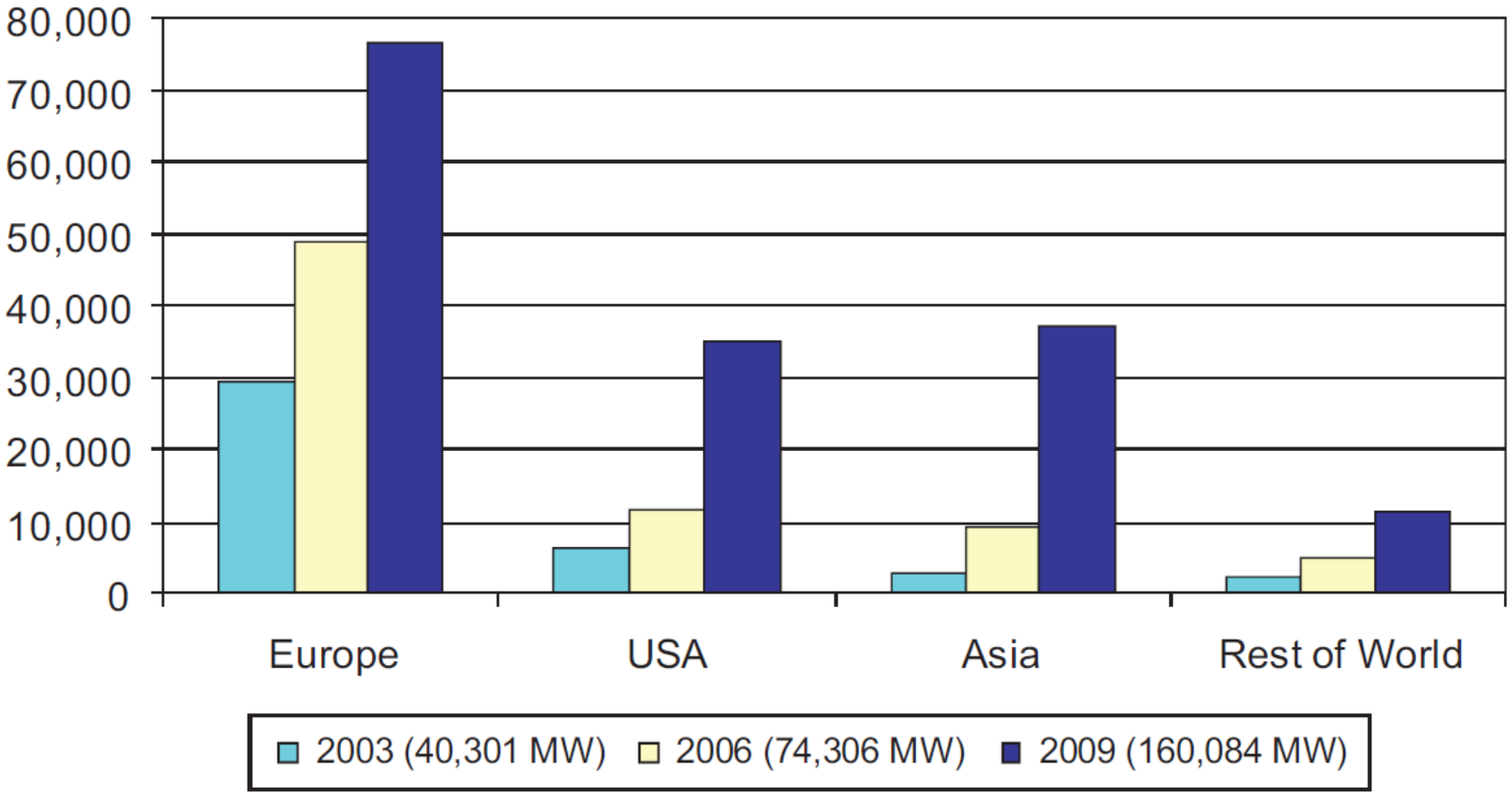
Global Wind Resource



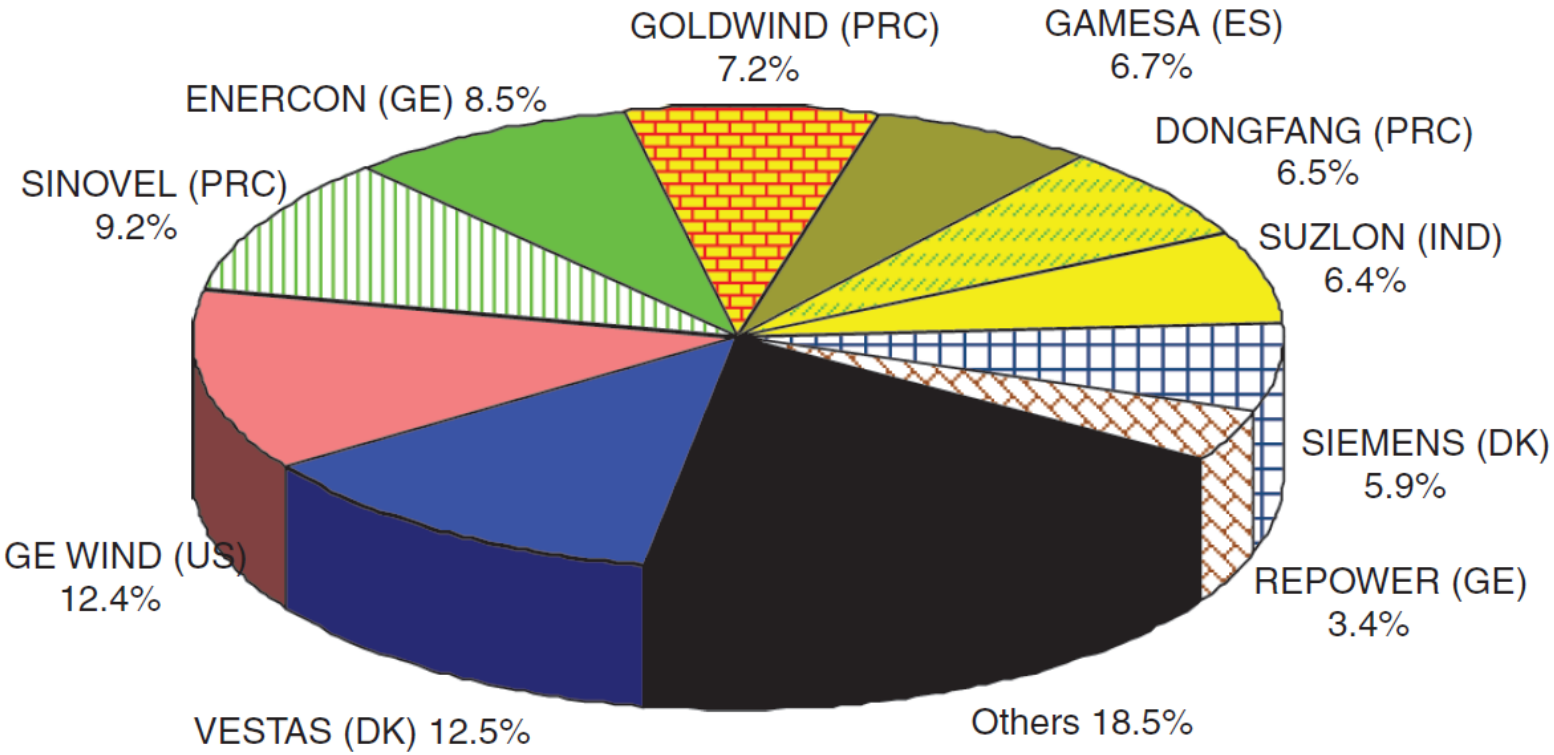
Wind Energy Generation



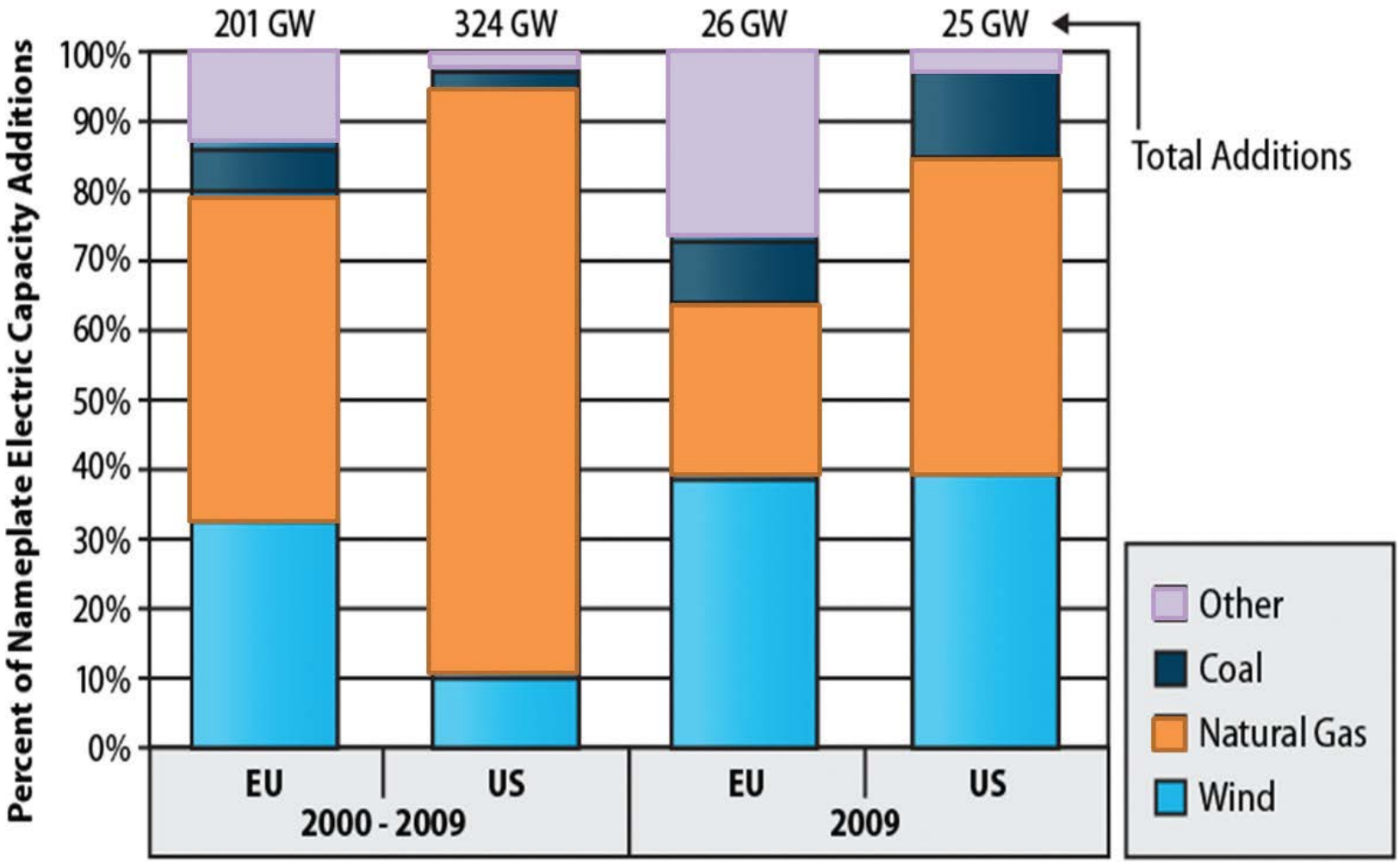
Cumulative Wind Installed Capacity in Europe



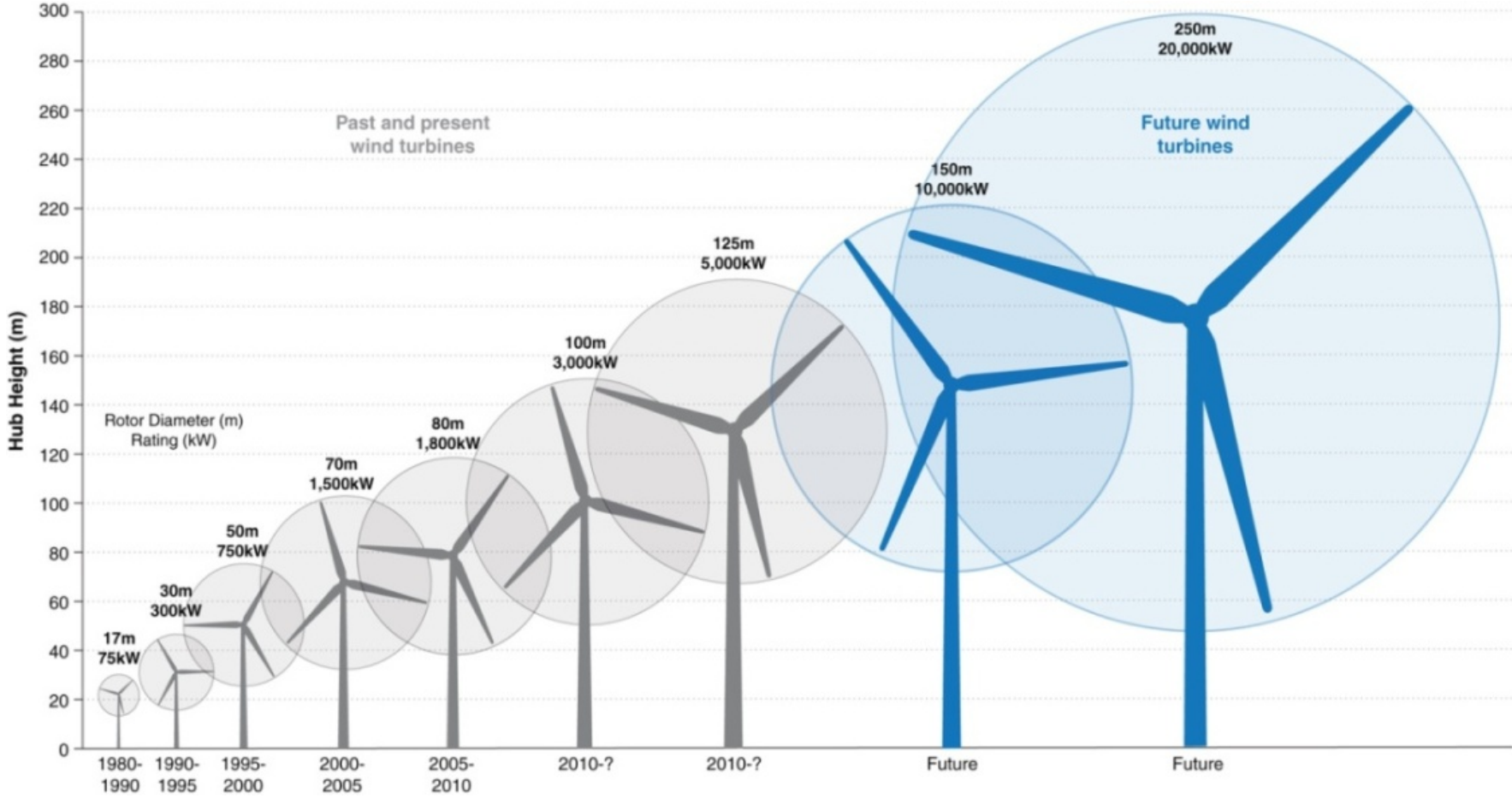
Top 10 Wind Turbine Suppliers



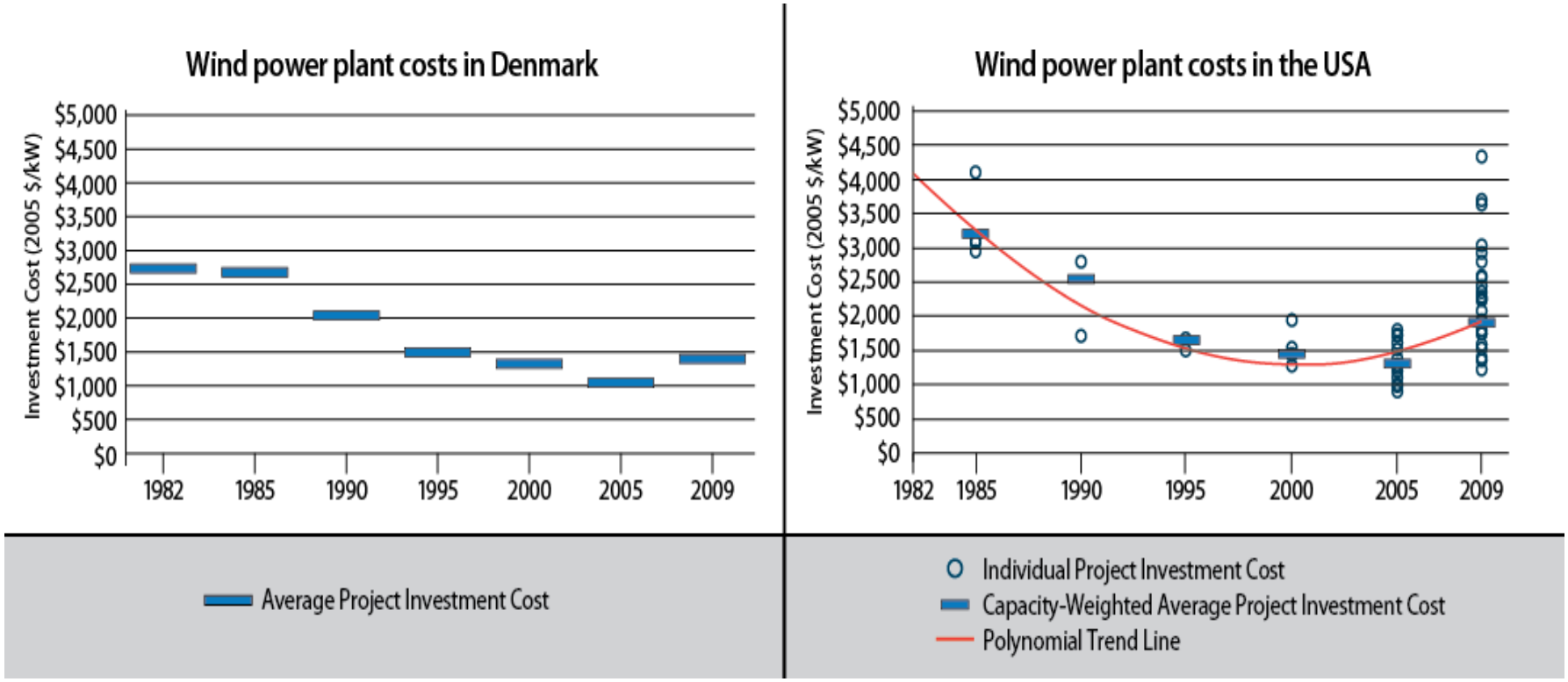
Relative Contribution of Generation Types to Capacity Additions in the US and EU



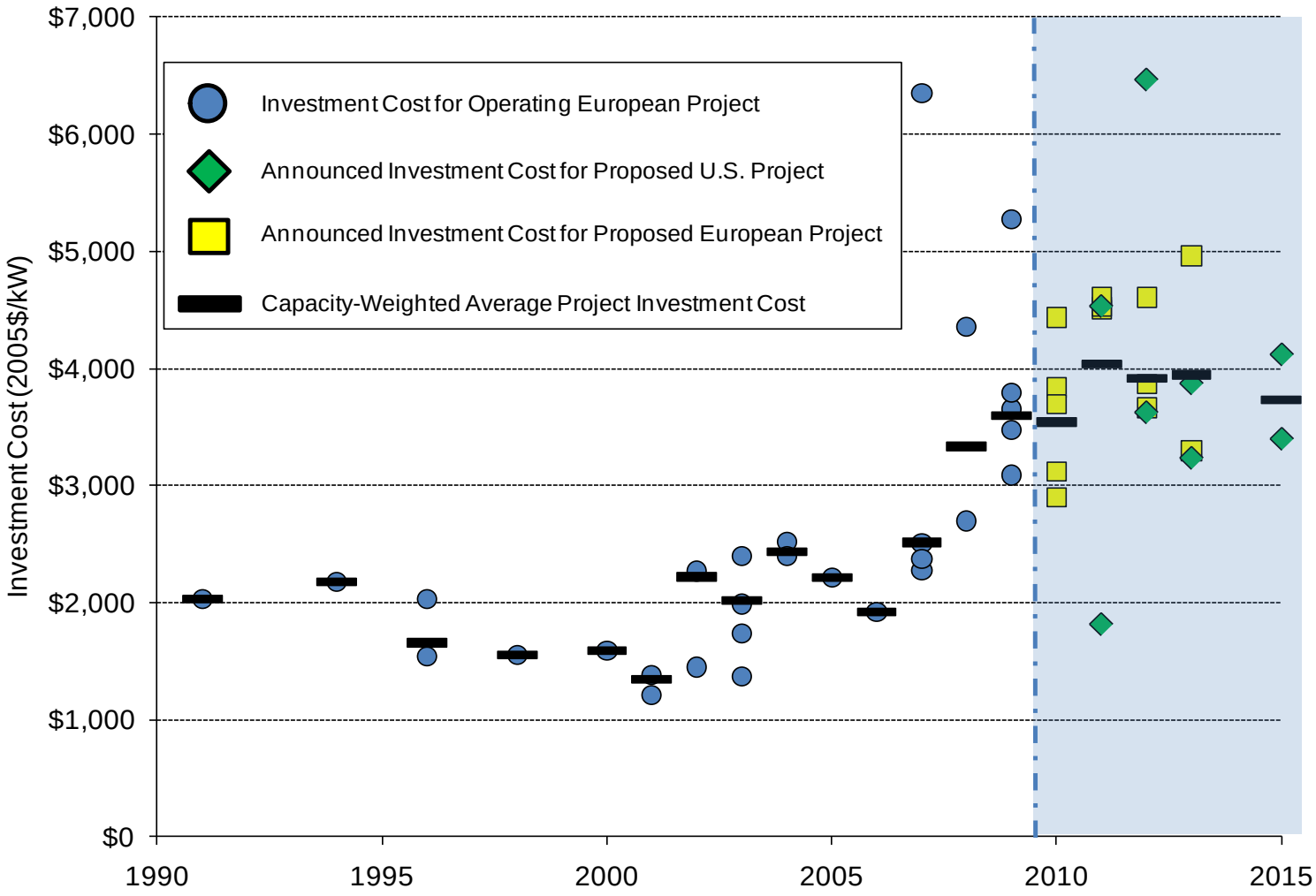
Development and Size Growth of Wind Turbines Since 1980



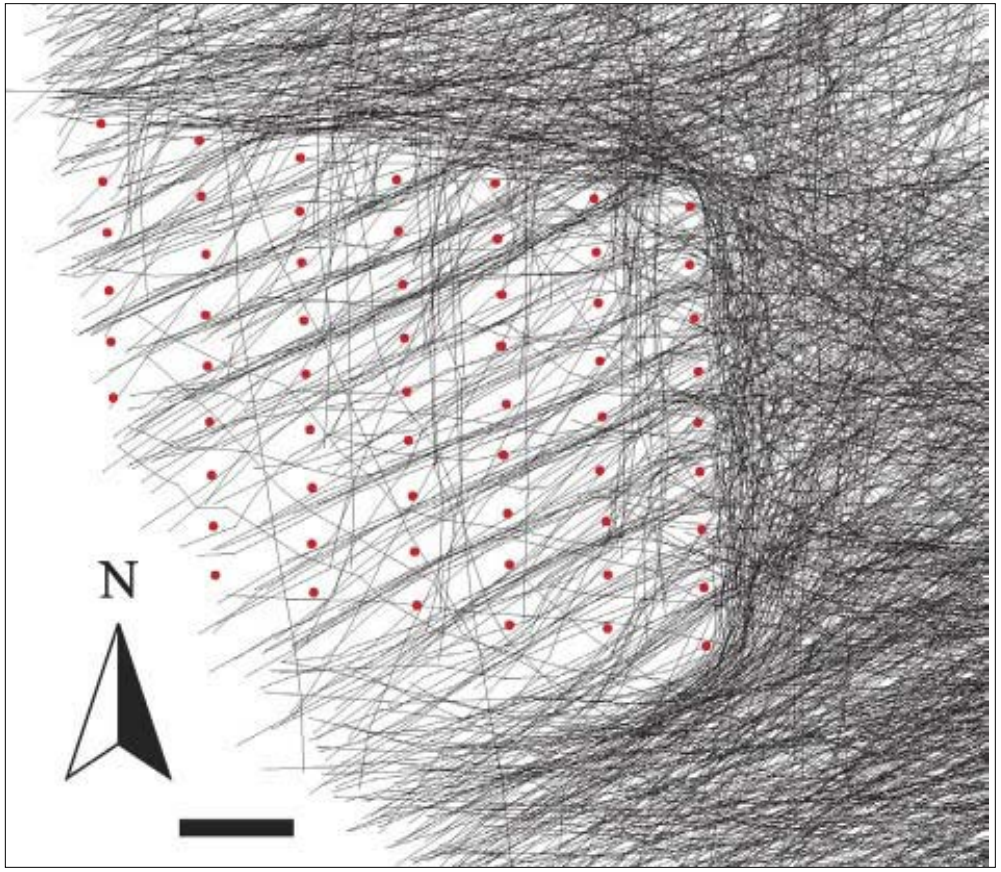
Installed Wind Project Costs over time in Denmark and the United States



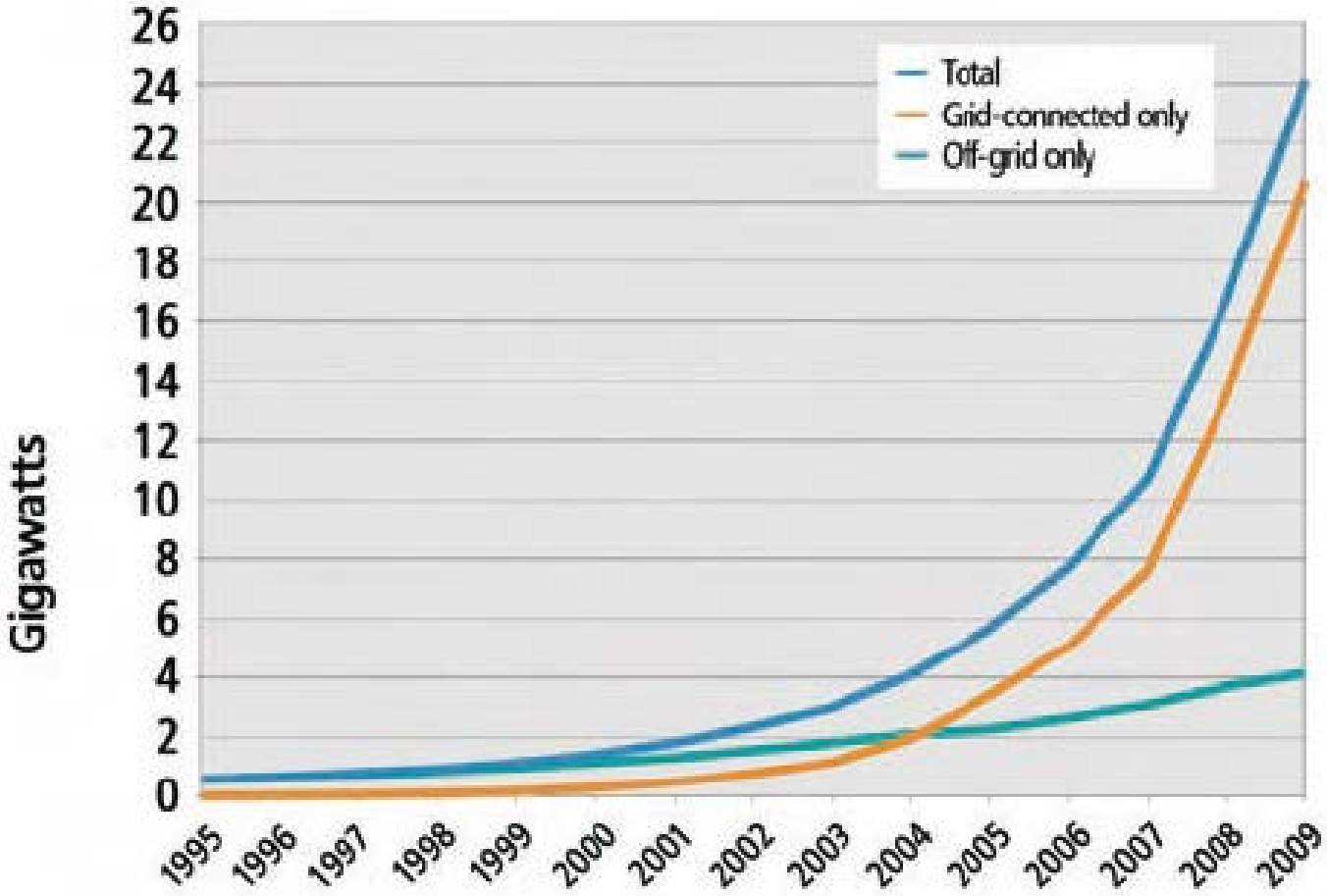
Capital Costs for Installed and Announced Offshore Wind Projects



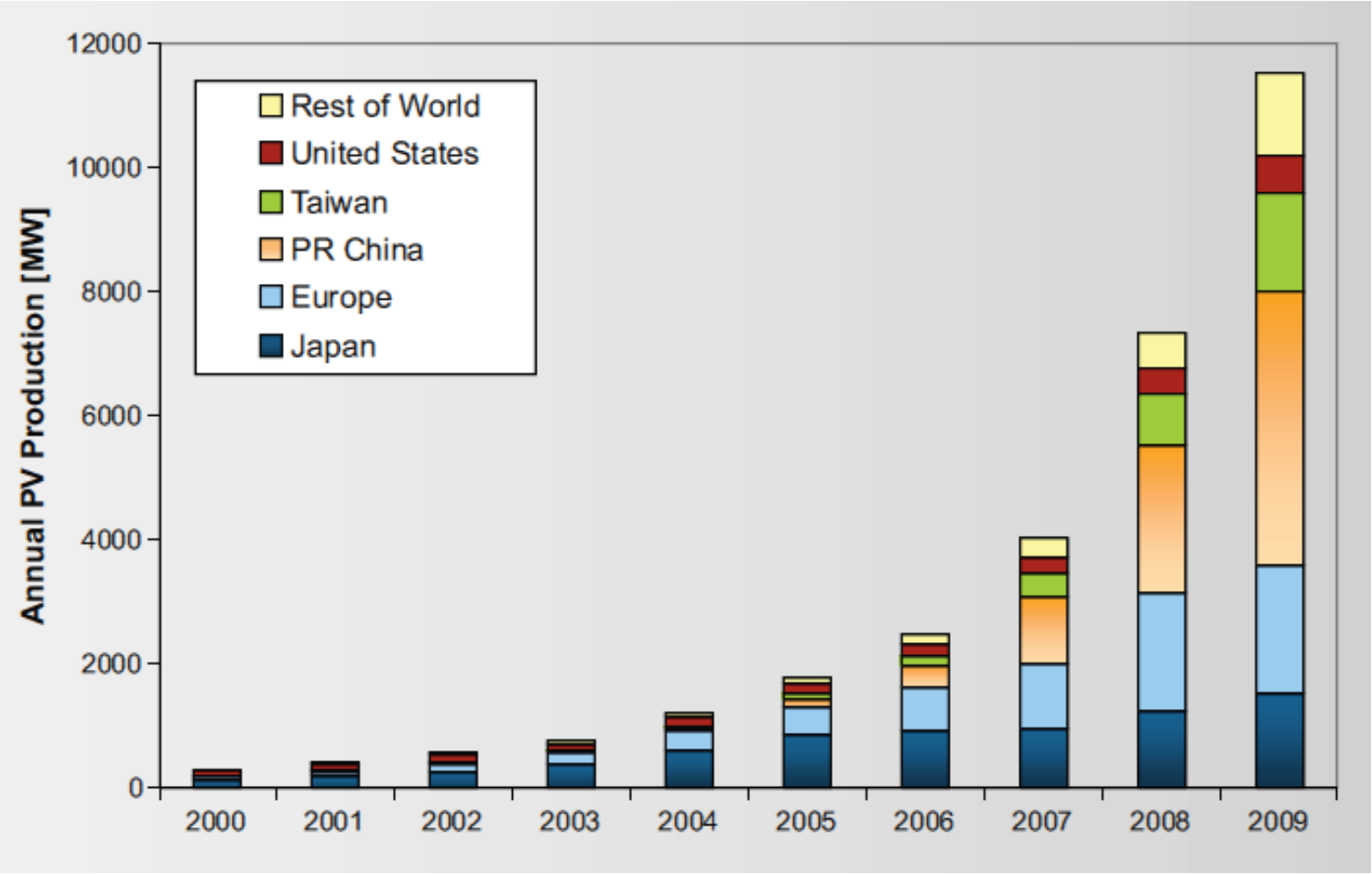
Water Bird Flight Trajectories around Wind Farms



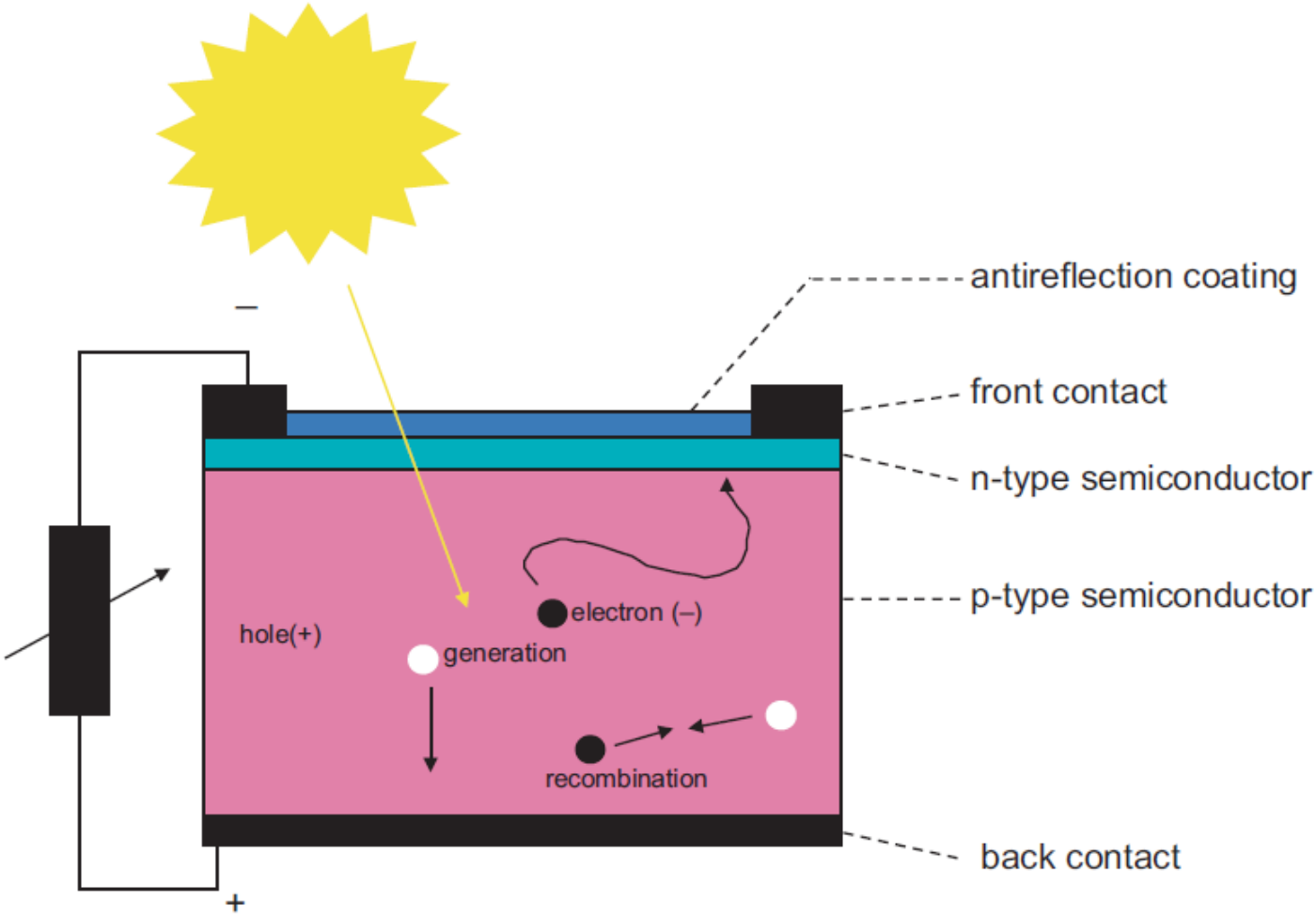
Cumulative Installed PV Capacity, 1995-2009



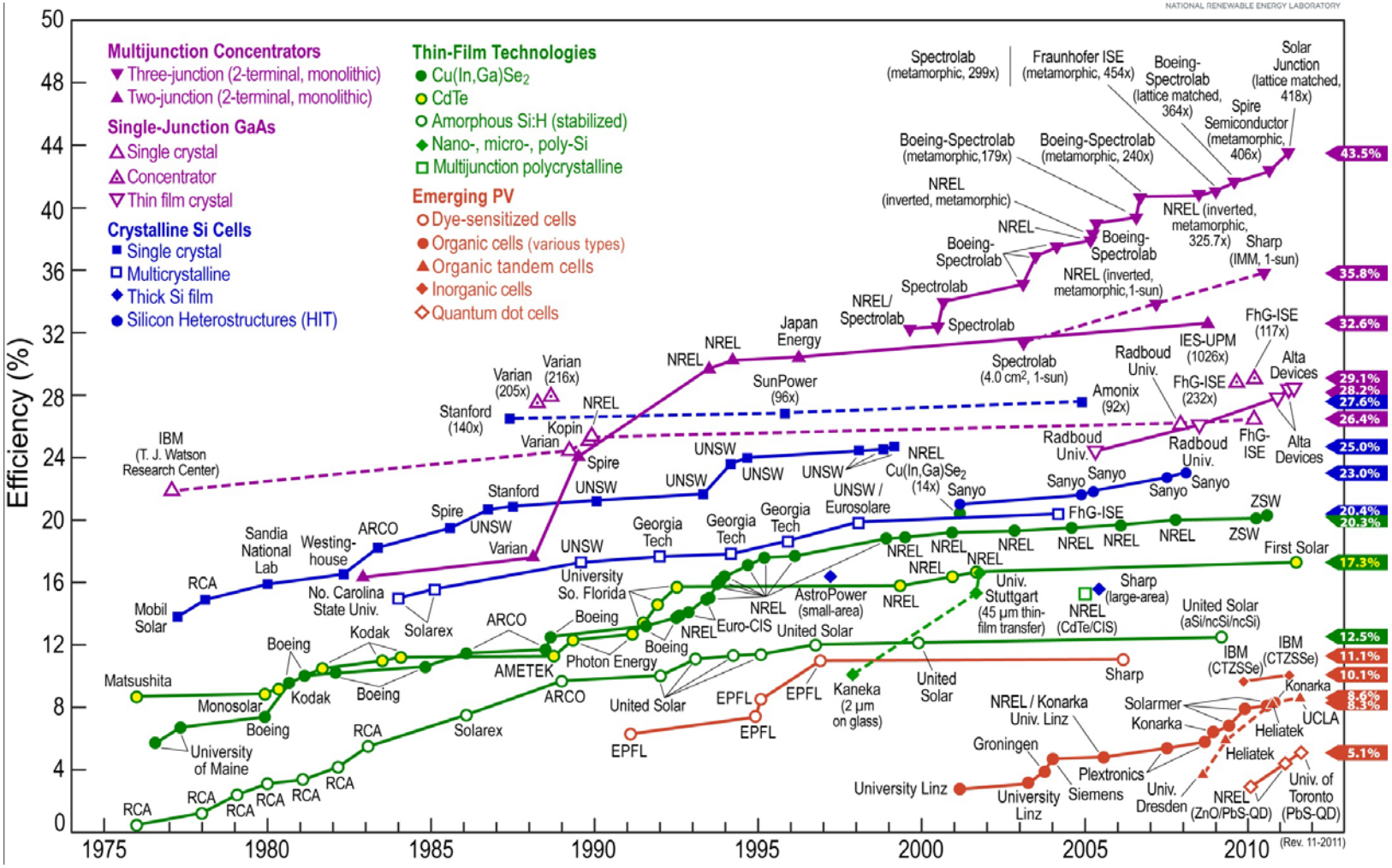
Annual Solar Cell Production by Region



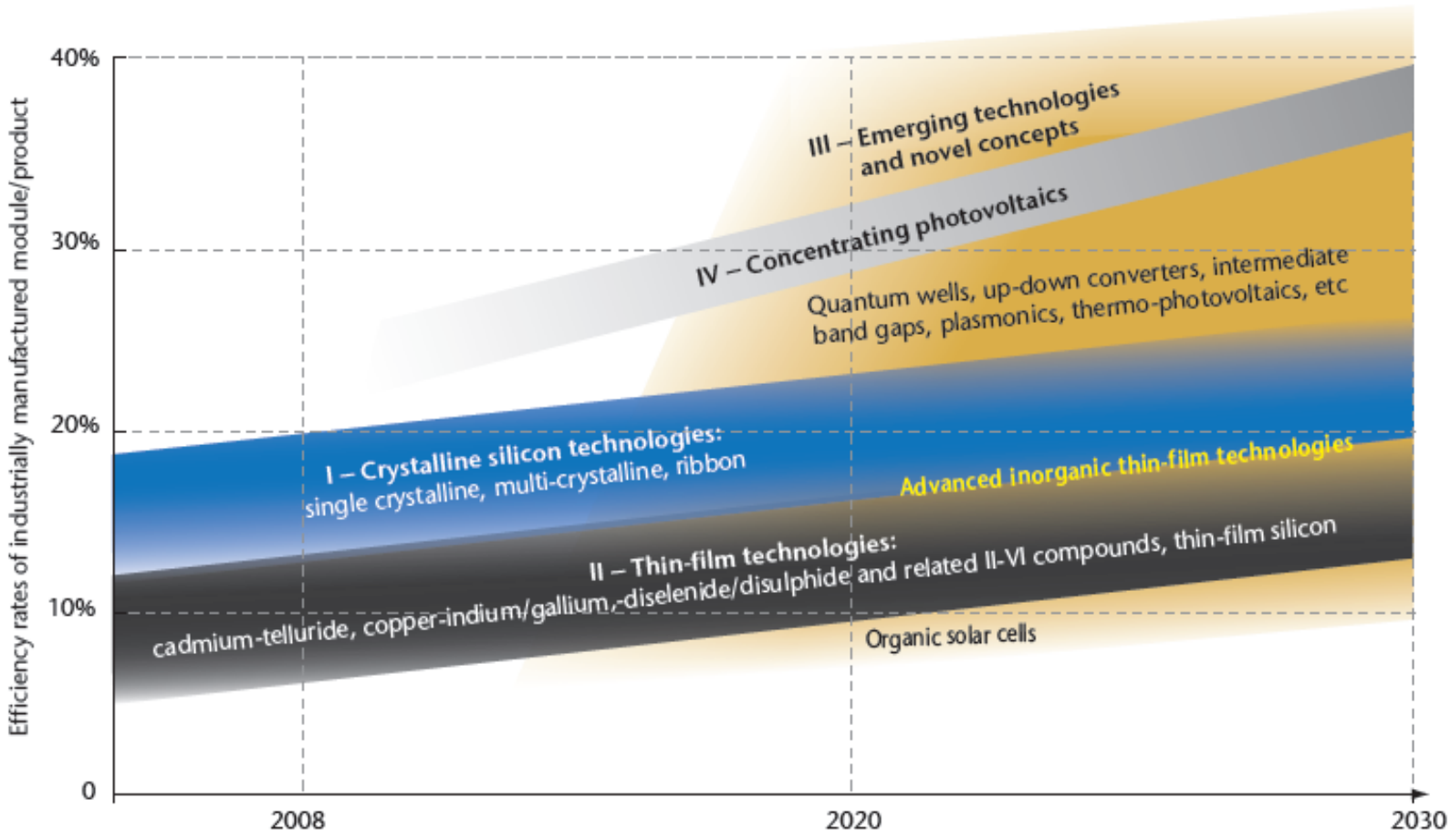
Schematic Cross-Section of a Asolar Cell



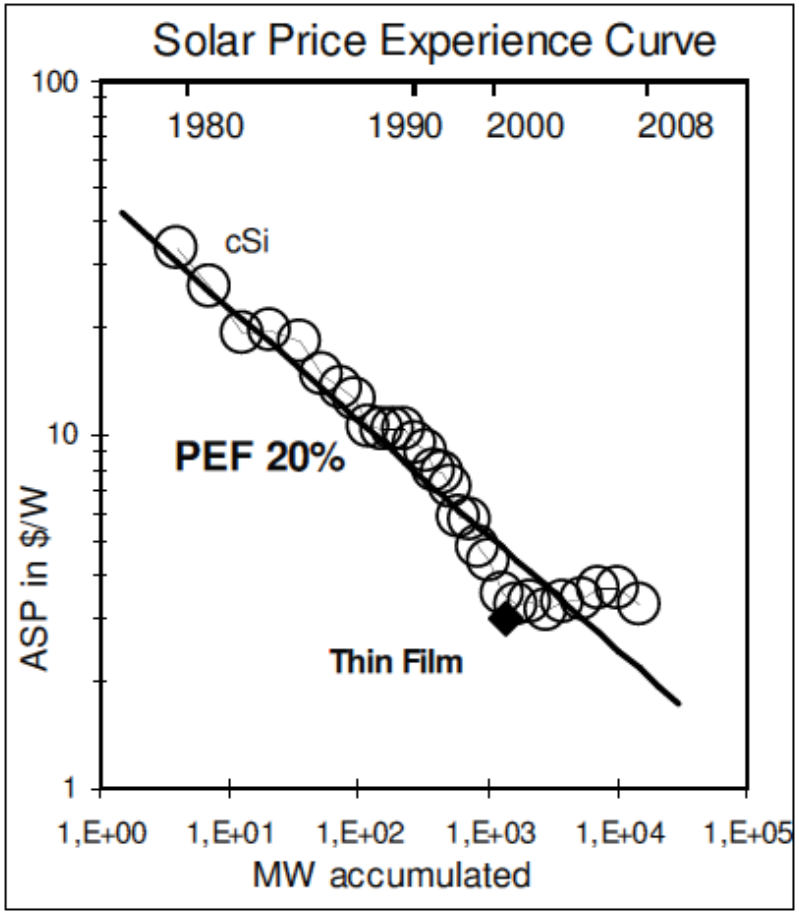
Trends in Conversion Efficiencies for Various Solar Cell Technologies



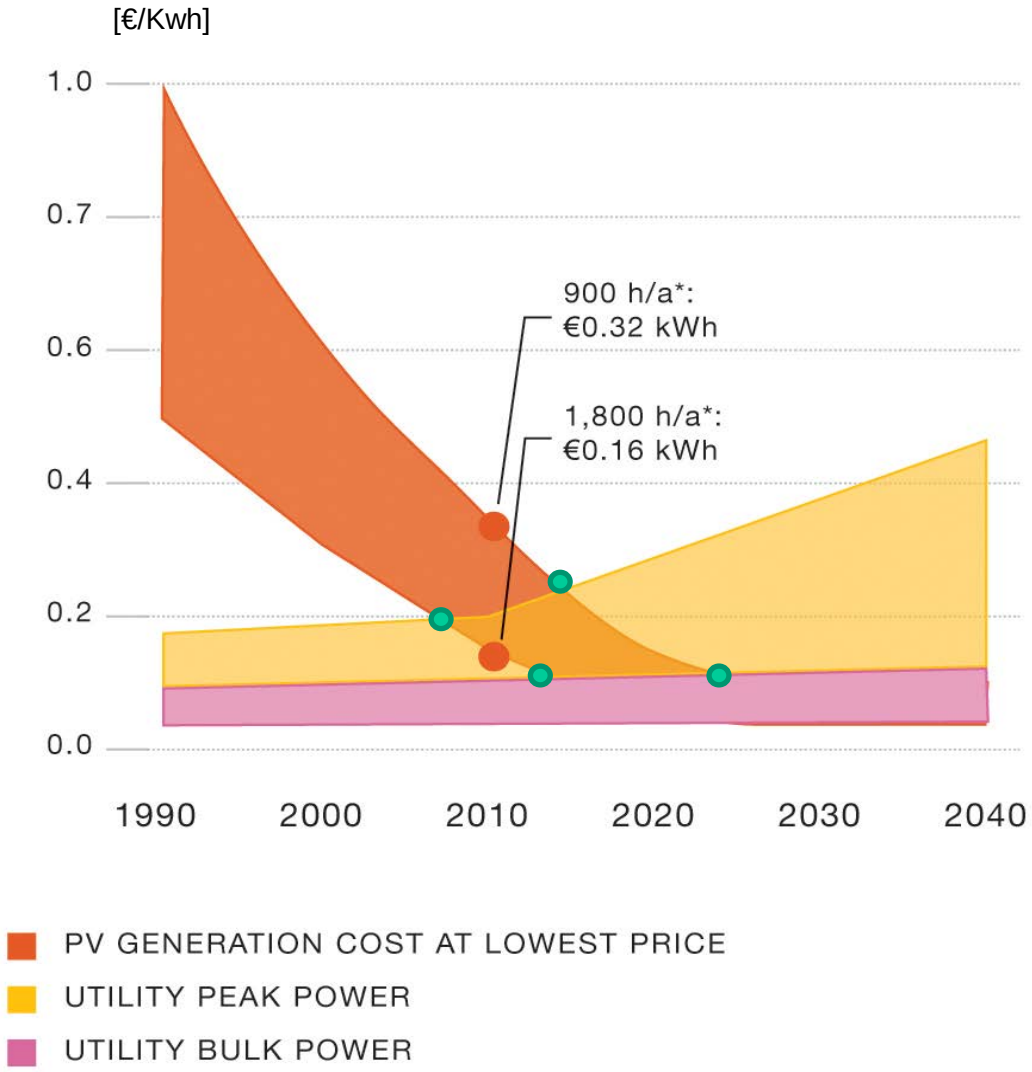
Possible Development of Commercial PV Module Efficiencies



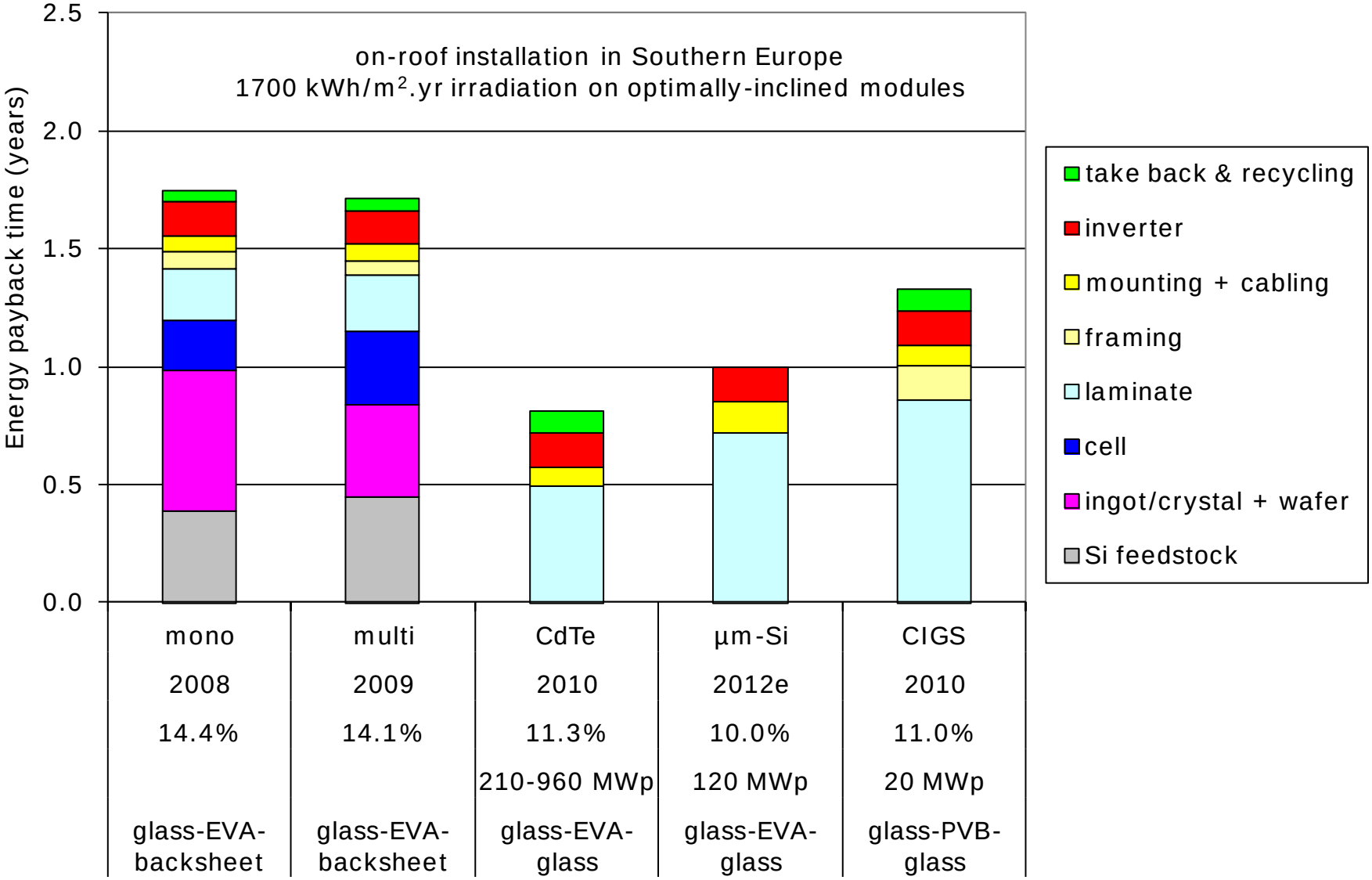
PV Module Experience Curve



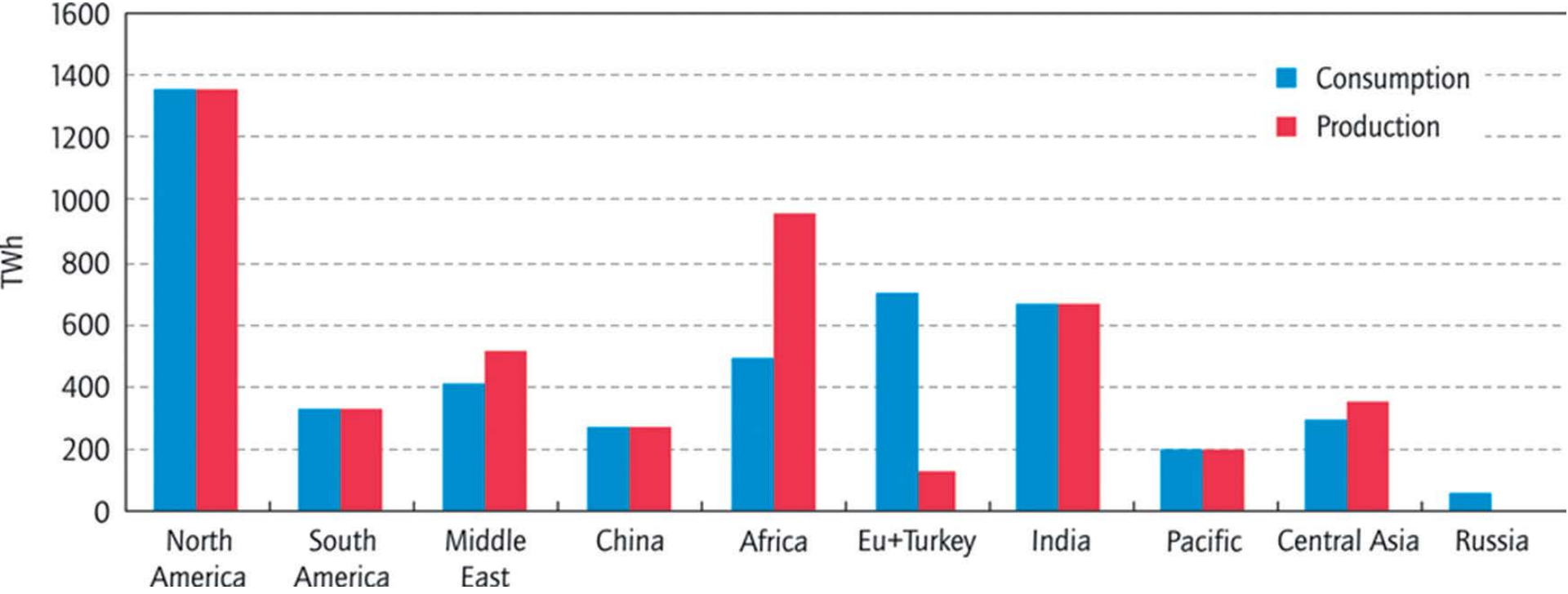
Schematic Representation of Grid Parity Points



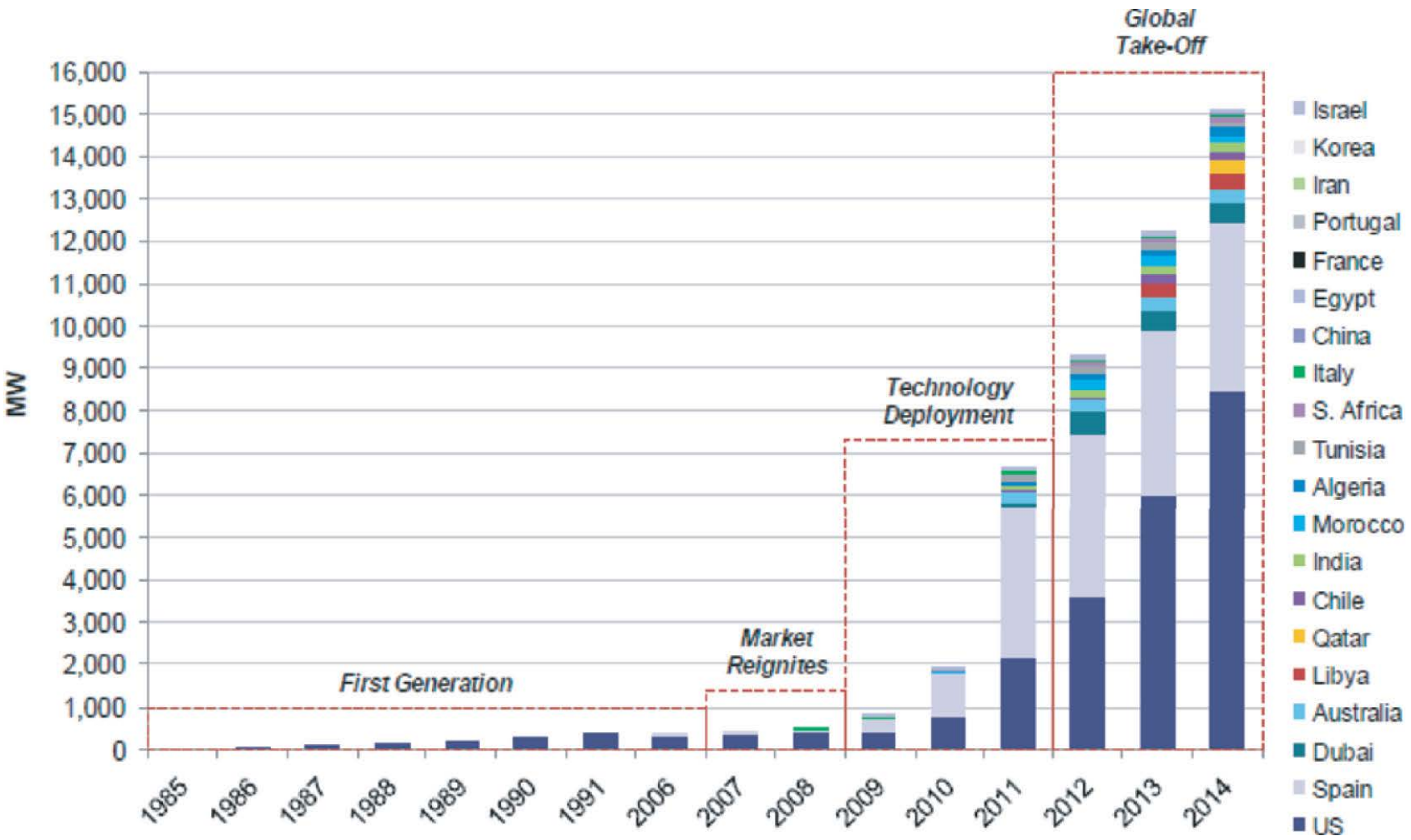
Payback Time of on-roof PV Systems for an In-plane Irradiation of 1700 kWh/m²/yr



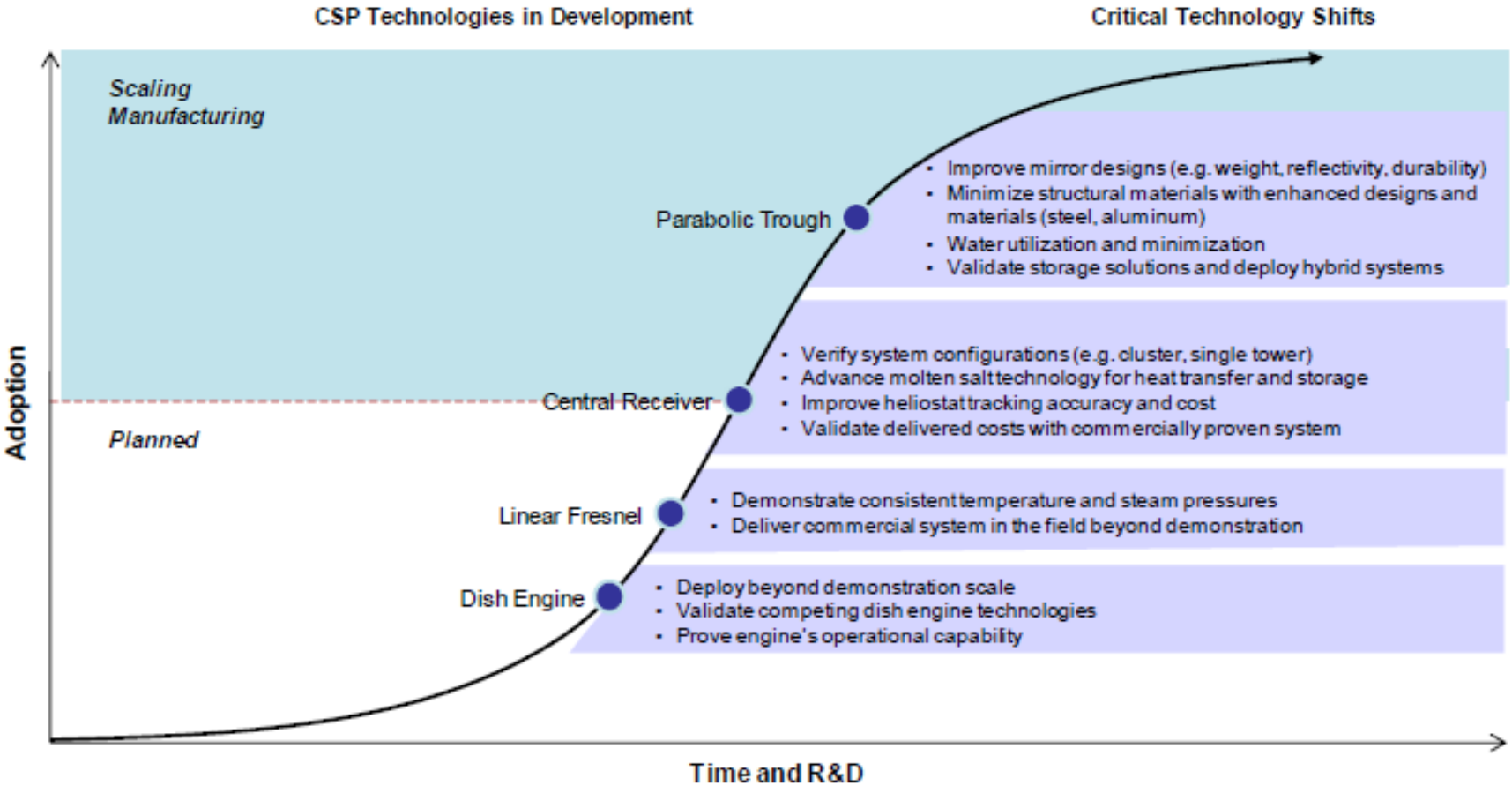
Possible Production and Consumption of CSP Electricity in 2050



CSP Development, 1985-2008, Project Pipeline by Country, 2009-2014



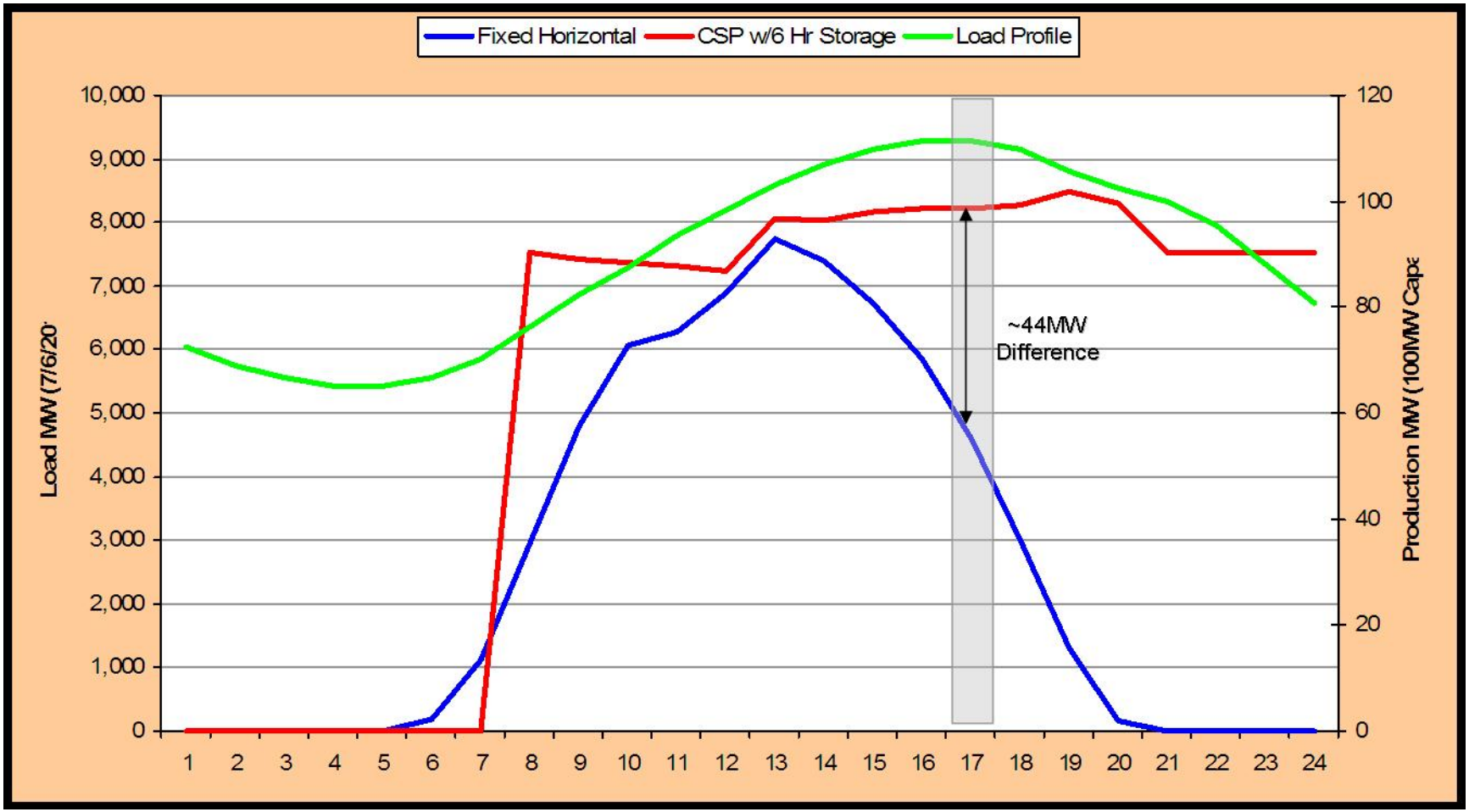
CSP Technology Curve and Evolutionary Changes



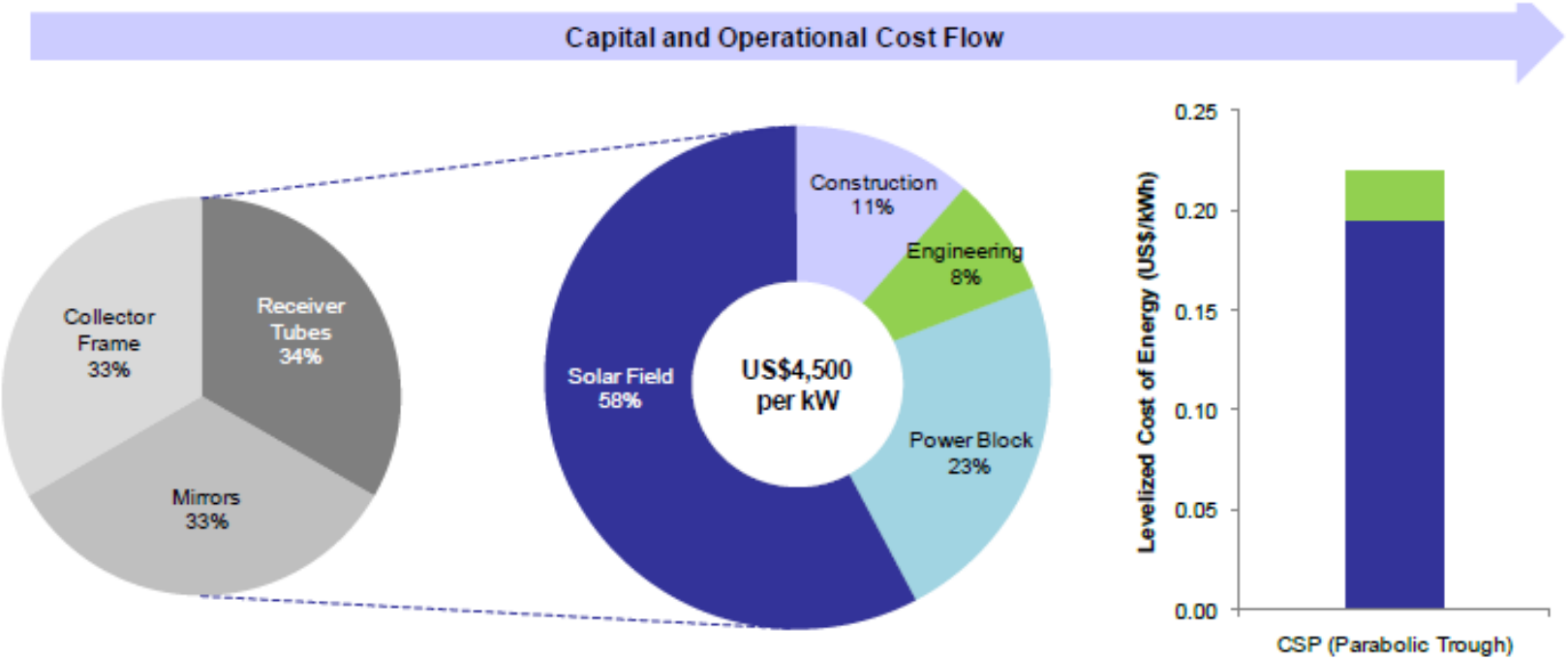
Solar Thermal Power Plants

Two-tank Molten-salt Indirect Storage System

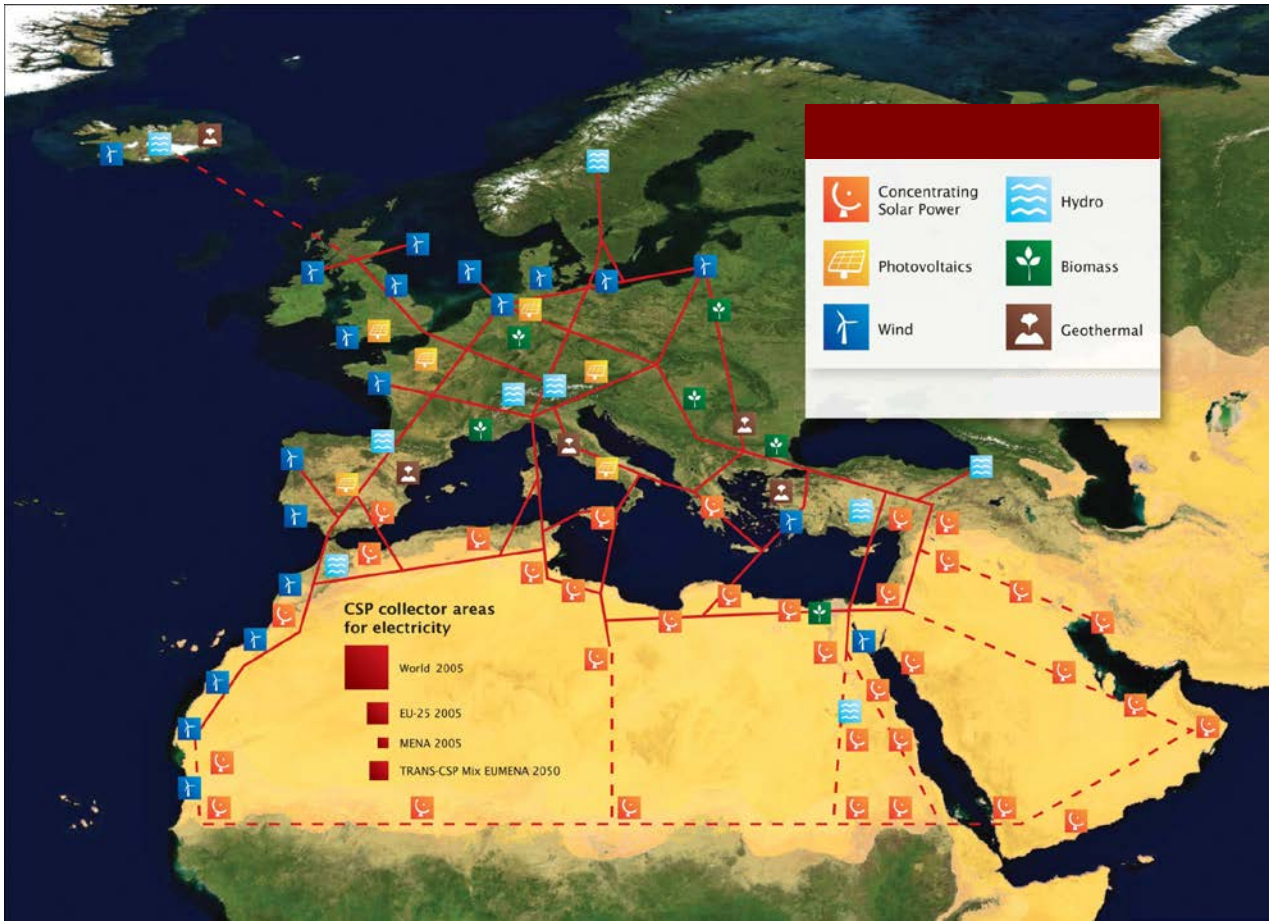
Customer load profile and power production profile of a CSP system with storage and a non-tracking PV system over 24 hours



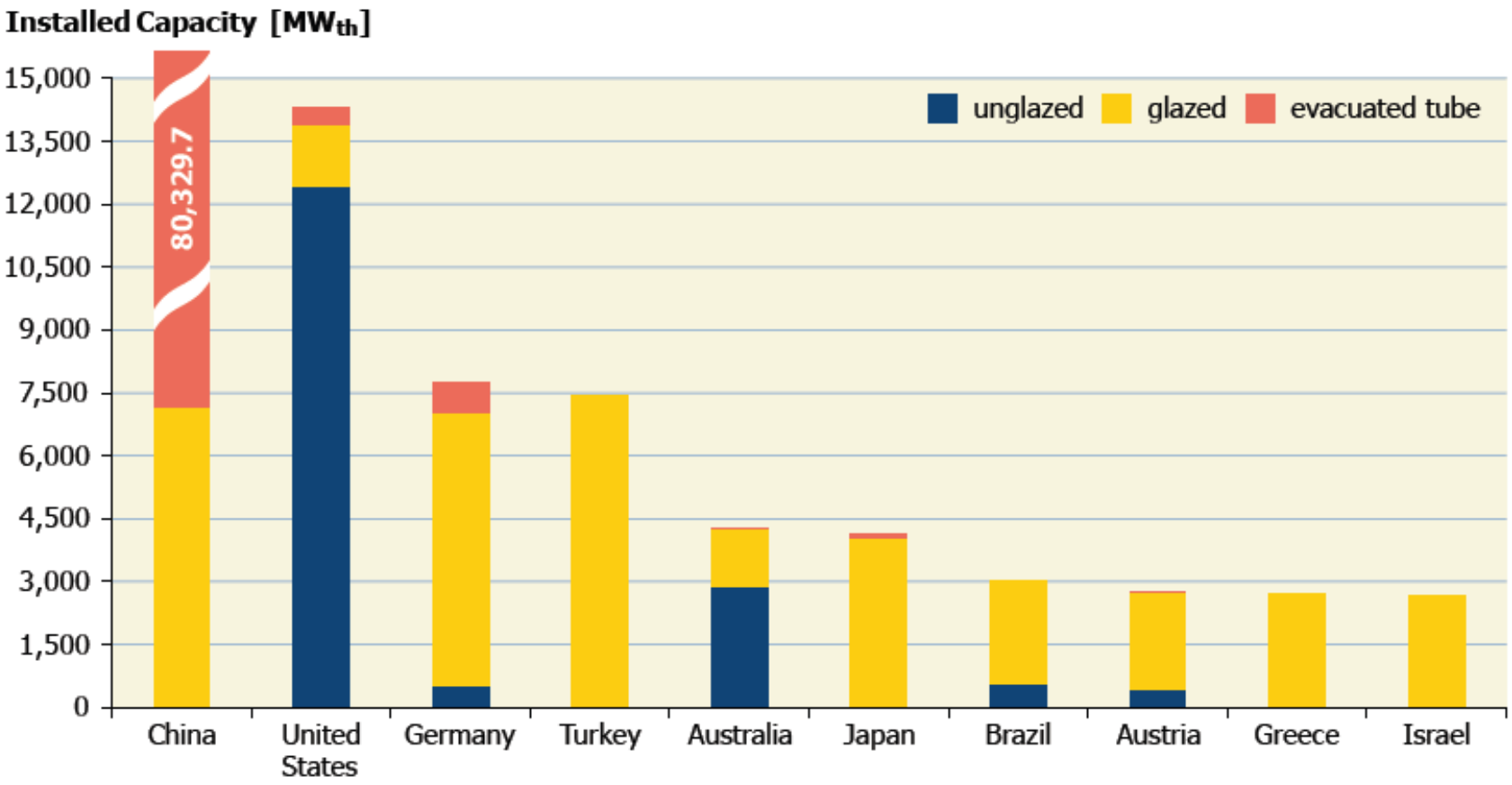
Capital Cost Breakdown for Parabolic Trough Plant



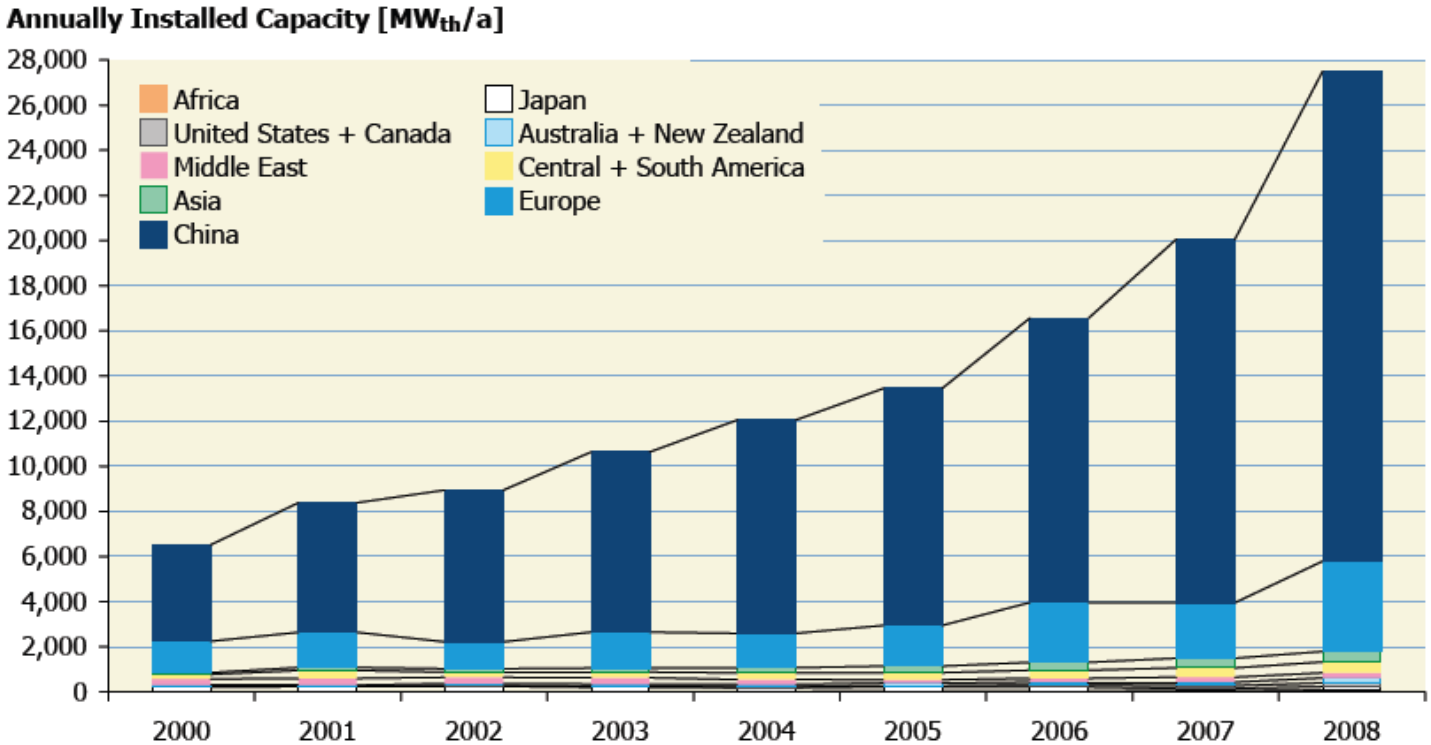
Super Grid Envisioned by DESERTEC



Total Capacity of Solar Collectors, 2008, in Top 10 Countries

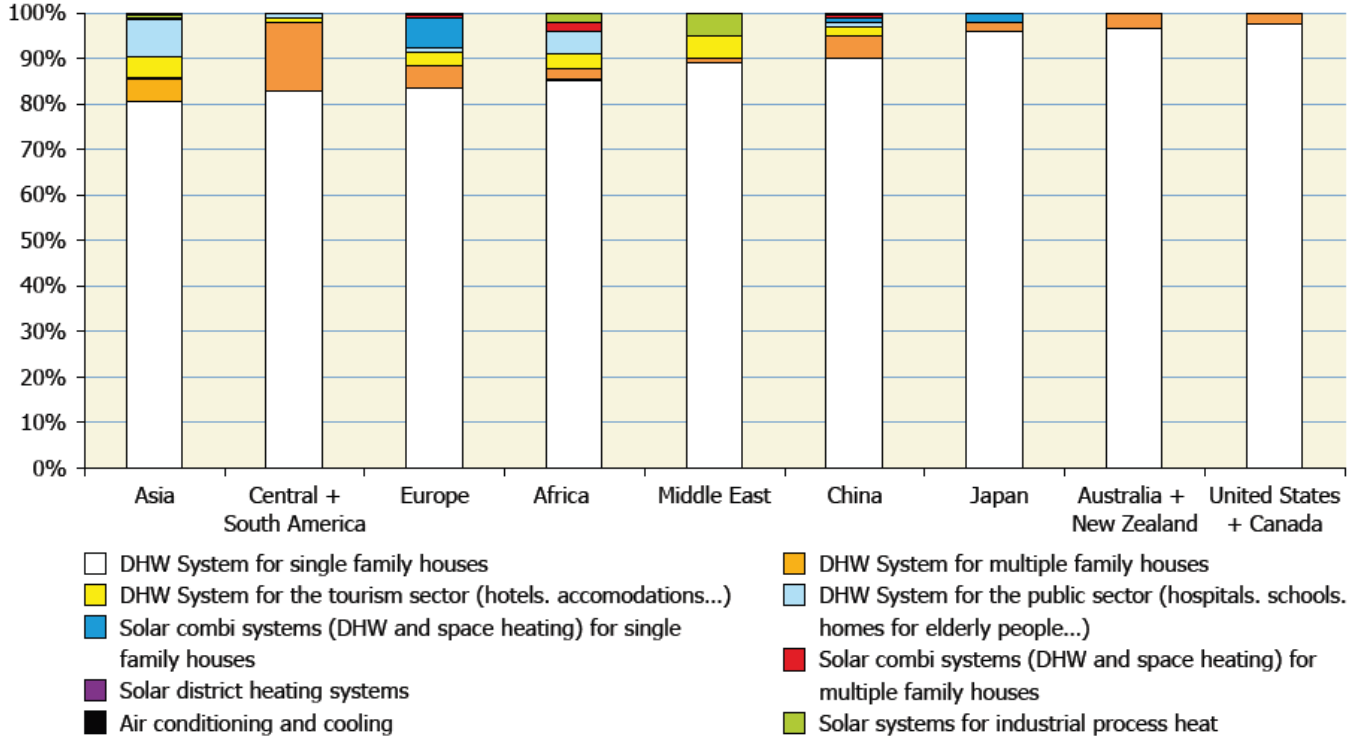


Annual Installed Capacity of Flat-plate and Evacuated Tube Collectors



Middle East:	Israel, Jordan
Africa:	Namibia, South Africa, Tunisia, Zimbabwe
Central & South America:	Barbados, Brazil, Chile, Mexico, Uruguay
Asia:	India, South Korea, Taiwan, Thailand
Europe:	EU 27, Albania, Macedonia, Norway, Overseas Dep. of France, Switzerland, Turkey

Applications of Glazed and Evacuated Tube Collectors in 2008



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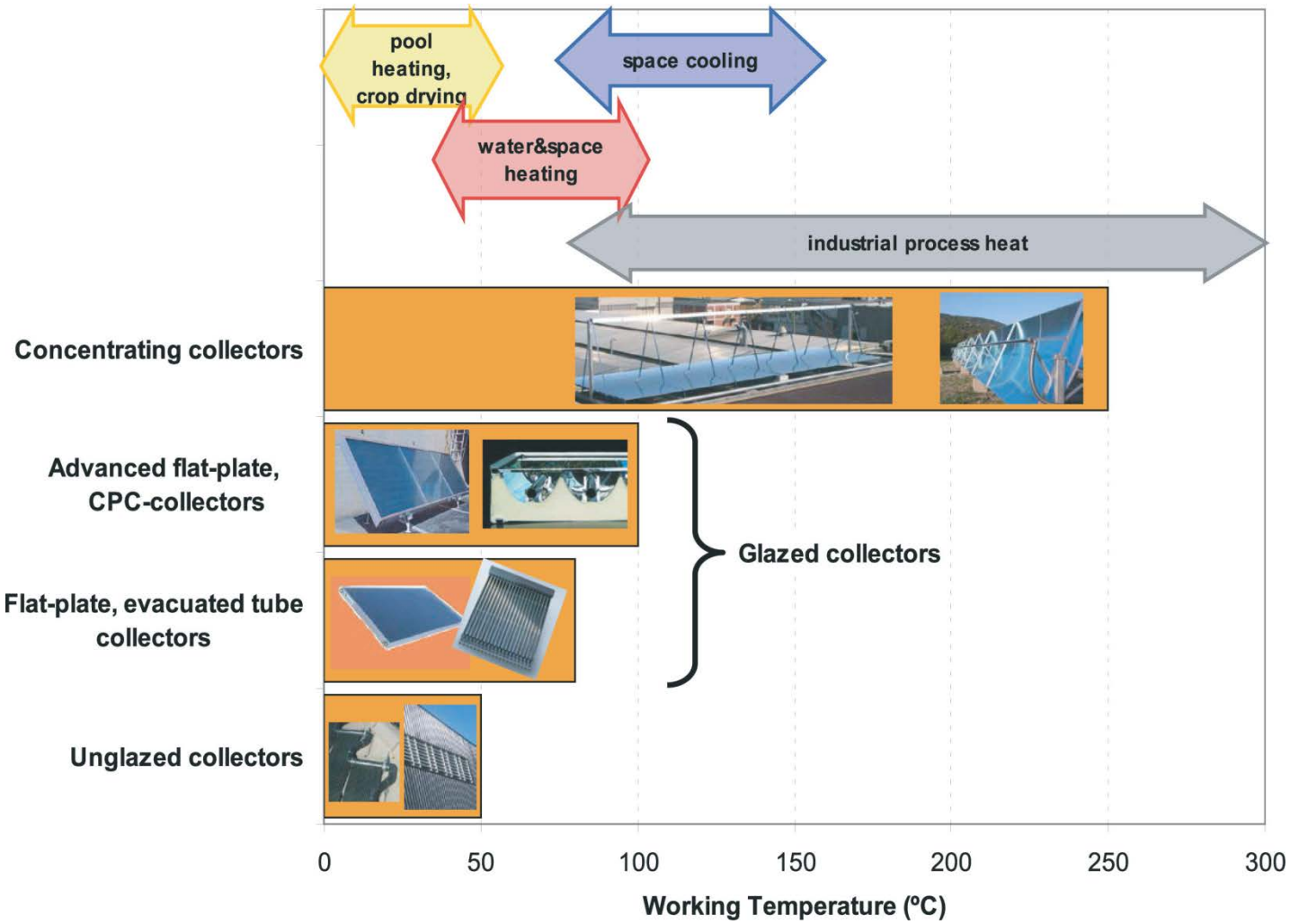
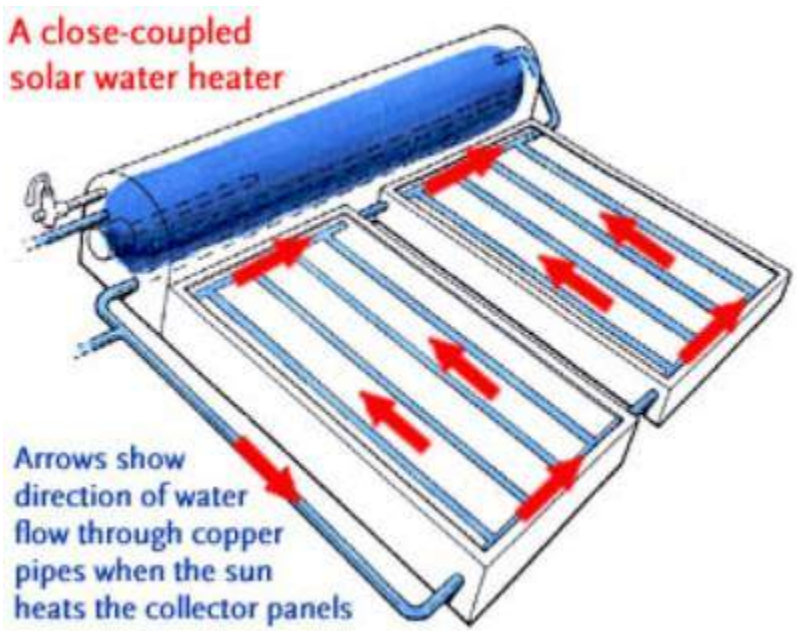
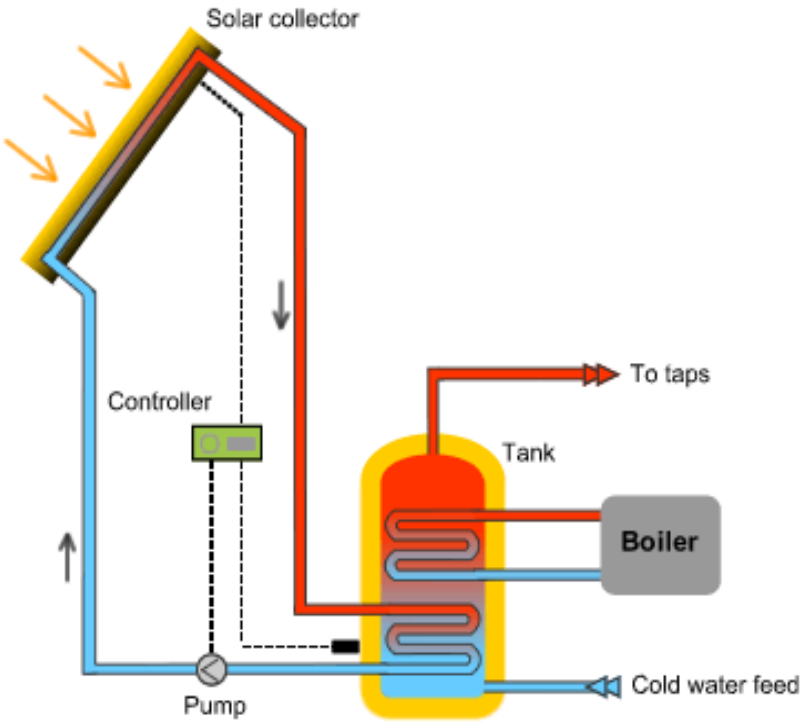
DHW:	Domestic Hot Water

Active Solar Thermal Technologies, Collectors, and Working Temperature Ranges

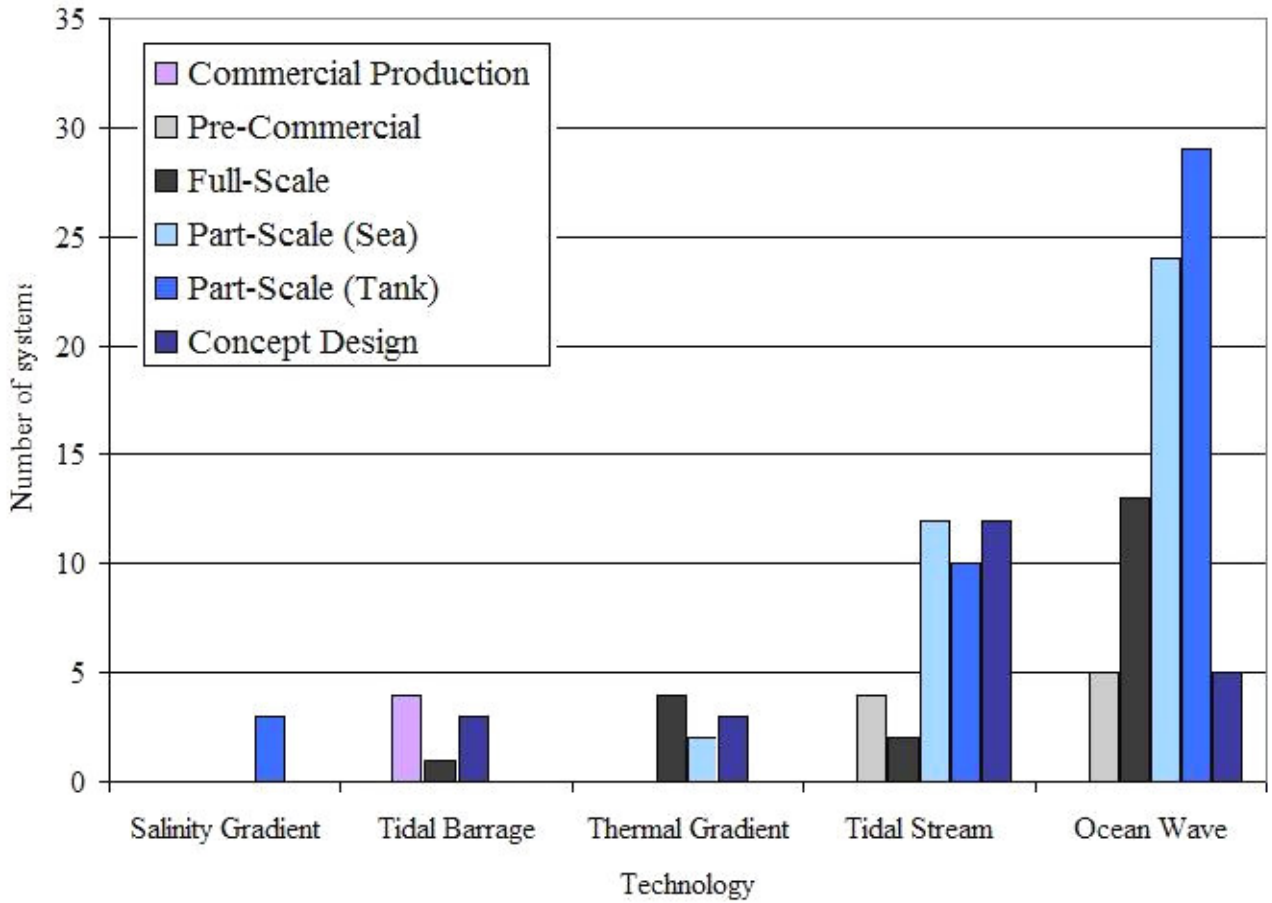


A Passive Thermo Syphon SWH System (left) and an Active Forced Circulation SWH System (right)

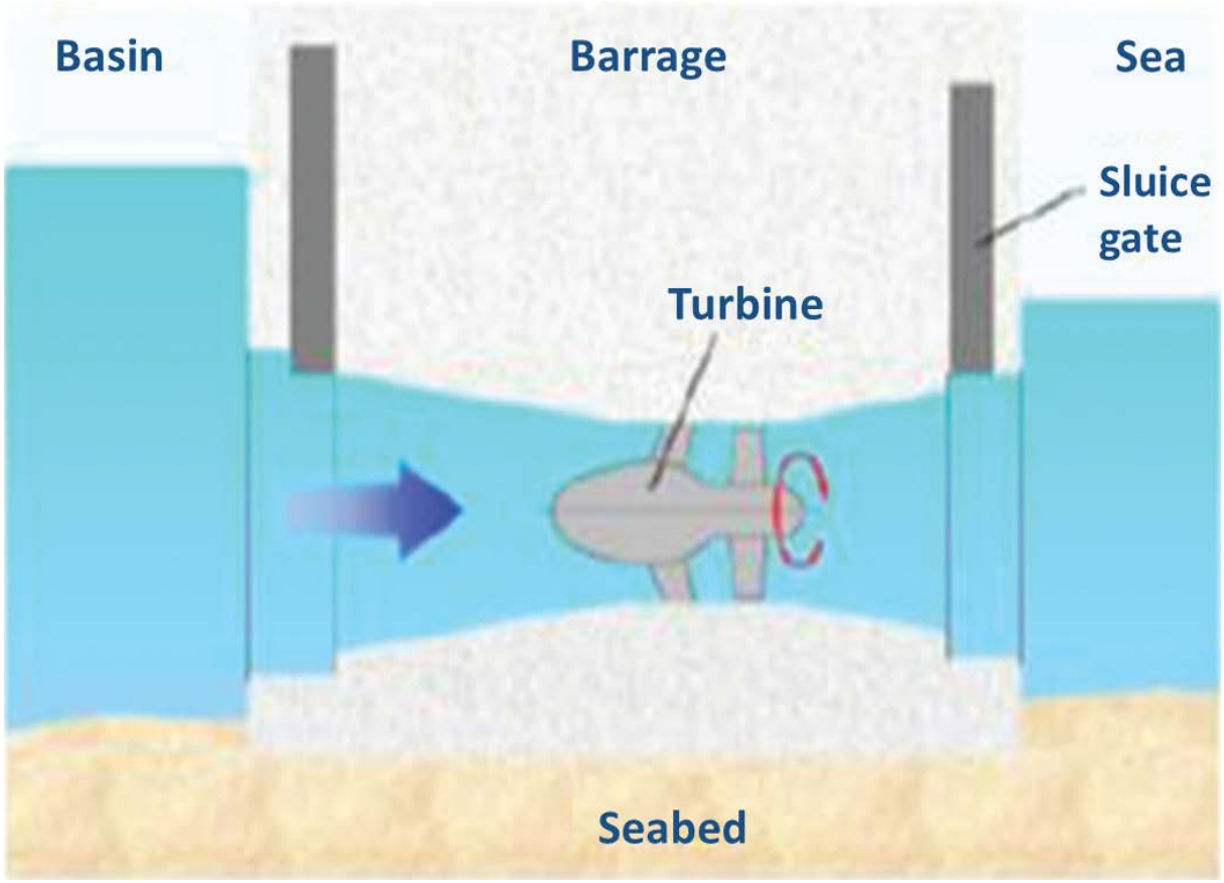




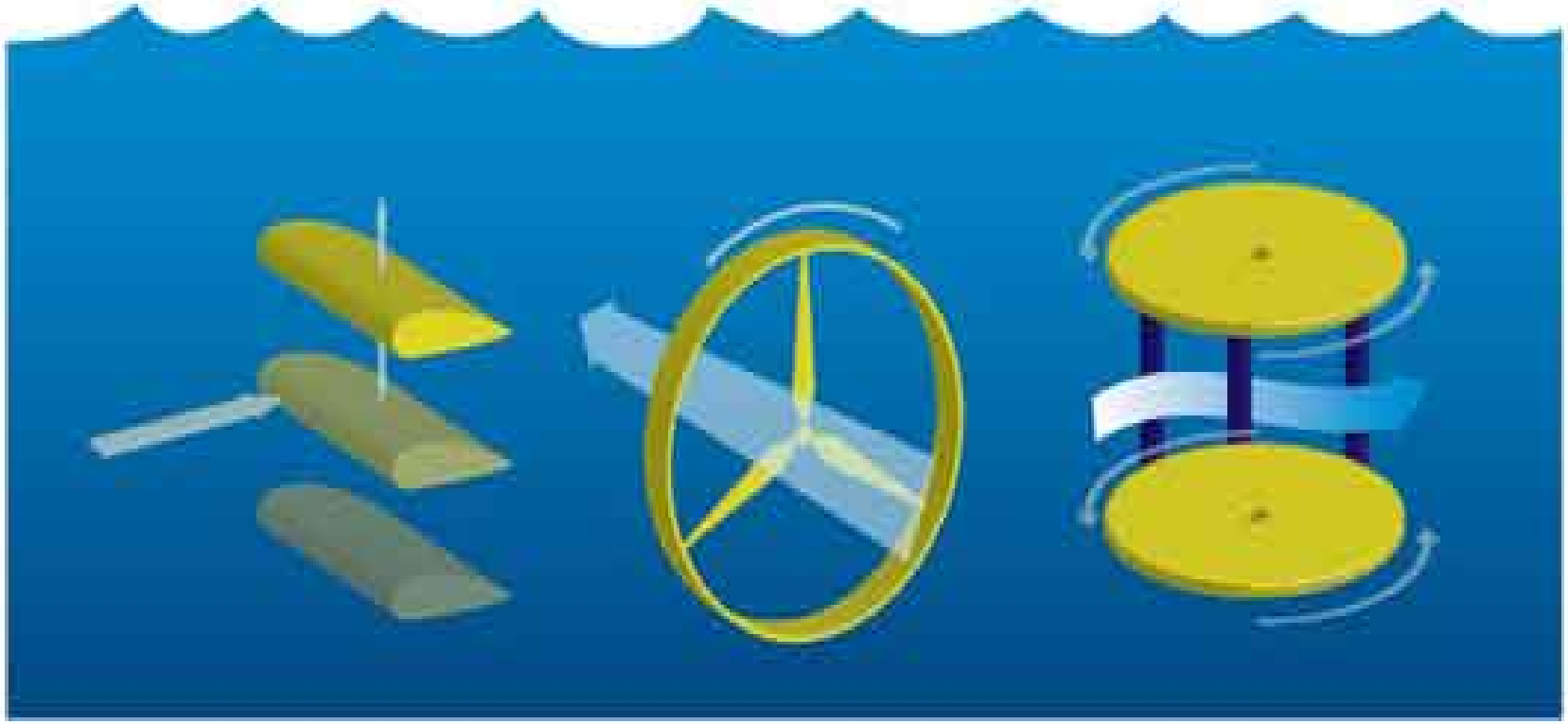
Number of Ocean Energy Conversion Schemes and their Maturity



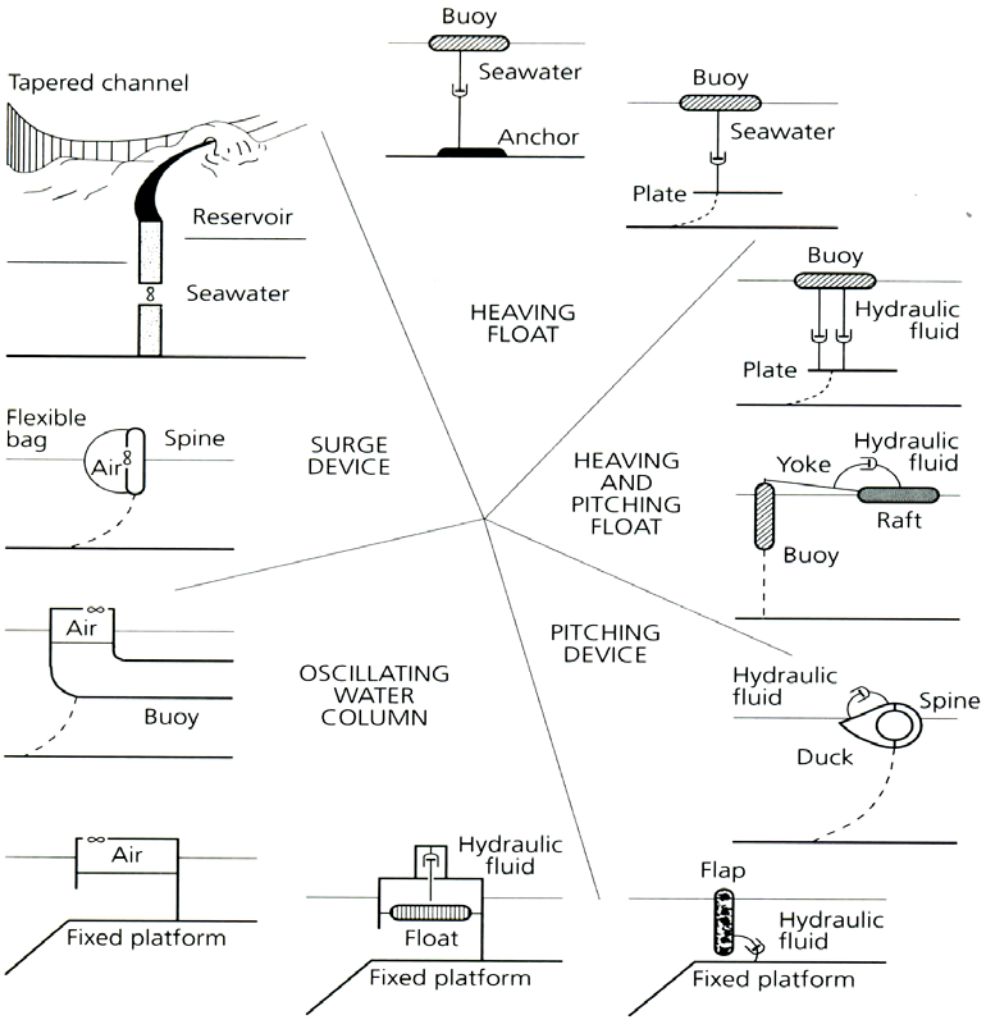
Ocean Energy Technologies



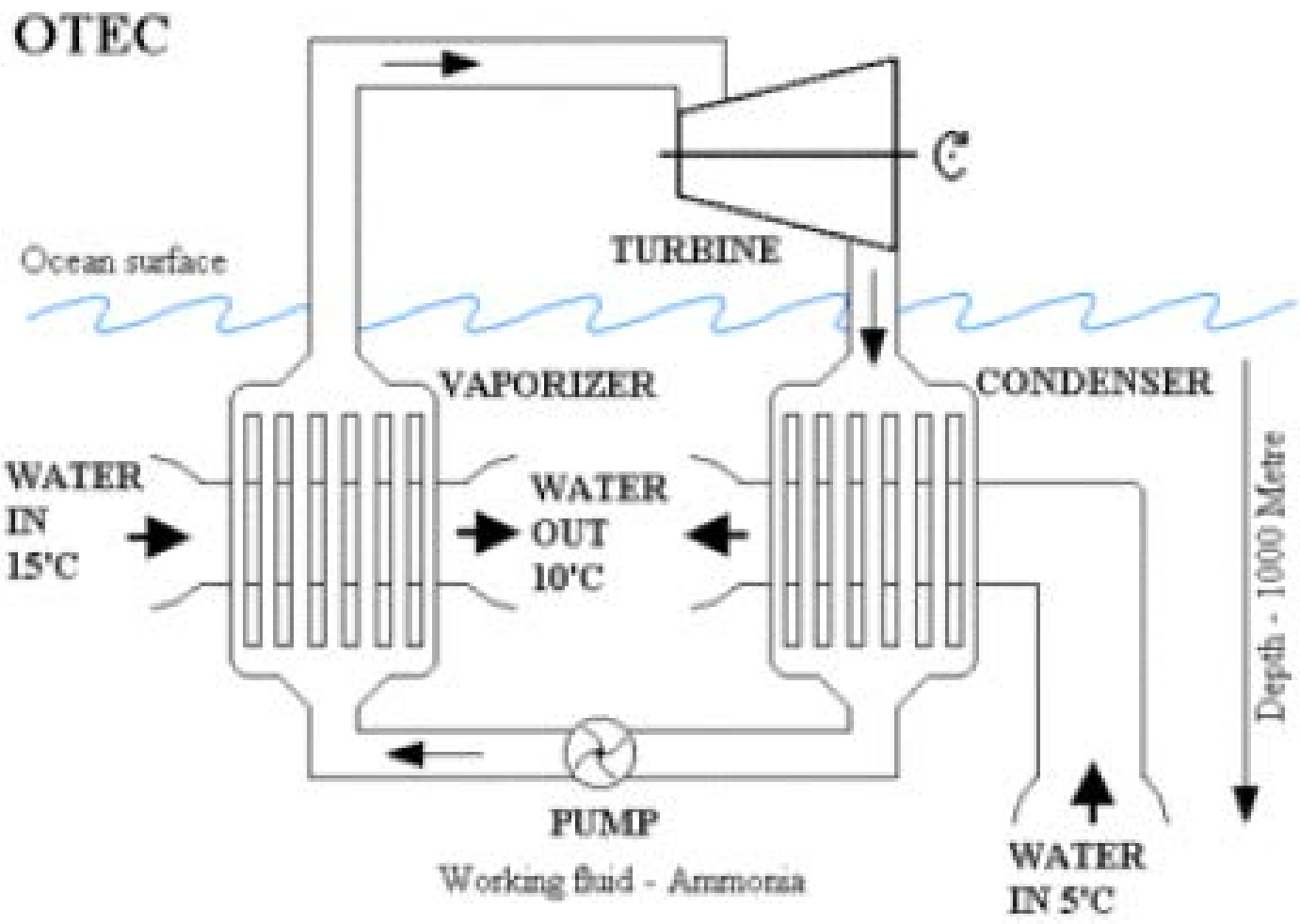
Three Technologies to Convert Ocean Current Energy



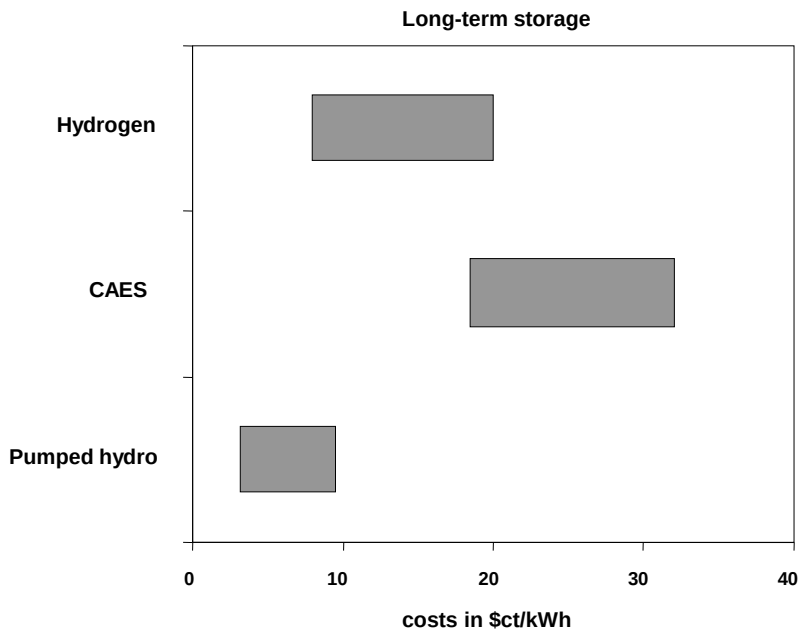
Schematic Representation of Mechanisms and Devices to Use Wave Energy

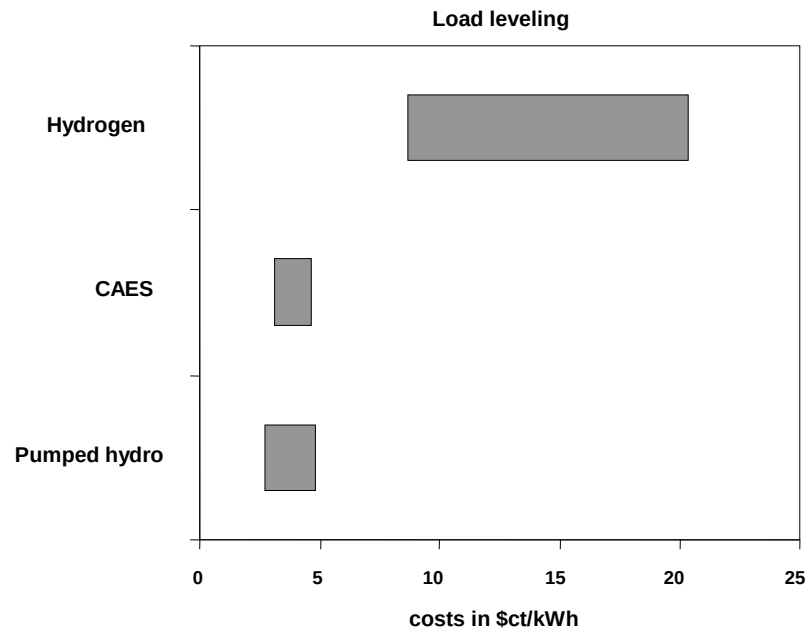


A Closed Cycle OTEC Power Plant

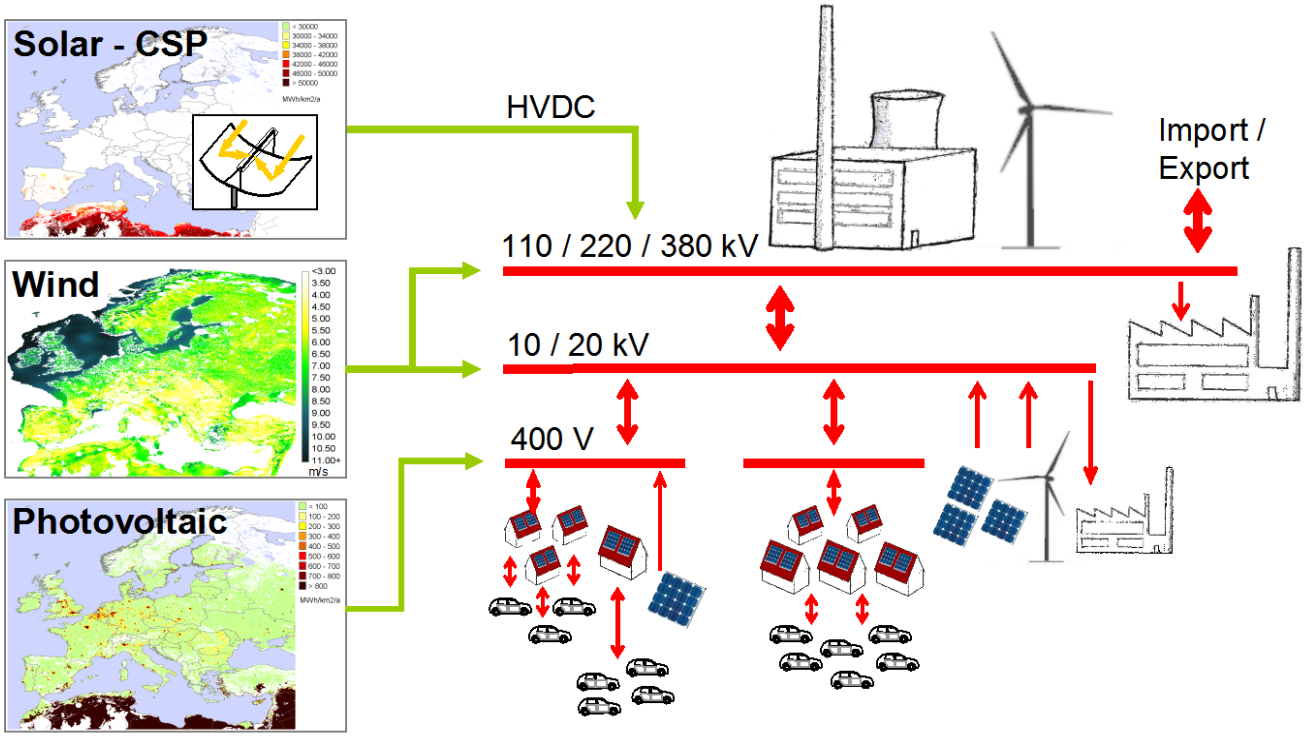


Electricity Storage Costs for Different Storage Options

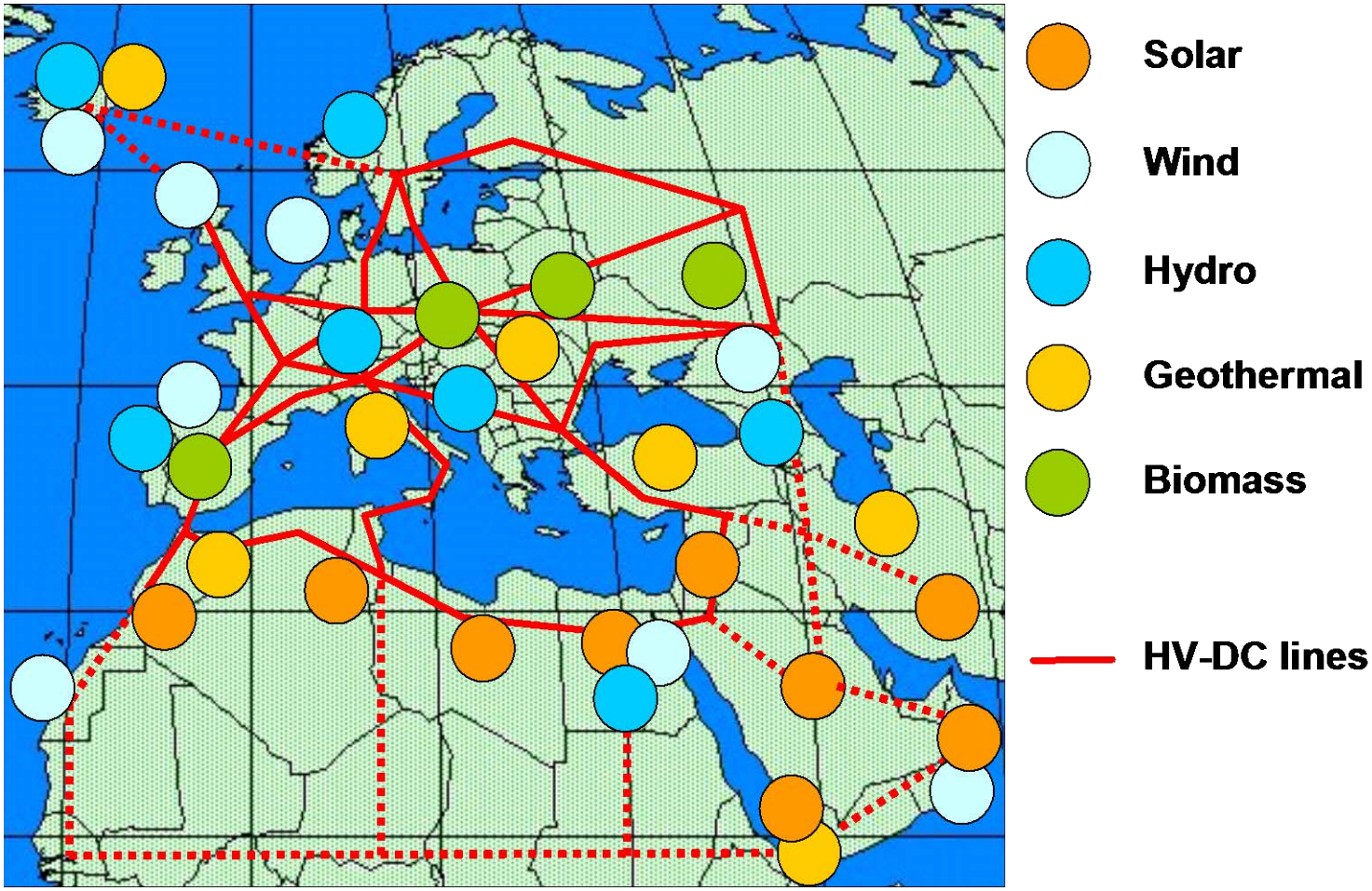




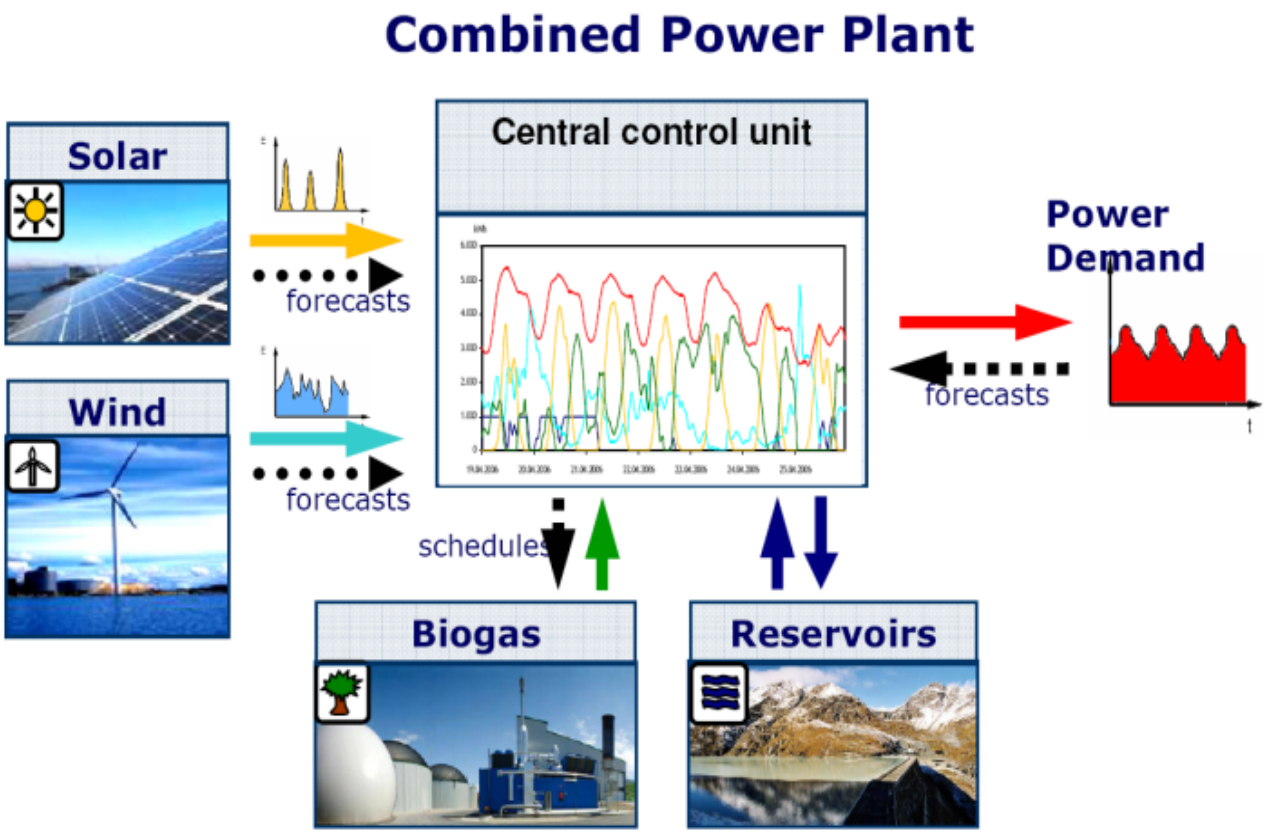
Integration of Renewables and Electric Vehicles into a Supply System



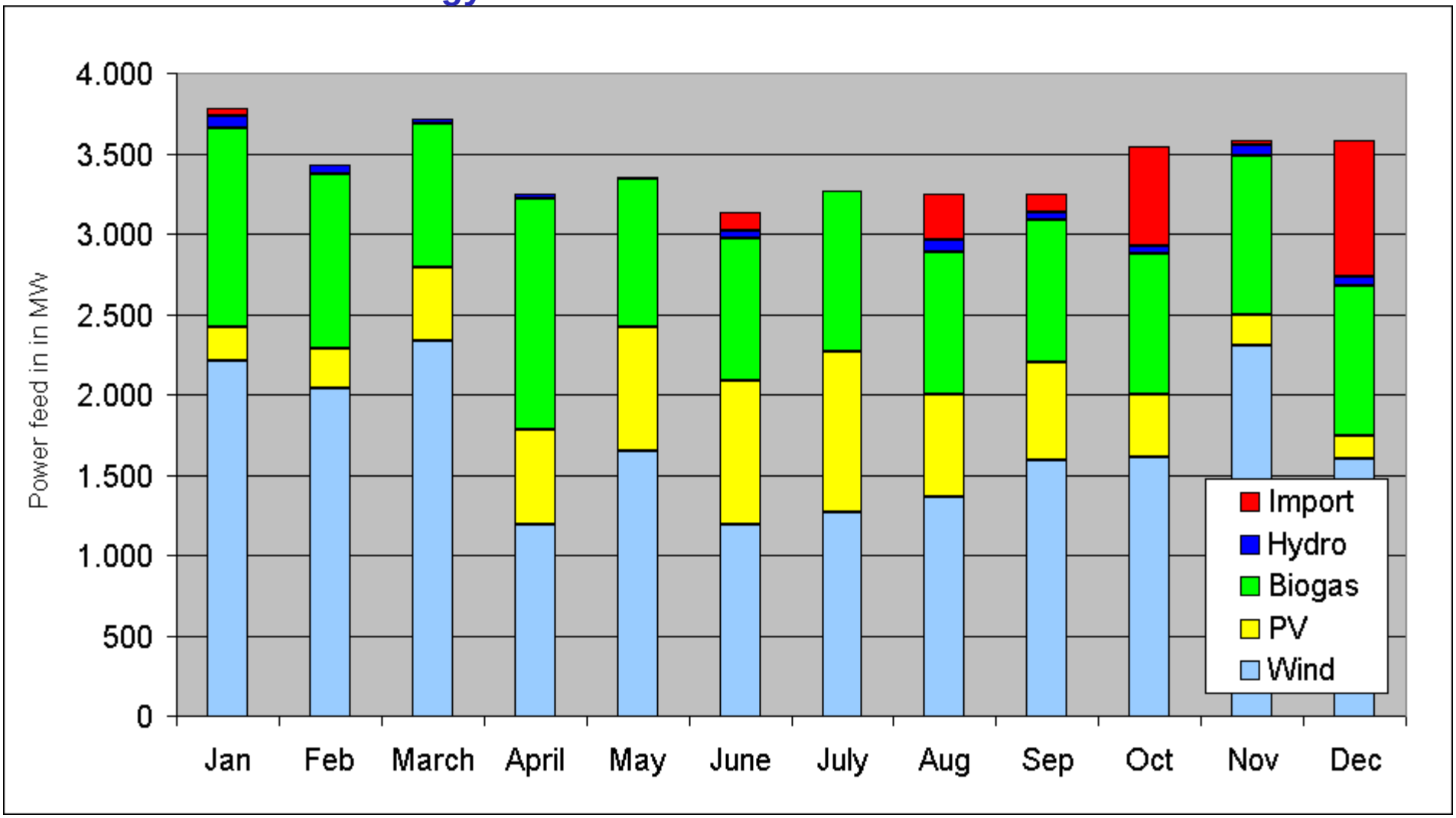
Concept of a HVDC-based Transcontinental "Super-grid"



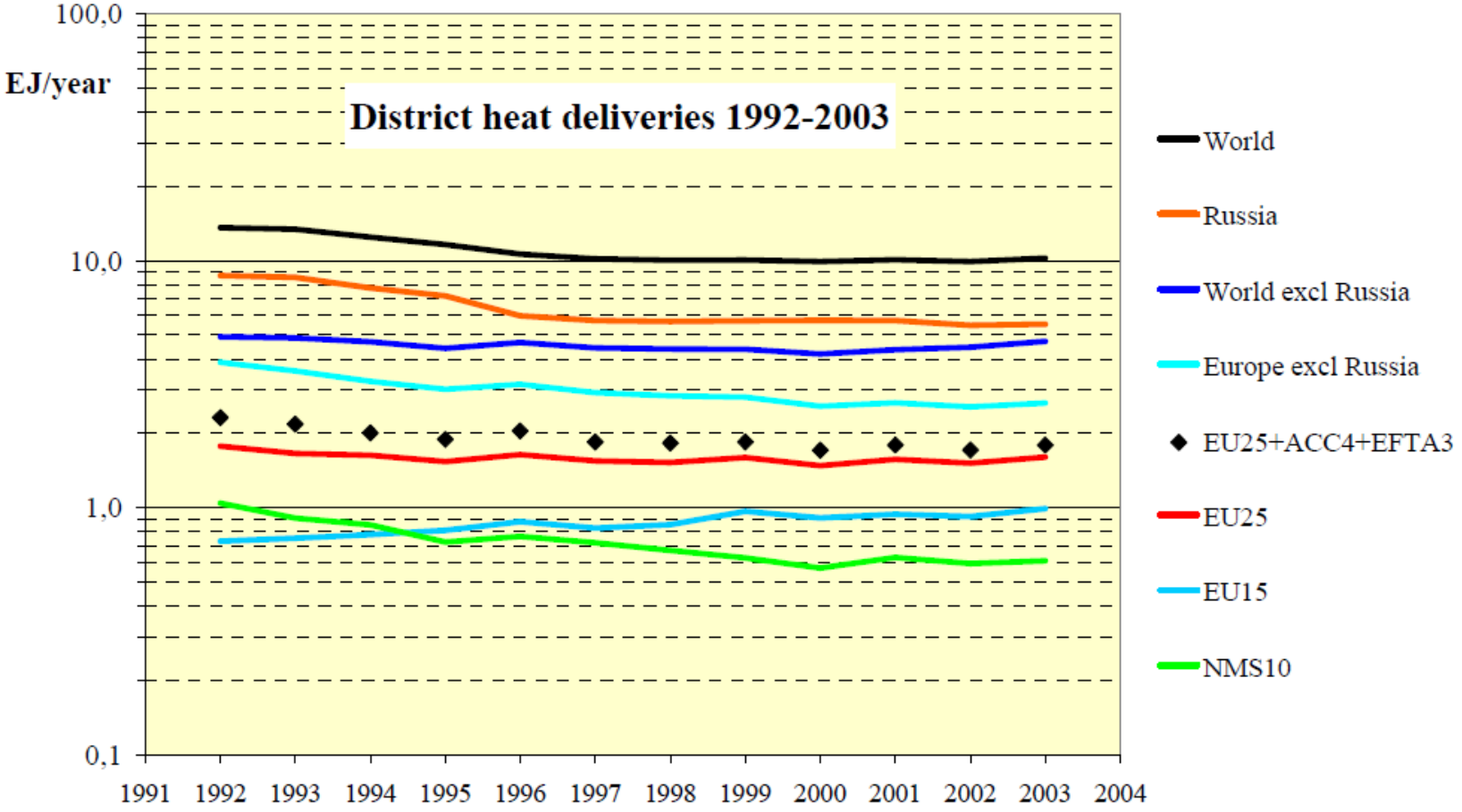
The Renewable Combi-Plant



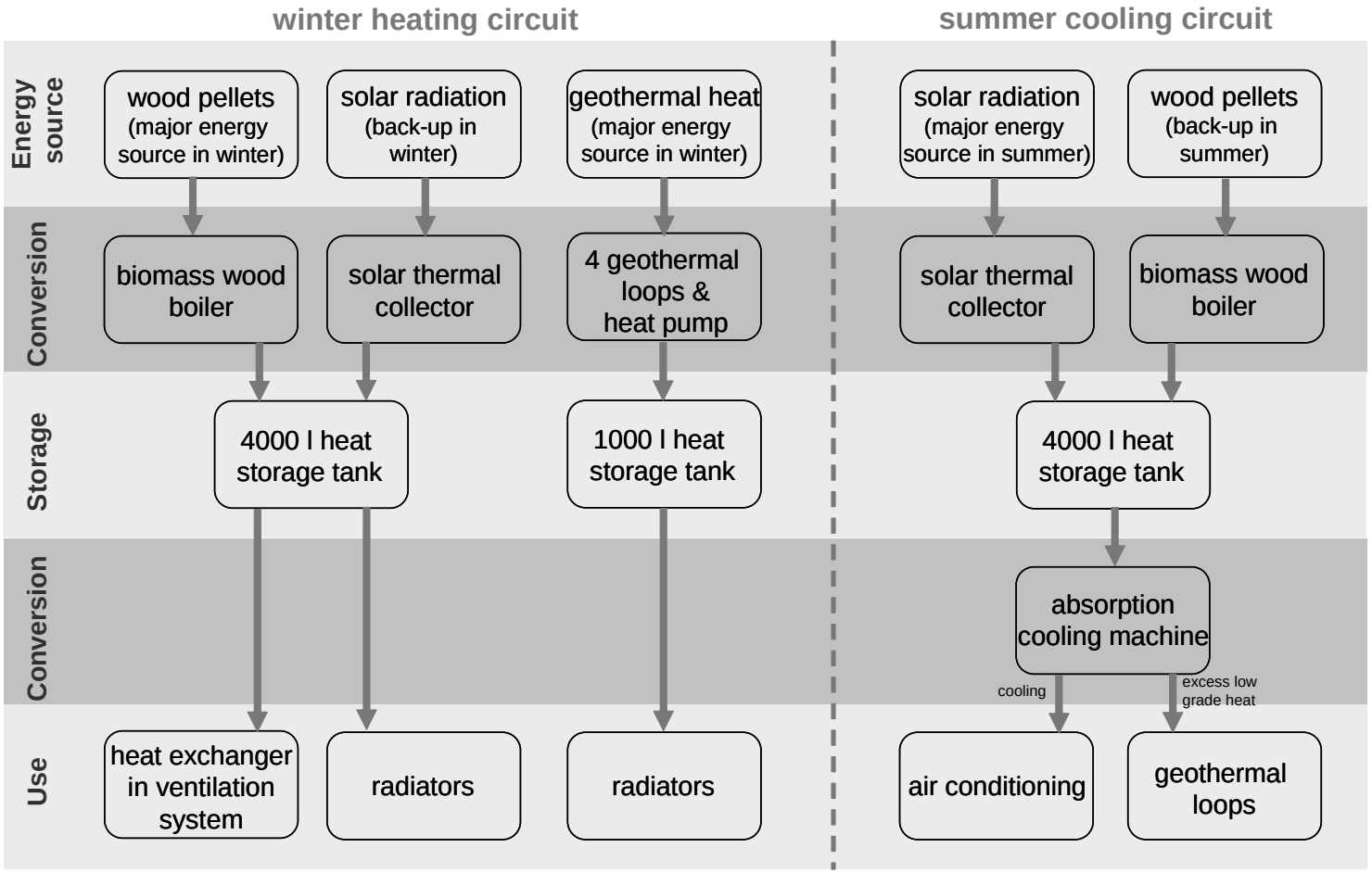
Renewable Energy Mix of the Combi-Plant: Simulation for 2006



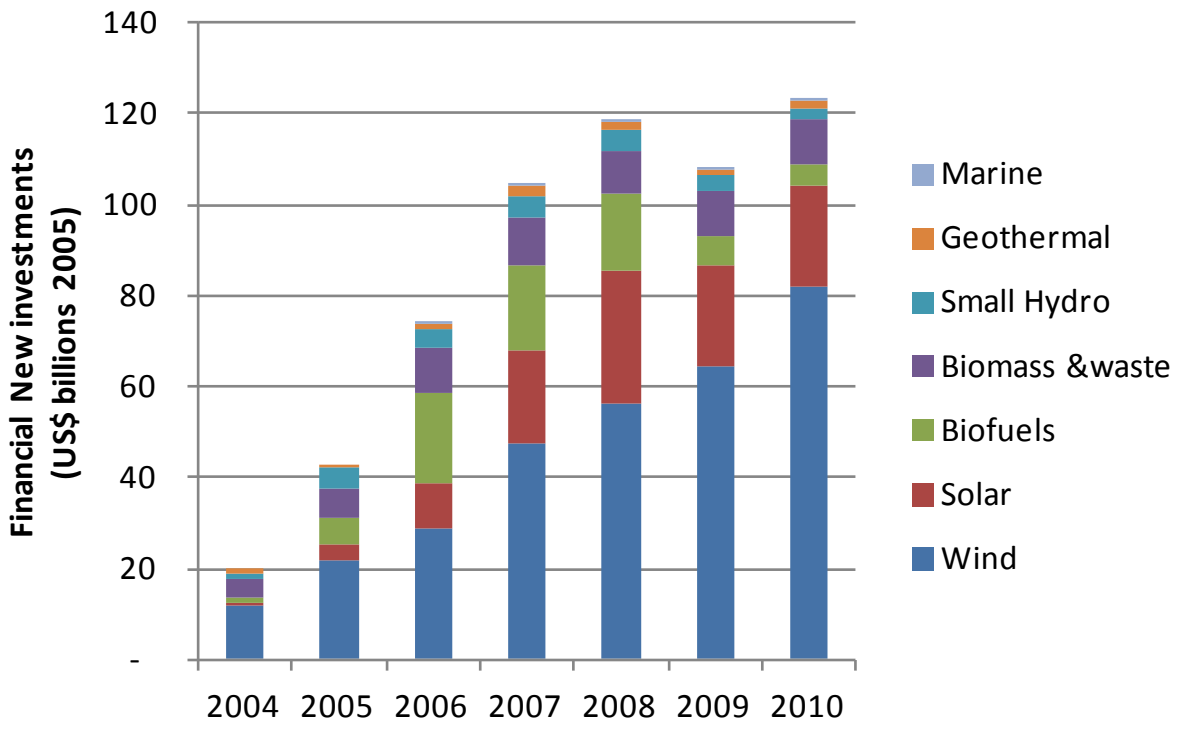
Development of District Heat in Various Parts of the World, 1992-2003



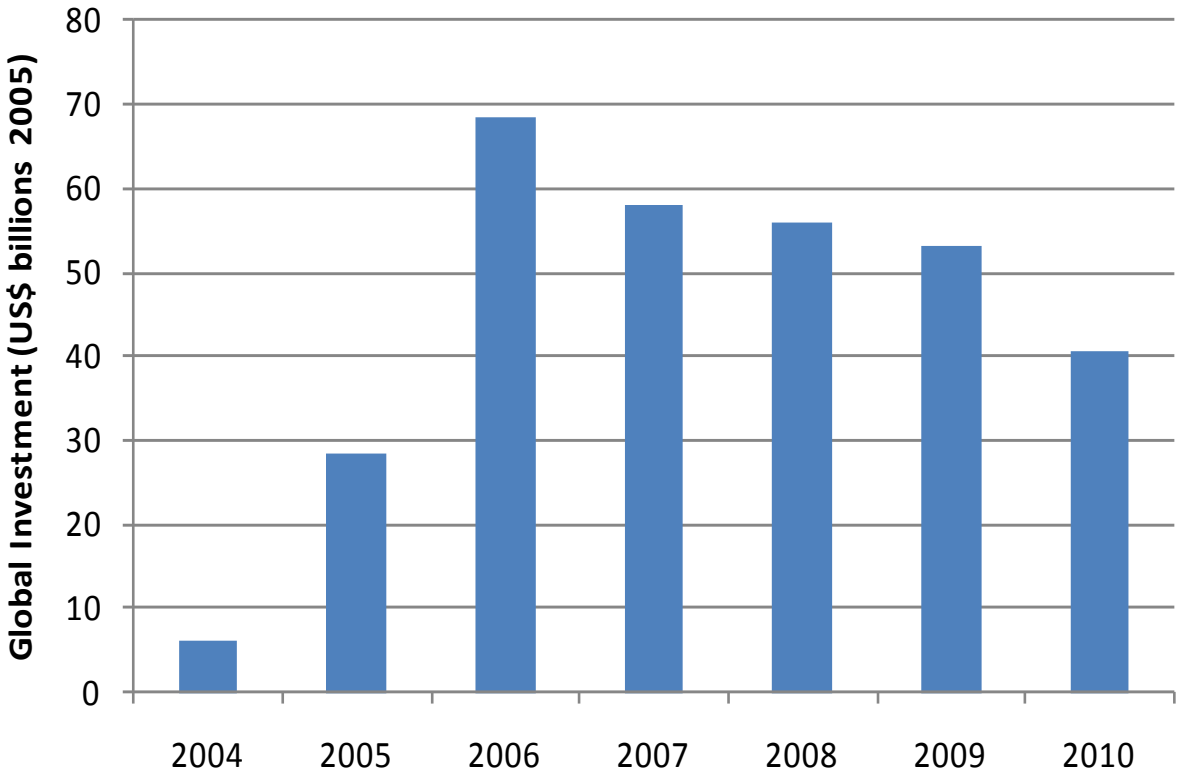
Renewable Heating and Cooling System in the Renewable Energy House, Brussels, Belgium



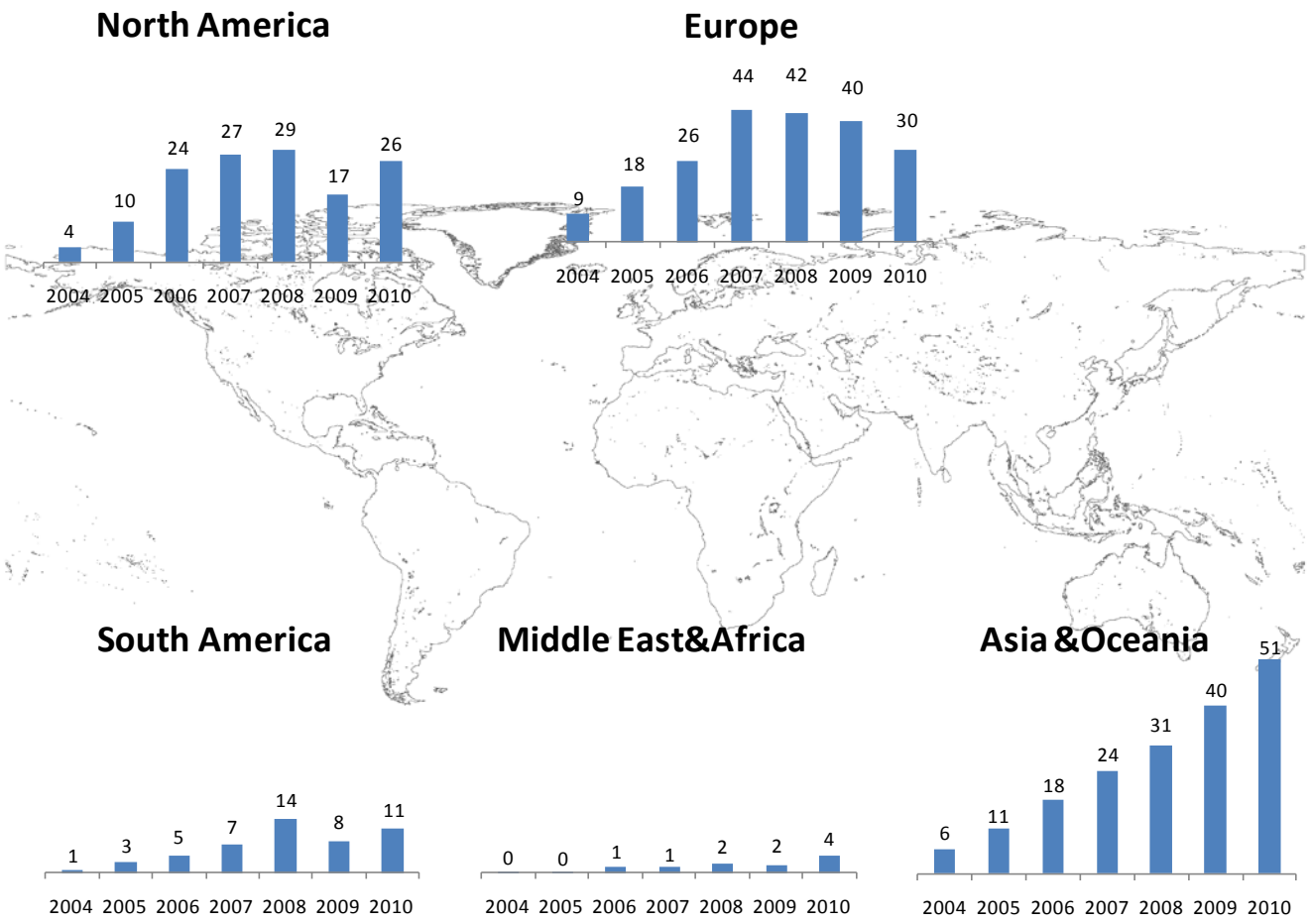
Financial New Investments in New Renewable Energy



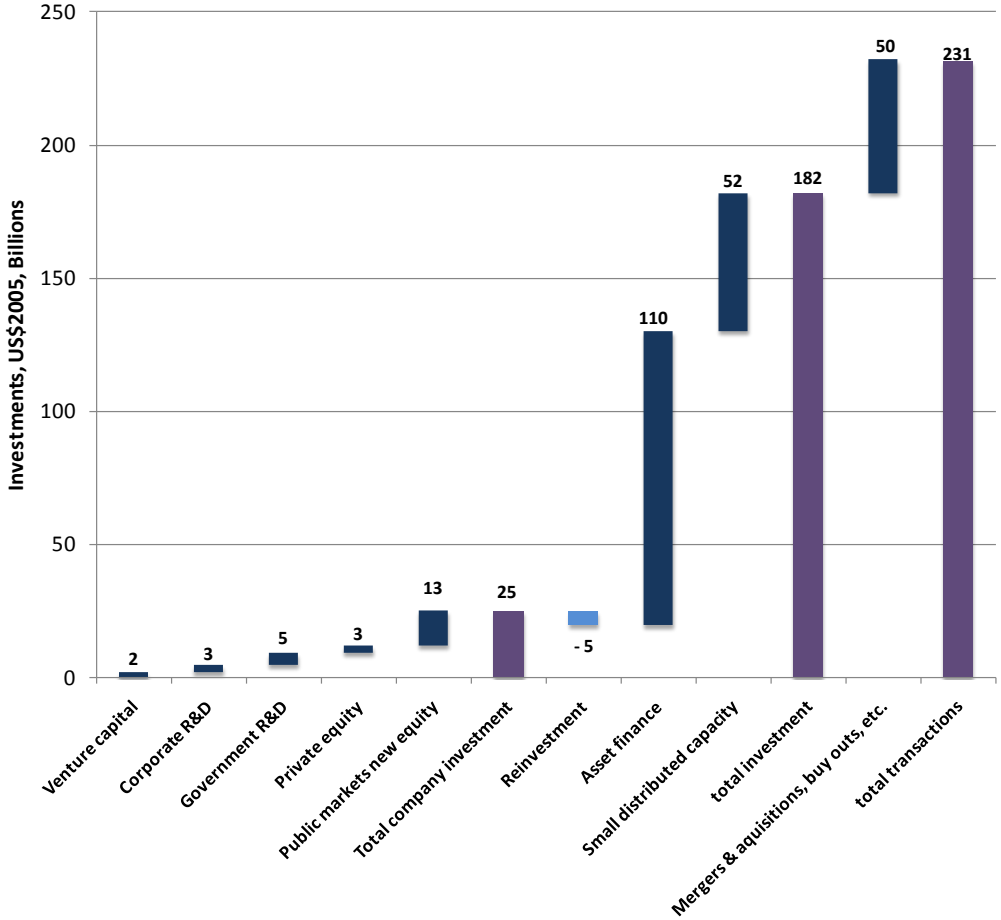
Investments in Larger-scale Hydropower, 2004-2010



New Financial Investments in Renewable Energy, By Region, 2004-2010



Global Transactions in Renewable Energy in 2010



Overview of Innovation System