



CLEAN ENERGY MINISTERIAL

Accelerating the Transition to Clean Energy Technologies



Solar and Wind

MINISTERIAL ROUNDTABLE “RENEWABLE ENERGY FOR SUSTAINABLE GROWTH AND EMPLOYMENT”

Pre-Read for Ministerial Roundtable

Clean Energy Ministerial 5
12 May 2014
10:30 a.m. – 12:30 p.m.
Seoul, Korea

MINISTERIAL ROUNDTABLE – KEY QUESTIONS

- Given the austerity measures applied in many countries today, is renewable energy deployment perceived as an opportunity for sustainable growth and employment creation or as additional strain on national budgets?
- Given potential impacts of fossil fuels as well as renewable energy on a country's economic activity and trade balance, does a renewables-based energy supply result in a net economic benefit?
- Is the potential for value creation beyond the manufacturing segment of the value chain of wind and solar energy technologies, such as installation, operation and maintenance, fairly recognised and included in political priorities?
- What are the instruments from various policy areas that facilitate the development of a domestic renewable energy sector and maximise the economic benefits of renewable energy deployment? What is the right mix of instruments?
- In recent years, some countries have imposed local content requirements. What are the lessons learnt from these measures? What alternatives exist to support the development of a nascent domestic industry while minimizing costs and economic inefficiencies?
- What lessons can be learnt from developments in other sectors that have benefited from an enabling industrial policy?



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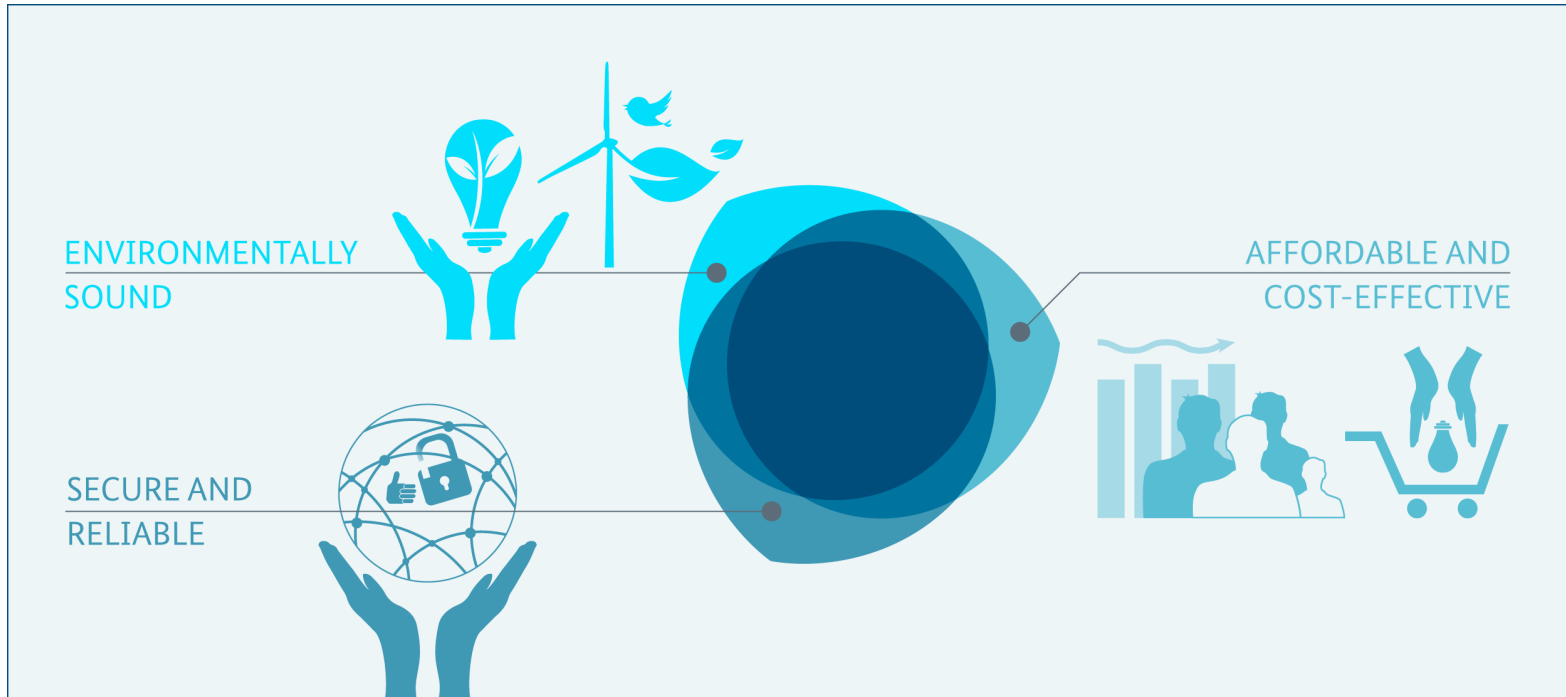
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SECTION I : DEVELOPMENT AND STATUS QUO OF RENEWABLE ENERGY TECHNOLOGIES



DRIVERS FOR RENEWABLE ENERGY DEPLOYMENT

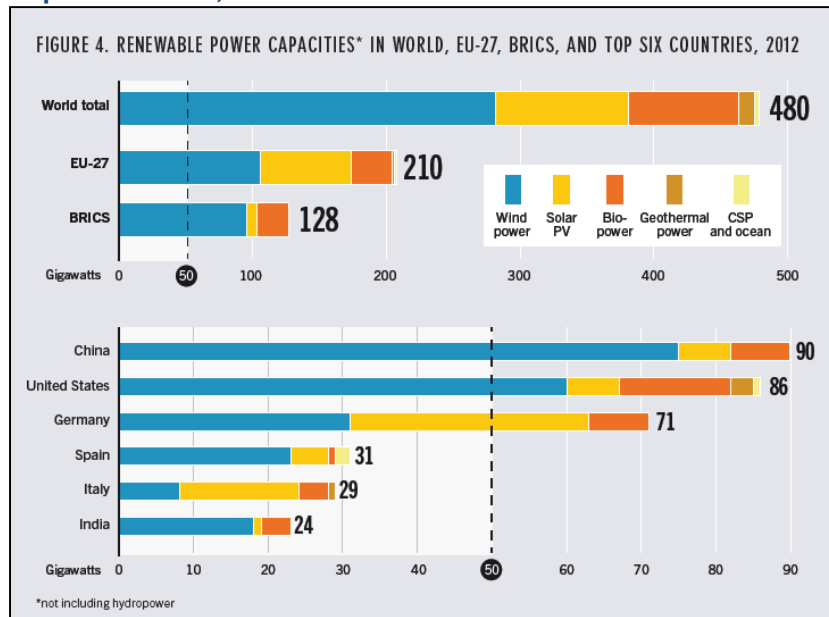


- Renewable energy deployment significantly contributes to an environmentally sound, secure and reliable, affordable and cost-effective energy supply
- Energy access can be significantly broadened with renewable energy technologies
- Positive economic effects, such as employment and trade balance, have gained importance as rationale for policymakers to foster renewable energy deployment

STATUS OF RENEWABLE ENERGY DEPLOYMENT

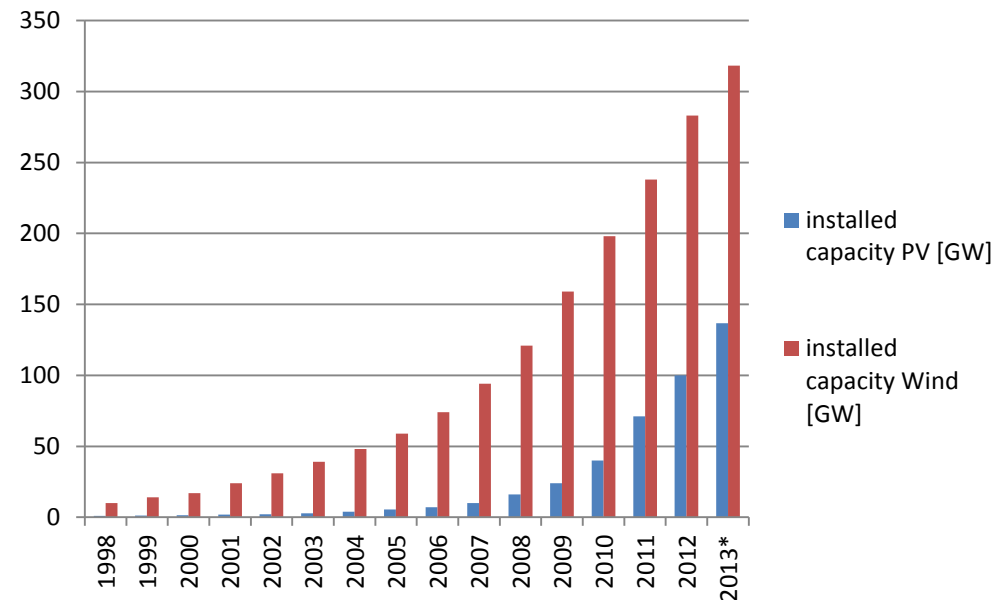
- Renewable energy deployment has seen remarkable growth in recent years
- Renewable energy technologies accounted for 43.6% of newly added electricity generation capacity in 2013
- Total renewable energy capacity worldwide >1,470 GW in 2012
- Total installed capacity 2013: PV = 137 GW; Wind = 318 GW

Renewable Power Capacities in World, EU 27, BRICS, and Top-6-Countries, 2012



Source: REN21 GSR 2013

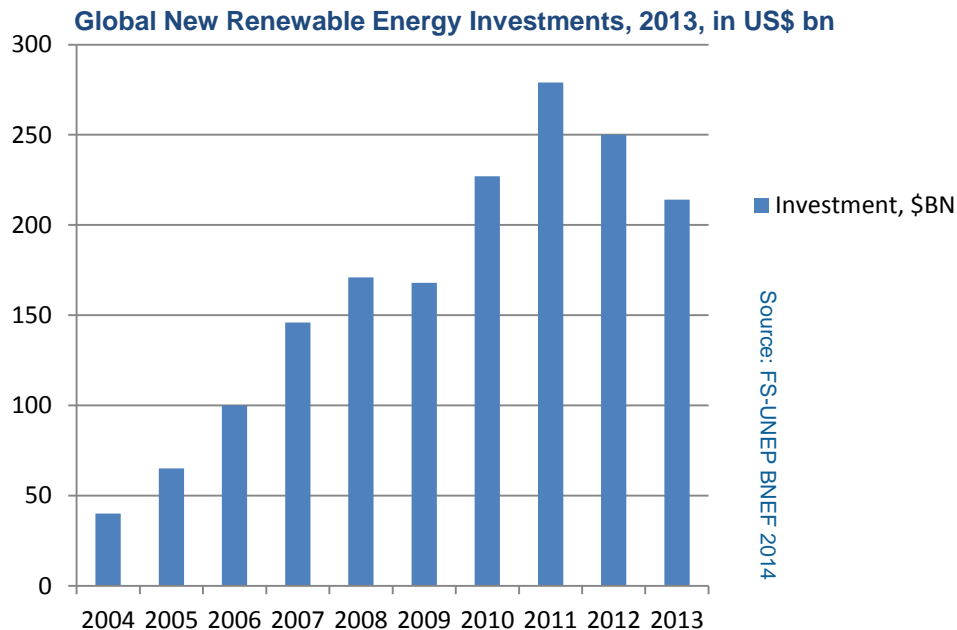
Global Installed Capacities of Solar PV and Wind Energy Technologies, 2013, in Gigawatts (GW)



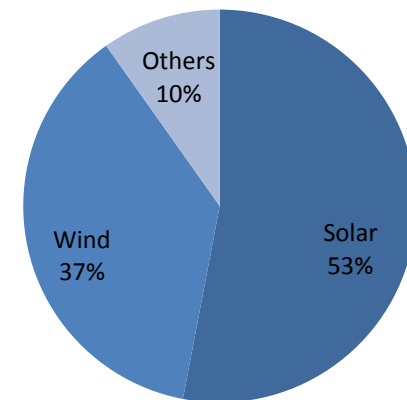
Source: REN21 GSR 2013; EPIA 2014; GWEC 2014

RENEWABLE ENERGY INVESTMENTS

- Investment levels declined for the second successive year in 2013 (-14% from 2012, -23% from record-2011):
 - Setbacks to investment in China (-6%), US (-10%), and - most significantly - Europe (-44%)
 - Two main reasons for fall in investments: Uncertainties about policy support and reduction in technology costs (particularly solar PV)
- Solar PV and wind energy are the two dominant renewable energy sectors regarding new investment flows



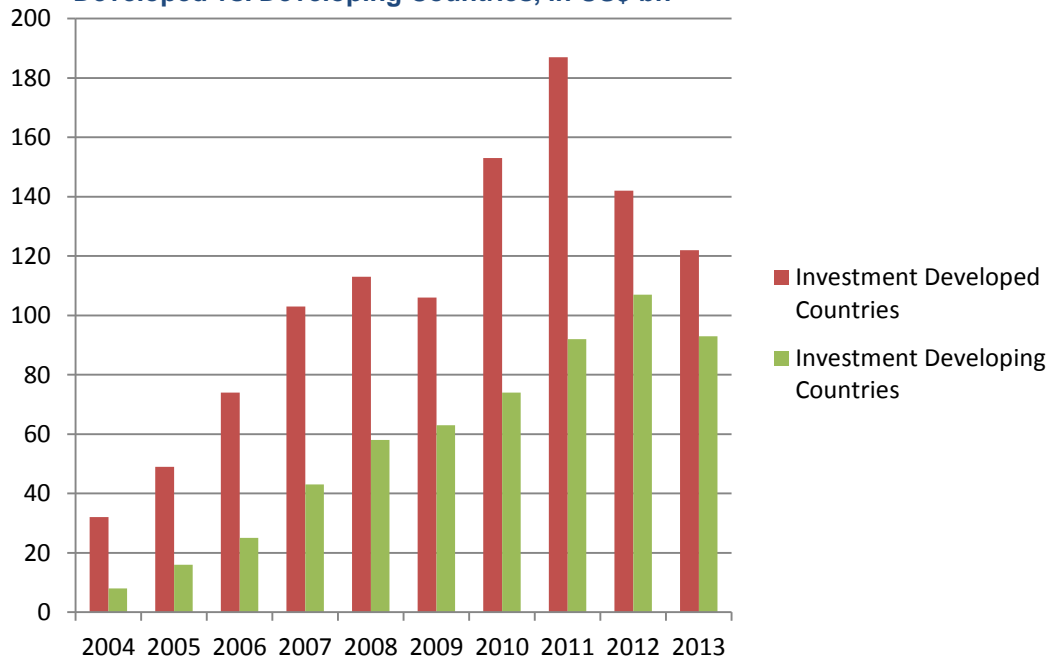
Global New RE Investment, %-Share by Sector, 2013



EMERGING ECONOMIES ON THE RISE

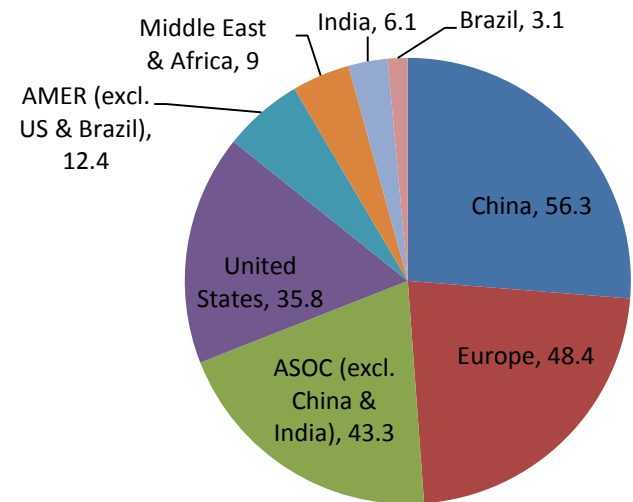
- Growing share of emerging economies in global renewable energy investments underlines their increasing importance for the renewable energy sector
- 2013 (-14%) saw an interruption to the previously 8-year rising trend of renewable energy investment in developing economies
- 2013 was the first year ever that China invested more in renewable energy technologies than the whole of Europe

Global New Investment in Renewable Energy: Developed vs. Developing Countries, in US\$ bn



Source: FS-UNEP BNEF 2014 [* Developed countries here refers to OECD countries excl. Mexico, Chile, and Turkey.]

Global New Investment in Renewable Energy by Region, in US\$ bn

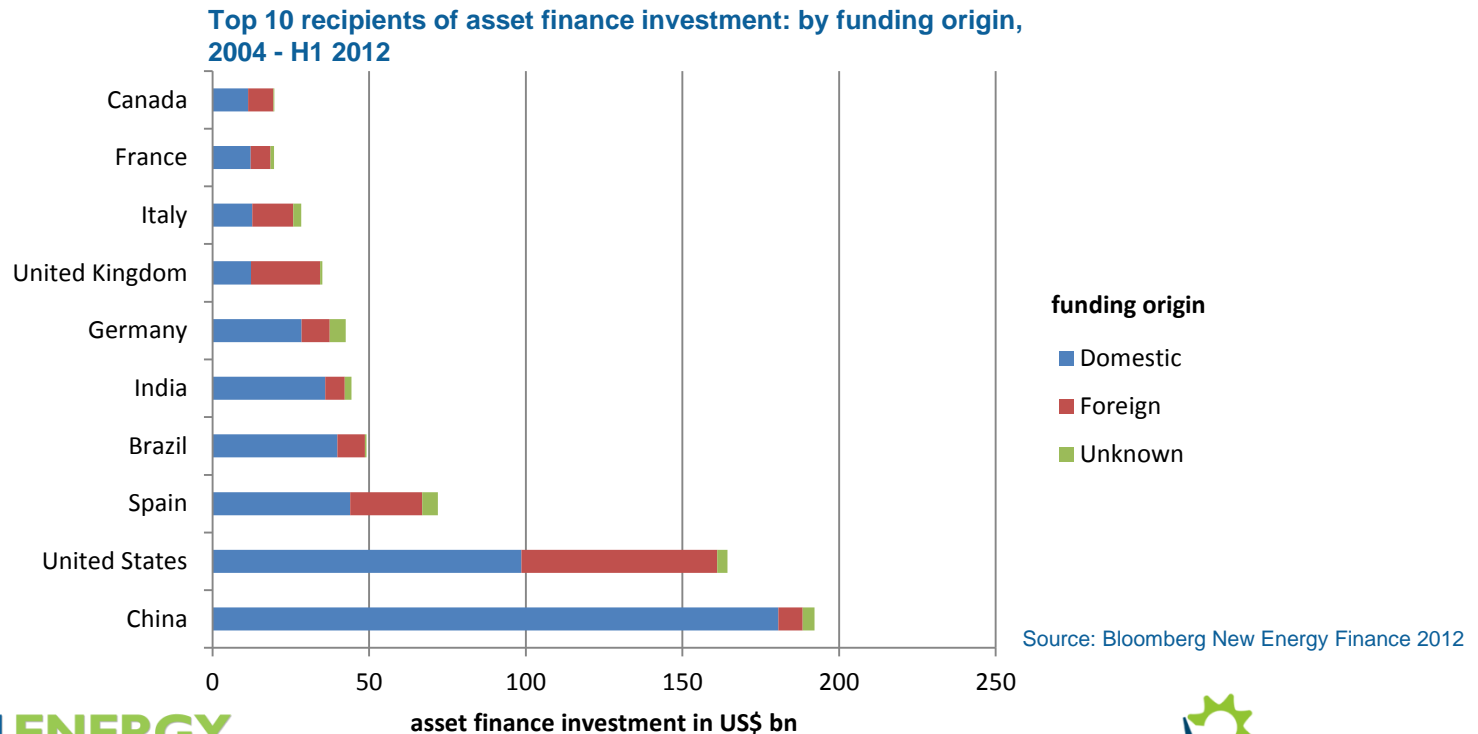


Source: FS-UNEP BNEF 2014



INTERNATIONAL INVESTMENT FLOWS

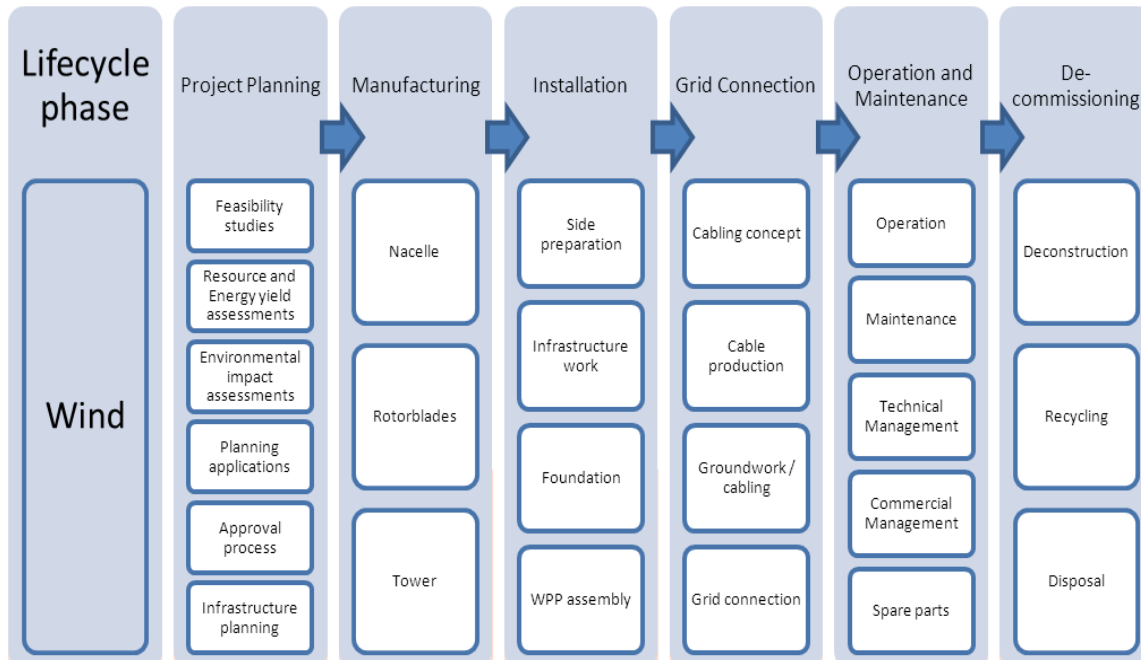
- Cross-border investments in the renewable energy sector are increasing, and the number of countries attracting investments is rising
- From 2004-2012, about 1/3 of asset finance for investment in renewable energy came from international investors
- Investment is shifting towards emerging economies and developing countries: In 2012, emerging economies' share of cross-border investment inflows for the first time exceeded 25%



VALUE CHAINS OF SOLAR AND WIND ENERGY

- Value is created in all segments of the value chain
- Solar PV and wind industry value chains are increasingly globalized, allowing manufacturers cost-optimized sourcing across countries
- Barriers to entry are comparatively lower in parts of the downstream segments of the value chain
- Potential for domestic value creation depends on the development status of the particular economy's renewable energy sector

Example: Sub processes & products in the segments of the wind energy value chain



Source: econValue 2014



RENEWABLES TO MITIGATE CLIMATE CHANGE

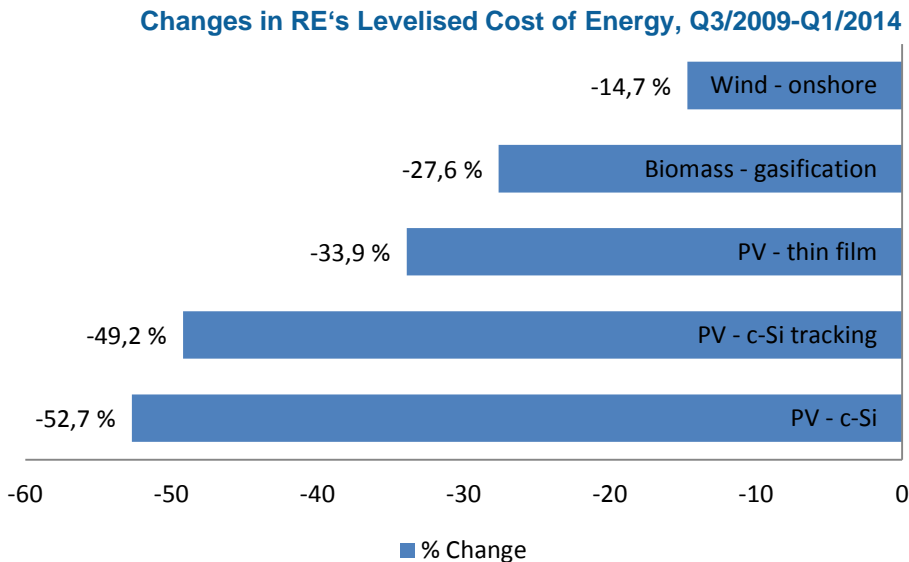
- Investments in renewable energy need to be massively scaled up in the coming years to satisfy demand and to keep a chance to achieve the 2°C-target
- Global energy demand is set to increase significantly in coming decades (WEO 2013, 2011-2035: „New Policies“: +33%; „450 Scenario“: +14%)
- According to one estimate, power generation assets will need investments of over US\$11 trillion to 2030, 50% of which for wind and solar

World Renewable energy use according to WEO 2013 “New Policies” and “450” (=achieving 2°C-target) Scenarios

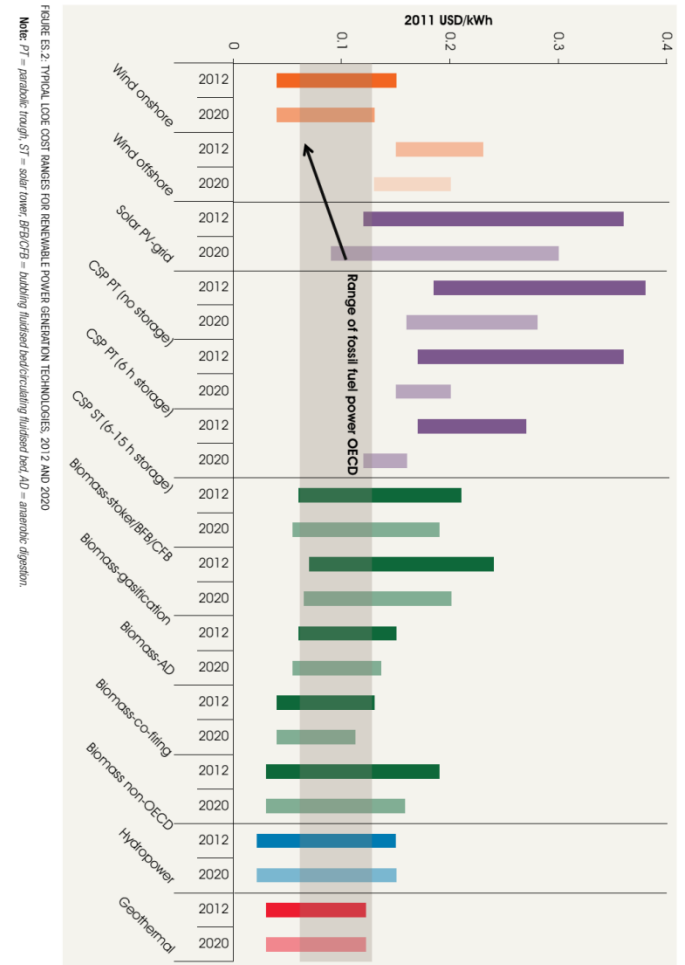
Year	2011	New Policies Scenario		450 Scenario	
		2020	2035	2020	2035
Primary Energy Demand (Mtoe)	1 727	2 193	3 059	2 265	3 918
Share of Global Total Primary Energy Demand	13%	15%	18%	16%	26%
Electricity Generation (TWh)	4 482	7 196	11 612	7 528	15 483
Share of Total Generation	20%	26%	31%	28%	48%
Out of which:					
Wind Electricity Generation (TWh)	434	1 326	2 774	1 441	4 337
Solar PV Electricity Generation (TWh)	61	379	951	422	1 389
Source: International Energy Agency, World Energy Outlook 2013					

RE – DECLINING COST OF ELECTRICITY

- Wind and solar PV technologies have achieved rapid cost reductions in recent years
- Sharply reducing costs of solar PV are one reason for declining RE investments: 39GW of capacity were installed in 2013 for less total investment than 31GW in 2012
- Wind and solar PV projects are built in growing number of locations around the world without subsidy support



Renewables' Levelised Cost of Energy 2012 and 2020 projection compared to fossil fuel averages



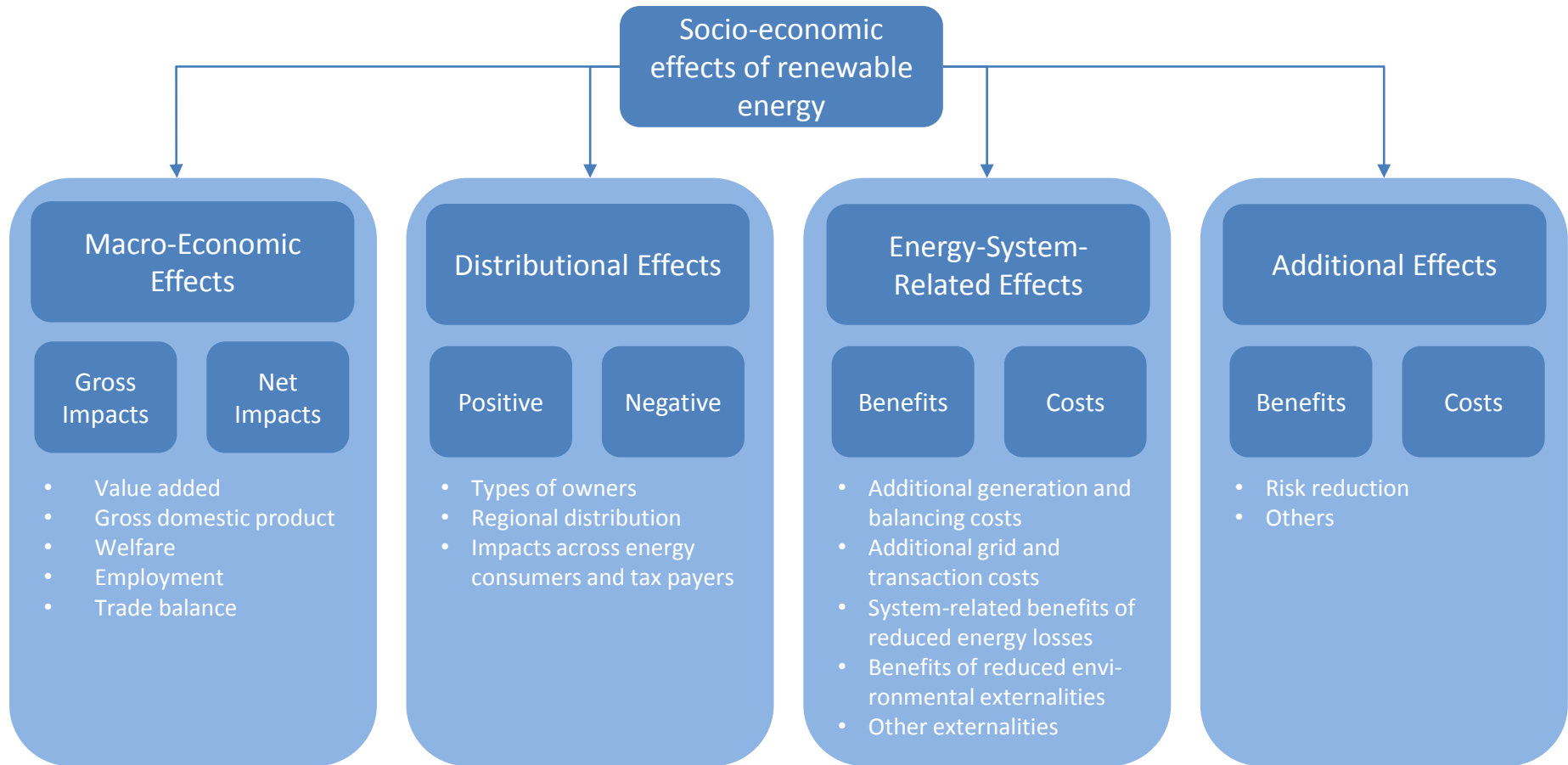
Source: IRENA 2013, Renewable Power Generation Costs in 2012



SECTION II : SOCIO-ECONOMIC EFFECTS OF RENEWABLE ENERGY TECHNOLOGIES



OVERVIEW: SOCIO-ECONOMIC EFFECTS



Source: econValue 2014

EXAMPLE OF MACRO-ECONOMIC EFFECTS: EMPLOYMENT

- In 2013, over 6.5 million people were estimated to be employed in the global renewable energy sector
- Largest employers: solar PV, biofuels, wind, and biomass sectors
- Employment effects are not limited to economies with high shares of manufacturing, but also occur in the downstream segments of the value chain

	World	China	Brazil	United States	India	Bangladesh	European Union		
							Germany	Spain	Rest of EU
Biomass	782	240		152	58		52	44	210
Biofuels	1,453	24	820	236	35		26	3	82
Biogas	264	90			85	9.2	49	0.5	19
Geothermal	184			35			17	1.4	82
Hydropower (Small)	156		12	8	12	4.7	13	1.5	18
Solar PV	2,273	1,580		143 ^j	112	100	56	11	153
CSP	43						1	28	0
Solar Heating/ Cooling	503	350	30		41		11	1	31
Wind Power	834	356	32	51	48	0.1	138	24	166
TOTAL	6,492	2,640	894	625	391	114	371	114	760

Source: IRENA Renewable Energy and Jobs – Annual Review 2014

in 1000's



EXAMPLE OF DISTRIBUTIONAL EFFECTS: REGIONAL VALUE ADDED

- Economic value generated by a hypothetical German model municipality of 75,000 inhabitants*:
 - A total of 9.3 million € value added (of which 3.9 m € solar power, 2.2 m € wind power, 1.2 m € bioenergy, 2 m € others), comprised of:
 - 4.4 m € after-tax profits of participating enterprises
 - 4.1 m € net income of employees
 - 0.8 m € municipal tax revenues
 - 166 people employed (direct and indirect jobs)
- In total, continuous effects in operation & maintenance and system operation are larger than one-time effects in manufacturing and installation (5 vs. 4.3 m €)
- Actual value creation effects at municipal level vary, as RE deployment and manufacturing differ across municipalities

* Underlying assumptions: 2011 average installed generating capacity for various RE technologies; 2011 average manufacturing capacity

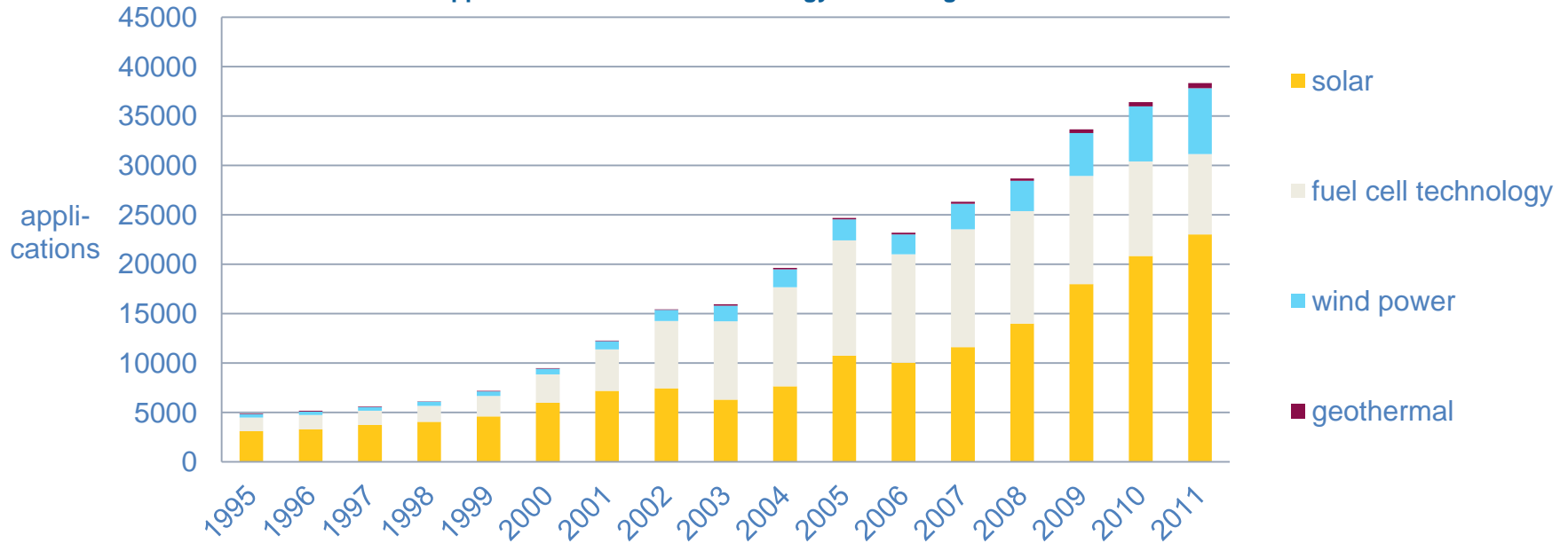
Source: Heinbach et. al. 2014



EXAMPLE OF ENERGY-SYSTEM-RELATED EFFECTS: TECHNOLOGICAL INNOVATION

- Constant growth of patent applications highlights the innovation potential of renewable energy technologies
- Beyond technical innovations, renewable energy deployment also creates product, process, marketing (or service) and organizational innovations

Worldwide Patent Applications for Renewable Energy Technologies from 1995 to 2011



Source: World Intellectual Property Organization 2012



SECTION III : POLICIES TO MAXIMIZE VALUE CREATION FROM DEPLOYMENT



POLICIES TO MAXIMIZE VALUE CREATION

Enabling policy framework for RE

- Vision and strategy on renewable energy sector
- Instruments addressing demand, supply and complementary areas (R&D, education & training, etc.)
- Implementation & processes to re-evaluate and elaborate strategies, targets and instruments, ensuring stakeholders participation

RE-sector challenges to be met by policy mix

- Need for long-term planning given comparatively higher technology risks
 - Need for adaptation to fast-paced market developments to ensure effective and efficient policies
 - Need to address trade-offs, e.g. distributional effects
 - Cross-sector coordination of policy instruments to address all issues along renewable energy technology value chains
- Cross-sector mix of policies that is adjusted to external factors (size & maturity of local industry, economic fundamentals, industry's international competitiveness, global & regional market dynamics, etc.)

Source: econValue 2014



RENEWABLE ENERGY DEPLOYMENT POLICIES

- Stable and reliable domestic policy frameworks have enabled massive scale-up in private investment in renewable energy technologies
- Effectiveness of deployment policies is highly context-dependent, e.g. on a country's industrial structures
- Tax reductions (84 countries), feed-in tariffs/premiums (71 countries), and auctions/ tenders (45 countries) are the most prevalent deployment policies, as well as biofuel obligations/mandates (54 countries) in the transport sector

Number of countries enacting specific renewable energy support policies, as of early 2013

	POLICY TYPE	NUMBER OF COUNTRIES
Fiscal Incentives	Tax reduction	84
	Renewable portfolio standard (RPS)	19
	Renewable heat obligation/mandate	20
Regulatory policies and targets	Biofuel obligation/mandate	54
	Feed-in tariffs ^a	71
	Net metering	31
Public financing	Auctions/tenders	45

^a Includes feed-in premiums.
Source: REN21, 2013.

Source: IRENA Renewable Energy and Jobs, 2013



LOCAL CONTENT REQUIREMENTS

- Local content requirements (LCRs), obliging investors to source certain shares of investments locally, have been implemented in approx. 15 countries, mostly since 2005
- LCR's effectiveness in increasing local value creation depends on:
 - Market size and stability
 - Appropriate, carefully chosen share of local content that is required
 - Early-stage participation of stakeholders (local and international businesses) in design of LCR scheme
 - Keep in focus long-term competitiveness, incentivize innovation and learning
 - Limited in time to early stages of industry development; various interdependencies and specificities of local context should be considered, e.g. impact of local sourcing on access to financing
- Potential trade and market distortions have caused controversy and resulted in several WTO proceedings
- May have adverse effects on downstream value creation by raising prices and reducing demand, reducing competitiveness and discouraging investments

Sources: econValue 2014; OECD 2013



INVESTMENT PROMOTION, TRAINING & EDUCATION

Investment promotion and technology transfer

- Effective investment promotion and facilitation measures play critical role for attracting foreign direct investment or if applicable also official development aid
- Governments need to strategically target and engage foreign investors
- Presence of / commitment to develop required domestic knowledge capabilities
- Enhancing capabilities via industrial upgrading / supplier development programmes and industrial clusters

Training and education

- Effective education and training policies are vital to support the sector and maximise value creation by ensuring availability of the skills needed
- Strategic planning for skill needs; supported by alignment of education and training policies with national renewable energy strategy
- Financing for renewable energy education, training and research; shared responsibility of public and private sector stakeholders
- Public financing of education or research institutes, PPPs or direct measures

Source: econValue 2014



RESEARCH & INNOVATION, POLICY MAKING

Research and Innovation

- Create policy tools to i.a. create and share knowledge, build competence, facilitate knowledge diffusion and creation collaborative networks
- Facilitate environment conducive to research and innovation, e.g.:
 - Robust national and international market for improved products or services
 - Strong links between basic and applied research centres, universities and private sector R&D

Policy making and implementation

- Long-term strategies can guide the setting of plans and allow for the integration of different goals; involve stakeholders and ensure public acceptance
- Political commitment to long-term strategies, based on learning and adaptation
- Precise and measurable targets should be set to operationalize policy objectives to enable monitoring, evaluation and allow for policy adjustments or adaptations
- Establish structured governance mechanisms/institutions for monitoring, capacity development and continuous learning
- Ensure high-level political mandate for institutions driving these processes

Source: econValue 2014



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