

Emerging Trends and Experience in Renewable Energy Policy

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SECTION 1
THE STORY OF RENEWABLE ENERGY IN A NUTSHELL

Key Messages

a. Renewable energy development over the last decade has been led by high income countries and emerging economies

b. As investments increased, technology costs lowered and markets developed

c. This has been a policy driven process, to some extent highly subsidized

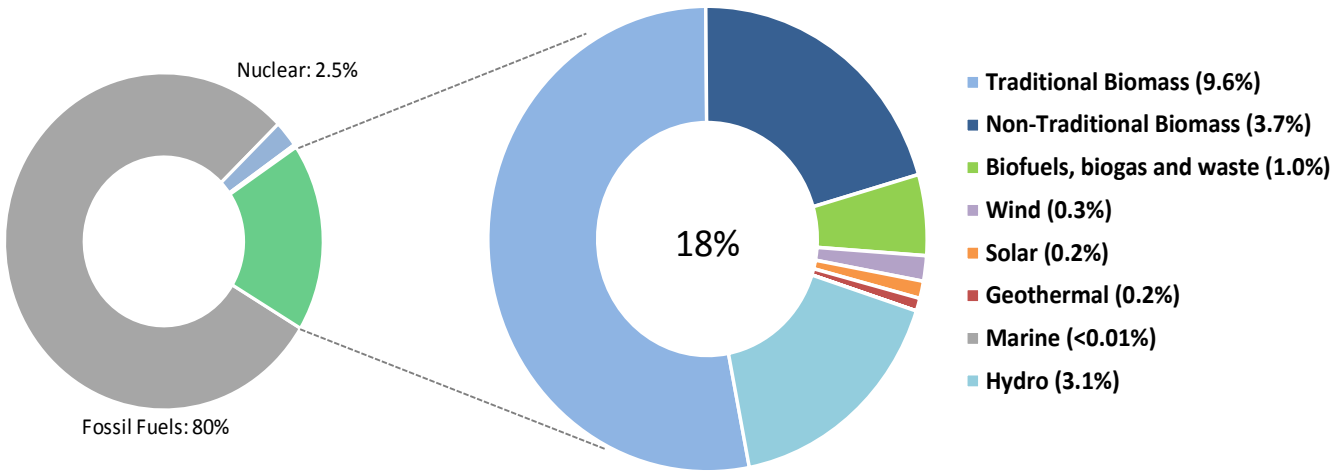
d. The technical potential for renewable energy is huge in the developing world

e. Renewable energy markets in the developing world are progressing slowly due to key economic, financial and technical/operational barriers

f. Policy will play a central role in addressing barriers and lowering risks

g. Developing countries are now learning from the pioneering development of RE in more developed countries

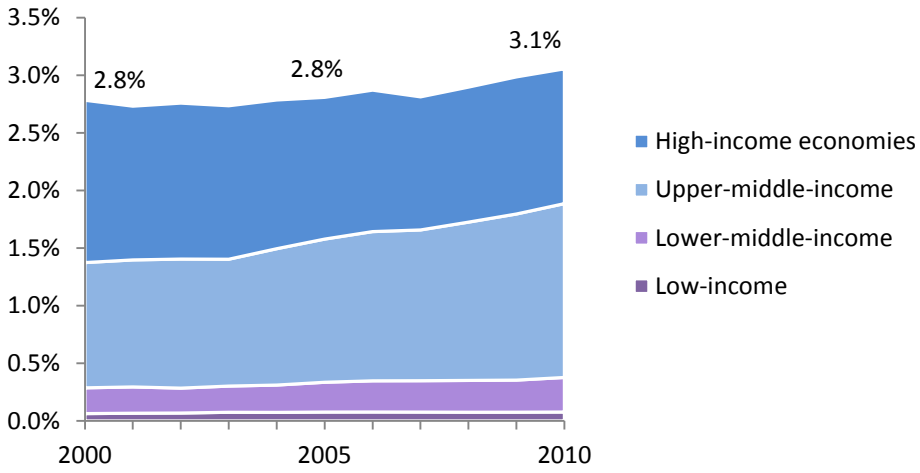
STORY OF RENEWABLE ENERGY DEVELOPMENT IN A NUTSHELL



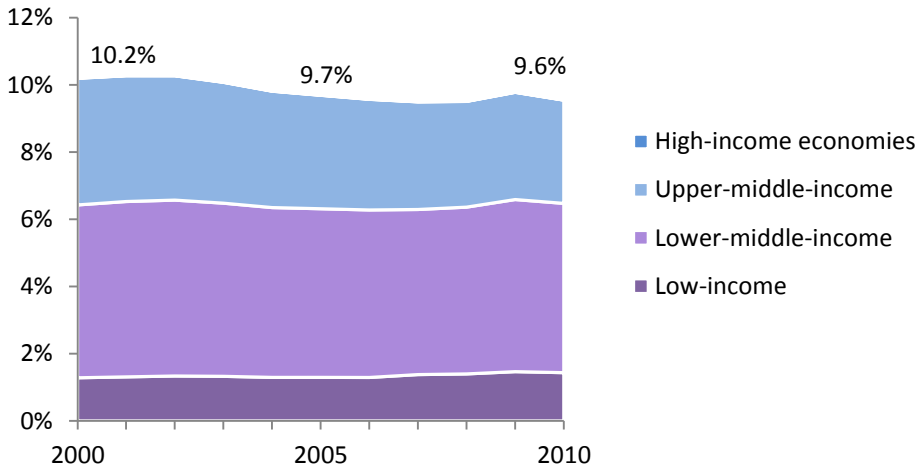
Source: IEA (2012)

- In 2010, RE sources supplied an estimated 18 percent of TFEC (1,421 Mtoe)
- More than 50 percent of this amount was traditional biomass
- The so-called new renewables contributed only 5.3 percent to TFEC
- Wind, solar, geothermal, marine, and biofuels/biogas/waste contributed only 1.7%
- About 80 percent of TFEC was consumed by developing countries: but almost all this consumption was in the form of traditional biomass and hydro
- 97 percent of “new renewables” was produced and consumed by high income and emerging economies: USA, Europe, Japan, Brazil, China and India

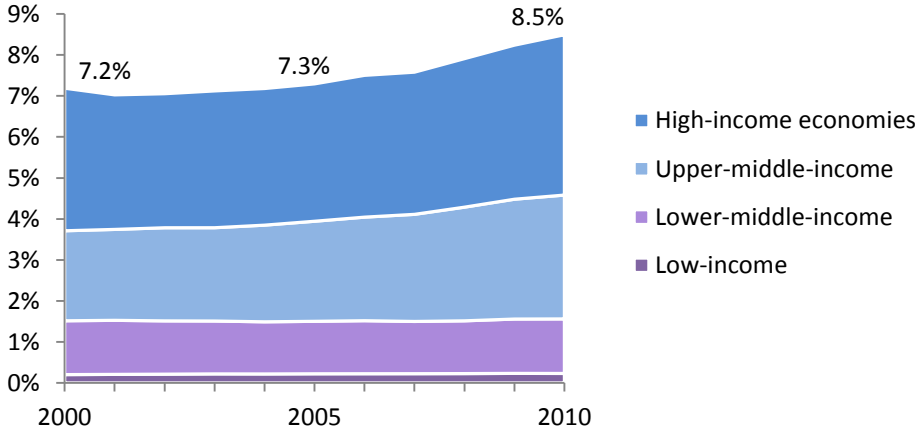
Share of Hydro in TFEC by Income Group



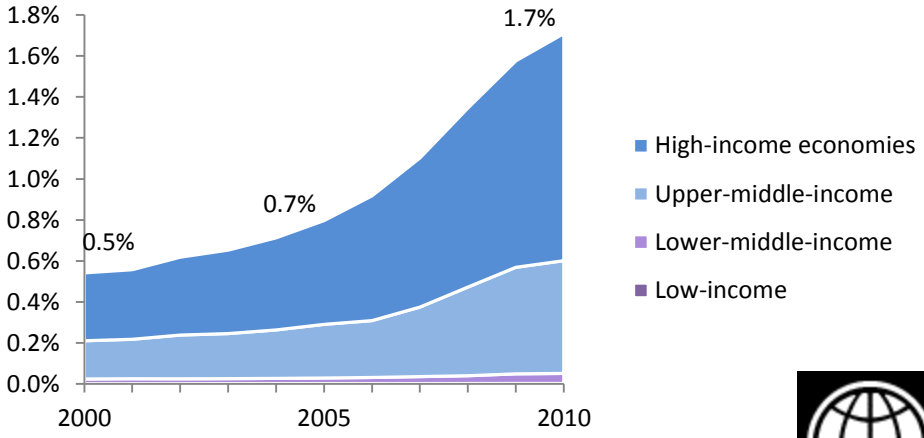
Share of Traditional Biomass in TFEC by Income Group



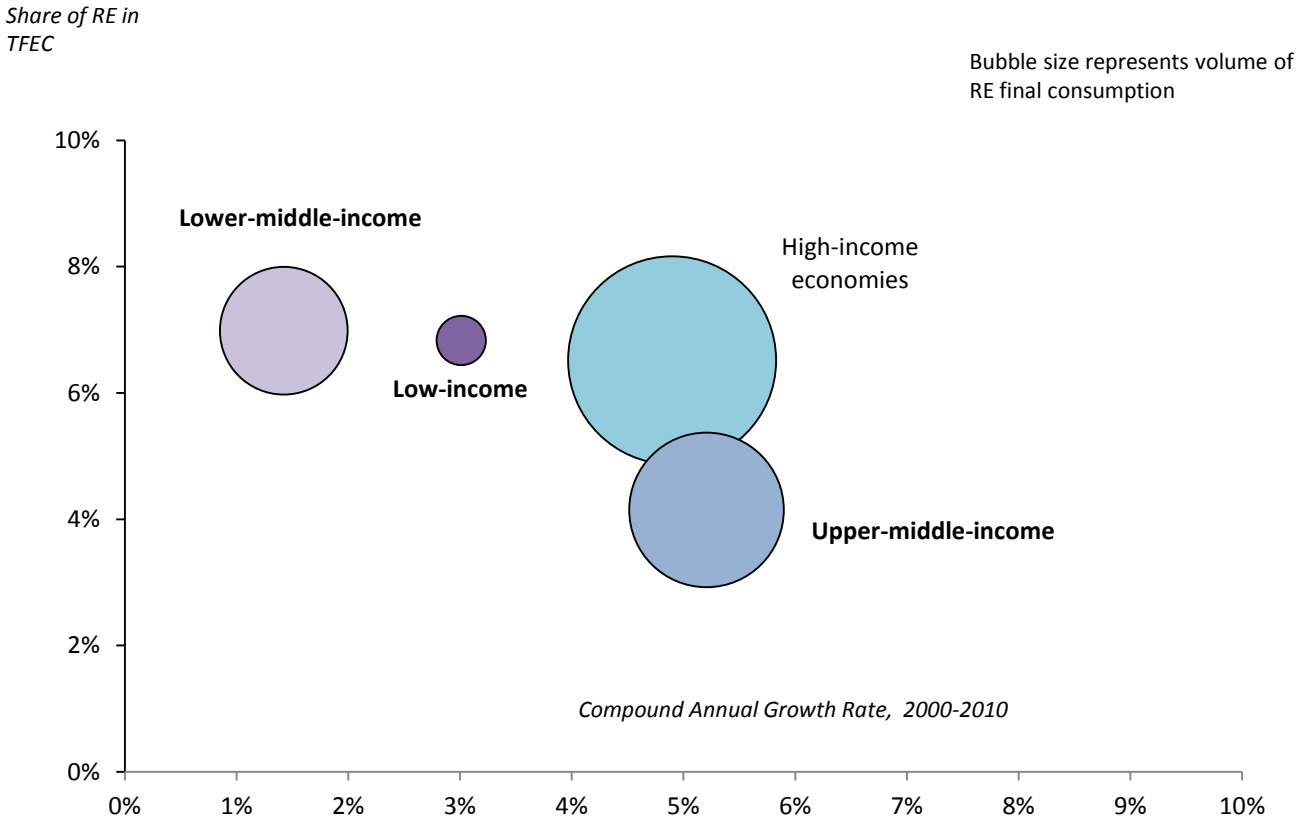
Share of Renewable Energy (excluding traditional biomass) in TFEC by Income Group



Share of Renewable Energy (excluding all biomass and hydro) in TFEC by Income Group



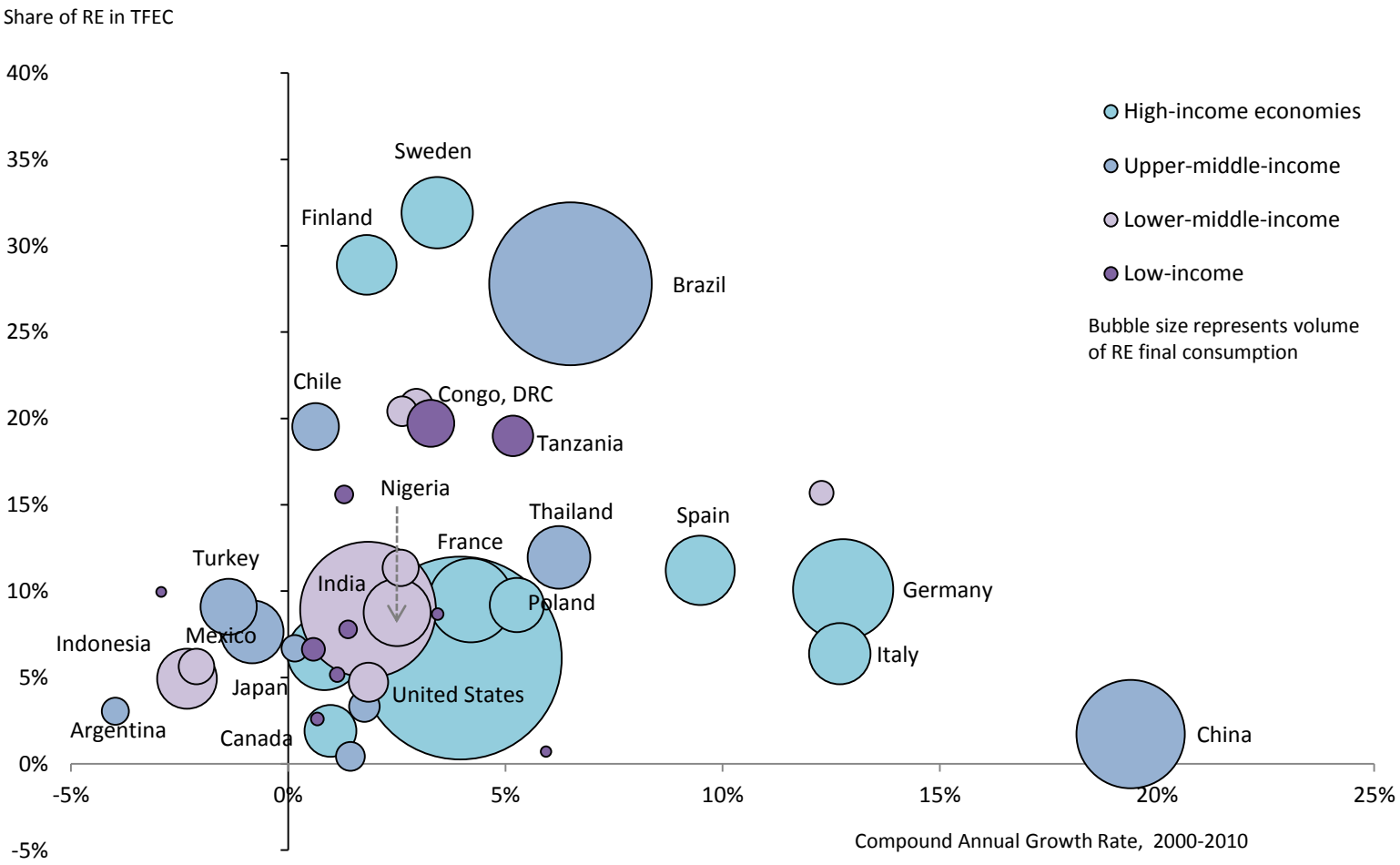
NEW RENEWABLE ENERGY MOSTLY CONCENTRATED IN HIGH INCOME AND EMERGING ECONOMIES



❖ About 97 of the volume of new renewables in 2010 was consumed in high income countries (USA, Europe, Japan) and 3 emerging economies (Brazil, China and India)

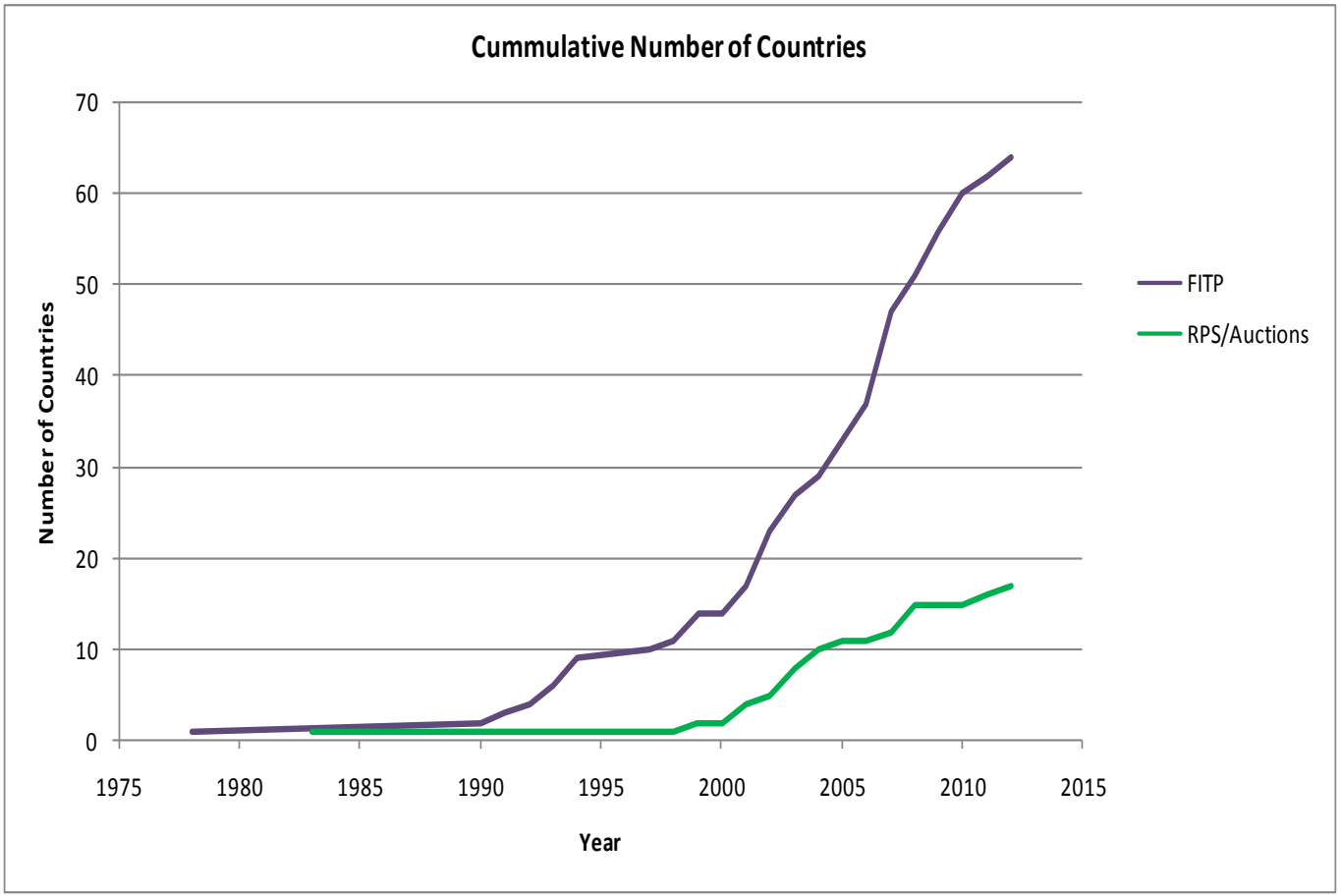
** Excludes traditional biomass and hydro*

THE USUAL SUSPECTS…..



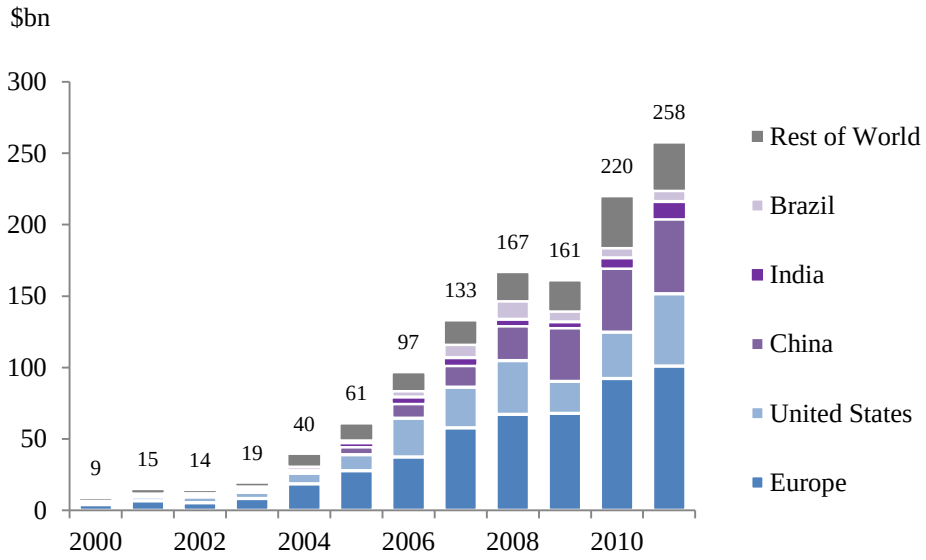
** Excludes traditional biomass and hydro*

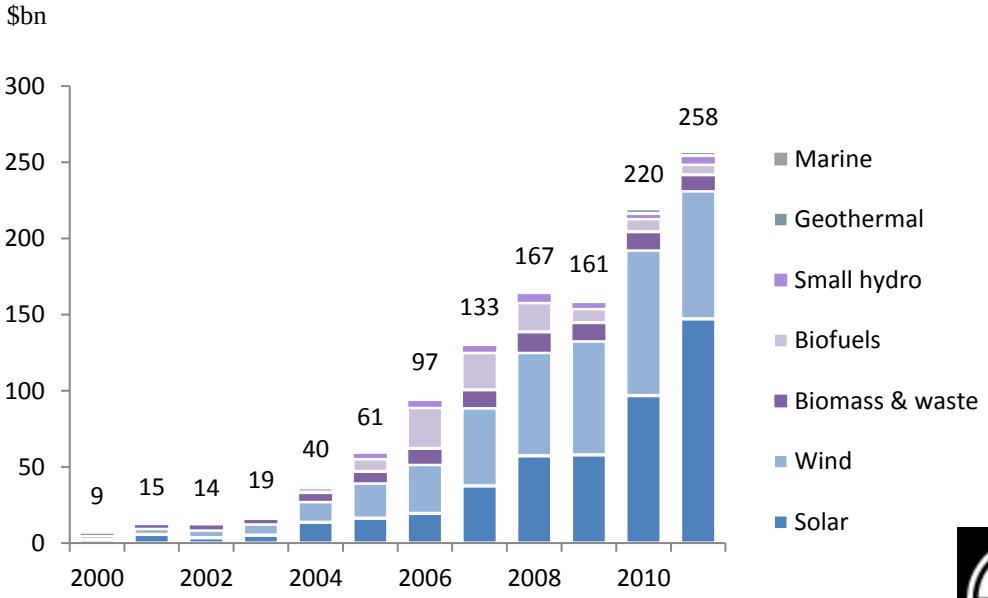
Countries have increasingly adopted price and quantity setting instruments to support the development of RE



Today, 118 countries in the world have a target on RE, more than half of them are developing countries

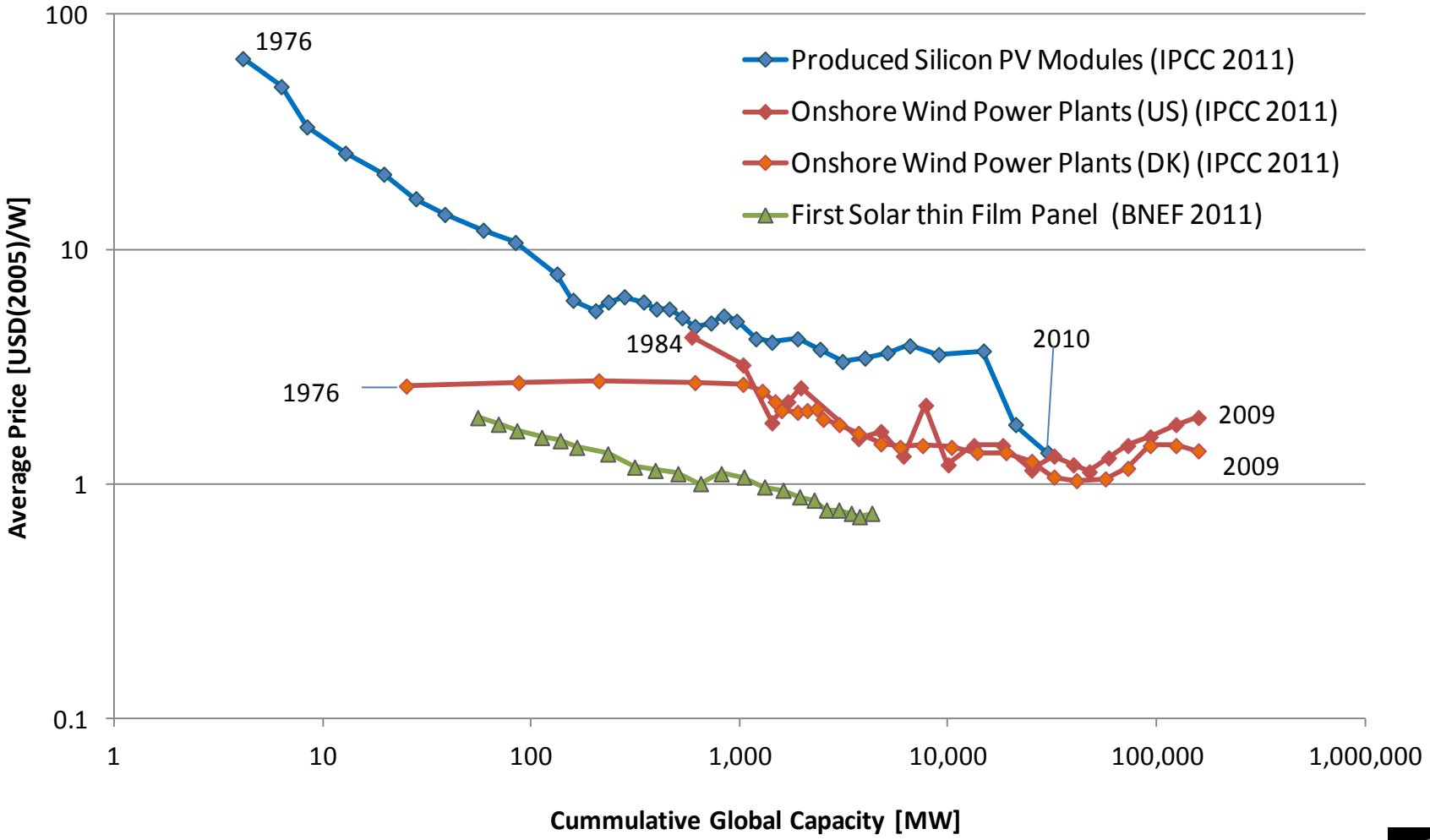
Global Investments in Renewable Energy



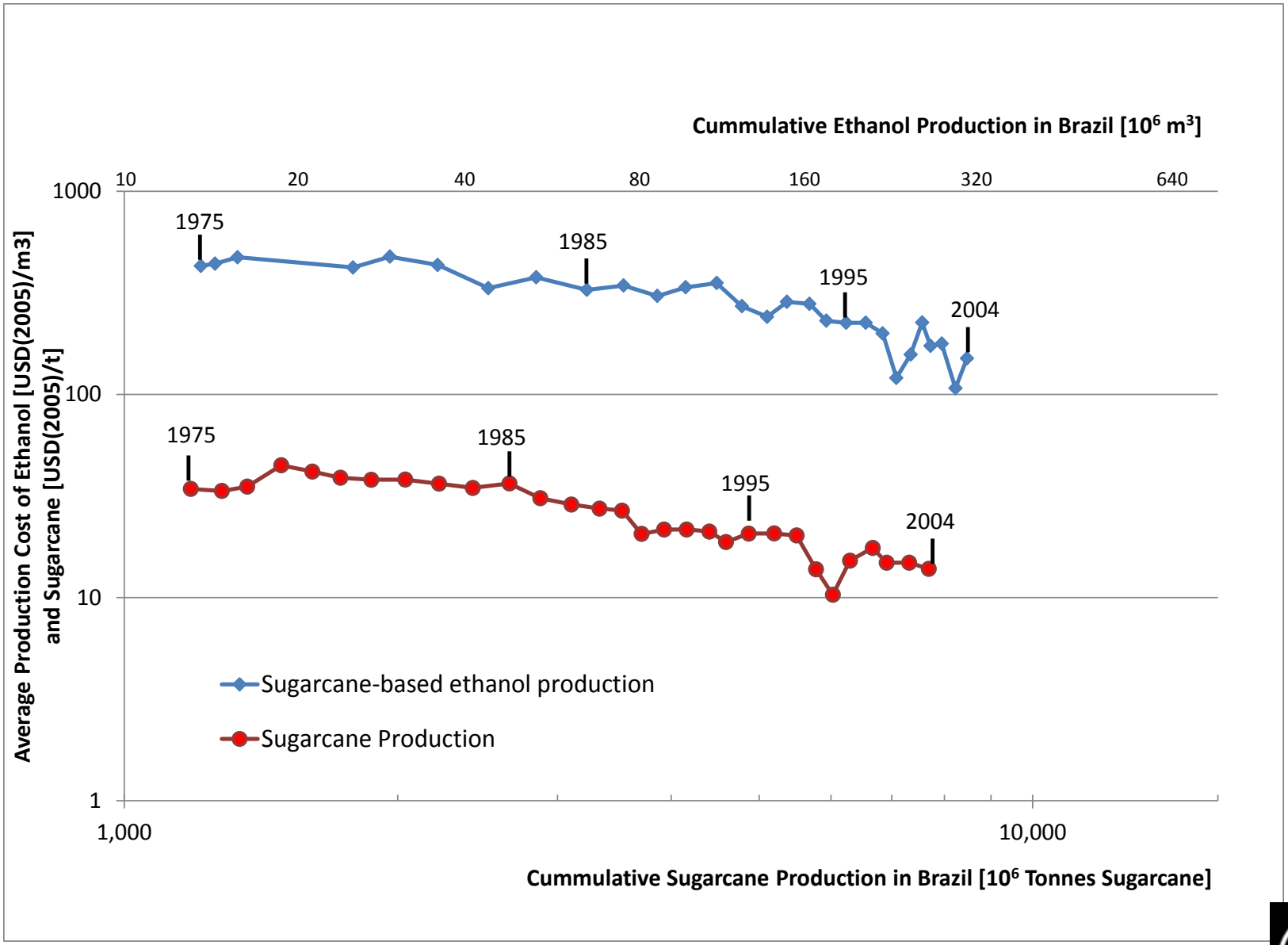


Source: Bloomberg New Energy Finance

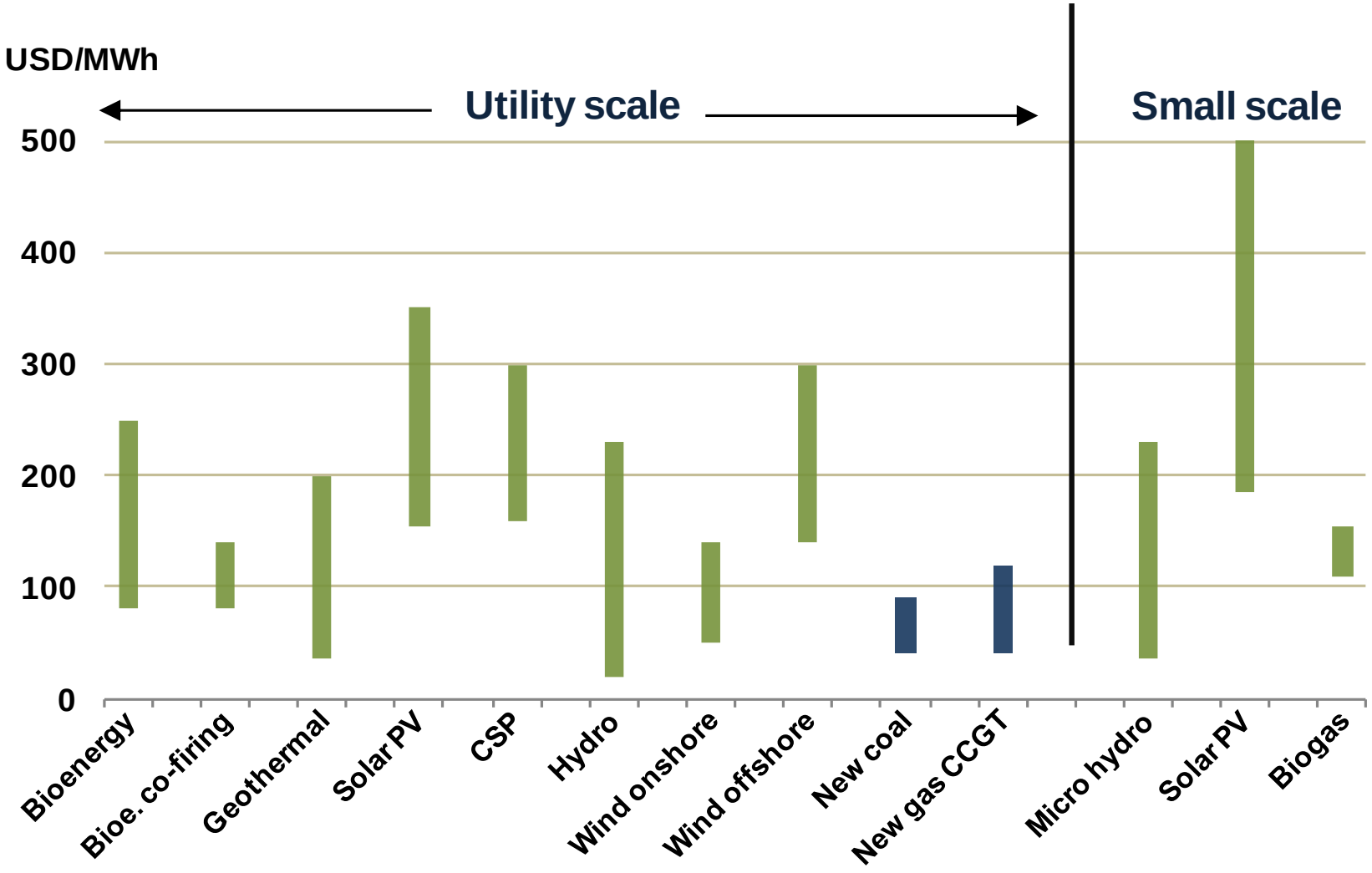
Experience Curves: Cost of wind and solar technologies have lowered substantially as markets evolve



Average Production Cost of Ethanol has also gradually lowered



Depending on the system some RE projects are now competitive with conventional fossil-fuel based power generation



TECHNICAL POTENTIAL FOR RENEWABLE ENERGY IS VAST

Total global technical potential for renewable energy is substantially higher than global energy demand projected to 2050 (IPCC, 2012).

Technical potential for solar energy is the highest among renewable energy sources, but substantial potential also exists for biomass, geothermal, hydro, wind and ocean energy.

Most of this technical potential is located in the developing world:

- At least 75 percent of the world's unexploited potential in hydropower is located in Africa, Asia and South America (IJHD, 2011).

- About 65 percent of total geothermal potential is in non-OECD countries (IPCC, 2012).

Clearly, the challenge will be to capture and utilize a sizable share of this vast global technical potential in a cost-effective and environmentally sound manner.

SECTION 2
TRENDS IN RENEWABLE ENERGY POLICY

MULTIPLE POLICY OBJECTIVES

SECURITY OF SUPPLY

- Oil price increases and volatility have had a major effect on government budgets and the sustainability of electricity systems across the developing world; technology and fuel diversification is key for hedging against these risks and develop resilient systems

ENERGY ACCESS

- Resilience to volatile fuel prices is even more important in the rural context; RE plays a key role in areas where dependence on diesel and other fossil fuels is high
- For isolated communities located far way from the grid, off-grid RE can be the economic and most viable alternative
- Renewable energy can create opportunities for income generation (productive uses of renewable energy in farm and non-farm economic activities, micro and small enterprise development)

ECONOMIC GROWTH / INDUSTRIAL DEVELOPMENT

- Middle income economies are developing a large manufacturing sector in RE equipment (Brazil, China and India, but also Mexico) which is creating new jobs

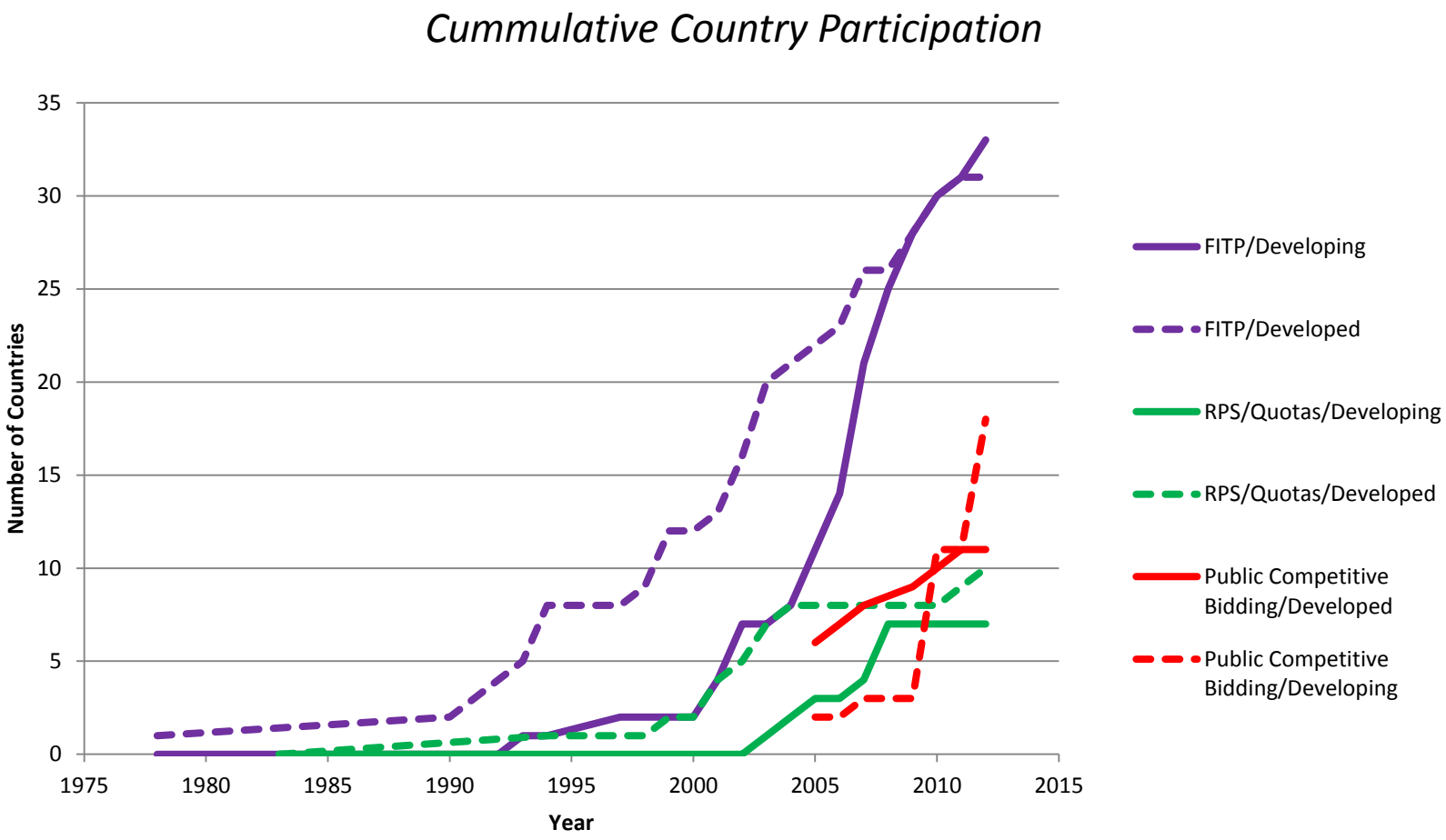
CLIMATE CHANGE AND LOCAL ENVIRONMENTAL SUSTAINABILITY

- To stabilize GHG concentrations, the global energy system must undergo a fundamental transformation, with a rapid increase of RE worldwide
- Developing countries are at the forefront of this challenge, as they are expected to add around 80% of all new electric generation capacity in the next two decades (IEA, 2010)
- Local environmental sustainability is also an important policy objective

EMERGING TRENDS IN RENEWABLE ENERGY POLICY

- Developing countries started to introduce price setting policies to deploy renewable energy capacity from 1993 : today about 39 developing countries have a feed-in tariff policy (36 are middle income countries and only 3 are low income countries)
- About 15 developing countries are also using auctions or Renewable Portfolio Standards (quota based mechanisms) to deploy RE capacity
- Many countries such as Brazil and China have made policy shifts (price to quota or quota to price)
- Many developing countries are now are using both, FITPs and RPS or auctions in parallel to support different segments of the RE market (India, China, Philippines, Argentina)
- Policy shifts and the use of quota and price based mechanisms in parallel is also being observed in the developed world (USA, UK, Italy)
- Quantity-setting instruments are setting a price cap (auctions) price-setting instruments are setting quantity caps

POLICY TRENDS: Increased up-take of price and competitive schemes

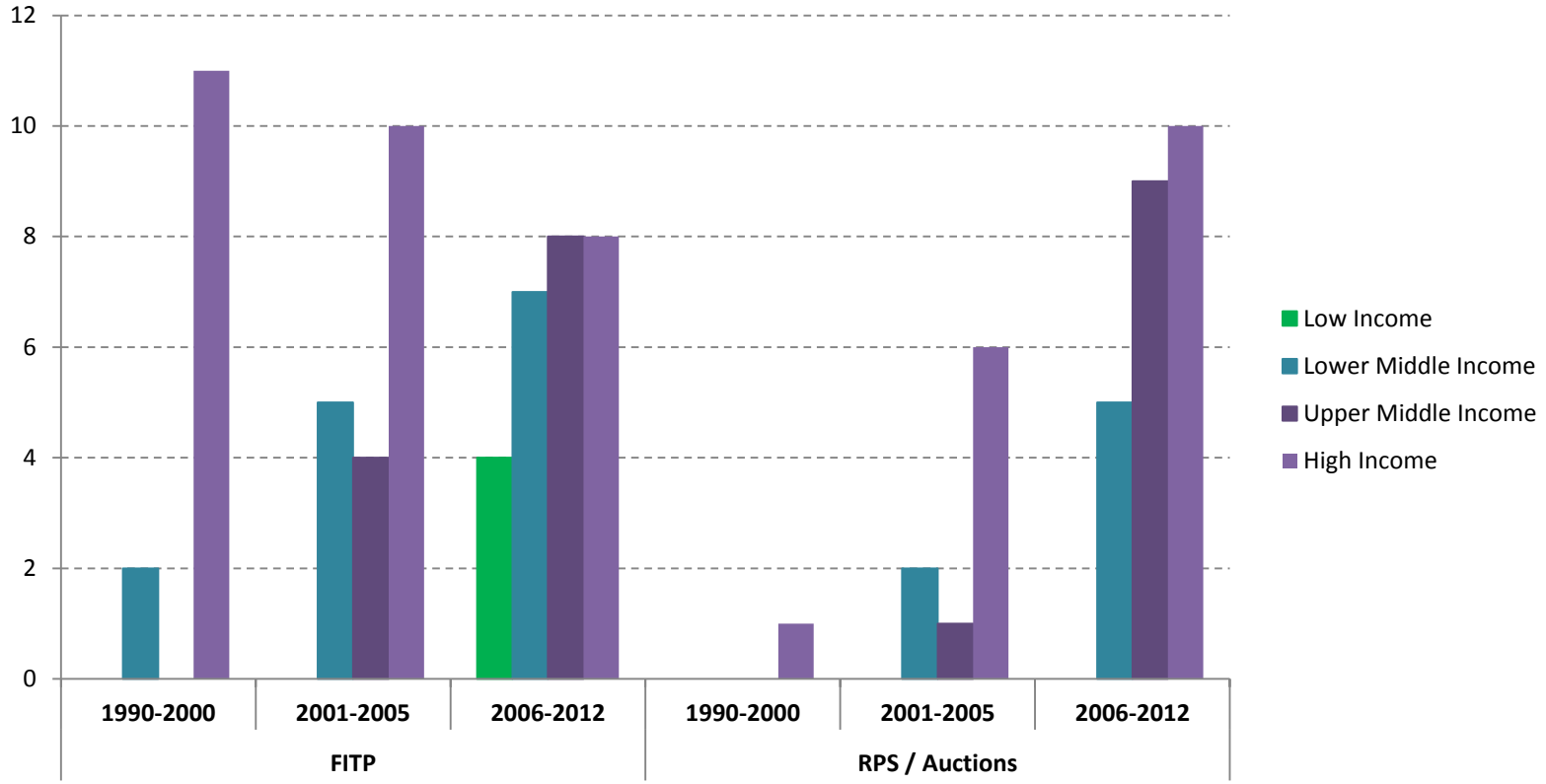


Source: REN 21 (2012)

Year	FITP	RPS/REC	Competitive Tender /Auction
1970s	USA (PURPA) (1978)		
1980s		USA (first Iowa)	
1990s	Germany (1990) Italy (1992) Many European Countries India (1993), Sri Lanka (1997)	Italy (1999)	UK (NFFO) (1990)
2000-05	Brazil (2002) Nicaragua (2004) Turkey, Ecuador, China (2005)	UK (RO) Belgium, Austria Japan, Sweden Canada Poland (2004)	China (2003)
2006-12	USA, Argentina (2006) Kenya, South Africa (2008) Philippines (2008) + 11 developing countries Italy (2007-2008) UK (2010) Bosnia & H (2010) Rwanda (2012) Netherlands (2012) Saudi Arabia (2012 TBD)	Chile (2008) Romania (2008) Philippines (2008) South Korea (2010) Puerto Rico (2010) Israel (2011) Norway (2012)	Brazil (2007) Peru (2008) Argentina (2009) China (2009) Uruguay (2010) South Africa (2011) California (2011) Denmark (2011) India (2012) France, Italy (2012) Australia (2012) Costa Rica, Panama, Honduras (2012) Morocco (2012) Saudi Arabia (2012 TBD)
Today	About 66 Countries	About 15 Countries	20-22 Countries

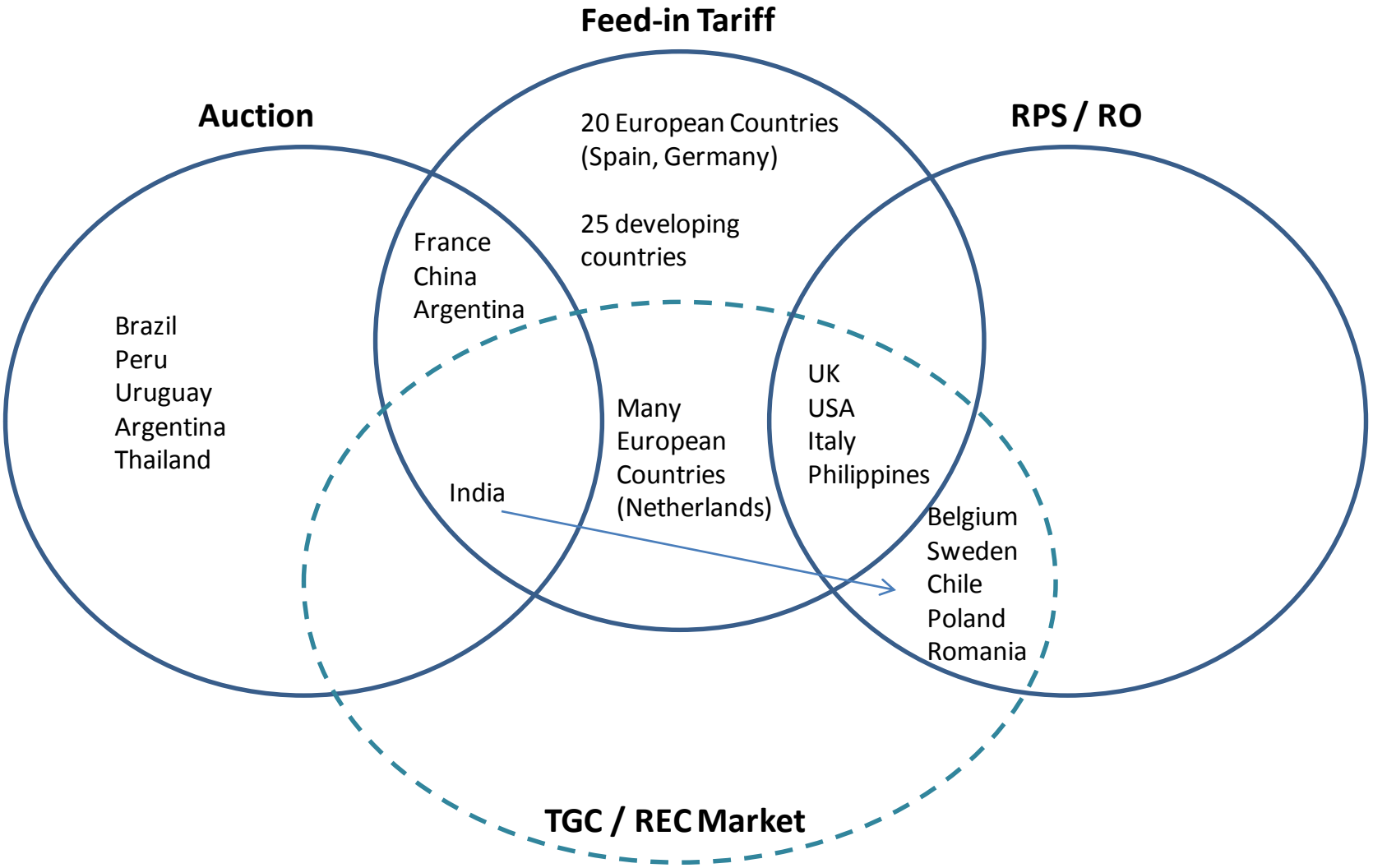
In red, countries that have made a policy shift or that use both FITs and RPS or Auctions

The majority of developing countries have introduced feed-in tariff policies



- Middle income countries have gradually introduced FITs and low income countries have recently started
- In the period 2006-2012, high and higher-middle income countries focus on revising FITP design and/or moved to RPS/Auctions (especially auctions)

USE OF PRICE AND QUANTITY SETTING INSTRUMENTS



- In addition to the price or quota based mechanism, all countries provide some type of fiscal and financial incentives

Complex Policy Packages: Use and Overlapping of Many Instruments

Country	FITP	RPS	Tradable RECs TGC	Public Competitive Bidding	Capital Subsidies, Grants, Rebates	Investment or other Tax Credits	Tax reductions, exemptions	Energy production Payments , Tax Credits	Public Investment Loans, Financing
India	X		X	X (auction)*	X	X	X	X	X
China	X			X (auction)	X	X	X	X	X
Brazil				X (auction)		X			X
South A.	X			X	X		X		X
Turkey	X				X				
Argentina	X			X (auction)*	X	X	X	X	X
Chile		X		X	X	X	X		X
Poland		X	X	X	X		X		X
Romania		X	X				X		X
Philippines	X	X		X	X	X	X	X	X
Kenya	X					X			
Tanzania	X				X		X		
Uganda	X				X		X		X

Source: REN21 (2010)

SECTION 3
GENERAL LESSONS OF EXPERIENCE

Key Messages

EMERGING EXPERIENCE

1. RE policy: necessary for developing RE markets in the absence of externality pricing

- Externality pricing would be preferable: valuing the full range of services that RE provide, including hedge against fuel price volatility, carbon emissions reductions and other
- RE policy necessary in the absence of a carbon tax or global carbon pricing system

2. Taylor-made approach to policy design is necessary

- Choice of policy instruments, policy design and complexity of the policy package should be tailored to the actual conditions of the system/market
- At the same time, price or quota mechanisms need to be accompanied by: i) adequate tariff level in a long-term commitment (PPAs, certainty), ii) mandatory access to the grid, iii) incremental cost pass-through (thus, a package of policy measures is necessary)
- Successful policies depend on predictable, transparent and stable framework conditions: long term price and volume certainty to private sector are essential for cost reduction

3. Policy sequencing is key to policy effectiveness

- Policy sequencing, the existence of basic legal and regulatory pre-conditions as well as institutional and administrative efficiency are crucial to the effectiveness of RE policy

4. Policy interactions and compatibility need to be assessed

- The coexistence of policy instruments has the potential to result in complex interactions and unintended effects (that is, their combined impact may result in inefficient outcomes)

5. Policies do not operate in a vacuum

- RE policy needs to be compatible and coordinated with the broader set of sector policies (market rules) and the wider set of conditions that impact the energy market in a specific setting (fuel markets)
- The success of FITPs or auctions depends on system and market conditions (legal and regulatory conditions, institutional and administrative efficiency), condition of financial markets and the existence of risk mitigating instruments, political economy issues

6. Policy and regulatory design is a dynamic process

- FITPs have required successive adjustments; however, policy adjustments should be controlled (stability, predictability are key to attracting investment)
- The flexibility to adjust as technology, markets and infrastructure capacity evolves is also very important

7. RE policy -in particular FITPs- needs to be accompanied by sustainable incremental cost recovery mechanisms

- Budgetary allocations or transfers, pass-through to consumer tariffs or the use of concessional transfers need to be clearly defined and broadly consulted (transparency, accountability, participation); RE targets need to be realistic and aligned to the available volume of funding sources

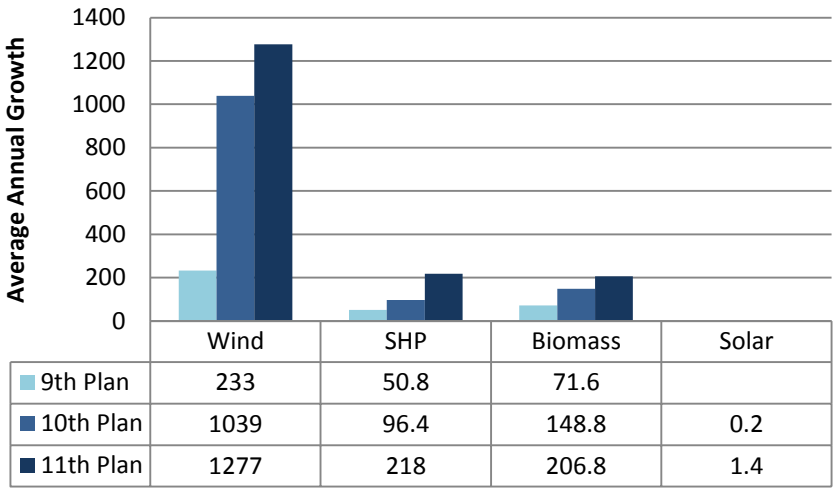
8. Proactive transmission network planning to absorb renewable energy scale-up is key for reducing costs and eliminating bottlenecks

- Regulatory bodies should focus on considering simple, but stable rules to efficiently allocate the cost of transmission, which will in turn facilitate that the private sector joins forces to finance and develop transmission needed

India Policy Package: Effective, but Economically Efficient?

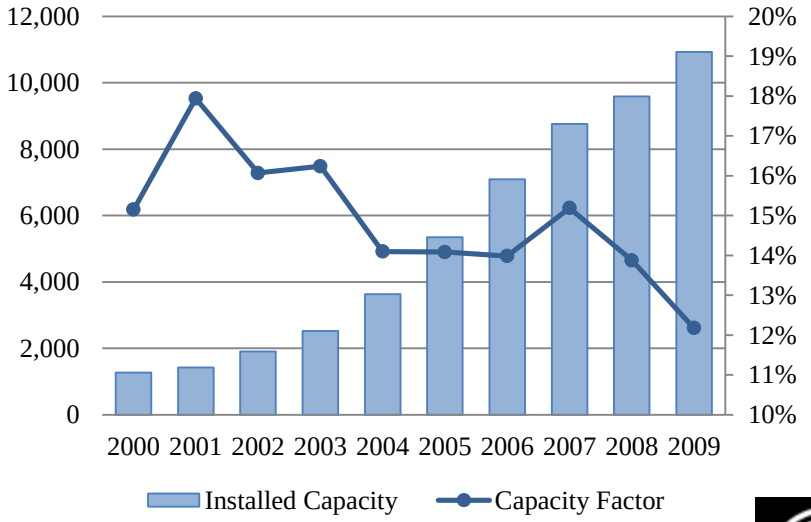
A complex and diverse policy package:

1. RE Targets (from 1997)
2. Green concessional financing (from early 1990s)
3. Preferential tariff or feed-in tariff (from early 1990s)
4. Accelerated depreciation /other tax exemptions (from 1994)
5. Generation based incentives (from 2007)
6. Renewable Energy Certificates Market (from 2010)
7. Auctions (from 2010)



	Wind	SHP	Biomass	Solar
9th Plan	233	50.8	71.6	
10th Plan	1039	96.4	148.8	0.2
11th Plan	1277	218	206.8	1.4

Expansion Scenarios	Target		Subsidy Required (incremental cost)	
	Volume	Year	Total	Per Year
Scenario 1: Diversified Mix (all types of NCRE)	45 GW	2020	USD 68 Billion	USD 6.8 Billion
Scenario 2: Only Wind and SHP (least cost)	45 GW	2020	USD 12 Billion	USD 1.2 Billion



- The average cost of equipment for on-shore wind facilities increased from about US$ 880,000 to US$ 1.3 million per MW between 2003 and 2008.

Table 3: Compliance with RPO in India, 2009

State	Targets (introduced from 2006)	Achievement 2009	Extent to which the target has been achieved (%)
RPO Andhra Pradesh	5% (1 % from wind)	4.52% (target on wind not met)	90
RPO Gujarat	2	2.10	105
RPO Haryana	3	0.01	~ 0
RPO Karnataka	7 to 10	9.47	95-135
RPO Kerala	5	1.22	24
RPO Madhya Pradesh	10	0.11	1
RPO Maharashtra	5	3.17	63
RPO Rajasthan	6.5-6.75	7.49	111 – 115
RPO Punjab	1	1.8	180
RPO Tamil Nadu	10	NA	NA
RPO Uttarakhand	5	1.32	26
RPO Chhattisgarh	10	3.77	38
RPO Himachal Pradesh	20	-	-

Source: SASDE/WB (2009), ESMAP (2010), States' Regulation on RPO (Maharashtra, Andhra Pradesh, Haryana)

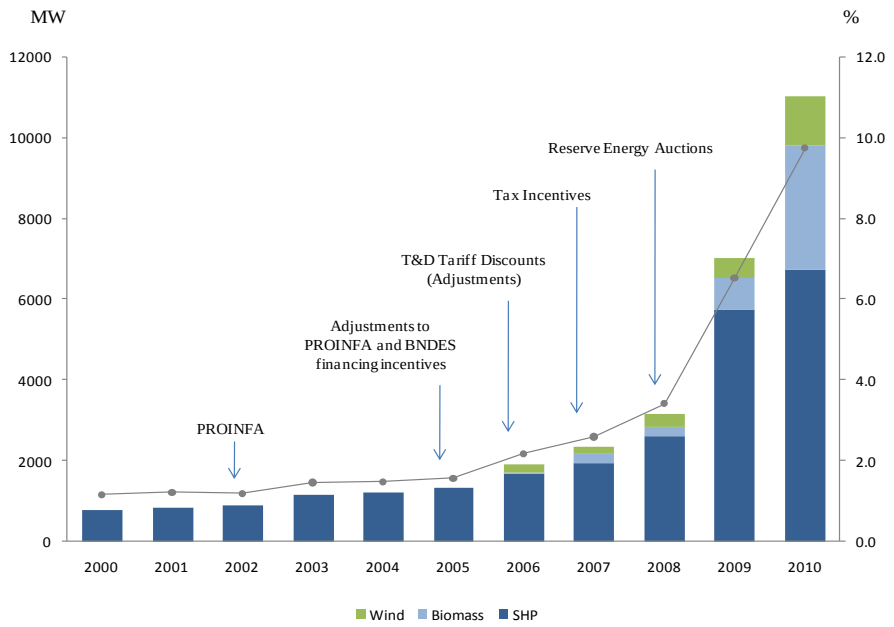
Brazil: FITP substituted for an Auction Mechanism

Experience with PROINFA (2001-2009)

- Imposed equal targets for different technologies (wind, small hydropower and biomass)
- Merit order for contracting: based on dates environmental permits were issued (creating a black market of environmental permits)
- Permitting and licensing became a bottleneck to renewable energy deployment (high transaction costs, court cases)
- Imposed a minimum "national business participation rate" (60 percent of equipment and services had to be of national origin) which created an additional bottleneck
- Deadlines for initiation of commercial operations where frequently postponed (lack of market confidence , stop-and-go situation)
- Several policy adjustments were necessary, and targets where met 4-5 years later

Experience with Auctions (from 2007)

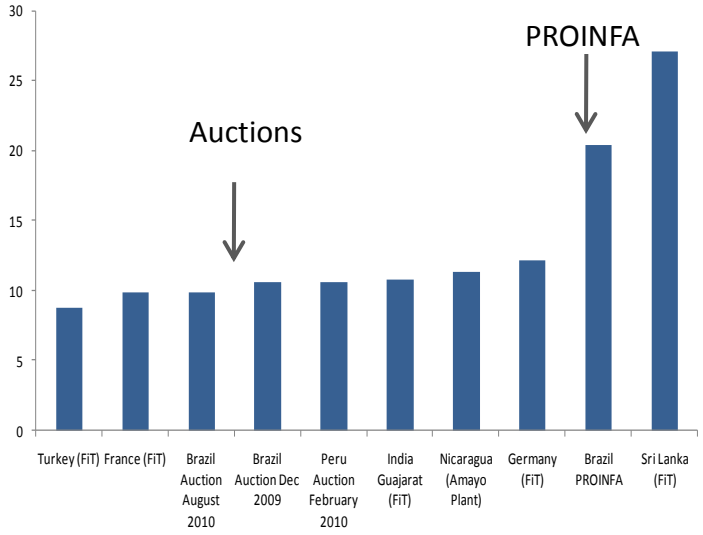
- A quick scale-up is expected
- Bid rounds have delivered low prices



Brazil: FITP vs. Auction Mechanism

- **PROINFA was an expensive program**
- **If projects are deployed, the auction mechanism will deliver a more economically efficient outcome**

International Comparison of Remuneration Level Efficiency: On-shore Wind



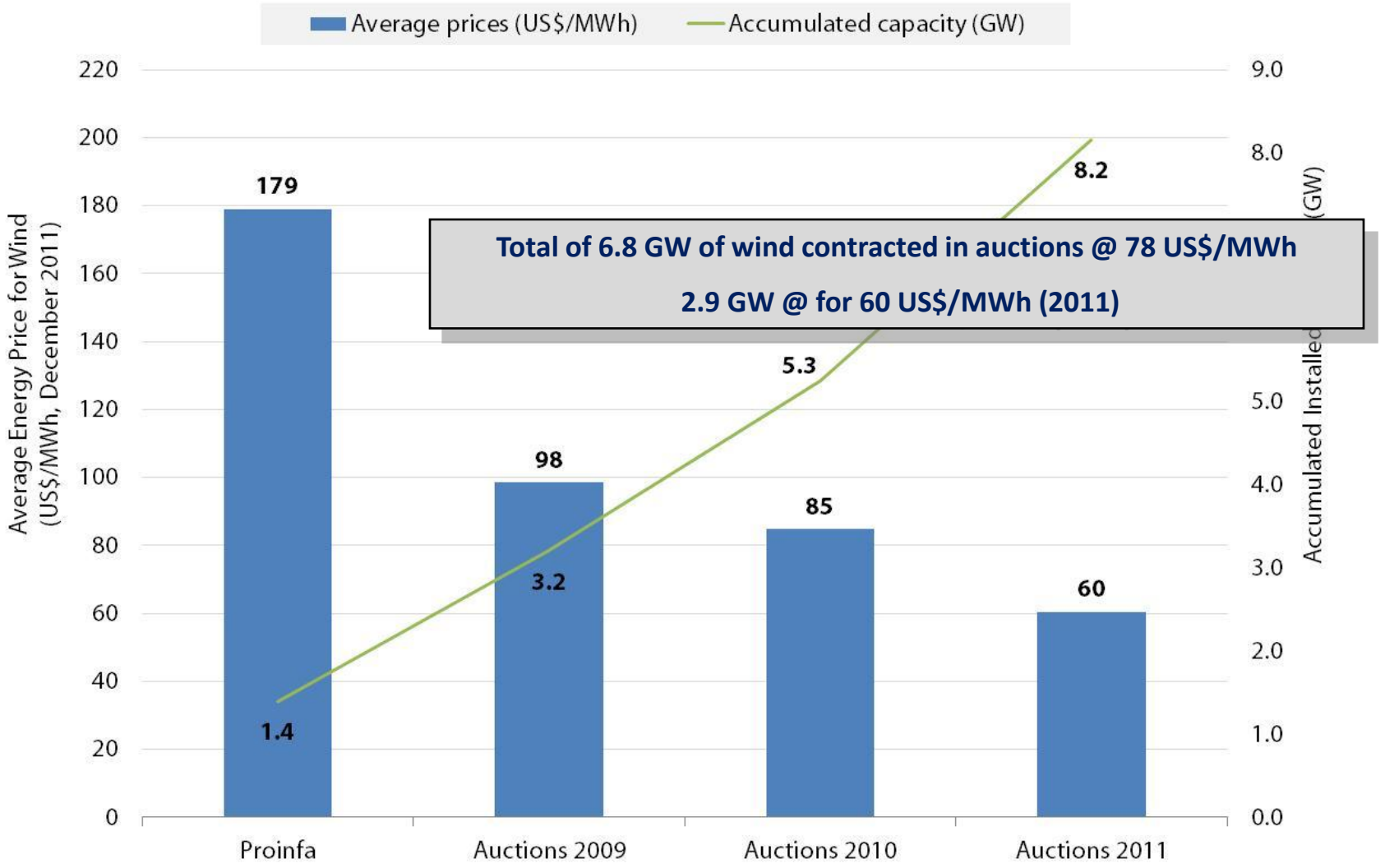
	PROINFA			Technology-specific auction ("reserve energy" auction) 2009		
	MW	GWh/year	USD/MWh	MW	GWh/year	USD/MWh
Wind	1423	3740	154	1800	6596	80
Small Hydro	1191	6260	96	-	-	
Bioelectricity*	779	2661	77	2379	4800	84
	Impact on costs					
Total capacity (MW) (2)	3,393			4,179		
Total energy (GWh/year)	12,661			11,397		
Average cost (USD/MWh)	**109**			**80**		
Total cost (million USD/year) (3)	1,381			911		
Net impact on tariffs (USD/MWh) (4)	**3.8**			**1.6**		

Notes:

1. Values of April 2010, prices include taxes
2. Installed capacity includes self-consumption. In the auction case, energy values correspond to the excess energy sold to the grid at the auction. More excess energy from the new plants is available to be sold to the free market of at future auctions.
3. Gross cost, i.e., total (fixed) cost paid by the consumers.
4. For the auction case, it is the net cost, i.e., includes estimates of yearly spot revenues collected by consumers.

Source: Eletrobras, EPE, Aneel, ONS and PSR. Exchange rate: 1.85 USD/BRL

Technology-specific auctions results – wind power



PROINFA was the first RES support mechanism in the country and based on a feed-in tariff (administratively set)

* Wind competed against small hydro and biomass

** Wind competed against small hydro, biomass and gas-fired plants

How to ensure that projects will be built?

- **Guarantees for new energy auctions: bid bond (1% of project's estimated investment cost) & project completion (5% of project's estimated investment cost)**
- **Regulator has the right to ask for contract termination if delay higher than 1 year is observed**
- **Several other penalties in case of delays**
- **Reduction of contract price with delays of construction or completion**
- **Depending on the auction type, developer required to contract "replacement firm energy" to cover period of delay**

Problems observed and ongoing adjustments

Some 40% of the wind projects of the 2009 auction are behind schedule (COD should be July 2011). Why?

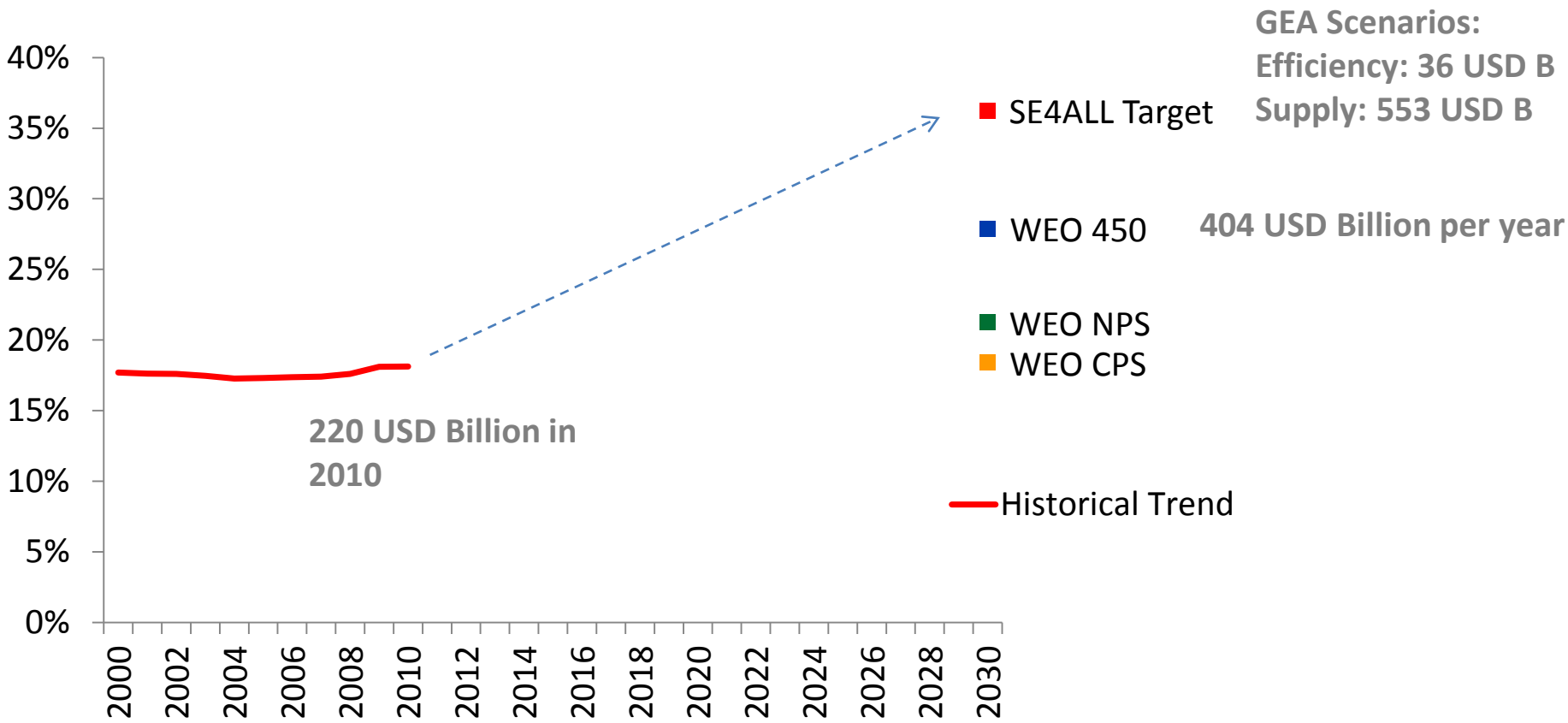
- **Delays in financing: BNDES is concerned about the financial situation of one contracting disco and requires higher guarantees**
- **This disco is one of the few remaining under state control (Amapá). It will probably suffer federal intervention for later privatization**
- **Affects smaller investors with less proven track records**
- **Delays in environmental licensing**
- **Lack of experience of investors (incomplete environmental studies) and lack of personnel from the environmental licensing agency**



Section 4

Scale of the Challenge

Scale of the Challenge: Baseline and Target (includes traditional biomass)



Required Annual Investment to Reach the Scenario's Targets (by 2030)

Organization	Scenario	$2010bn/yr	Actual Investments in RE in $2010bn
IEA	New Policies Scenario	252	*220
IEA	450 Scenario	404	
IIASA	GEA - Supply	553	
IIASA	GEA - Efficiency	36	
IIASA	GEA - Mix	258	
IIASA	A2r	n.a.	
IIASA	B1	n.a.	
IIASA	B2	n.a.	

*Source: Bloomberg New Energy Finance
Note: IIASA GEA scenario figures were converted from $2005 to $2010 using a standard 2.5% discount rate

KEY MESSAGES OF THIS PRESENTATION

1. Transforming the energy system on the scale required to meet the climate change challenge will require significant public and private investment, concessional finance and official development assistance. The transfer of multilateral and bilateral resources must leverage available public and private resources with a focus on building capacity and reducing risks

2. Capacity building is crucial: developing countries need to continue strengthening their macro-economic conditions, institutional structure and capacity, governance (regulatory quality, rule of law, control of corruption, political stability, government effectiveness), market structure and dynamics, utility performance and financial sustainability, and infrastructure capacity

3. These and other challenges reinforce the central role of effective national policy and the need for the systematic development of policy frameworks that reduce risks and enable private sector investment

4. Policies to deploy renewable energy need to be tailor-made, but a few principles for ensuring a path towards economic efficiency will be necessary to balance the interest of the public and private sectors, as well as to maximize the leverage provided by concessional finance and grants

THANK YOU

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