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Renewable Energy Policy Brief

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1. Policy

Brazil's medium-term energy policy is reflected in the Ten-year energy expansion plans (PDEE), which are updated on a yearly basis. Originally focused on electricity, in 2007 the ten-year plans expanded to cover the energy sector. The National Energy Plan 2030 (PNE), developed in 2006-07, provides a longer-term integrated energy strategy. A National Energy Plan 2050 is in the development stages. Law 9478 of 1997 established the general principles of Brazil's national energy policy, including the use of renewable energy sources as a pillar of the country's energy policy.

The National Council for Energy Policy (CNPE) is the highest-level body in charge of setting energy policy in Brazil. The Ministry of Mines and Energy (MME) has the overall policy-making responsibility for the electricity sector while the Brazilian Electricity Regulatory Agency (ANEEL) is responsible for regulating and controlling electricity generation, transmission and distribution in compliance with existing legislation.

Electricity

Brazil's renewable energy **targets** are embedded in its Ten-year energy expansion plans (PDEE). The PDEE aims for renewable energy to account for 42.5% of the country's total primary energy supply by 2023 up from 42.1% in 2014 which are the basis for ordinary power capacity auctions (see below). The latest PDEE edition, PDEE 2023, anticipates renewables (including large hydro) to represent 86.1% of the electricity generation matrix by 2023 up from 79.3% in 2013[1], with wind power accounting for8.1% and expanding 20 GW. By contrast, in 2007, the PNE projected additional capacity of 3.3 GW for wind power by 2030[2]. The 2007 Brazil National Climate Change Plan (Decree 6233 of 2007) set the goals of increasing electricity co-generation, mainly from sugarcane bagasse, to 11.4%[3] of total supply in 2030, and adding 34.5 GW of hydropower capacity as scheduled in the PDEE.

The **legal framework** for the electric system is the Electricity Law of 2004 (Law 10848 of 2004, regulated by Decree 5163 of 2004), which proposes a number of amendments and redesigns the original electricity market launched in 2000, following the 2001-2002 electricity crisis. It creates a regulated market for electric companies providing public service and upholds the market for qualifying consumers, alongside a market for free customers (defined as having a peak load peak load ≥ 3 MW). The core of these legal instruments is the creation of an organised procurement process scheme for the regulated utilities (distribution companies) via auctions of power purchase agreements (PPAs). Auctions are organised to offer short-, mid- and long-term PPAs, where in the latter the objective is to ease generation financing.

Auctions have then been the main instrument to promote new renewable electricity in Brazil, as the government can explicitly intervene on the technologies that will be allowed to participate as supply in the auctions. Decree 5163 of 2004 provided for new capacity auctions A3 and A5, to begin power delivery respectively 3 and 5 years after contracted, and A1 auctions for existing capacity, to deliver power one year after contracted. Decree 6048 of 2007 allowed A1 to A5 auctions exclusively for renewables. New capacity auctions must be included in the PDEE, while the government has more flexibility to call for reserve and alternative energy auctions. For renewable energy auctions, specific details such as PPA duration, ceiling prices, connection requirements, etc., are determined on a technology-by-technology and auction-by-auction basis. Table 1 below summarises Brazil's renewable energy auctions to date and provides links to official documentation for details.

Strategic projects of public interest (usually large hydropower), are regulated by a different type of auctions, where a long-term PPA for the development of the project is auctioned. Projects are declared of strategic public interest by the CNPE, as for example the 8,040-MW Sao Luiz do Tapajos hydropower project

[1] Source: National Energy Balance 2013, EPE: http://www.epe.gov.br/3AB972F4-2C29-464D-ADFB-B21046707D25/FinalDownload/DownloadId-1CD3E5ADF86931EAD0671A7A888BD613/3AB972F4-2C29-464D-ADFB-B21046707D25/Estudos/Documents/BEN%202014%20Rel%20S%C3%ADntese%20ab%202013a.pdf

[2] This goal was surpassed in 2013 with 3456 MW installed. Source: IRENA Resource: http://resourceirena.irena.org/gateway/

[3] Corresponding to 136 TWh.

(CNPE Resolution 3 of 2011). Then a project-specific auction is conducted (see bottom of Table 1).

Table 1- Brazil Renewable Energy Auctions 2007-2015

Auction	Date	Type	Wind (MW)	Solar (MW)	Biomass (MW)*	Small Hydro[4] (MW)	Large Hydro (MW)*
Rule MME 070/2015	13 Nov 2015	Solar + Wind reserve	X	X			
Rule MME 069/2015	14 Aug 2015	Solar reserve	X	X			
Rule MME 672/2014	24 July 2015+	A3 new	X		X		
Rule MME 653/2014	30 Apr 2015+	A5 new			X	X	X
Rule MME 563/2014	10 Apr 2015+	Alternative	X		X		
010/2014	5 Dec 2014	A1 existing			0		
008/2014	31 Oct 2014	A3 reserve	769.1	889.6**,[5]	X		
006/2014	28 Nov 2014	A5 new	926	0	611	43.88	
005/2014	30 Apr 2014	A0 existing			1 MW_{av}	4	1467 MW_{av}
003/2014	6 June 2014	A3 new	551				417
010/2013	13 Dec 2013	A5 new	2337.8		161.8	307.7	700
009/2013	18 Nov 2013	A3 new	867.6	0	0	0	0
006/2013	29 Aug 2013	A5 new			647	218.5	400
005/2013	23 Aug 2013	Wind res	1505				
006/2012	14 Dec 2012		281.9		0	0	292.4
007/2011	20 Dec 2011	A5 new	976		100	0	135
003/2011	18 Aug 2011	Wind + Biomass res	861		357		
002/2011	17 Aug 2011	A3 new	1067.6		197.8	0	450
007/2010	26 Aug 2010	Alternative A3	2047.8		712.9	131.5	
005/2010	25 Aug 2010	Alternative reserve					
004/2010	17 Dec 2010	Hydro A5				0	2120X
003/2010	30 Jul 2010	Hydro A5				79	729.9X
003/2009	14 Dec 2009	Wind Res	1805.7				
001/2008	14 Aug 2008	A1 Reserve			2379.4		
003/2007	18 June 2007	Alternative	0		541.9	96.7	
		TOTAL	**13,997**	**889.6**			
		Strategic projects of public interest (large hydro)					
006/2009	24 Apr 2009	Belo Monte					
005/2008	19 May 2008	Jirau					
005/2007	10 Dec 2007	Sto Antonio					

"X" means technology eligible, "0" means technology eligible but no contracts awarded.
* unless otherwise noted. One MW_{av} the capacity equivalent to one MW generating for 8766hours in a year.
** this figure has also been reported as 1048MW_p.
+ planned
Source: Own elaboration with data from Brasil Energy Research Enterprise (EPE) and Brazil National Electric Energy Agency (ANEEL).

[4] ANEEL Resolution 652 of 2003 defines small hydropower as those hydropower facilities between 1-30 MW of installed capacity that either have a reservoir of less than 3km^2 or have a reservoir of less than 13km2 and meet certain criteria regarding height, water flow and installed capacity.
[5] It should be noted that 8.8 GW of solar projects where accredited to participate in the 2014 auction. Source: http://www.epe.gov.br/leiloes/Documents/Leil%C3%B5es 2014/NT_EPE-DEE-NT-150_2014.pdf

Procurement in the free market can also be done through auctions but free consumers cannot participate as buyers in the auctions for the regulated utilities. This means that free consumers can organise their own auction-based procurement processes if they please. For example, in October 2014 Eletrosul, a subsidiary of state-owned Eletrobras covering the southern states of Brazil, auctioned as a seller 10-year PPAs for 800MWh/year of solar power, with a minimum price of USD 114/MWh.[6,7,8] At the sub-national level, for example, the State of Pernambuco conducted a solar-only auction for 122.8 MW in late 2013.[9]

In 2002 Brazil launched the Programme to Incentivise Alternative Electricity Sources, better known as PROINFA, through Law 10438 of 2002 (regulated by Decree 4541 of 2002 and then Decree 5025 of 2004). PROINFA was a **hybrid scheme** aimed at developing a total of 3,300 MW of renewable energy generation capacity, equally distributed among wind, biomass and small hydropower projects. Under PROINFA, the government-owned utility Eletrobras would sign 20-year PPAs with developers for wind, biomass and small hydro at pre-established variable rates.[10] The cost of PROINFA was distributed among electricity consumers.[11] PROINFA included a 60% local content requirement (in equipment and services) and sought to distribute installed capacity regionally by imposing per-state limits: 165MW for small hydro and 220 MW for biomass and wind. Benefits derived from the carbon markets, including CDM, were to be used to cover PROINFA costs (Decree 5882 of 2006). The original date for PROINFA projects to start commercial operation was 2006. This was subsequently extended to December 2008 (rule MME 452 of 2005), December 2010 (Law 11943 of 2009), and December 2011 (Law 12431 of 2011).

A previous **feed-in tariff** was the 2001 PROEOLICA programme (Resolution 24 of 2001), which, mandated Eletrobras to sign by 2003, 15-year PPAs with wind power producers for a capacity of up to 1,050 MW. The resolution provided incentives of 10-20% over the prevalent wind tariff for projects installed before 2003, but resulted in no contracts awarded.

Resolution 482 of 2012 provided **net metering** for small producers (<1MW) of solar, wind, hydro and biomass. It provided that exceeding production would be credited for up to 36 months against future consumption.

Preferential financing for renewable energy projects is provided by the Brazilian National Development Bank (BNDES), which provides low-interest financing for renewable energy projects that meet **local content** requirements. Over time, local content requirements for renewables have evolved from a quantitative approach (60% local content) to a qualitative approach, with access to preferential financing depending on which elements of the project are local. For example, in the case of PV, BNDES local content methodology includes a detailed list of project components, including required, optional and premium during three different time periods (2014-17, 2018-19, 2020-onwards). In order to be considered "local", suppliers must be pre-accredited by BNDES. Another BNDES financing programme is FINEM, which provides financial support to infrastructure projects equal to or greater than BRL20 million (approximately USD 7 million).

A **dedicated fund**, the Energy Development Fund (CDE), was created in 2002 (Law 10438 of 2002) to finance PROINFA projects, among others, and promote renewable energy. The CDE is funded through a levy on electricity prices.

The 2013 programme INNOVA ENERGIA, with up to USD 924 million in funding, provides **subsidies** of up to 90% of project costs for R&D projects related to smart grids, renewable energy, hybrid vehicles and energy efficiency in transport.

[6] Source: http://www.eletrosul.gov.br/sala-de-imprensa/noticias/eletrosul-promove-leilao-de-venda-energia-da-usina-megawatt-solar

[7] Buyers receive an up to 80% discount in transmission and distribution charges, as discussed below

[8] Original amount: R$280/MWh.

[9] Source: http://www.pe.gov.br/blog/2013/12/27/pernambuco-promove-primeiro-leilao-de-energia-solar-do-pais-que-atrai-investimentos-de-r-597-milhoes/

[10] The prices depended among others, on technology, average national electricity tariff, capacity installed, and technical aspects such as reported capacity factors for wind projects. Rule MME 45/04 of 2004 established floor prices as follows: wind BRL 150.45/MWh, small Hydro BRL 117.02/MWh, biomass BRL 83.58/MWh.

[11] Excepting low-rent consumers, as defined by law, with consumption below 80kWh/month.

In 2015, the creation of a new fund was announced, with a capital of USD 9.7 billion[12] from public and private contributions, to finance electricity generation in the Northeast region, including 8 GW of wind and solar power.

Grid access policies for renewable energy in Brazil include transmission and distribution tariff discounts of at least 50%. Initially established by Law 9427 of 1996 for hydropower projects between 1MW and 10MW, the discounts were subsequently expanded by Law 9648 of 1998, Law 10438 of 2002, Law 10762 of 2003, Law 11488 of 2007 and Law 13.097 of 2015 to include biomass, hydropower under 1 MW and up to 30 MW and, solar, and wind, as well as renewable electricity in the market for free customers.

Fiscal incentives for renewables include a general regime for infrastructure development, import tax exemptions and state tax (ICMS) exemptions.

In 2007, Law 11488 created a fiscal incentive regime for infrastructure development, known as REIDI, regulated by Decree 6144 of 2007 and Decree 6416 of 2008. Only electricity and cogeneration renewable energy projects are eligible. Benefitting from REIDI requires a project-by-project approval, with conditions established by MME Rule 274.

In 2011, Decree 7660 provided **import tax** exemptions for wind power equipment, and set those for solar PV equipment in the 2% to 10% range.[13] Pending legislation (317/2013) plans to provide import tax exemptions for solar PV generation equipment, so long as there is no equivalent local production. In 2015, Law 13097 provided import tax exemptions (PIS/COFINS) for wind turbine components.

State tax (ICMS) exemptions for wind and solar energy (including water heating and water pumping) were established in 1997 by ICMS Agreement 101/97. Initially envisaged for one year, the exemptions have been extended numerous times,[14] and are currently valid until the end of 2021.

Environmental impact assessments are required for all power stations of 10 MW or more regardless of energy source as per CONAMA Resolution 1 of 1986.

Heating

Solar water heating is integrated in the **social housing** programme *Minha Casa Minha Vida (My house My life)*. Phase 1, launched in 2009, included solar water heating in 40,000 units. Phase 2, launched in 2011, includes solar water heating for all new dwellings.[15] As of 2013, over 183,000 units had been equipped with solar collectors under this programme.[16]

Standards and certifications for solar heating equipment have been developed since 1998 by the National Institute of Metrology, Standardisation and Industrial Quality (INMETRO)

Funding for solar water heating includes a 0.5% levy on electricity bills established by Law 9991 of 2000[17] to finance R&D and end-user energy efficiency.[18] BNDES energy efficiency support programme PROESCO provides preferential financing for eligible projects.

At the subnational level, **solar mandates** have been established in numerous cities. For example, through Law 14459 of 2007, Sao Paulo mandated that 40% of water heating needs be provided by solar heating in new construction (residential and commercial). At the State level, Rio de Janeiro requires all new and refurbished public buildings to meet at least 40% of their water heating needs with solar energy (State Law 5184 of 2008).

Fiscal incentives include ICMS exemption (see electricity section above). Many municipalities provide tax incentives for solar water heating through a discount of the ITPU local tax (as part of a *Green ITPU* package). Examples include Belo Horizonte (Law 1415/11) and Sao Paulo (Law 39/2011).

[12] BRL 20 billion.

[13] As defined in Tax Table for Industrialised products (TIPI Table). Wind: 8502.31; Solar PV: 8541.40.

[14] By ICMS Agreements 23/98, 05/99, 7/00, 21/02, 10/04, 46/07, 76/07, 106/07, 117/07, 124/07, 148/07, 53/08, 71/08, 138/08, 69/09, 119/09, 01/10, 75/11, and 10/14.

[15] http://www.planejamento.gov.br/conteudo.asp?p=noticia&ler=7373

[16] http://mcmv.caixa.gov.br/minha-casa-minha-vida-ja-levou-aquecimento-solar-a-mais-de-183-mil-familias/

[17] As amended by Law 11465 of 2007 and Law 12212 of 2010

[18] Given the prevalence of electric water heaters in Brasil, solar water heating is considered and efficiency measure.

Transport

Brazil is a pioneer in the development of support instruments for biofuels, with the establishment of the ProAlcool programme (Decree 76593) dating back to 1975. Brazil's National Energy Plan 2030 (PNE) aims to reach a yearly production of 66 and 18.5 billion liters for bioethanol and biodiesel respectively by 2030.[19] Law 12490 of 2011 aimed to secure the national supply of biofuels and ensure their international competitiveness as key principles of Brazil's national energy policy, in addition to those set by Law 9478 of 1997.

Brazil has **blending mandates** for bioethanol and biodiesel. Law 8723 of 1993 established a blending mandate of 22% for **bioethanol**. In 2003, Law 10696 of 2003 empowered the government to increase the bioethanol blending mandate to 25% (E25) or to reduce it to 20% (E20) depending on market conditions. In 2013, the bioethanol blending requirement was set at 25% (CIMA Resolution 1 of 2013). In 2015, the bioethanol blending requirement was set at 27% (E27) for regular gasoline.[20,21]

A **biodiesel** blending requirement was established in 2005 by Law 11097, which established a blending mandate of 2% for 20065% by 2013. CNPE Resolution 2 of 2009 increased the mandate to 4% by 2009. Law 13033 of 2014 set the blending mandate at 7%.[22]

Financing support include the 2014 BNDES PRORENOVA programme for new sugarcane plantations. With a total funding of BRL 4m, the programme provides financing for up to 90% of projects, limited at BRL 20 million per project, at 5.5% interest rate, with an 18-month no-payment and a 72-month repayment period.[23]

Fiscal incentives for bioethanol include Law 12859, which reduced the tax (PIS/COFINS) for bioethanol, and the 2012 Decree 7725, which reduced the Industrial Products Tax (IPI) for flex-fuel vehicles.[24] At the sub-national level, States like Rio de Janeiro discount the vehicle tax for vehicles running exclusively on bioethanol.[25] Export tax credits for bioethanol are provided by Decree 7633 of 2014. Law 11116 of 2005 provided tax reductions for biodiesel producers and importers. These reductions were updated by Decree 7768 of 2012.

Law 11116 of 2005 also created a registry of biodiesel producers and importers, who must be based and legally constituted in Brazil. Law 12490 of 2011 contemplates that all companies active in the biofuels sector be based and legally constituted in Brazil.

At the sub-national level, for example, the city of Curitiba, as part of its *Biocidade* programme, has included buses that run with 100% biodiesel in its municipal fleet.

Energy Access

Brazil's main rural electrification programme, known as *Luz Para Todos* (*Light for All*) was created in 2003 by Decree 4873 and operationalised by Rule MME 447 of 2005. Initially envisaged until 2008, it has subsequently been extended to 2010 by Decree 6442 of 2008, to 2014 by Decree 7520 of 2011 and then to 2018 by Decree 8387 of 2014. While initially mostly focused on grid expansion, the programme also includes mini-grids and stand-alone systems, to be supplied by renewables, diesel and/or hybrid systems.

Funding for *Luz Para Todos* is provided by the RGR Fund, created by Decree 41019 of 1957 and last modified in 2013 (Law 12783). The fund is financed by a 2.5% tax on electricity generation equipment and transmission assets, not to exceed 3% of yearly revenues. A different fund, the CDC, created in 1973 (Law

[19] The plan expects reaching 12% biodiesel blending and 60% blending for agricultural uses.

[20] Premium gasoline blending stays at 25%.

[21] Source: http://www.brasil.gov.br/economia-e-emprego/2015/03/adicao-de-27-de-etanol-na-gasolina-e-estabelecida-pelo-governo

[22] 6% by July 2014 and 7% by November 2014.

[23] Source : http://www.bndes.gov.br/SiteBNDES/export/sites/default/bndes_pt/Galerias/Arquivos/produtos/download/Circ028_13.pdf

[24] Flex-fuel vehicles are optimized to run on any mix of E20-E25 gasoline and up to 100% hydrous ethanol fuel (E100). According to Brazil's National Vehicle Distribution Federation (Fenabrave), flex -fuel vehicles currently account for close to 90% of total sales.

[25] Source: http://www.fazenda.sp.gov.br/download/imprensa/ipva_2015.pdf

5899) and last modified in 2009 (Law 12111), subsidises isolated systems.[26]

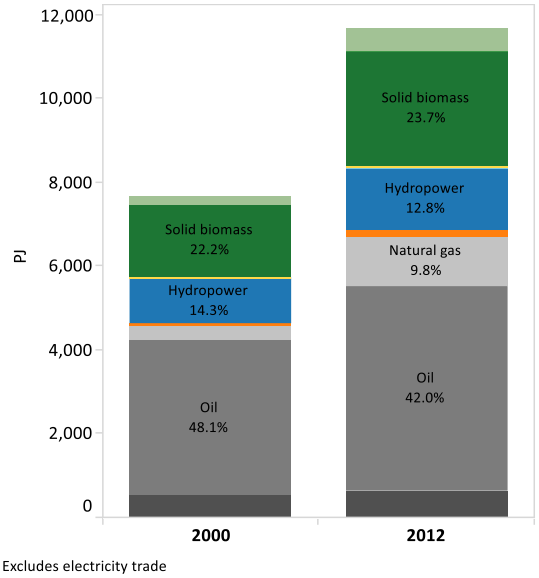
In 1994, Brazil created the Programme for Energy Development of States and Municipalities (PRODEEM) established by Decree in 1994. By 2003, PRODEEM had spent USD 37.25 million for nearly 9,000isolated PV systems totaling 5.1 MW, mostly rural schools.[27] In 2005, PRODEEM was incorporated in the *Luz Para Todos* Programme (Rule MME 447 of 2005). By 2004, Brazil had 30,000 solar PV systems installed.[28]

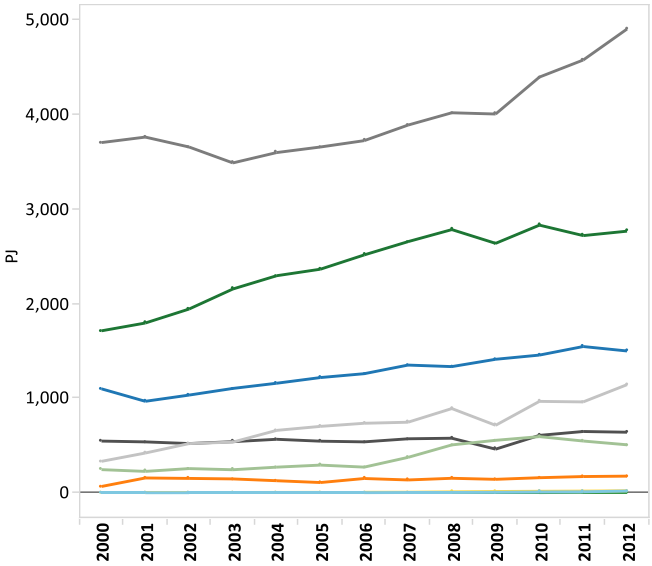
Luz Para Todos' predecessor was the Rural Electrification Programme "Luz No Campo," established in 1999 by Decree 2/12/1999.

[26] This includes grids in the North of the country not connected to the National Interconnected System (SIN) as well as isolated grids.
[27] http://www.aneel.gov.br/aplicacoes/atlas/energia_solar/3_4_2.htm
[28] Source: PNE2030, pp 190

2. Statistics

Total Primary Energy Supply





Excludes electricity trade

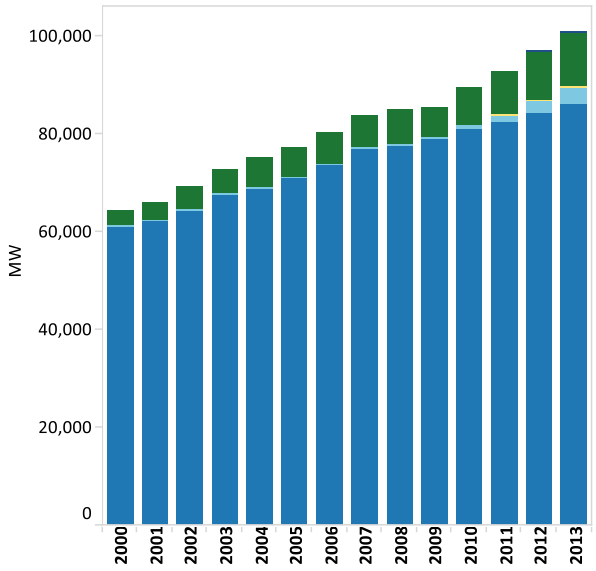
Liquid biofuels, Solar, Nuclear, Biogas, Wind, Natural gas, Solid biomass, Hydropower, Oil, Coal

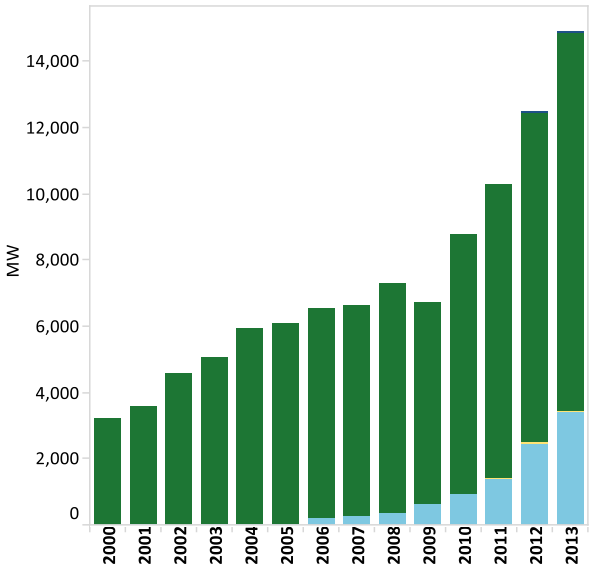
		Total Primary Energy Supply	Share of renewables
2000	Total	7,847.8 PJ	
	Of which renewables	3,049.2 PJ	38.9%
2012	Total	11,795.2 PJ	
	Of which renewables	4,803.1 PJ	40.7%

Total includes electricity trade

		Total Primary Energy Supply	Share in total renewables
2012	Wind	18.2 PJ	0.4%
	Solar	20.8 PJ	0.4%
	Liquid biofuels	505.7 PJ	10.5%
	Biogas	3.8 PJ	0.1%
	Solid biomass	2,759.1 PJ	57.4%
	Hydropower	1,495.5 PJ	31.1%

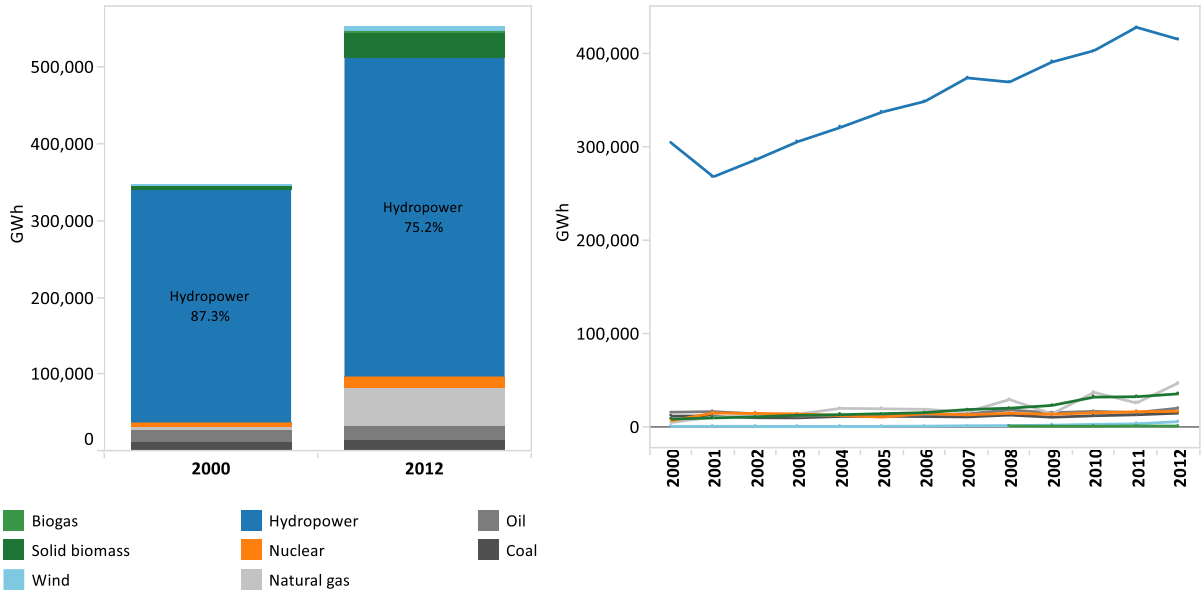
Renewable Power Capacity





Tide, Wave and Ocean, Solid biomass, Onshore Wind, Biogas, Solar Photovoltaic, Hydropower

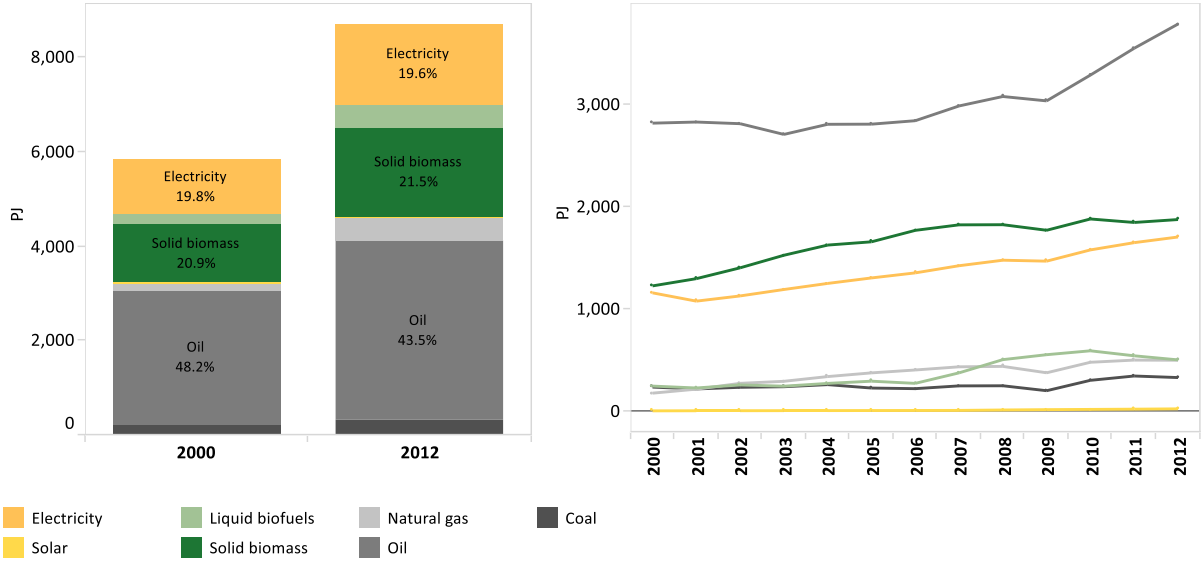
Electricity Generation



		Electricity generation	Share of renewables
2000	Total	348,910.0 GWh	
	Of which renewables	312,249.0 GWh	89.5%
2012	Total	552,469.0 GWh	
	Of which renewables	455,629.0 GWh	82.5%

		Electricity generation	Share in total renewables
2012	Wind	5,050.0 GWh	1.1%
	Biogas	340.0 GWh	0.1%
	Solid biomass	34,897.0 GWh	7.7%
	Hydropower	415,342.0 GWh	91.2%

Total Final Energy Consumption



		Total Final Energy Consumption	Share of renewables
2000	Total	5,850.8 PJ	
	Of which renewables	1,469.2 PJ	25.1%
2012	Total	8,708.4 PJ	
	Of which renewables	2,394.8 PJ	27.5%

		Total Final Energy Consumption	Share in total renewables
2012	Solar	20.8 PJ	0.9%
	Liquid biofuels	500.2 PJ	20.9%
	Solid biomass	1,873.8 PJ	78.2%

Sources for these statistics: IRENA, IEA, UN

Renewable Energy Policy Briefs

This brief is part of an IRENA series providing a comprehensive and timely summary of renewable energy policies in Latin America (including Argentina, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Guyana, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Suriname, Uruguay, and Venezuela).

The brief brings together the most up-to-date information on renewable energy public policies for the power, heating and transport sectors, and also includes a section on energy access policies. The objective of this brief is not to provide an assessment of the reported policies. The brief is primarily based on the information contained in the IEA/IRENA Joint Policies and Measures Database, complemented with information drawn from: (i) additional existing legislation, (ii) official government sources such as plans, reports and press releases, and (iii) input from country policymakers and experts. While the brief focuses on policies at the national level, sub-national policies are also included where relevant. Specific projects or programmes implemented by actors such as international organisations, development partners and the private sector are beyond the scope of this brief.

The information contained in this document is posted on IRENA's REsource web portal, will be used to update the IEA/IRENA Joint Policies and Measures Database, and will form the basis of IRENA's future policy work in Latin America.

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