# Will an in increase in share of renewable power in Brazil and United States be enough to curb emissions to levels consistent with necessary reductions in the countries?

**Climate Action Tracker policy brief**

Andrzej Ancygier, Marcia Rocha

*Climate Analytics*

Hanna Fekete, Lucas Prinz, Niklas Höhne

*NewClimate Institute*

**21 August 2015**

***The 20% goal for renewables in the US and Brazilian power sectors is a step in the right direction. The main positive point is that it is an example of countries agreeing to work together on their way to low carbon economy. In both, Brazil and the United States long-term policies ensuring investment stability at the federal level are lacking, thus making the achievement of these goals questionable. If they were achieved, they would contribute to emissions reductions from the Brazilian power sector by between 11 and 38 $MtCO_2$ by 2030 and 200 $MtCO_2$ in the USA. In addition to supporting renewables, both countries will have to implement measures to decrease the reliance on natural gas, also from non-conventional sources, and coal to achieve the deep decarbonisation in the coming decades, that is suggested by the most recent IPCC report.***

Increasing the share of renewable sources of energy in the power sector was the main focus of the Brazil-U.S. joint declaration made at the end of June in Washington. By 2030, at least 20% of electricity produced in both countries should be coming from renewables. According to the announcement, this target excludes hydro-energy, which is currently the source of three quarters of electricity in Brazil and about 6% in the United States. For Brazil the target would mean tripling non-hydro renewables (International Energy Agency 2014). For the US, it would imply increasing four times the share of non-hydro renewables, compared to today (5.6% in 2012) (Energy Information Administration 2015).

Power markets in both countries are very different. The most obvious of the differences are their sizes: With 1,137 GW capacity installed, the US American power sector is almost ten times bigger than that of Brazil. It is also responsible for much more carbon emissions – in 2012 it emitted over 2 $GtCO_2$ – 40 times that of Brazil. This has not only been caused by its size, but also the much higher share of fossil fuels in the US power sector. In 2012, 65% of electricity in the world's biggest economy was coming from fossil fuels and a further 19% from nuclear (Energy Information Administration 2015). This results in an average emission intensity of the electricity generation of 500 $gCO_2$/kWh. At the same time, due to a high share of bio and hydro energy in its power mix, Brazil already belongs to the list of countries with the lowest carbon intensity of electricity in the world: with 97 $gCO_2$/kWh, the country's emissions intensity is one sixth of the global average.

The other major differences between these two countries are current trends in the electricity sector. The first one concerns energy consumption. Massive electrification over the last decade taking place in the framework of the "Light for All" program, and increasing standard of life of average Brazilians, will in the future lead to rising electricity consumption in the South American country. The IEA's World Energy Outlook 2014 predicts an increase by over 70% until 2030,

compared to 15% increase in power consumption in the United States in the same period (Energy Information Administration 2015). But even despite much stronger dynamics in 2030, an average Brazilian will still consume only a quarter of the electricity that an average citizen of the United States uses.

At the end of the next decade Brazilians will not only be consuming more energy but, if the trend from the past two decades is to continue, the country's power sector will also be much more carbon intensive than today. Between 1990 and 2012 emissions for each kilowatt-hour generated increased by over 80%. This has largely been caused by the shift towards more carbon-intensive sources, notably coal, which has increased by 300% in this period. This shift was mainly a reaction to energy crises in 2000/2001 and 2014, when the lack of rain significantly decreased power production from hydro power plants.

The more recent drought crisis in 2014 led the Brazilian government to open energy auctions to fossil fuels. The investor who offers the lowest price for produced Megawatt hour receives a guaranteed electricity price for 20 years. Only as result of two auctions conducted in November 2014 and April 2015 almost 5 GW of gas and coal fired-power plants should be constructed. (Bloomberg 2014; Bloomberg 2015)

This constitutes an increase in Brazil's combined capacity of these two energy sources by almost 40% compared to 2012. According to Brazilian Government predictions (Brazilian Ministry of Energy), and those of the International Energy Agency (International Energy Agency 2014), much more is to come. According to IEA, the share of natural gas in the power sector is to increase by almost 2 percentage points - from 8.5% in 2012 to 10.4% 2030. Keeping in mind the significant increase in total power demand, this would mean an increase in natural gas capacity of almost 160%.

The situation for the United States looks very different. On one hand, power consumption per capita – one of the highest in the world – is set to only slightly increase further in the next decade. On the supply side, the US American power system has recently passed a drastic shift from coal fired power generation to gas, resulting from cheap gas prices during the shale gas boom. Due to the replacement of coal by shale gas and renewables, carbon intensity of the power sector has already decreased by over 16% between 1990 and 2012 (International Energy Agency 2014).

The low gas prices alone do not guarantee that this short term development turns into a long term trend, however the Obama administration additionally works on building a longer-term framework for a low carbon power sector. The most important recent step in that direction is the Clean Power Plan finalized in August 2015, which expects to reduce the emissions of the power sector by 2013 by 32% below 2005.[1] With this policy in place, the CAT expects emission reductions of around 0.5 $GtCO_2e$ in 2030, below a scenario excluding additional actions in the power sector.[2]

Besides the Clean Power Plan, decarbonisation of the US power sector depends largely on the longevity of the renewable energy policies on the state level. In this regard the situation is mixed. The majority of the US states have introduced support mechanisms and renewable energy targets. Whereas some of them are very ambitious, some other, most South Eastern states have no target or ambitious instruments to achieve these at all.

[1] Compare also the CAT news item: http://climateactiontracker.org/news/216/Obamas-final-Clean-Power-Plan-makes-a-difference.html

[2] It should be noted that the EPA's impact assessment for the Clean Power Plan indicates a share of 20% renewable energy including hydro energy. The announcement with Brazil does not seem to be consistent with this analysis, however the states have some freedom regarding how they want to implement their emission reductions targets, so this number is not fix.

Without any support measures for renewables in 14 states, a northwest to southeast line of low ambition can be drawn from Alaska via Idaho, Wyoming and Nebraska, down through Arkansas to Florida. Within a medium ambitious group, 12 states have adopted pre-2020 targets, out of which 10 on the border to Canada. This coincides partially with power generation through hydro. Considerable hydro capacity is installed along the Canadian border except for the prairies in Montana and North Dakota (National Hydropower Association n.d.). Here, targets stretch from only 10% of electricity generation until 2015 in Wisconsin to 40% until 2017, of which 10% are non-hydro generation facilities built after 2005 in Maine. 18 states have adopted post-2020 targets, which all revolve on average around the federal target of 20% until 2030 (Durkay 2015). Eight out of these medium states have voluntary goals. In contrast to Renewable Portfolio Standard requirements, voluntary targets only set incentives for utilities to achieve a certain share of renewables, but do not sanction non-compliance.

Most ambitious states are Hawaii with 40% until 2030 and 100% until 2045 and Vermont, which aims to increase the share of renewables in the power sector to 75% by 2032. They are followed by California, with current targets of 33% by 2020 adopted and 50% by 2030 considered (Durkay 2015).

At the Federal level, the Investment Tax Credit for solar installations, which allows investors to recuperate 30% of their expenses, is due to be reduced to 10% for companies and expire completely for residential installations after 31 December 2016 (Solar Energy Industries 2015). This might slow down investment in new installations especially in the states without their own renewable energy targets. It remains to be seen if measures under the CPP will replace the tax credit with a similar or higher effectiveness.

The 20% goal for renewables in the US and Brazilian power sectors is a step in the right direction, but the impact on greenhouse gas emissions remains unclear. According to CAT calculations, it will contribute to emissions reductions from the Brazilian power sector by between 11 and 38 $MtCO_2$ by 2030 compared to IEA's BAU projections. This is an equivalent to between 16% and 53% of the emissions from the electricity generation projected for 2030 by the IEA. This wide range depends on the sources of fuels that will be replaced: the highest if renewables were to replace coal, and the lowest if they instead allow for increased investment in nuclear and some natural gas power plants. Although that would mean a significant potential for emissions reduction in the power sector, with most of the $CO_2$ generated in other sectors of the Brazilian economy, reaching the target of 20% non-hydro renewables in the power sector would mean emissions reduction of total emissions from the energy sector in Brazil by between 1.8% and 5.9% in 2030 compared to IEA's BAU.

Due to the much larger size of the US power market, increasing the share of renewables in the power sector would also have a much larger impact on the emissions. If the Clean Power Plan leads to a share of 12% of non-hydro renewable electricity generation as indicated in the EPA's Impact Assessment, an additional 8% of non-hydro RE from the announcement would reduce emissions further by 200 $MtCO_2$ in 2030 compared to EPA's BAU. However, the way for states to reach their obligations under the Clean Power Plan is not fixed. It can be expected that if they were forced to a higher share of renewable energy through another instrument, they would implement less efficiency measures or other low-carbon technologies and not necessarily overshoot the targets under the Clean Power Plan. Further, it is very unclear how the 20% of non-hydro renewable shall be reached, as there are no additional policy instruments in place or in the pipeline, which would lead to such an increase in non-hydro renewable energy.

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Climate Analytics is a non-profit organization based in Berlin, Germany. It has been established to synthesize climate science and policy research that is relevant for international climate policy negotiations. It aims to provide scientific, policy and analytical support for Small Island States (SIDS) and the least developed country group (LDCs) negotiators, as well as non-governmental organisations and other stakeholders in the 'post-2012' negotiations. Furthermore, it assists in building in-house capacity within SIDS and LDCs. Contact: Dr. h.c. Bill Hare, +49 160 908 62463

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http://www.pik-potsdam.de

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www.newclimate.org