Advanced Review

The different paths for renewable energies in Latin American Countries: the relevance of the enabling frameworks and the design of instruments

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The promotion of renewable energy is a priority for the majority of the regions of the world. The key motivation for the promotion of these sources varies according to the countries; in some cases, the aim is to mitigate climate change, in some others is to address the growing energy demand, or to reduce the dependence on imported fossil fuels. To this purpose, governments implement different energy policies, based on a combination of primary and secondary instruments. Nevertheless, the performance of the policy will depend on the policy design and the enabling environment of the policy, e.g., macroeconomic conditions, political and regulatory risk, and financial sources. During the last decades, many Latin American and Caribbean countries have implemented energy policies to promote renewable electricity. Many of these countries have used a similar combination of support instruments (feed-in laws, targets, auctions, investment subsidies, etc.). However, the results are very dissimilar. In some cases, similar policies, and even the same instruments led to significant increases in renewable energies, while in other cases the impact has been very small. The aim of this study is to review the recent application of energy policies to renewable energies in a group of South American countries and to analyze whether the performance of the policy is due to policy incentives or enabling environment.

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INTRODUCTION

The diversification of the energy mix and promotion of renewable energy have become a priority for all the regions of the world with the key motivation differing within the countries. While traditionally developed countries have been motivated by mitigation purposes due to their higher level of green house gases (GHG) emissions and reduction commitments; developing countries have been oriented by development goals (increasing energy access, addressing growing energy demand, or reducing the dependence on imported fossil fuels), as they have a small participation out of the total of anthropogenic GHG emissions and no binding reduction targets. However, this situation appears to be changing. In the 2001–2012 period energy-related emission grew significantly in developing non-OECD countries (nearly 80%) and remained nearly stable in the OECD region.[1] As argued by different scenarios performed by the Department of Energy of the US

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Energy Information Administration (DOE/EIA) and the Intergovernmental Panel on Climate Change (IPCC) by 2040/2050 developing countries will be the most energy consumer and emitting regions, because of the high rate of growth of their economies and population and because they will rely on fossil fuels to meet this growing energy demand.[1–3] Then mitigation will turn into a relevant motivation to promote New Renewable Energy Sources (NRES).

The Latin American and Caribbean region (LAC) presents one of the cleanest electricity mix of the world, with more than 50% of power generation corresponding to big hydro and nearly 42% to thermal and nuclear generation (the remaining share corresponds to NRES). The situation within the region is diverse, and it can be divided in countries where big hydro power generation is predominant (Paraguay, Guatemala, Colombia, Costa Rica, Brazil, Suriname, Venezuela, Belize, Uruguay, Peru, and Ecuador), and countries with higher share of thermal generation (Panamá, Bolivia, Argentina, Chile, Haiti, México, Dominican Republic, Jamaica, Cuba, Guyana, Barbados, and Grenada). However, along the last decades many of these countries have been facing different energy challenges: increasing energy security, reducing external dependence and economic impact of the energy balance, and improving environmental quality of the energy sector, among others. Therefore, they have begun to implement energy policies to promote the diversification of their electricity sectors. Although many of them have used a similar combination of support instruments (feed-in laws, targets, auctions, investment subsidies, etc.) the performance of these policies has been very dissimilar: in many cases they resulted in significant increases in renewable energies, while in other cases the impact has been very small. The key question, then, is why have these countries shown this different performance if support schemes are similar? Which factors have determined different policy paths?

After a worldwide review of instruments in different regions, del Rio and Linares[4] concludes that instrument choice is context-dependent (ergo the good performance of an instrument in country A is not a sufficient condition for its application and good performance in country B) and that the design of the instrument is critical to obtain good results. In this framework, the objective of this article is to study the impact of the context (or as it will be defined later *the enabling environment*) on the performance of the NRES in a group of seven countries from the South American Region: Argentina, Brazil, Chile, Colombia, Ecuador, Peru, and Uruguay. This research argues that understanding the role and relevance of the enabling context and design elements of the instruments is crucial to comprehend the different performance of the NRES in the countries under study. The enabling context is relevant because it can enhance or reduce the impact of policy instruments, as it has been mentioned before and argued by del Rio and Linares.[4] Then the countries are evaluated on relative scores estimated under different indicators.

Accordingly, the article is structured as follows. *Enabling Environments and Instruments* section describes the concept of enabling conditions and presents a review of the literature. *Methodology* section describes methodology and data for the analysis. *Comparing Enabling Frameworks*, *Legislation and Renewables Deployment in Lac* section presents the core characteristics of the countries, studies their enabling conditions according to methodology defined in *Methodology* section and briefly analyses the existing instruments for the promotion of NRES. *Lessons Learned and Policy Recommendations* section presents the main policy lessons and recommendations. Then, some brief conclusions are presented.

ENABLING ENVIRONMENTS AND INSTRUMENTS

The performance and success of any energy policy result from the combination of different factors: the international and national context, the attitude of the stakeholders of the sector, the elaboration of the policy, and the instruments chosen to overcome the existing barriers for the penetration of different technologies.[5]

The renewable energy policy is a subsectorial policy, which main objective is to increase the share of NRES in total electricity produced or consumed. To this purpose, there is a range of options of instruments and support schemes that could be applied to each specific source. Nonetheless, there is no a unique combination of them. As stated by del Rio and Linares,[4] economic and political considerations should be present and considered at the moment of designing an instrument, because this context (and the consequent stakeholder's reaction to the support system) affect the outcome of the policy. Yin and Powers[6] study the effectiveness of Renewable Portfolio Standards (RPS) to promote in-state NRES generation in the United States, and find that studying policy design details is crucial for assessing the effectiveness of the policy. As mentioned by the authors, the key features of the design of the instrument affect

the magnitude of the effect of the incentives. According to Marques et al.,[7] there are three key factors that should be considered when designing renewable policies as they are crucial to encourage or discourage investments: political, economic, and country specific factors. Vachon and Menz[8] argue that the existence of political commitment and consistent policy framework is crucial for the development of NRES. In this regard, the Climate Change commitment has been crucial in the countries studied by the authors, because a GHG reduction is one of the two leading motivations for green electricity policies. Additionally, the authors found that the success of policies depends on governmental capacities to implement them and the existence of long-term consistent scenery for investments. Recently, Jacobs et al.[9] evaluated the renewable energy incentives in a group of countries from the LAC region (Argentina, Dominican Republic, Ecuador, Honduras, and Nicaragua) and find out that design aspects appear to have been less relevant than the broader enabling environment. In particular: political risk, regulatory risk, and counterparty risk, have been responsible for the results of these policies in the countries.

Following the literature, the context of the implementation of the policy can be defined as the *enabling framework or enabling conditions*: 'institutional, regulatory, economic, and political framework conditions favorable to promote and facilitate the policy'[10] or, as mentioned in Marques et al.,[7] the economic, political, and country-specific factors. This context should be considered at the moment of the elaboration of the policy and selection of the specific instruments to promote NRES. The relevance and impact of the enabling framework are straightforward: the performance of any policy implemented depends on how favorable is the context; e.g., the performance of economic instruments (e.g., tax incentives for investments, renewable subsidies, etc.) will depend on the economic context of the country. As it will be seen shortly, in some countries well-designed incentives failed because of a nonfavorable investment environment.

Table 1 presents a categorization of the enabling frameworks for the promotion of renewable energies. As argued by Boldt et al.,[10] some categories of an enabling environment are more relevant or influential than others. This will depend on the specific situation of the country, the historical moment and the characteristics of the energy sector. For instance, finance and macroeconomic aspects appears to be crucial in LAC, as in 2010 most of financial funds for renewable energies were allocated in countries categorized as investment grade, in which there is a clear consistence between economic and energy policies.[12]

The design and elaboration of the NRES strategy is the second critical aspect for a good performance of the policy. A careful evaluation and understanding of the most relevant obstacles and problems that projects may confront is supposed to be the first stage of the elaboration of the policy. Empirical evidence has shown that in spite of high renewable energy potential, countries do not succeed on including NRES on energy systems, unless they address the specific issues that prevent the penetration of renewable energies.[13] These barriers (obstacles or impediments) faced by renewable energies, can be defined as man-made factors that interfere between the potential and actual installed capacity of renewable energies and need to be removed; otherwise they will translate into higher costs and risks.[14] The relevance of these barriers for the penetration has been widely discussed in the economic literature, and each author makes a different classification of them (see, e.g., Refs 10,13,15–18). It is worth noting that barriers tend to be context-specific and vary over time and, therefore, require country-specific policies instruments and strategies to remove them. However, empirical evidence shows that one unique instrument is not enough to successfully promote NRES because technologies confront more than one barrier, and a combination of instruments will be required.[19,20]

There is a branch of instruments to promote renewable energies. The literature on renewable energy support classifies them in primary (dominating instruments or main support schemes) and secondary instruments.[19] Primary instruments are the base of the incentive structure and are used to promote the investments and set the remuneration of the projects, and include: Feed-in laws (*Feed-in Tariffs* [FITs] or *Feed-in Premiums* [FIPs]), Quotas or RPS, Tradable Green Certificates (TGCs), Tenders, Auctions, and Net metering; secondary instruments are used as complements for investment profitability: investments subsidies, soft loans, fiscal incentives, and R&D policies.

All these instruments are different and tend to remove a specific barrier (investments feasibility, financial access, technology access, etc.). As mentioned, the performance of the instruments depends on their design. Some common design elements should be considered carefully: Eligibility of the plants to be included in the promotion (incentives will be applied only to new plants or the incentives are to be applied to existing capacity also?); Eligibility of technologies to be promoted; duration of the support (recommended time length of 15–20 years);

TABLE 1 | Most Relevant Enabling Conditions for Renewable Energy Policies

National Enabling Condition	Subcategory	Description/Relevance for the RE policy
Organizational leadership and institutions, coordination and participation	High-level commitment and leadership	A high level of political commitment contributes to enhance the institutional arrangements and regulations as well as the required coordination across ministries
	Clear and strong institutional organization	The existence of strong institutions facilitates the development and implementation of policies, and is crucial to stimulate private investment. These institutions can be independent or integrated to the national energy authority, but they need a strong institutional capacity (technical, managerial, and financial)
Policy and regulatory framework	Clear and stable policy and regulatory frameworks and enforcement of laws	The existence of a clear and stable regulation is a 'necessary condition' for the development of RE. These regulations should frame and orient all the efforts of developing RE. These policies require to be 'enforceable.' All the most accurate institutional arrangements and mechanisms should be put in place to guarantee that regulation is enforced in practice
	Synergies with other sectorial policies and strategies	The RE policy should take into account the linkages and synergies with other existing strategies, plans or program. This is particularly important for environmental and climate change policies (especially mitigation policies)
Economic and financial issues	Local macroeconomic conditions	The existence of enabling macroeconomic conditions can erase the barriers for RE. In particular, uncertainty context for energy policy may affect the investment in new technologies; and also macroeconomic evolution may affect negatively socioeconomic aspects and reduce the capacities to face the higher costs of RE from consumers
	Effective availability and use of funds and investments	The deployment of RE project requires both private and public investments. In those cases in which no local funds are available the country will require external access to funding. This enabling condition includes, low (or inexistence) of credit restrictions and low or competitive rates of interest for NRES projects
Information for decision making and for monitoring	Transparent, clear, and quality information in the energy sector	The existence of this information on the different subsector of the energy sector will provide more confidence to local and foreign investors. This will also be important to develop and monitoring the public policies implemented and their performance. The information should be of good quality and be available and accessible

TABLE 1 | Continued

National Enabling Condition	Subcategory	Description/Relevance for the RE policy
	Information on the availability of resources	Investment will require initial information on the availability of renewable resources. This includes technical data for sectorial diagnosis, as well costs and benefits of different alternatives
Capacities	Individual, institutional	Individual capacities (knowledge and abilities) are required in the staff of the RE agencies, but it also requires the institutional capacity of coordination between all the individuals of the agency and with other individuals from other agencies
	Synergy between individual and institutional capacities	The existence of individual capacities is not a sufficient condition to the successful promotion of RE. It is crucial that these capacities are developed within national or regional public agencies and remain in those institutions
Public awareness and outreach	Acknowledgment of the importance of RE for environmental policy and other energy objectives	This will require public and NGOs campaigns to encourage more responsible behavior production and consumption of energy resources. These campaigns should create a general understanding of the relevance of the topic for global and national sustainable development

Source: Own elaboration based on Refs 10,11.

size of the projects to be supported; support locally oriented or not; decreasing support level along the policy timeframe or constant support; who will carry the cost burden of the support (consumers or public budget).[20] All these aspects are directly related to the renewable energy policy elaboration.

Additionally, there are specific features that depend on each instrument. Tenders (also referred to as competitive bidding or auctioning) have been used in almost 60 countries around the world by 2015,[21] and have shown some positive effects (low support requirements and good adaptation to reductions in required support levels) and negative impacts (ineffectiveness in terms of electricity commissioned, low diversity, administrative costs, among others). However, negative aspects can be surpassed with some key designing aspects: establishing a schedule for regular auctions in order to provide more certainty to investors, a minimum number of bidders, long-term contracts, penalties for noncompliance to avoid abandonment, deadlines, and combination with price polices.[4,20]

Feed-in laws can be implemented as FIPs, long-term contracts providing a payment per kWh on top of the electricity wholesale-market price; or FITs, long-term contracts at a fixed price established to provide developers a reasonable rate of return.[22] FITs are widely used (at early 2015, they were in place in 73 countries at the national level and in 35 states/provinces in Australia, Canada, China, India, and the United States[21]) and are considered very cost-effective options. Nevertheless, in the last decades, their pace for adoption slow and many countries have switch from FITs to FIPs or to public competitive biddings or tenders, and many FIT payment rates were adjusted downwards.[23] Similarly to the rest of the instruments, the design of the policy should take into consideration different aspects such as: rules for grid connections (guaranteed interconnection, guaranteed purchase, and priority dispatch); amount of electricity generated to be purchased; long-term contracts (usually 15–20 years) and transparent characteristics for delivery; how to set remuneration rates and the payment structure; and a periodic adjustment of the policy; among others.[4] For FITs in the LAC region, Jacobs et al.[9] find that in none of the countries under study (Argentina, Dominican Republic, Ecuador, Honduras, Nicaragua, and Peru) FITs resulted in high deployment rate. In these cases policy design, despite not fully

matching the low-risk design of other regions may have not been the primary constraint to renewable energies market growth. External factors (the enabling framework) to the FIT have been responsible to constraint the market.

TGCs are certificates of green electricity that can be sold in the market, allowing for additional revenues to NRES producers,[19] and are usually used with an obligation share of renewable energy established by authorities. These instruments are cost effective and promote the competition among producers. Some of the key features of the TGC are: setting minimum TGC prices to limit risks for investors and reduce financial costs; establishing the possibility to use the TGC in the future to comply with NRES targets; institute a maximum TGC price above the marginal cost of the technologies in order to limit the cost of the support and discourage noncompliance.[20,21]

Quotas or RPS, also known as Renewable Electricity Standard (RES) in the United States or Renewables Obligation in the UK, is a mandate to increase renewable energies production, or an obligation to companies to produce a share of their electricity with renewable sources. RPS have been widely used by different states in the United States, and more recently have gained significance worldwide and are being implemented in Australia, Belgium, Italy, Sweden, and the UK.[24,25] By early 2015, they were implemented in 27 countries around the world.[21] Some aspects to consider while designing this instrument are: RPS should be stable and requires a long term, they are more effective when used with other instruments (e.g., TGC), costs of RPS should be allocated across all utility consumers, and noncompliance penalties are required. As argued by Yin and Powers[6] RPS have a positive effect on renewable energy development, although there are significant differences among different countries due to the enabling framework of the implementation of the instrument.

These primary instruments are complemented by other support policies (secondary instruments), as for instance: tax reductions, grants, and low-interest loans, which are adopted by more than 126 countries in the world.[21]

Finally, although a mix of policy instruments is required to remove barriers to entry and successfully promote renewable energies, Heeter et al.[26] highlights that there are conflicts between individual instruments in mixes (especially if instruments design and implementation fall within different governmental levels). The success of the policy also depends on implementation capacity, and the existence of stable objective and policies along a long-term horizon.[21] In this sense, design, coordination, and implementation of the instruments are crucial.

METHODOLOGY

Analytical Framework

In order to facilitate the comparison among countries, some patterns and indicators for each enabling condition must be delineated. Transforming qualitative characteristics, noneasy to measure, into quantitative comparable indicators is one of the most challenging aspects of the study.

The enabling conditions defined in *Enabling Environments and Instruments* section have been traduced into specific indicators. Indicators selection was based on their capacity to represent the enabling condition, their simplicity and the availability of information. Indicators were built on at least two characteristics or variables for each one of them. Following Corrigan et al.,[27] the variables selected for each indicator were aggregated by transforming them into a 1–5 scale. To this purpose, a min–max transformation was applied to preserve the order and the relative distance between the countries scores.[a]

Table 2 presents the indicators selected. Additional studies may involve a different selection of indicators, according to the criteria of the author. Due to the difficulty of translating enabling conditions 8–10 into quantitative indicators, they have been simplified.

In order to simplify the analysis, an equal weight was given to each one of the indicators. This may represent a weakness of the methodology, as not all the enabling conditions may have the same impact over the RE policy, and should probably be improved in future extensions of the work.

Finally, with the purpose of avoiding aggregation problems, indicators were not converted into a unique index. Instead of this, the performance of each country is shown in a chart built on the 10 pillars of the enabling context mentioned in Table 2. This schematic framework, broadly used different authors[28–32], is used to show how each one of the enabling conditions cooperate and interact to provide a facilitating context for NRES investments.

Data

This study relied mostly on qualitative information, and some quantitative data. Each one of the 10 indicators was built on a conjunction of information: review and evaluation of the energy information (energy balances, reserves, wholesale prices, NRES

TABLE 2 | Selected Indicators for the Enabling Conditions, Definitions, and Scoring

No.	Indicator	Definition and Score
1	Commitment	How is the governmental commitment to the RE cause in the country? Is there any expression of commitment with RE? Official documents or laws establishing RE as a priority for energy policy or of national interest. Has the country elaborated or developed energy related NAMAs or Clean Development Projects on renewable energy? (1 = extremely low; 5 = extremely high)
2	Institutions	How can be assessed the RE institutions in the country? Is there any particular institution, independent or dependent of any official organization, specialized with RE in the governmental sector? (1 = extremely underdeveloped, 5 = highly developed and efficient)
3	Regulation	Are there policy incentives and structures for clean energy policy? Which are the perceptions about the ability of governmental institutions to formulate and implement clean energy policies? (1 = very poor; 5 = extremely good)
4	Synergy	Does the country have any Low Carbon Development Strategy or Climate Change Strategy that explicitly addresses the RE promotion? Does the country have of is planning to implement GHG market based incentives? (1 = no strategies; 5 = strategies exist and the country has developed both CDM and NAMAs)
5	Economy	How good are macroeconomic conditions perceived for private investment? Annual percent change in consumer price index (year average). Gross general government debt as a percentage of GDP (1 = non favorable macroeconomic conditions; 5 = highly favorable)
6	Financing	Property rights and country credit rating. How strong is the protection of property rights, including financial assets? Probability of sovereign debt default
7	Energy information	How good and reliable is energy information on the country? Is there enough and reliable information on different variables for the energy sector in at least the last 10 years (energy balances, prices, reserves, wholesale market, etc.) (1 = nonreliable; 5 = completely reliable and accurate)
8	RE information	How good and sufficient is information on renewable energies in the country? Existence of freely available information on renewable energy resources endowments: wind and solar maps, information on biomass, databases with costs, etc. (1 = not sufficient; 5 = sufficient and relevant)
9	Capacities	Existence of public programs to promote the training of the professionals in the country in the branch of RES. (1 = not sufficient; 5 = sufficient)
10	Public awareness	Do the governmental institutions perform relevant information campaigns to promote the use of RES in conjunction with mitigation policies? (1 = very poor; 5 = extremely good)

Source: Own elaboration.

availability, solar and wind maps, existence of official documents or laws establishing renewable energy as a priority for energy policy or of national interest, NRES targets, existence of independent institutions renewable energy, instruments to promote NRES, among other) available at Ministries of Energy or Secretaries for Energy of each of the countries; information on Low Carbon Development Strategy or Climate Change Strategy from Ministries for Environment; data about NAMAs related to renewable energy submitted to the United Nations Framework Convention on Climate Change (UNFCCC) was gathered from the official Web page of the Convention; finally quantitative information on inflation rates, and governmental debts were gathered from Ministries for Economy of each country.

In order to complement the information, four sources of information were used. First, the Climatescope2014[b] report[34] and the REN21 site[c] that have been used to complement the information from countries governmental sites. Secondly, the Global Competitiveness index Report 2014–2015[28] and the World Governance Indicators (WGI) from the World Bank,[d,35] which were really helpful to obtain information on private perceptions for different countries in a similar base, that makes it easier to compare.

COMPARING ENABLING FRAMEWORKS, LEGISLATION, AND RENEWABLES DEPLOYMENT IN LAC

Brief Country Characterization and Comparison

At the end of eighties and early nineties, some countries from the Latin American region reformed and

liberalized their electric systems.[5,35–42] This process was initiated in Chile in 1982, and followed by Argentina, Peru, Bolivia, Colombia, Panamá, El Salvador, Guatemala, Nicaragua, Costa Rica, Honduras, Brazil, Venezuela, Mexico, and Ecuador, and took them to a deep transformation of the energy (and electricity) sectors.[37,41] The discussion around the aspects that motivated the implementation of these reforms has been very diverse. On the one hand, there are arguments pointing out that in Latin American countries power sector reforms were motivated by fiscal deficits, inefficient management of utilities and lack of capital investment.[41] On the other hand, other authors and institutions highlight the role of the Washington Consensus and the policies promoted by the World Bank and the International Monetary Fund to implement radical economic policies.[5]

The initial energy context of the electricity reforms was very similar: vertically integrated business driven by the State, evolving to a disintegration of generation, transmission, distribution, and supply, with competition among private actors and State regulation.[37–40] Nevertheless, each country applied the reforms in a different way attending to their specific economic and political context and, therefore, electricity sectors followed different paths. Argentina implemented the deepest reform, followed by Chile, Peru, and Colombia. All these countries went throughout a path from high state control of the systems, to a high penetration of market coordination rules. However, Brazil, Ecuador, and Uruguay developed more moderated reforms.[e] Indeed, Montero[37] and Nagayama and Kashiwaki[41] stress that while Argentina, Bolivia, and Peru totally privatized the sector, Colombia and Brazil aimed at promoting private participation to the sector avoiding full-scale privatization and keeping the governmental control of natural resources.

The debt crises during the eighties, the high external indebtedness, the globalization, and changes in the economic structure promulgated by international financial organisms were the worldwide socioeconomic and political settlement for the energy reforms in the region. The key drivers of the economic reforms were: reducing fiscal deficit; paying the external debt; reduction of the autonomy of central governments; opening the economy to external commerce; reducing discretion in exchange rates; deregulation of the majority of internal markets; reductions of the role of the State as entrepreneurship; and privatization of public companies.[5]

Within the group of countries, the situation was quite dissimilar. In Argentina, e.g., the macroeconomic crises that framed the reforms had been preceded by a political crises and the existence of a long period of dictatorships, which ended in high rates of unemployment, hyperinflation, and external debts.[37,38,40,43] In the case of Chile, the political context was characterized by the lack of institutional freedom and independence and the reforms were performed during Pinochet dictatorship. In Peru, the reforms were developed in a context of macroeconomic and structural changes implemented in 1990 and the reform of the National Constitution.[42] More recently, these countries have gone through new socioeconomic and energy situations. For example, in Argentina, after the 2001/2002 economic crises (high unemployment rates, emergency laws, and changes in the monetary regime) the government has gone throughout re-reforms[43,44] as well as the dollarization of the Ecuadorian economy has also settled a new context for the energy policy. In the energy sectors, some countries have performed a renationalization of some of the energy companies (Venezuela, Bolivia, Ecuador, and Argentina).[45]

Table 3 resumes some of the most recent, core economic and energy characteristics of the countries under study. As it can be noted, most of the countries belong to upper middle income group, but display an inequality income distribution as shown by the Gini Index, which is above or nearly 50 for all of them. Conversely, in most of OECD countries this index is around 31, differing from values under 30 (Germany, Austria, Belgium, Denmark, Czech Republic, France, and Hungary) to values near 40 (Spain, Italy, and USA), among others.[46] Except for Peru and Colombia, the region has high urbanization rates, and good electrification rates (at least in urban areas).

With regards to electricity consumption and environmental pressure, electricity per capita is superior to others underdeveloped or developing regions, but significantly lower than OECD countries (8089 kWh/capita in 2013).[48] Environmental impact (measured as CO_2 emissions per capita) is low compared to the majority of the regions of the world (OECD, Middle-East, Non-OECD Europe and Eurasia, and China),[48] except for Argentina and Chile, which can be related to their electricity generation mix.

Argentina and Brazil are the countries with the highest wind power potential. All the countries have significant hydropower capacity, with Brazilian hydro potential accounting to 51% of total hydro potential of the region. Argentina, Chile, Ecuador, and Peru are the less 'green' countries regarding the composition of their electricity mix. For all the

TABLE 3 | Country Socioeconomic and Energy-specific Characteristics

Country	GDP pc[2013] (Constant 2005 US$)[a]	GINI Index[b]	Urban Rate	Electricity Coverage (%)[c]		Elec. Cons. pc (kWh/capita)[d]	CO_2/pop (tCO_2/capita)[d]	Renewables Potential[e]	Energy Intensity (toe/mill 2005 U$S)[f]	Electricity Mix/Power Generation by Technology
				Urban	Rural					
Argentina	8257	43.57 (2011)	92.4	98	70	3027	4.59	Wind (MW): 200,000 Geothermal (MW): 2010 Solar (W/m^2): 412.10 Hydro (MW): 40,000	251.27	2013[g] Hydro: 29.12% Thermal: 66.97% NRES (wind and solar): 0.64% Nuclear: 3.27%
Brazil	5823	52.67 (2012)	86.5	98.8	73	2509	2.22	Wind (MW): 142,000 Geothermal (MW): 115 Solar (W/m^2): 471 Hydro (MW): 260,000	239.65	2013[h] Hydro: 67.86% Thermal : 28.82% NRES (wind and solar): 1.74% Nuclear: 1.56%
Chile	9728	50.84 (2011)	89	100	93.5	3807	4.47	Wind (MW): 40,000 Geothermal (MW): 452 Solar (W/m^2): 452.70 Hydro (MW): 25,000	214.81	2013[i] Hydro: 35.23% Thermal: 60.73% NRES (biomass and wind): 4.04%
Colombia	4394	53.53 (2012)	75.1	93	55	1130	1.41	Wind (MW): 18,000 Geothermal (MW): 2210 Solar (W/m^2): 417.80 Hydro (MW): 90,000	162.16	2014[j] Hydro: 70.20% Thermal: 29.21% NRES: 0.58%
Ecuador	3700	46.57 (2012)	66.9	93	79	1276	2.14	Wind (MW): 884 Geothermal (MW): 1700 Solar (W/m^2): 323 Hydro (MW): 25,000	244.67	2013[k] Hydro: 38.98% Thermal: 60.62% NRES (wind and solar): 0.41%

TABLE 3 | Continued

Country	GDP pc[2013] (Constant 2005 US$)[a]	GINI Index[b]	Urban Rate	Electricity Coverage (%)[c]		Elec. Cons. pc (kWh/capita)[d]	CO_2/pop (tCO_2/capita)[d]	Renewables Potential[e]	Energy Intensity (toe/mill 2005 U$S)[f]	Electricity Mix/Power Generation by Technology
				Urban	Rural					
Peru	4109	45.33 (2012)	71.6	95	30	1118	1.53	Wind (MW): 22,000 Geothermal (MW): 2990 Solar (W/m^2): 508 Hydro (MW): 60,000	184.79	2013[l] Hydro: 32.2% Thermal: 67.1% NRES (wind and solar): 0.7%
Uruguay	7808	41.32 (2012)	92.5	98.7		2933	2.47	Wind (MW): 3000 Solar (W/m^2): 405.30 Hydro (MW): 1800	180.20	2014[m] Hydro: 41.36% Thermal: 34.28% Thermal (biomass): 11% NRES (wind): 12.94%

Source: Adapted from Ref 46.
[a] Base 2013. Source: World DataBank: http://databank.worldbank.org
[b] Values between 0 and 100. Source: World DataBank: http://databank.worldbank.org
[c] Access to Electricity in %. Source: REEEP Policy Database: http://www.reeep.org
[d] Base 2013, Source: IEA Key World Energy Statistics 2014. www.iea.org
[e] www.olade.org and http://sier.olade.org/[48];
[f] Own calculations based on information from World DataBank: http://databank.worldbank.org on base 2011.
[g] Secretaría de Energía: www.energia.gov.ar
[h] Ministério De Minas E Energia, Secretaria De Energia Elétrica, Departamento De Monitoramento Do Sistema Elétrico: http://www.mme.gov.br/
[i] Comisión Nacional de Energía: http://www.cne.cl/estadisticas/energia/electricidad
[j] UPME, Sistema de Información Eléctrico Colombiano: http://www.siel.gov.co/
[k] Ministerio de Electricidad y Energía Renovables, Agencia de Regulación y Control de Electricidad: http://www.conelec.gob.ec/index.php?l = 1
[l] Ministerio de Energía y Minas: http://www.minem.gob.pe/
[m] Ministerio de Industria, Energía y Minería, Dirección Nacional de Energía: http://www.dne.gub.uy

countries of the sample, Uruguay appears to be the one with the highest share of NRES in electricity sector.

The Enabling Framework of NRES Implementation

Following the methodology presented in *Methodology* section, Figure 1 presents the chart for each of the countries analyzed in this study. As it can be clearly noted Chile, Brazil, and Uruguay have the best enabling frameworks for NRES promotion. These results are similar to Bloomberg New Energy Finance,[33] even though in the Climatoscope report Brazil is ranked as the country with the best context for NRES deployment.

Chile scores are high due to commitment and the synergy between policies. The country shows a high degree of commitment with NRES promotion, renewable energies have been declared as of national interest in laws and programs, and the country has one of the highest renewable energy targets of the sample; furthermore, recently the government doubled the renewable power target to 20% of total generation by 2025. For synergy, the country has high scores due to the existence of a framing National Climate Change Action Plan and different initiatives related to the reduction of GHG (CDM and NAMAs), and it has recently approved South America's first carbon tax that will start in 2017.[33] Additionally, it has good macroeconomic and financial conditions.[33,34] According to REN21,[21] Chile belong to the group of six new countries to which renewable investments spread in 2014, with more than 1 billon US dollars of investments.

In the case of Brazil, the good performance is related to the institutional framework, shown in the existence of specific institutions for the promotion of renewable energies and renewable fuels; and the commitment expresed in its recent increase in the share of electricity, as mentioned in Brazilian Intended Nationally Determined Contribution (INDC). Since 2009 Brazil has a National Law on Climate Change and a lot of different plans related to mitigation.[49] Brazil also presents high-quality information on the energy sector and on renewable energies. Finally, macroeconomic conditions have been good for the most important economy of the LAC region. These conditions have transformed Brazil into one of the top 10 national investors in renewable; the Global New Investment in Renewable Power and Fuels in the country grew 194% between 2013 and 2014 to almost 7.6 billon US$.[21]

Uruguay also shows a high political commitment with NRES, this can be clearly noted in the National Energy Plan 2005–2030, which states the increase of the share of renewable energy sources in power generation; and the National Plan on Climate Change that specifically address the relevance of the diversification of the energy mix. It also has good qualification on synergy (this is the country with the greater number of NAMAs registered to the UNFCCC related to renewable energy). The country also presents different official information on energy sector and renewable energies (energy balances 1965–2011, wind speed data, wind maps, solar maps, solar resource assessments, among others). Additionally, from 2010 there is a Multi-Party Energy Board, made up by four political parties with representation in the parliament to discuss and determine the energy policy which clearly constitutes an expression of long-term stable energy policy. Macroeconomics and finance conditions have made the country an attractive destination for energy investments, and this country has received in conjunction with other countries) between the 500 million to 1 billion US dollars.[21] These conditions turned it into the fourth biggest recipient of clean energy investment in the LAC region during 2013–2014.[33]

On the opposite side, Argentina appears to have the least promising framework for the promotion of renewable energies. Despite having implemented renewable energy policies more than 15 years ago, Argentina has established a low quota for renewable energies, and NRES are mentioned as of national interest only in the Law 26.190 for the promotion of renewable energies. For synergy, scores are also low. Despite being developing the Climate Change National Strategy, still there is no an official document that clearly relates Climate Change and NRES, and the country has not submitted any NAMA to the UNFCCC. The institutions score is also low, as the country has not an independent institution or organization to promote NRES. Instead of this, the Coordination of Renewable Energy, (which main objectives are the identification of renewable energies projects, updating information about renewable technologies, coordination of international cooperation activities, and barrier identification for renewable energies) belongs to the National Direction for Promotion in the Undersecretary for Electricity.[49] As mentioned in Corrigan et al.,[27] the country presents a low regulatory quality and low property rights. Due to the economic performance of Argentina at the start of the millennium, its default of external debt and rupture of different contracts of public services, its negotiation with external donors

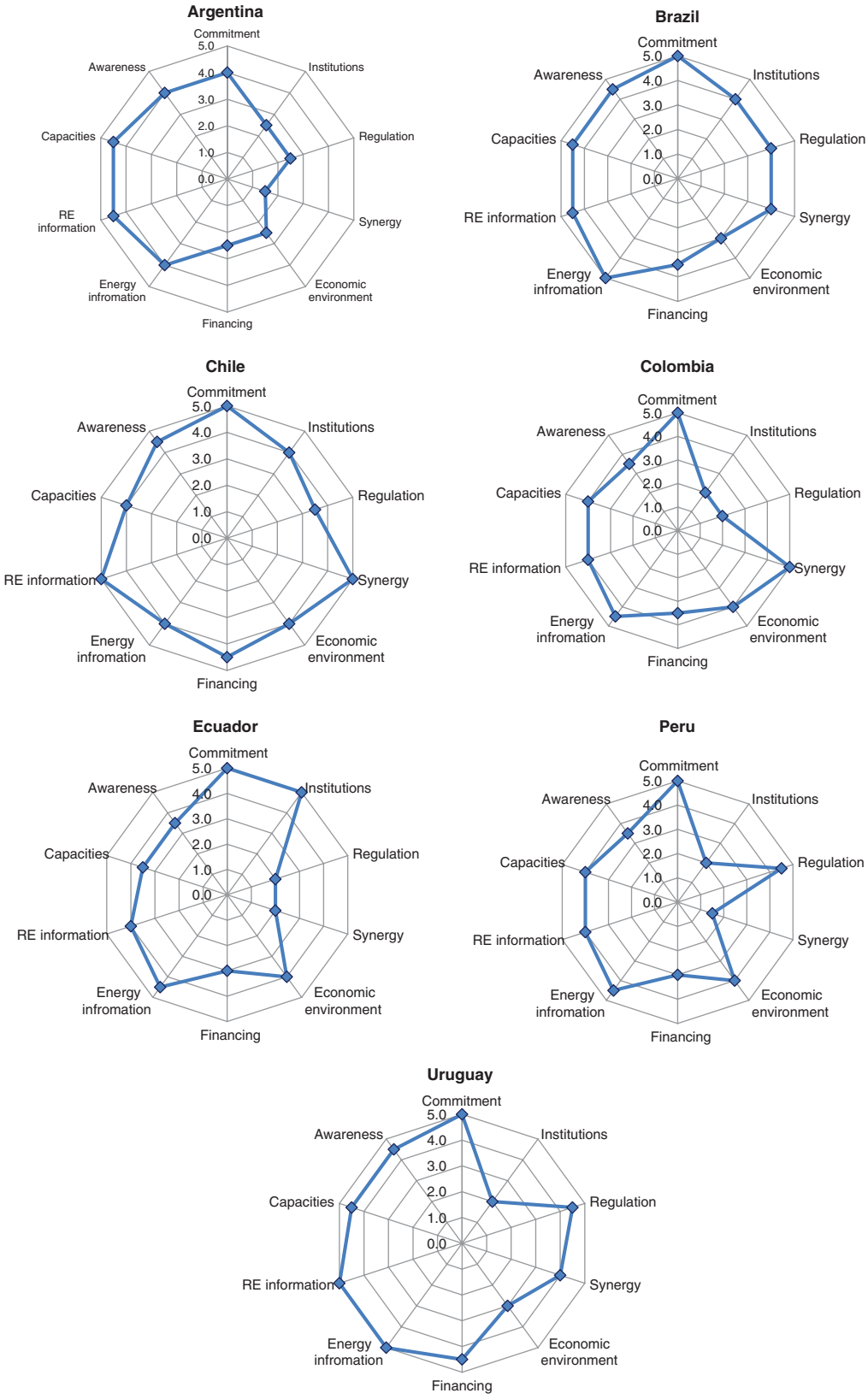

FIGURE 1 | Enabling frameworks for the studied countries by December 2014. Source: Own elaboration

remains frozen and the financing has been reduced. As remarked by Bloomberg New Energy Finance,[33] market risk, lack of financing alternatives, subsidies and low retail electricity prices, offtaker counterparty risk, and policies not fully implemented are the main hurdles faced by renewables in the country.

For the rest of the countries, the enabling framework appears to be quite similar. Colombia has good scores on commitment, as there are different Laws or plans that clearly state the relevance of renewable energies and mix diversification, e.g., the 2010–2015 Indicative Action Plan (PROURE). For synergy, the Colombian Strategy for Low-Carbon Development (ECDBC) that aims to decouple the growth of GHG emissions from national economic growth, and addresses the relevance of the promotion of NRES in both interconnected and noninterconnected zones, as well as the development of NAMAs on renewable energy.[49] It is also member of the Partnership for Market Readiness.[33] The lowest scores in this case are institutions and regulations due to incipient clean energy policies, and low regulatory quality.[33] Nevertheless, in 2015 Colombia has been developing a new regulation for NRES and energy efficiency (Law 1715) that may have a significant contribution to the regulatory framework of the country. This new regulation includes a lot of tax incentives (import duty exemptions, value added tax [VAT] exemptions, income tax reduction, and accelerated depreciation.[21]

Similarly to Colombia, Ecuador has good scores in governmental commitment and institutions; but a low score on regulation because of its incipient clean energy policies, and low regulatory quality. However, Ecuador has a promising clean energy policy framework although NRES competitiveness in the country is complicated by its low retail electricity prices.[26] Finally, Peru has an average score in the majority of indicators except for synergy and institutions were the scores are low, and regulation with high scores due to regulatory quality.[33] For macroeconomic conditions, the low electricity prices have become renewables energies in highly dependent on government-driven auctions.

The Instruments

The share of NRES in power generation capacity and in power production is very dissimilar among the countries. Despite different results, all the countries have used a similar combination of instruments to promote NRES: targets, feed-in-laws, and tenders/auctions. Regarding the primary instruments three of the countries have implemented targets, FITs or FIPs and tenders (Argentina, Brazil, and Uruguay); three have instituted targets and tenders (Chile and Peru); and one country has only used one primary instrument (Colombia) (targets).

All the countries have instaured a quota for NRES between 5 and 25%, as shown in Table 4.[f,g] Chile and Uruguay have the most ambitious targets, and they also have reached the highest rate of deployment. On the opposite site, Ecuador, Colombia, Argentina, and Peru have a low NRES installed capacity and are far from their quotas, which in the cases of Peru, Colombia, and Argentina are significantly lower than Chile and Uruguay.

In Argentina, according to the Law 26,190 (2009) the share of NRES in total electricity generation must be 8% by 2016. This law also sets FIPs for the renewable energy produced and establishes different secondary instruments (income tax exemptions and accelerated depreciation for investments). However, these instruments were not successful. FIPs from Law 26,190 had two main criticisms: on the one hand, they were set at low level and based on the wholesale market prices, which were frozen after the 2001 devaluation[43,44]; however, these FIPs were established on Argentinean pesos and then after years of slow but permanent devaluation of the national currency these premiums are outdated. These two aspects reduce the profitability and the incentives of the investments. In order to overcome these problems, in 2010 the government implemented a public tender for auction for 1000 MW of NRES (the GENREN program), adopting a *FIT* scheme, with prices set in US dollars (see Table 6). Nevertheless, by December 2014 the rate of deployment of the projects contracted by the GENREN was significantly low: 15.55%.[50]

Along the last years Brazil has implemented a branch of primary instruments: a target of 13%, auctions, and FITs (in the frameworks of the PROINFA). The country has also commanded net metering policies in the region by the implementation of a new scheme for small residential users. This instrument, implemented in 2012 by the Brazilian Energy Agency (ANEEL) is limited to hydro, solar, biomass, and wind power generators up to 1 MW, within this program ANEEL also provides credits for the acquisition of the equipment that must be used within 36 months. The Program for Alternative Energy Sources (PROINFA) was implemented in 2002 with the aim of increasing the installed capacity of wind, solar, and small hydro power plants, and was supposed to be developed in two stages.[49] The first stage of this policy set contracts for capacity up to 3300 MW, with a FIT stablished in Brazil Real

TABLE 4 | Renewable Energy Targets for Nonconventional RES

	Argentina	Brazil	Chile	Colombia	Ecuador	Peru	Uruguay
Target	8% (2016)	23% (2030)	20% (2025)	6.5% (2020)	10% (2020)	6% (2018)	15% (2030)
NRES power capacity	0.64% (2013)[a]	1.74% (2013)[a]	4.04% (2013)[b]	0.58 (2014)[b]	0.41% (2013)[a]	0.7% (2013)[a]	12.94% (2014)[a]
NRES power generation	0.36% (2013)[a]	1.21% (2013)[a]	3.36% (2013)[b]	4.68 (2014)[c]	1.97% (2013)[d]	0.46% (2013)[a]	6.22% (2014)[a]

Source: Own elaboration from countries official information (see official Web pages at the end of the paper).
[a] Includes wind and solar.
[b] Includes wind and biomass.
[c] Includes wind and mini hydro.
[d] Includes wind, solar, and biomass.

(BRL). The program made it to hire all the capacity planned capacity, and had a more important impact on wind power: wind 43%, 36% of small hydro, and 21% thermal biomass.[51] For the evaluation of the program, Assunção et al.[52] argues that PROINFA created important distortions to the pricing schedule for wind projects, and provided incentives to investors to miss-report the capacity factor of the power plants.[h] Additionally, operations should begin in 2006 and contracts last for 15 years, but due to different problems investments were delayed to 2008 and contracts term were extended to 20 years.[51] Some of the problems that led to the delay in the operations were more related to the context than to the design of the instrument, e.g.: bureaucratic procedures to obtain or renew environmental licenses; problems and delays in obtaining the Declaration of Public Utility (DUP) for projects; obstacles in connecting to the grid; difficulty for the domestic industry to meet high demand for equipment.[53] Then, the main barriers faced by the program have been due more to uncertainties of the regulatory frameworks (a component of the enabling framework of the policy) than to uncertainties of the program itself.[51] In addition to these primary instruments, there are several secondary instruments within the RES policy, such as tax incentives and R&D policies. Wind turbine components are exempted from federal taxes, this exemption is extended to components locally manufactured and imported. In 2013 the National Development Bank (BNDES), the ANEEL and Finep created an energy innovation fund 'Inova Energia' with the purpose of fostering innovation in the energy sector. This fund provides grants and loans to finance companies that work in smart grid and ultra-high voltage transmission; solar and wind technology; and hybrid vehicles and vehicle energy efficiency. The role of the BNDES has been crucial for the NRES development of the country. Since 2004 the BNDES has implemented a low interest rate credit line for renewable energy projects, financing up to 80% of the total costs.[33]

Despite being one of the two countries with the highest share of NRES, Chile is still far from complying its target. In 2008, Chile established that at least 10% of the electricity traded by utilities with more than 200 MW of operational capacity should be produced by NRES; more recently the government doubled this mandatory quota (20%) to 2025. The regulation, which establishes penalties of 28 US $/MWh for those utilities who do not compliment this obligation[54] is complemented by auctions and a net-metering scheme as primary instruments, as well as a fund to support development of renewable

projects. According to the Law 20.571 (09/2014) retail electricity consumers with a capacity smaller than 100 kW will be able to connect to the grid and sell the surplus generation, obtaining credits equivalent the price/kWh charged by the utilities. Nevertheless the country, which in 2010 entered to the Organization for Economic Co-operation and Development (OECD) with repercussions to its environmental quality standards, is far from the objective. von Hatzfeldt[55] highlights that, in spite of the recent evolution of the regulation, and although according to Herrera et al.[56] Chilean renewable production is actually competitive, the country still has to surpass different barriers: one of the most concentrated electricity markets of the region; geographically isolation of renewable power plants requiring high investments in transmission lines reducing the feasibility of these projects; bureaucracy in the institutional procedures for the establishment of renewable energy projects; lack of available financing for renewable energy projects because Chilean financial markets still do not have enough knowledge on nonconventional renewable energies.

Up to end 2014 and early 2015, Colombia had the less developed policy framework. The first law adopted to promote the use of NRES was Law 697, and the subsequent regulations established implementation goals, tax exemptions, research grants, and reliability charge exemptions for small (<20 MW) projects.[49] By 2014, the country has only implemented one primary instrument: a target for renewable energy by the 2015–2020 period (On-grid: 2015—3.5%, 2020—6.5%; Off-grid: 2015—20%, 2020—30%). Differently to the rest of the countries, Colombia has not implemented Feed-in Laws or tenders. But there are different secondary instruments and other polices. For example, since 2002 there is a law that exempts for a 15 years period the payment of the income tax to wind and biomass power generators and waives import duties on equipment if carbon emission requirements are met. Nonetheless, this exception to the income tax is based on the condition that the projects sell carbon emission credits, and invest at least 50% of the carbon credits revenues in social programs where it is based. Although these two conditions may be important for mitigation and social purposes and enhance the synergy between energy policy and other development goals, they are quite restrictive and reduce the feasibility of the application. There are also different loans offered by the Bancoldex (The Colombian bank of business development).[49] However, this situation appears to be changing. Since 2014 the government is elaborating a new regulation, Law 1715 that aims at promoting energy efficiency and the production of nonconventional renewable energy sources.[21] This new regulation is supposed to include additional tax incentives and a fund for the promotion of these two objectives.

Ecuador has the second smallest electricity sector compared to the rest of the Latin American countries (5 GW). In 2012, the government implemented a FIT scheme for different nonconventional energy sources, which was modified in 2013 to exclude solar PV. The projects have priority dispatch and receive a fixed tariff nominated in USA dollars, which are slightly lower in mainland than in the Galápagos Islands. The FIT is directly covered by consumers. The special treatment is secured to all NRES projects up to the 6% of total installed capacity. There are other secondary instruments to induce NRES investments: renewable equipment is exempted from import tax and renewable energy developers and generators receive a 5-year waiver from income tax.

Uruguayan electricity sector is the smallest, with an installed capacity of 3GW, but it is the country with the highest share of renewable energies. The National Energy Plan 2005–2030 establishes that 15% of the country's energy supply must come from renewable sources by 2015. In order to achieve the target, the plan (revised in 2009) establishes the addition of 300 MW of wind capacity and 200 MW of biomass to the national grid. Besides targets, auctions and FITs, in 2010 Uruguay developed a microgeneration plan (decree 173/2010) setting 10 years contracts between consumers and UTE to provide electricity from wind, PV, biomass and small hydro technologies. In 2009 the Solar Thermal Law established as national priority the R&D and capacity building in solar technology. Additionally, there is a branch of secondary instruments: income tax reductions and net metering generation. The Uruguayan solar regulatory framework is one of the most complete and promising of the region.

Tables 5 and 6 present a description of the key features of feed-in laws and tenders in each case. As seen from Table 6 the differences in design conditions of the auctions resulted in different prices and installed capacity. In some of the cases (Argentina, Brazil, and Uruguay) there is a binding condition for equipment to have national components. Brazil has the highest local content requirement (60% in the wind case), which has had an additional co-benefit: it has promoted the expansion of the national industry of RE equipment. For the majority of the cases, the higher cost of the renewable energy produced is passed to the consumers (Brazil, Peru, and Uruguay). Setting a penalty for noncompliance and deadlines

TABLE 5 | Overview of Feed-in Laws and Results by Country

		Argentina	Brazil	Ecuador	Uruguay
Design instruments	FITs/FIPs	FIP	FIT	FIT	FIT
	Initial date	2009	2002–2011 (PROINFA)	2012	2010
	Technology	Wind, solar PV small hydro, geothermal, biomass, biogas, tidal, urban waste	Wind, biomass, and small Hydro	Solar (PV included until 2013), wind, geothermal, biomass & waste, marine-tidal and small hydro (less than 50 MW)	Biomass and solar FV
	Price/currency	Argentinean pesos	Brazil Real (BRL) 2010 prices: small hydro 161.21 BRL/MWh; wind 258.62 BRL/MWh; biomass 128.7 BRL/MWh[i]	USD dollars Different price for technologies and differing between the continent and the Galapagos	USD dollars 110 USD/MWh biomass 91.5 USD/MWh for solar FV
	Duration of support	15 years	20 years	15 years	20 years
	Limitation? Or Amount purchased	No/100%	Yes 3300 MW	No more than 6% of total installed national electricity capacity	Yes to the target: 200 MW (2015)

Source: Own elaboration from countries official information (official Web pages are mentioned at the end of the paper), Ren21 Global Policies Map.[4,33]

for the projects is one important feature in the majority of the cases, and according to the literature, this is a key condition to increase the effectiveness of the auctions, in order to avoid the back-off of projects developers.[4] Nonetheless, in the Brazilian case in spite of the existence of this condition there was a delay in the implementation of projects.

The decrease in renewable energy contract prices in tenders, especially for solar PV is a recent trend in different regions, and particularly in LAC region.[21] However, as shown in Table 6, Argentinean contracts are based on prices significantly higher than in the rest of the countries; e.g., prices for GENREN wind projects in Argentina were 121–134 US$/MWh while in Brazil and Uruguay similar projects from auctions were 60–80 US$/MWh.[12,50] This could be partly attributed to the shorter time frame of contracts, but mostly to the enabling environment for NRES policy addressed in the previous section. In the Brazilian, Peruvian, and Uruguayan cases a path reduction of costs is clear. This can be related to different aspects: cost reduction in the technologies as a result of local cost learning curves, increase in the confidence of the schemes as tenders are applied sequentially, and cost reductions regarding the existence of other infrastructure investments. Additionally, these path reductions costs may be attributable to the lower costs of capital as a result of greater investment stability (a more favorable framework in these countries).

LESSONS LEARNED AND POLICY RECOMMENDATIONS

The existence of institutions that transcend political cycles is crucial in order to create the confidence for private investors. This is, indeed, one of the key aspects to explain the success of the Uruguayan RES policy. The promotion of good governance throughout institutional reforms and the economic stability have been important to site the country as the second most successful country of Latin American region on 2014 on the promotion of clean energies.[57] The existence of a multiparty commission where long-term energy policies are agreed by present and future leaders from different parties provides stability awareness for investors. This solid institutional context is reinforced by the existence of an ambitious National Strategy on Energy Policy 2005–2030 which main objective is to satisfy energy requirements with local resources and establishes a quota of 50% of renewable energies in total primary consumption and 15% of nonconventional renewable energy sources in electricity supply by 2030. Similarly, in the Chilean case, the institutional framework is

TABLE 6 | Overview of Tendering/Auction Characteristics and Results by Country

		Argentina	Brazil	Chile	Peru	Uruguay
Design instruments	Auctions schedule	No	Yes (20 up to November 2014)	Yes	Yes Auctions scheduled every 2 years	Yes
	Penalty for noncompliance–Deposit/ guarantee	Penalty (1000$MW) Penalty for noncompliance of the percentage of local content requirement	Penalty (it depends on the electricity contracted) Guarantee: Some of the auctions established a registration fee to participate	Guarantee: three documents: 15.000 UF; 350 UF/MWh. Penalty: 1.000 UF/each obligation unfulfilled	Deposit of 100,000	—
	Deadlines for building project	Yes (2 years)	Yes (established in each auction TORs)	Must be concluded within the time frame indicated in the technical proposal	Yes	Yes (3 years)
	Bands	Yes Wind, biofuel, urban waste, biomass, small Hydro, geothermal, solar thermal and PV and biogas	Yes—wind; small hydro and biomass 2014 specific auctions for solar FV and biogas from waste	No - all technologies	Yes PV, wind, and small hydro	Yes Wind, solar PV, and biomass
	Time length of contracts	15	15/30 (depending in the auction and technology)	25	20	15
	Institution	ENARSA	Ministry of Mines and Energy (MME)	National Energy Commission	Ministry of Mines and Energy	Administracion Nacional de Usinas y Trasmisiones Electricas (UTE)

TABLE 6 | Continued

		Argentina	Brazil	Chile	Peru	Uruguay
Implementation and results	Initial year	2010	2007	2010	2009	2009
	Objective[f]	500 MW Wind 150 MW Biofuel 120 MW Urban waste 100 MW Biomass 60 MW Small Hydro 30 MW Geothermal 20 MW Biogas 20 MW PV	2008: 2379 MW of biomass 2009: 1805 MW for wind power 2010: 2050 MW wind, 713 MW sugarcane, 132 MW small hydro 2011: 976 MW wind	1st: 99 MW 2nd: 10–150 MW 3rd: 40 MW 4th: 10–150 MW	Initial auction: 500 MW for biomass, solar and wind; and 500 MW for small hydro	Administración Nacional de Usinas y Trasmisiones Eléctricas has conducted four wind auctions, contracting 684 MW of wind capacity for 20 years. Uruguay has also established an auction to contract 200 MW of PV
	Price contracted	136 U$S/MWh (wind);259–297 (biomass), 150–180 (small hydro); 547–598 (solar PV)	Prices have varied along the different auctions in a descendent path. 2009: 77 U$S/MWh (wind) 2010: 75 U$S/MWh (wind); 82 (biomass), 91 (small hydro) 2011: 56 U$S/MWh (wind)	107 U$S/MWh (PV)	2010: 80 U$S/MWh (wind); 63 (biomass), 60 (small hydro); 221 (solar PV) 2011: 69 U$S/MWh (wind); 63 (biomass), 47–56 (small hydro); 119 (solar PV)	2010: 85 U$S/MWh 2011: 63 U$S/MWh

Source: Own elaboration from countries official information (official Web pages are mentioned at the end of the paper), Ren21 Global Policies Map.[4,33]

perceived as a favorable condition for renewable investments. The creation of an official governmental agency for the promotion of RES, the Renewable Energies Center (CER for its acronym in Spanish), which provides information and increases local capacities improves the NRES business environment.[57] However, institutional bureaucracy and financial reaction to NRES has reduced the effectiveness of the policy.

The higher the degree of public engagement and commitment with the promotion of renewable energy, the higher the result in terms of installed capacity. This commitment should be shown and expressed by different ways. This is reinforced by the strong synergy between energy policy and climate change policy. In some developing or underdeveloped countries, the promotion of NRES is a co-benefit of other development policies (reducing poverty through energy access, reducing public deficit resulting from the import of fossil fuels or conventional derivatives, etc). Brazil is, a good example on how the implementation of RES policies may have spillover effects. In this country, local content requirements, as well as macroeconomic conditions perceived as positive and secure by investors, have resulted in a wide installation of wind generators industries, with significant prospects of becoming the regional leader in wind power industry.[57]

The existence of strong financial institutions appears to be crucial for the evolution of the policy. The existence of financial institutions and good financial global conditions at national level is a necessary, but not sufficient condition. Financial markets need to be aware and understand the features of the renewable business and offer competitive credit lines. In some cases, this is related to the existence of national development banks, as the BNDES in Brazil that has been the primary energy financer, backing more than ten times the financing of the rest of the banks in 2013; or from public/private capitals attracted by local macroeconomic conditions, as in Uruguay were most of the funds have come from multilateral and export–import institutions that see Uruguay as an attractive and stable market.[27] Opposite, in Argentina, the low deployment rates of renewable projects are related to the financing problems. According to the Climastescope 2014 Report, foreign financiers and development finance institutions have avoided Argentina in light of the country's recent fiscal troubles and then, most of the financing come from state-owned banks or have been raised via debt offerings on the local bond market.

Finally, the design, implementation and monitoring process of the RES policy is crucial. There are instrument-specific design elements that increase the effectiveness, the efficiency and the acceptability of the instruments increasing the performance of the sector.[9,10,16,19,20] The elaboration of a renewable strategy should be case oriented and the selection of the instrument need to be preceded by an evaluation of the local conditions and technology barriers. Afterwards, establishing size limitations, penalties for noncompliance, long-term contracts, specific bands, among other elements, increase the effectiveness of the instruments.[18]

CONCLUSION

The main objective of this study has been to analyze the different performance of the NRES policies in a group of LAC which appear to have been very dissimilar. The aim was to identify which factors have determined different policy paths.

Along this research, the relevance of the elaboration of the policy, the evaluation and design of instruments, as well as the national enabling context has been highlighted. As argued by the World Economic Forum[58], *for energy policy to have sustainable results, it must be built on strong governance, solid institutions and macroeconomic stability conditions, and this requires creating institutions that transcend political cycles to create the confidence and visibility needed to succeed*. Therefore, for a NRES policy to be successful, policy makers need to evaluate carefully the enabling conditions and the barriers of each one of the technologies to be implemented. If instruments and policies are carefully designed and implemented, they will probably manage to overcome the barriers of different technologies. However, the correct identification of sectorial barriers and the accurate design of instruments is not a sufficient condition for a good performance. The strategies should be elaborated considering the context where this policy is to be implemented, because some aspects from the enabling environment can reduce the effectiveness of the instruments selected.

The relevance of both aspects (enabling context and instruments design) claims for additional research on this topic. In the near future, further extensions of this work will compare and analyze a broader group of countries, including the comparison of enabling contexts and instruments used in developed and developing countries in order to enhance the conclusions on the relevance of each aspect. Additionally, future research will develop more carefully aspects remarked on the methodology section on the equal weight given to each one of the

indicators that may represent a weakness of the methodology, as not all the enabling conditions may have the same impact over the NRES policy, and should probably be improved in future extensions of the work.

NOTES

[a] Formally: $4 \times \left(\frac{\text{Country score} - \text{Sample minimum}}{\text{Sample maximum} - \text{Sample minimum}}\right) + 1$. The sample minimum and sample maximum are, respectively, the lowest and highest country scores in the sample of economies.

[b] For more information on the Climatescope report, see: http://global-climatescope.org/en/

[c] For more information on the ren21, see: http://www.ren21.net/

[d] See: http://info.worldbank.org/governance/wgi/index.aspx#home

[e] For a more detailed analysis of the reform paths, see Ref 5.

[f] These targets may have been modified after the aproval of this paper acording to the countries INDC.

[g] The numbers indicate the initial objective of the auctions, they do no reflect the final capacity contracted and efectively deployed.

[h] This is due to the pricing scheme of PROINFA that was dependent on project's estimated capacity factor, plus the governmental decision of increasing the economic viability of less efficient plats to increase investment by offering higher tariffs to projects with lower CPs.

[i] On 3 December 2014, the tariffs set for 2015 year were: small hydro BRL 222.1/MWh, wind BRL 371.65/MWh, and biomass BRL 175.51/MWh.

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