Latin American countries are implementing innovative policy and market mechanisms to catalyse the development of non-conventional renewable energy sources. This Brief presents some of the region's success stories.

INCENTIVES FOR ELECTRICITY GENERATION IN A GREEN ECONOMY: EFFECTIVE FRAMEWORKS FROM LATIN AMERICA

SUMMARY

In 2008, for the first time in history, global investment in renewable energy generation (US$140 billion) overtook fossil fuel generation (US$110 billion). Developing countries were responsible for driving this trend over the tipping point, even as many markets in the West waivered under financial crisis. In fact, developing country investments in renewable energy have grown year on year since 2005, chipping away at substantial leads held by Europe, the US and Japan. In 2012, 5% of Latin America's electricity came from "non-conventional renewables", referring primarily to small hydropower (under 30 MW), solar photovoltaic, biomass, geothermal, and wind. Latin American countries are now setting ambitious targets that aim to dramatically increase the share of non-conventional renewables in national energy portfolios. This shift in development of energy resources relies on incentives, policies, and institutions that support their expansion. In this Brief, incentive systems developed in Brazil, Chile and Peru are analysed, with renewable energy policy frameworks emerging as the overarching driver behind the region's growth.

COMMON CHALLENGES FOR DEVELOPING NON-CONVENTIONAL RENEWABLES

Renewable energy professionals believe that greening energy matrices requires a framework of incentives and policies that encourage investors, developers and operators to invest in the non-conventional renewable energy sector. This is not the case for large-scale hydro *per se*, but it is especially true for non-conventional renewables, many of which have yet to reach price parity with conventional energy resources. [1]

KEY LESSONS LEARNED

Most Latin American countries use frameworks – a combination of aligned policies and programmes – to encourage the generation of renewable energy, mixing mechanisms such as national targets, feed-in tariffs, reserve auctions, special financing, complimentary tax incentives, net metering, and renewable portfolio standards, depending on specific country circumstances.

Feed-in mechanisms are currently the most common type of incentive used in Latin America because they are flexible and based on market principles, guaranteeing minimum energy prices, while also demonstrating governments' long-term commitment to renewables.

Although the percentage of people with electricity in Latin America is substantially higher than other developing countries, it continues to develop innovative solutions to reach the rural poor, specifically via green microfinance loans.

[1] Throughout this Brief, statistics are presented that refer to renewables in general, including large-scale hydro, yet nearly all the policies and market incentives discussed target non-conventional renewables precisely because they still require government support. In contrast, conventional energy refers to fossil fuels such as oil, gas, and coal.

Though developing countries in Africa, Asia, and Latin America vary in terms of their levels of investment, growth, and capacity for non-conventional renewable energy development, they face several common challenges:

1. *Price Premiums for Renewables.* Renewable technology markets are still evolving and, despite ever-lower prices, remain more expensive than conventional fossil fuels in most cases. Therefore, market incentives and government regulations are required for the adoption of renewables. Although renewable premiums are partly an economic truth, the impairing effects of market-distorting policies and externalities also must be considered for potentially driving up costs.

2. *Counter-Productive Policies.* Market distorting subsidies (such as fossil fuel subsidies and utility price caps) and trade protectionism (for example, renewable technology tariffs and local-content rules) only serve to exacerbate the price premiums and relative competitiveness of renewables.

3. *National Administrative and Institutional Capacity.* Even well designed policies, when poorly managed, will experience issues with implementation, pricing and permitting. This regulatory and institutional instability, when coupled with market distortions, dissuades prospective investors, both private sector and multilateral funds, from developing new projects.

4. *Insufficient Funding and Support.* All investors – private, bilateral development assistance, and multilateral funds – have varying degrees of risk aversion. Developing countries with unpredictable regulatory frameworks, distorted markets and/or inadequate institutional capacity will be perceived as inefficient and risky by investors, even when demand for renewable energy is high.

5. *Balancing Energy Access and Sustainability.* Worldwide, there were 1.2 billion people without access to electricity in 2012. Sub-Saharan Africa and South Asia account for 87% of this group, while 34 million of these people live in Latin America and the Caribbean. Policymakers in developing countries are under pressure to take care of impoverished communities while simultaneously complying with renewable energy commitments.

This Brief explores the extent to which select Latin American countries have overcome these challenges, identifying how and why certain incentives were developed and why they proved successful. These experiences will be useful to thought leaders in other developing regions interested in the efficient development of their own non-conventional energy resources.

LATIN AMERICAN POLICIES

Broadly speaking, non-conventional renewables are capital-intensive and the upfront financial constraints are many, impeding their widespread expansion in developing countries. However, despite these financial obstacles, most Latin American countries readily acknowledge that externalities from extracting and burning fossil fuels pose serious risks to humans and the environment, leading them to set ambitious greenhouse gas (GHG) reduction targets that call for the transition to low-carbon sources of energy – the bedrock of green economies.[2] Governments are not powerless with respect to this clean energy transition; they can implement mechanisms to help accelerate the development of these resources. Globally, the top-10 most common policies are feed-in tariffs, renewable portfolio standards, capital subsidies/grants, investment tax credits, tax exemptions, green certificate trading, direct energy production payments, net metering, direct public investment, and public competitive bidding.[3]

By adopting existing mechanisms already available in Europe and the US, Latin America is tailoring strategies from the developed world to incentivise the integration of non-conventional renewable energy (Figure 1).[4] The combination of these policies into a coherent framework provides clear signals to investors that governments in Latin America, and the markets they oversee, support renewable energy. Over time, such frameworks of policies and incentives boost investment in renewable energy industries, lowering the capital cost by attracting more investment, increasing domestic human capital, and diversifying technologies available to the market. As this Brief will show, Brazil is currently reaping the benefits of precisely this type of progressive energy framework.

[2] To learn more about green economies in Latin America, see the ELLA Guide: Pursuing a Green Economy: Growth Alongside Environmental Sustainability in Latin America.
[3] KPMG. 2011. *Tax and Incentives for Renewable Energy*. KPMG, Geneva.
[4] International Trade Administration Manufacturing and Services (MAS). 2013. *Chile's Renewable Energy and Energy Efficiency Market: Opportunities for US Exporters*. MAS Office of Energy and Environmental Industries (OEEI), Washington, DC.

Figure 1: Latin America's Electricity Portfolios and Pro-Renewable Energy Mechanisms

	Electricity Matrix			Regulatory Policies and Targets				Fiscal Incentives				Public Financing	
Country	Share of electricity production from renewables, 2011	Target 1	Target 2	Renewable energy targets	Feed-in tariff/ premium payment	Electric utility quota / RPS	Net metering	Capital subsidy, grant or rebate	Investment or production tax credit	Reduction in sales, VAT, energy, CO_2 or other taxes	Energy production payment	Public investment, loans or grants	Public competitive bidding/ tendering
Argentina	31%	8% by 2016	8% by 2016	✓	✓			✓	✓	✓	✓	✓	✓
Brazil	89%	16GW wind, 2021	8GW small hydro 2021	✓			✓		✓	✓		✓	✓
Chile	6%	5% by 2014	5% by 2014	✓		✓	✓	✓		✓		✓	
Colombia	N/A	3.5% by 2015	20% of off-grid by 2015	✓						✓			
Costa Rica	91%	100% by 2021	100% by 2021	✓									
Ecuador	N/A	N/A	N/A		✓					✓		✓	
El Salvador	63%	N/A	N/A						✓	✓	✓	✓	✓
Guatemala	64%	60% by 2022	60% by 2022	✓			✓		✓	✓			✓
Guyana	N/A	90% by TBD		✓						✓			
Honduras	65%	N/A	N/A		✓				✓	✓			✓
Mexico	16%	35% by 2026	35% by 2026	✓			✓		✓			✓	✓
Nicaragua	33%	N/A	N/A		✓					✓			
Panama	N/A	N/A	N/A		✓		✓		✓	✓	✓		✓
Paraguay	N/A	N/A	N/A							✓			
Peru	57%	N/A	N/A		✓					✓			✓
Uruguay	75%	1GW wind by 2015	N/A	✓	✓		✓	✓		✓		✓	✓

Source: Renewable Energy Policy Network for the 21st Century (REN21). 2013. *Renewables 2013 Global Status Report*. REN21, Paris.

BRAZIL'S RENEWABLE ENERGY FRAMEWORK: A TALE OF DIVERSIFICATION

In 2010, Brazil was the sixth largest investor in renewable energy in the world, with 44% of its internal energy supply derived from renewables. However, the country was traditionally dependent on large-scale hydro, which satisfies 80% of electricity generation. In 2001, amidst severe droughts and plummeting hydro production, electricity rationing pushed policymakers to take action. In the wake of the 2001 energy shock, the government started working to diversify its energy portfolio.[5]

The Feed-In Tariff (FIT) was adopted by Brazil in 2002, jumpstarting the country's renewable energy industry. FIT ensures renewable energy producers can sell at a guaranteed fixed price through a legal contract (power purchasing agreement or PPA) for a specific period of time (usually five to 20 years). This mechanism can dramatically reduce the perception of risk by investors and developers. As of 2012, 65 countries across the world used FIT mechanisms.[6] Generally, FIT generation projects receive a price premium over conventional electricity resources. Government assessments determine the appropriate premium to ensure each source is economically viable for the developers. Brazil implemented one of the world's largest renewable energy FIT mechanisms through the Incentive Programme for Alternative Sources of Electric Energy (PROINFA). From 2002 to 2012, the programme accounted for 132 plants, divided into 533MW of biomass (21 plants), 1,182MW of wind (51 units), and 1,157MW of small hydro (62 units) using 20-year contracts.[7] The government-approved FIT prices were: US$96/MWh for small hydro; US$150/MWh for wind energy; and US$70/MWh for biomass.[8] To give an idea of the premiums paid for non-conventional renewable, the wholesale price of energy in Brazil in 2001 was US$22/MWh,[9] meaning the diversification of the country's grid was a priority worth between US$48-128/MWh to policymakers. The FIT price is revised at each new call and the costs are collected from consumers of PROINFA energy as a usage charge under

[5] Chacon, L. B. 2012. Long-Term Contracting the Way to Renewable Energy Investment: Lessons from Brazil Applied to the United States. In: *Emory Law Journal* 62 1564-1612.
[6] Renewable Energy Policy Network for the 21st Century (REN21). 2013. *Renewables 2013 Global Status Report*. REN21, Paris.
[7] Electrobras. 2013. *Plano Annual do PROINFA (Annual Plan of PROINFA)*. Electrobras, Rio de Janiero.
[8] International Renewable Energy Agency (IRENA). 2013. *Renewable Energy Auctions in Developing Countries*. IRENA. Abu Dhabi.
[9] Centre for Energy Economics. *Brazil's Power Market Crisis*. University of Texas at Austin, Austin.

the programme's contract portfolios. All payments are sent to Electrobras, the federal power utility.[10] Inefficiencies in the scheme were encountered early, including: miscalculated premiums, confusion and bottlenecks with environmental permitting, construction and grid connections.[11] The next section shows how these issues were addressed.

Reverse Energy Auctions (REAs) were integrated into the Brazilian renewable energy market in 2008,[12] as an extension of the FIT programme described above. For Brazilian REAs, regulators announce the day of the auction, the corresponding technologies that will be tendered on that date (such as wind and hydro), and the associated maximum price caps. To avoid programme inefficiencies (i.e. FITs problems) and bottlenecks from overly optimistic bidders, energy producers must have all the necessary permits and feasibility studies completed prior to participating in the auction. During the auction, producers offer how much energy they can supply and at what price.[13] Because it is a competitive-bidding process, the winners are determined based on two key factors: the amount of energy supplied and the lowest price.

The government offers REA winners 20-year PPAs (issued through the FIT programme's PROINFA), along with substantial financing incentives (described in the next section). There are also penalties for bidders that violate their PPAs. For example, if the developer's actual generation falls short of the contracted supply of energy, then it is penalised at 115% of the contracted price for the difference and must make up the difference the following year.[14]

Special Financing has also played a key role in ramping up Brazil's renewable portfolio. The most important financier is Brazil's development bank (BNDES). It provides 16-year loans with interest rates pegged below the Brazilian central bank's benchmark. To further support renewable energy investments, interest is not charged during construction, a six-month grace period is given at the start of operations and debt amortisation occurs up to 12 years.

Box 1: Improving Brazil's Energy Policy Framework

In the early 2000s, PROINFA required energy developers to source 60% of their equipment from Brazilian firms. While on the one hand this was an incentive to grow local manufacturing industry, on the other hand it was a serious limitation to the competitiveness of resources that Brazil did not specialise in, such as non-conventional renewables. With the development of these technologies so strictly linked to national industrial policies, taxation regimes, labour and employment regulations, Brazil negated potential cost-saving opportunities from importing countries that specialise in the goods and services it needed. As a result of the low number of manufacturers of wind turbines in Brazil and the red tape on similar imports, national production could not meet the demand for equipment in the first phase of the FIT programme. The government needed to harmonise its policies to make an effective framework. With the creation of the REA in 2006, the Brazilian government started giving clear signs that it was going to support renewable energy production over several years[15] and investors started financing wind turbine manufacturing plants in Brazil. Since 2008, Brazil has become a manufacturing base of choice for some of the global wind turbine manufacturing companies. Thanks to an improved framework, the price of wind energy fell 41% per megawatt hour between 2009 and 2012 and today wind energy is the most competitive non-conventional energy source in the country.

Sources: Chacon. 2012, see above n5; Cleantech Investor. 2011. *Brazil: Wind Manufacturing Hub*. Cleantech Investor, online publication; Nielsen, S. 2013. *Brazil Seeks Higher Power-Auction Rate to Spur Use of Coal, Gas*. Bloomberg News, online publication.

[10] Barroso, L. 2012. *Renewable Energy Auctions: The Brazilian Experience*. World Bank-IFC-ESMAP workshop presentation.
[11] IRENA. 2013, above n8.
[12] Ibid.
[13] Cozzi, P. 2012. *Assessing Reverse Auctions as a Policy Tool for Renewable Energy Deployment*. The Center for International Environment & Resource Policy, The Fletcher School, Tufts University, Medford, MA.
[14] Ibid.
[15] A national target of 10% of electricity provided by non-conventional renewable sources under 20-year PPAs was set during the second phase of PROINFA.

Complimentary Tax Incentives that boost non-conventional energy in Brazil are provided in three broad areas. The first is REIDI, a programme that provides five-year tax exemptions for companies buying and/or importing equipment for infrastructure projects, including renewables. Secondly, sales tax exemptions for solar and wind generating equipment, first adopted in 1997, are currently available until 2015. And lastly, from April 2012 to December 2017, regulators are providing an 80% discount on energy distribution and transmission taxes to 30MW-or-less solar plants during their first 10 years of operation.[16]

Net Metering, which allows homes and businesses to exchange their excess solar energy for energy they consume at night, is one of the newest mechanisms incorporated into Brazil's renewable energy framework.[17] Adopted in April 2012, forecasts estimate this mechanism will push Brazil's fledgling solar industry into relevance with the installation of up to 300,000 rooftop solar devices (US$3bn) by 2030. This begs an important question: will the solar equipment be imported or domestically produced? Because of Brazil's 12% tax on solar imports, the purchase price is US$5.32/watt – twice the cost in Europe. *Tecnometal Equipamentos Ltda.*, Brazil's only solar panel manufacturer, is already ramping up supply with US$127 million in capital investments.[18]

By 2020, Brazil aims to get 19% of its electricity generation from non-conventional energy.[10] As of 2011, that figure was just 10%.[20] Doubling installed capacity will not be easy, but with some fine-tuning of its already progressive energy framework, it is possible for Brazil to achieve this goal.

CREATING AN ATTRACTIVE INVESTMENT ENVIRONMENT IN PERU

Peru, like Brazil, aims to diversify its energy matrix by capturing the country's vastly underutilised renewable energy potential, as outlined in its 2010-2040 National Energy Policy. Currently, nearly all of the country's electricity generation comes from two sources: 56% from hydro and 44% from natural gas. It has a pro-renewables energy framework that grants tax reductions throughout project planning and implementation phases, as well as FITs for the final sale of energy. This reduces overall costs and makes projects more economically attractive for private investment. Given the country's energy demand is rising 9% annually, 2012-2020 forecasts estimate that the country will need an estimated 6.1GW of newly installed energy (US$10.8 -13.3 billion in investment), part of which will need to come from the private sector.[21] Therefore, to create an appropriate investment environment, the Peruvian government grants special contracts and financing in the form of:[22]

- A 30 year concession under a 30% income tax regime, effective upon completion of a PPA. If one of the contracts generates losses through the taxation, such losses can be offset against the profits derived from another contract
- A tax exemption for all goods and inputs required to develop the resources under concession, provided such goods and inputs are included in a specific list approved by the Ministry of Mines and Energy (MME)
- An annual maximum 20% accelerated depreciation regime for income tax purposes for plant and equipment used to produce electricity after 29th June, 2008
- Every five years, the MME determines the minimum amount of renewable sources that are to be contracted in public auctions – similar to those described in the previous section for Brazil

CHILE: BUILDING A RENEWABLE PORTFOLIO

Chile invested US$4.5 billion in the clean energy industry over the last five years, third only to Brazil (US$70 billion) and Mexico (US$5.8 billion) in Latin America, impressive for a country with only a fraction of the population.[23] It uses many of the same instruments as the other countries mentioned above. However, a unique mechanism in its energy framework is the Renewable Portfolio Standard (RPS). In 2006 the Chilean government established an RPS, which

[16] Chacon. 2012, see above n5.
[17] REN21. 2013, see above n6.
[18] Nielsen, S. 2013. *Brazil Seeks Higher Power-Auction Rate to Spur Use of Coal, Gas*. Bloomberg News, online publication.
[19] IRENA. 2012. *Renewable Energy Country Profile: Brazil*. IRENA. Abu Dhabi.
[20] Global Business Intelligence. 2012. *The Future Looks Green for Brazil's Impressive Renewable Energy Industry*. Global Business Intelligence.
[21] International Finance Corporation (IFC). 2011. *Assessment of the Peruvian Market for Sustainable Energy Finance*. IFC, Lima.
[22] Ibid.
[23] Inter-American Development Bank (IDB). 2012. *Climatescope 2012: Assessing the Climate for Climate Investing in Latin America and the Caribbean*. IDB, Washington, DC.

was later ramped up in the national senate in 2013. Initially, it required utility companies to obtain 5% of their electricity from non-conventional renewable energy sources by 2014, plus an additional 0.5% per year thereafter (i.e. RPS of 10% by 2024). The 2013 RPS requires utilities to source 20% of their energy from non-conventional renewables by 2020. As with Brazil, the non-conventional renewable caveat is crucial because Chile already gets 40% of its renewable energy from Patagonia.[24] The fact that the RPS has been ramped up demonstrates that the policy is working.

The country faced several barriers to begin developing its energy potential: a long history of limited government involvement in the energy sector; high initial investment costs without energy-technology manufacturers; constrained financial resources from local banks; poor grid infrastructure; few electrical engineers; difficulty in developing connections to transmission lines; and trouble negotiating long-term PPAs. Despite this, the potential of the Chilean renewable energy market is two fold: [25]

1. Its natural environment is replete with potential for new renewable development: wind, geothermal (with 10% of the world's active volcanoes), and solar (the world's largest solar resources in the Atacama Desert)

2. Scarce domestic fossil fuel resources for electricity production, sustained economic growth, widely-dispersed urban centres, and an energy-intensive mining industry make the Chilean electricity and transmission market one of the most expensive in Latin America (estimated at US cents 12/kWh on average, see Figure 2 for comparison to renewables)

These two factors make Chile's energy market ripe for non-conventional renewable energy production. Its auction system for geothermal exploration led bidding companies to invest US$250 million in 2012.[26] For solar, it has become one of the first markets where solar PV is viable without subsidies and is the first South American country with a concentrated solar power (CSP) plant.[27] This has as much to do with the country's insolation as it does with high electricity costs and the dispersed nature of its small to medium-sized cities. The above explanations also apply to other renewable sources such as small wind and small hydro (Box 2).

Modern renewable energy equipment costs are now globalised. For each resource, their price differences and domestic competitiveness primarily depend on the import tariffs, subsidies, and infrastructure of each country. Additionally, the difference between the cost of energy generated by coal and natural gas versus other renewable energy sources in a given country provides an indication of the amount of incentives that are necessary to make different types of renewable energy financially attractive.

Figure 2: Average Capital and Energy Costs for Various Energy Sources

Energy source (electricity)	Characteristics	Capital costs (US$/kW, 2011)	Energy costs (US cents/kWh, 2011)
Coal		1,500	3.5-6.0
Natural gas		400-800	4.0-6.0
Biomass	Plant size: 25–100 MW Conversion efficiency: 27% Capacity factor: 70–80%	3,030-4,660	7.9-17.6
Geothermal	Plant size: 1–100 MW Types: binary cycle, single and double-flash, natural steam. Capacity factor: 60–90%	2,100-4,200	5.7-8.4
Hydropower (grid based)	Plant size: 1 MW–18,000+ MW Plant type: reservoir, run-of-river. Capacity factor: 30–60%	1,000-4,000	5.0-10.0
Hydropower (off-grid/ rural)	Plant capacity: 0.1–1,000 kW Plant type: run-of-river, hydrokinetic, diurnal storage	1,175-3,500	5.0-40.0
Ocean power (tidal range)	Plant size: <1 to >250 MW Capacity factor: 23–29%	5,290-5,870	21.0-28.0
Solar PV (rooftop)	Peak capacity: 3–5 kW (residential); 100 kW (commercial); 500 kW (industrial) Conversion efficiency: 12–20%	2,480-3,270	22.0-44.0
Solar PV (ground mounted, utility scale)	Peak capacity: 2.5–100 MW Conversion efficiency: 15–27%	1,830-2,350	20.0-37.0
Wind power (onshore)	Turbine size: 1.5–3.5 MW Rotor diameter: 60–110+ meters. Capacity factor: 20–40%	1,410-2,475	5.2-16.5
Wind power (offshore)	Turbine size: 1.5–7.5 MW Rotor diameter: 70–125 meters. Capacity factor: 35–45%	3,760-5,870	11.4-22.4
Wind power (small-scale)	Turbine size: up to 100 kW	1,580	15.0-20.0

Sources: REN21. 2013, see n6 above .

[24] Miller, A. 2013. *Chile Proving to Be a Hot Market for Solar*. Clean Energy Authority, online publication.
[25] MAS. 2013, see above n4.
[26] REN21. 2013, see above n6.
[27] Ibid.

Box 2: El Arrayán Wind Farm

The El Arrayán Wind Farm is a US$245 million 115-megawatt wind farm in Chile – the country's largest non-conventional renewable energy resource to date. The project is located approximately 400km north of Santiago, where it is able to capture strong coastal winds. Because of the high cost of electricity in northern Chile's grid, the project was viable using a 20-year power offtake agreement with *Minera Los Pelambres*, a mining company.[28] A United Nations economic assessment concluded the project had an internal rate of return of 7.3%.[29] In addition to being financially viable, the project presents strategic advantages over coal, primarily reduced water consumption and carbon emissions. It will offset more than 300,000 metric tonnes of carbon dioxide per year, which is equal to the annual carbon footprint of more than 70,000 Chileans, and it will save the water consumption equivalent of 11,000 Chileans. The El Arrayán Wind Farm is bringing the country one step closer to its goal of producing 20% of its energy from non-conventional renewable resources by 2020 and approximately 200 jobs were created during construction.

GREEN MICROFINANCE FOR RURAL ELECTRIFICATION

According to the Green Microfinance Institute, green microfinance integrates the Guiding Principles of Microenterprise and the Environment "into all lending policies and programmes through microfinance and other financial institutions that serve the world's poorest families."[30] As of 2012, US$75 million in green micro loans was granted in Latin America and the Caribbean, providing renewable energy to 44,000 low-income borrowers.

In terms of non-conventional renewables versus total electricity generation, Nicaragua is the leader in Latin America (behind only Belize and Haiti if the Caribbean is included), with 305MW of non-conventional renewables out of a total of 1GW. With a regionally low electrification rate (72%), Nicaragua's government and development organisations are supporting off-grid, non-conventional renewable energy projects using green microfinance loans. With 10 microfinance organisations, US$2.9 million disbursed, and 3,511 low-income recipients, Nicaragua is leading the region in green micro loan initiatives.[31] From October 2011 to January 2012, the average interest rate in Nicaragua for a green micro loan was 13.2%, varying from 1.5% to 28% depending on the project and the organisation. When compared to the 2010 global average interest rate of 37%, these green microloans look rather appealing.[32] The lower rates have to do with substantially larger project size (i.e. energy technology) coupled with relatively stable returns from net metering. Recipients include rural citizens, as well as rural micro, small and medium enterprises (MSMEs).[33]

Yet green microfinance is just one of many mechanisms that can improve rural electrification. Large national projects are proving effective as well. Peru only invested US$245,574 in green micro loans in 2012, but thanks to a coherent rural electrification policy framework, coverage in Peru's rural areas increased from 30% in 2007 to 55% by late 2010.[34] The framework (i.e. The National Plan for Rural Electrification and the National Law for General Rural Electrification) was established in 2006 to integrate both national grid expansion and rural development in national policy. The Ministry of Energy and Mines (MEM) plans, designs and constructs rural electrification projects. Between 2006 and 2012, investment of US$144 million was received from the International Bank for Reconstruction and Development (IBRD), the General Environmental Facility, electricity providers, and the World Bank. Thanks to the stability and credibility provided by this framework, from 2006-2011, the government further extended the grid to an additional 92,000 households, using non-conventional renewables.[35]

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[28] PR Newswire. 2012. *Parque Eolico El Arrayan Starts Construction of Chile's Largest Wind Project*. PR Newswire, online publication.
[29] United Nations Framework Convention on Climate Change (UNFCCC). 2012. *El Arrayan Financial Assessment*. UNFCCC.
[30] See the Green Microfinance webpage for more information.
[31] IDB. 2012, see above n26.
[32] Kneiding, C., Rosenberg, R. *Variations in Microcredit Interest Rates*. CGAP, Washington, DC.
[33] IDB. 2012, see above n26.
[34] REN21. 2013, see above n6.
[35] Global Network on Energy for Sustainable Development (GNESD). 2012. *Peruvian Rural Electrification Project*. GNESD, online publication.

CONTEXTUAL FACTORS

ENABLING THE THE DEVELOPMENT OF CLEAN ENERGY

The factors that enabled the development of non-conventional renewables into Latin America include:

The High Cost of Electricity – In Latin America and the Caribbean, on average, end-users paid US$0.14/kWh in 2012. In Brazil, that figure was US$0.16/kWh and in Nicaragua, US$0.18/kWh.[36] Like much of the developing world, these figures are high compared to say, the United States, which is nearly 30% cheaper at US$0.096/kWh in 2012.[37] There are many factors that contribute to these high costs and they vary from country to country. Generally speaking, energy-intensive industries and rapidly rising populations accelerate energy demand, import-tariffs raise the capital costs, poor infrastructure makes grid maintenance costly, resource volatility (fossil fuel and large hydro) destabilises pricing, and getting energy to rural populations can be costly. For renewable energy integration, high costs for electricity are good because they improve the competitiveness of non-conventional renewables.

Market Support for Renewables – Governments are supporting the diversification of their energy portfolios because overreliance on any particular source comes with its own price. This was the case in both Brazil and Peru. Furthermore, there is an abundance of untapped non-conventional resources in Latin America that allow for the decentralised development needed to reach isolated communities (e.g. Nicaragua) and businesses (e.g. Arrayán) and, when possible, sell the excess generation back to the grid (e.g. net metering in Brazil). Among all of the policies outlined in this Brief, FITs are the most widely used in Latin America. They are legally structured to allow for changing economic conditions – such as inflation. Simplicity, transparency, and predictability are additional key factors that make them effective at attracting investment, especially when the government coordinates its policies and agencies to align interests and facilitate positive outcomes.

Strong Institutional and Administrative Capacity – Governments in Latin America started dedicating greater institutional support to their renewables programmes. This is exemplified by Brazil's reverse auction programme that initially allowed bidders to enter the auction without the appropriate environmental permits and feasibility studies, both of which took governments and firms much longer to complete than anticipated. To avoid future project delays, auction entrants are now required to provide these documents ex ante. Across many of the examples in this Brief, ministries of energy, environment, social development and mining had dedicated support programmes for non-conventional energy developers.

Harmonising Energy and Trade Policies – Without a review of policy interactions, the price premiums of renewables can be artificially inflated due to protectionist tariffs on clean energy imports. Countries are understandably trying to grow domestic expertise, but are often unable to meet their target deadlines.[38] In addition to stripping away counterproductive policies, the addition of tax exemptions and special financing are quickly becoming commonplace mechanisms that counterbalance import tariffs, providing further incentives to investors and developers to find least-cost inputs. As these issues were addressed, more stable non-conventional energy frameworks were created in Latin America. Over time, such frameworks of policies and incentives boost investment in their respective renewable energy industries, lowering the capital cost by attracting more investment, increasing domestic human capital, and diversifying technologies available to their markets.

Predictable Energy Frameworks Attract Investment – The energy sector is so capital intensive that it requires developing countries to attract foreign investment. In Brazil, the combination of various mechanisms and efficient institutions to manage them has effectively attracted outside investment. By using 20-year contractual feed-in tariffs and energy auctions, along with long-term targets and energy-specific requirements, the government has established credibility and mitigated the risk associated with non-conventional renewable energy development. This is demonstrated by massive renewable energy investment in the country of US$5.4 billion in 2012. Peru followed a similar path to Brazil, but focuses on fiscal incentives and special grants. The strategy adopted by the Peruvian government is particular in that by eliminating taxes on equipment importation, ensuring fiscal stability and allowing accelerated depreciation, it is not forced to generate extra cash to pay for any incentive, or through direct taxation to the end users. Chile, similarly, has many of the same mechanisms, but relies heavily on its Renewable Portfolio Standard (RPS) to drive the development of non-conventional renewables. Furthermore, Chile shows that areas with very large renewable energy potential, high-energy prices and expensive grid connections may make renewable energy cost competitive with conventional sources of energy, even without incentives.

Rural Electrification – In many cases, non-conventional renewable energy is better suited for the electrification of the rural poor in developing countries than conventional, centralised energy. The primary factors are scale and fuel. Conventional sources are much larger, requiring dense populations and/or long-distance transmission lines; not small,

[36] IDB. 2012, see above n26.
[37] US Energy Information Administration (EIA). 2013. Short-term Energy and Winter Fuels Outlook. EIA, Washington, DC.
[38] Rennkemp, B. 2012. *Renewable Energy: Made in Brazil*. CDKN, online publication.

isolated communities with low relative demand and minimal grid infrastructure. Furthermore, most conventional sources of energy in developing countries are powered by fossil fuels, which means distribution points can be far away from power plants and delivery affected by poor road quality. Developing countries, including those in Latin America, are overcoming these obstacles by finding creative solutions. Most non-conventional renewables are decentralised because they are based on local resources (not the transport of fuels), making them well suited for rural deployment. Furthermore, new green microfinance programmes are showing a new way to meet rural citizens' demand for energy.

In all of the areas mentioned above, the combinations of ancillary policies (such as trade, development, and environment) support – rather than undermine – the central policy and institution working to grow non-conventional renewable energy in Latin America.

LESSONS LEARNED

1. Diversification of energy portfolios is becoming a policy priority around the world. For developing countries, non-conventional renewable growth can simultaneously provide environmental, economic, and social benefits. By integrating non-conventional renewable resources, countries can build resilience to climate change and energy security issues while also leveraging the decentralised potential of those resources to electrify rural areas and power isolated, energy-intensive industries.

2. Energy frameworks provide the foundation for domestic, international, and multi-lateral investors to fund long-term, capital-intensive non-conventional renewable energy projects. Efficiency, transparency and credibility should be the core tenets used to harmonise policy frameworks and the institutions that implement them.

3. Best-fit policies are those that consider the in-country level of expertise, availability of technology and financing, national budgets, electricity price, commitments from national government and local renewable sources potential. Some types of policies may be more appropriate for promoting more expensive technologies (e.g. solar photovoltaic), while other policies are more effective to finance technologies in a more advanced stage of maturation, such as wind.

4. FITs and auctions are becoming the favoured energy market mechanism for non-conventional renewable growth in the developing world. For example, from 2009 to 2013, the number of countries employing renewable energy auctions increased from nine to 44, with 30 developing countries accounting for the bulk of the increase.[39] FITs are the most common market mechanism in Latin America by far.[40] Technology-specific auctions can be used to select preferred energy sources.

5. Latin American experience shows that the attractiveness of direct financial incentives alone does not encourage sustained development of renewable energies. Regulations, market potential, legally binding targets and the presence of all relevant local stakeholders (technology manufacturers; class associations; consulting, engineering, installation and maintenance firms; environmental agencies; NGOs; research programmes and institutions; financial institutions and project developers) are essential components for realising renewable energy potential. Governments in the region had to create fertile ground, nationally, by simultaneously considering all of these aspects, as well as the interests of key stakeholders.

[39] IRENA. 2013, above n8.
[40] REN21. 2013, above n6.

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