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# POLICY BRIEF



## *Financing the Transition to Renewable Energy in the European Union, Latin America and the Caribbean*

*By Miguel Vazquez, Florence School of Regulation*

### **Highlights**

- The transition to more sustainable energy systems has a variety of relevant implications for the EU and LAC countries. This study will show that, in order to develop renewable technologies, special attention needs to be paid to the financing challenges faced by investment in these new technologies.
- Given the variety of investment conditions across countries, including different characteristics of financial markets, there is no one-size-fits-all solution. Nonetheless, this study aims at drawing lessons from the experiences already implemented and identify fundamental elements of the way forward.
- This policy brief precedes a report<sup>1</sup> developed for the EU-LAC Foundation and it summarizes its main findings.

*Michelle Hallack (Florence School of Regulation and Faculty of Economics, Fluminense Federal University), Gustavo Andreão (Faculty of Economics, Fluminense Federal University), Alberto Tomelin (Faculty of Economics, Fluminense Federal University), Felipe Botelho (Economics Institute, Federal University of Rio de Janeiro), Yannick Perez (Chaire Armand Peugeot, CentraleSupélec) and Matteo di Castelnuovo (IEFE, Bocconi University) are co-authors of the study.*

1. The report will be available in August/September of this year in the digital library of the EU-LAC Foundation (<https://eulacfoundation.org/en/search/ipaper>) . A Spanish version will be also available (<https://eulacfoundation.org/es/search/ipaper>).



The transition to more sustainable energy systems has a variety of relevant implications for the European Union (EU) and Latin America and the Caribbean (LAC) countries. These include: ensuring and diversifying electricity supply to an increasing population; the potential for job creation and economic and industrial development; and the fast technology advancements towards cost-effective solutions.

This study is focused on the analysis of financing mechanisms for renewable energy technologies in the EU and LAC countries. The aim is comparing experiences in the introduction of renewable energy in order to draw meaningful lessons, either from LAC countries to the EU or the other way around. This objective is not straightforward. For instance, feed-in-tariffs were a successful instrument for the introduction of renewable energy sources in Germany, but not to the same extent in Brazil. Dedicated auctions for wind power were successful instruments in Brazil, but not in Argentina. The same auctions were used in Brazil to introduce solar PV with limited success.

Most of the research efforts that can be found in the literature have focused on the analysis of different mechanisms to enhance renewable projects' revenue streams (feed-in-tariffs, auctions, etc.) However, in order to understand the whole picture, special attention needs to be paid to the financing challenges that the investment in these new technologies faces. That is especially true in developing countries (as LAC countries), where financial markets are severely constrained. This study aims at complementing the existing literature by an in-depth analysis of the issue.

We show that, in order to develop renewable technologies, we need to take into account that the associated investment needs are significant and markets alone might not be sufficient to coordinate all actions to be taken. Moreover, given the variety of investment conditions across countries, including

different characteristics of financial markets, there is no one-size-fits-all solution.

This study is structured around three main dimensions of the challenge of introducing renewable technologies in electricity industries, both in the EU and LAC:

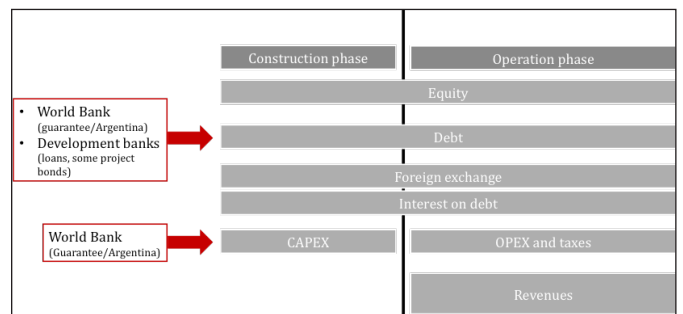
- Public instruments to facilitate the participation of private capital in renewable energy projects;
- Technology flows between the EU and LAC;
- Interaction between flows of capital and flows of technology (e.g. companies may provide financing in order to export technology).

## 1. Public Policies for the Financing of Renewable Energy Source (RES) Projects

There are important differences between EU and LAC policies and financing instruments. The different level of economic and infrastructure development in both regions cannot be forgotten when we analyse both contexts. However, there are some key elements that can be underlined when comparing both regions that may be insightful.

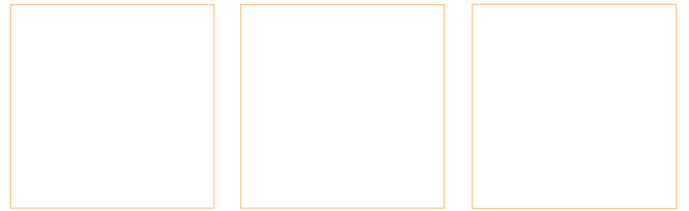
### Financing in LAC Countries

Figure 1: Main Financing Instruments used in LAC



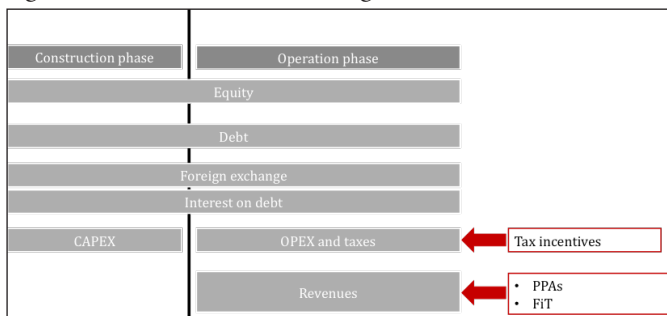
Source: Own elaboration

In LAC countries, a large volume of financial resources comes from development banks, typically in the form of long-term loans associated with



a special purpose vehicle (SPV). As observed in the Argentinian case, in the early implementation of its renewable programme, when this financing source was not available, little investment was observed. Recently - probably related to a relative reduction of available resources - we observed an increasing importance of public participation through guarantee facilities.

Figure 2: Main Revenue-Enhancing Instruments used in LAC

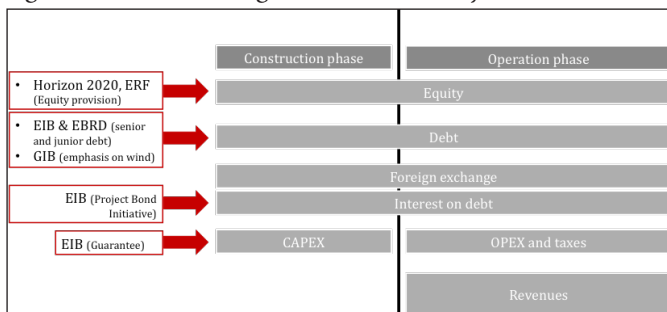


Source: own elaboration

Besides strong participation of development banks, the regulatory design is central to the LAC strategy to promote RES. Together with several forms of tax incentives, the predominant mechanism to sell energy is the use of a long-term contract tied to a SPV. In principle, this implies the identification of RES projects with an infrastructure asset class.

### Financing in the EU

Figure 3: Main Financing Instruments used by the EU



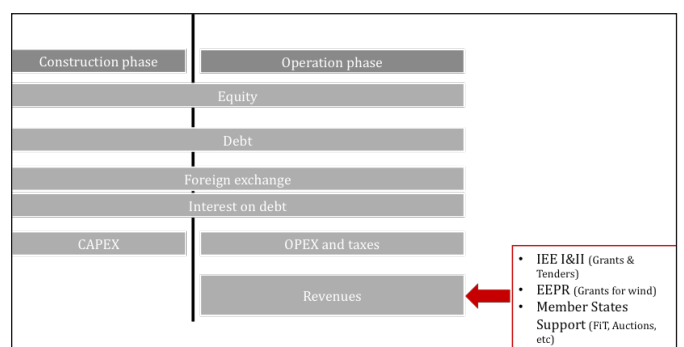
Source: own elaboration

Two main differences can be observed in the EU strategy: As shown in Figure 3, several instruments based on equity provision were considerably impor-

tant in the early stages of development of RES in the EU. These instruments were related to innovation policies to develop RES technology.

In addition, the financial instruments used to facilitate RES (and other infrastructure) projects are varied. In particular, we observe a stronger reliance on guarantee facilities and various forms of junior debt. All these measures are targeted at facilitating the participation of the private sector in the financing of long-term investments.

Figure 4: Main Revenue-Enhancing Instruments used in the EU



Source: own elaboration

By contrast, the EU has relied to a lower degree than LAC countries on revenue-enhancing mechanisms. Although it is true that auctions and feed-in mechanisms (mechanisms aimed at securing revenue streams) have played an important role in the development of RES projects, the reference market design in the EU has been one based on short-term contracting and hence relatively riskier.

Comparing experiences in the introduction of renewable energy, we find that:

- Two basic market designs can be identified. On the one hand, the “utility business model” is based on a firm that undertakes long-term investments (e.g. power plants) and recovers it by selling power through 1-2 year contracts. On the other hand, the “infrastructure business model” is based on selling power through long-term contracting, e.g. Power Purchase Agreements (PPAs).



Long-term contracting can be viewed as mitigating the risks associated with projects' revenue streams so that it facilitates financing. On the other hand, acting on revenue streams may limit significantly the number of available choices for the electricity market design. We see that, in LAC regions, market designs based on long-term contracts assume there exists a centralised planning effort, which might not be the case, or it may face coordination challenges. On the other hand, the EU choice of relying on more competitive electricity markets requires the existence of a quite efficient access to capital sources, which might not be always the case. In summary, this fundamental trade-off (long-term contracting requires planning, short-term contracting requires liquid capital markets) needs to be recognised. Although there are no silver bullets, the market design needs to be coherent in order to attract private investment for renewable projects.

- Utility business models are based on riskier projects (less available sources of finance) but eliminate the need for planning that characterises infrastructure business models. We observed in LAC countries a preference for mitigating as much as possible risks related to revenue streams to get as much competition as possible from different capital sources. We used solar projects to highlight that not all RES projects share the same characteristics from an investor's point of view. Policies may be applied equally to all RES projects, considering them as infrastructure, but this decision may be associated with financing solutions that are not efficient. In fact, we identified Yieldcos<sup>1</sup> as an instrument to separate riskier activities in RES projects in a project finance environment. In that sense, market environments that impose the development of RES under the same framework of more traditional infrastructure projects may

create undesired constraints. This challenges the adequacy of a convergence to a pure infrastructure-like market design.

- Manufacturers of solar panels are increasing their participation in LAC markets. This may be viewed as a consequence of low risks associated with their revenue stream: as signing a PPA gives them the possibility to find financing sources, they see the opportunity to introduce their technology in LAC countries. At the same time, this mitigated risk implies that investors are not facing technological risk, even if it exists. This risk is absorbed by the counterpart of the long-term contract, who is typically a regulated consumer.
- If the utility business model is discouraged, technological flows channelled through utilities will face difficulties.

## 2. Technological Flows of Renewable Energy Between Both Regions

We focus on Solar Photovoltaic (Solar PV) and wind power. We analyse each technology separately and compare the main results afterwards. We identify the key players of each industry both in the EU and in LAC focusing on the intersections among the regions, i.e. players in both regions (LAC and EU). The analysis shows that the main players in the EU are utilities. Consequently, when considering technological flows from the EU to LAC countries, the main channel will be projects undertaken by utilities. Nonetheless, manufacturers of solar panels are increasing their presence in LAC countries. In that view, market design in LAC may diversify technology sources.

In fact, we analyse patent flows. According to UNEP & EPO (2014), from 1995 and 2010, patent filings related to Climate Change Mitigation Technologies

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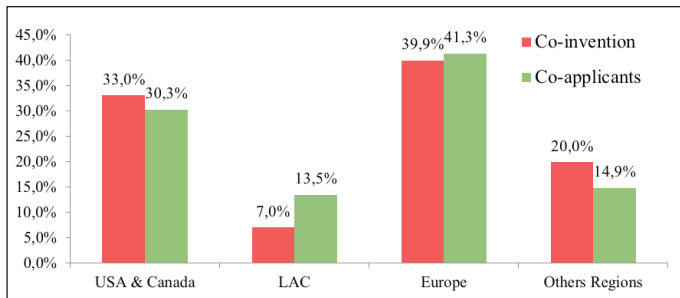
1. A Yieldco is a dividend growth-oriented public company that bundles long-term contracted operating assets in order to generate predictable cash flows.



(CCMT)<sup>2</sup> in LAC countries increased considerably, especially regarding patents from clean energy technologies (includes renewables and energy storage). However, they represented only 2.8% of the world's global patent filings in this area.

LAC and EU countries present levels of co-invention, indicating international cooperation in R&D, and co-application, that are indications for technology transfer. From the sample analysed in UNEP and EPO (2014), see Figure 5, one can observe that Europe as a region had a closer relationship in CCMTs' R&D with LAC countries (representing around 40% of all patent filings in the period) than among LAC itself and North America (representing respectively around 13% and 33%).

Figure 5: Share of Co-Invention and Co-application Partners of CCMT's Patent Filings with LAC Countries from 1995 to 2010



Source: Elaborated from CCMT patent filing sample of (UNEP and EPO 2014)

The relation between LAC and Europe, however, is not balanced as IRENA (2013) explains, because the key patent holders in RES technologies are the US, EU, and Japan (see Figure 6). On the other hand, there is a movement pushed by local content policies to patent duplicating application locations in developing countries, such as Brazil, South Africa, South Korea and China (especially the last one).

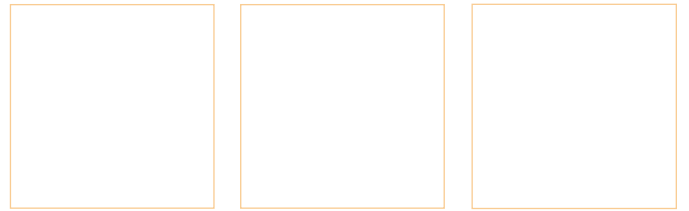
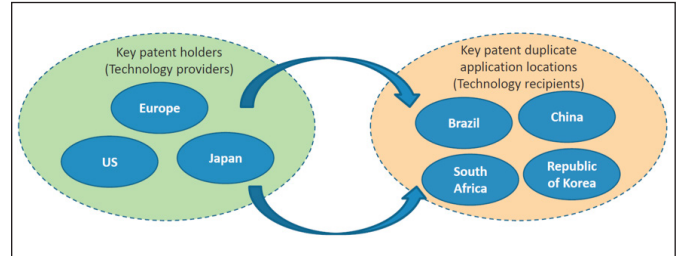


Figure 6: Trends of Technology Transfer of Solar PV and Wind Energy from OCDE to Developing Countries



Source: IRENA 2013

### 3. Interplay Between Technology and Financing

On the one hand, we observe that reinforcing competition among several investors (utility and non-utility investors) is possible and may bring efficiency to financial decisions. This does not mean that choices regarding the generation mix (energy planning) will be efficient as well, because the previous logic considers the choice of generation technology exogenous to the project. On the other hand, the technological trajectory of solar PV is less defined both in LAC countries and in the EU, which means that there is a larger technological risk if compared to wind projects. The comparison between the EU and LAC strategies shows pros and cons of both schemes. The LAC strategy has proved its strength when investments are similar to infrastructure projects (particularly if technological risks are low). However, when the risk is not negligible it may be costly and may hamper innovation.

### 4. Conclusions and Way Forward

- **Market design crucially affects the available financing mechanisms.** As we have seen, LAC and the EU have chosen different market designs. Both solutions have pros and cons. LAC choice facilitates access to capital markets, although they may face planning challenges. The EU choices

2. Climate Change Mitigation Technologies (CCMT) include: (i) greenhouse gas capture and storage; (ii) energy generation, storage and distribution; (iii) CCMTs relating to buildings; (iv) CCMTs relating to transport; (v) smart grids.



enhance competition in the market, although it requires liquid access to capital sources. The design chosen needs to address this trade-off in order to design a solution that is coherent with each country situation.

- **The infrastructure business model implicitly assumes that the role of equity is relatively unimportant.** The EU and LAC are converging to markets designed to facilitate access to capital, reducing the importance of debt. RES project where equity is important may find difficulties in implementing the efficient financing solution.
- **The infrastructure-like market design might allocate technological risk to consumers.** Developing RES projects through long-term contracts may result in an inefficient technological risk transfer from the investor to consumers.

Based on this evidence, we formulate a series of suggestions for action with the objective of facilitating the decision-making process in electricity industries:

- Formalisation of the decision-making process associated with the definition of a market design. We stress that the complete set of measures implemented in the electricity industry must be coherent.
- When the infrastructure model is chosen, the complexity of electricity projects needs to be tackled also from the financing viewpoint. The design of appropriate contracts is a fundamental element

for a well-functioning market, as they allow the existence of long-term financing sources.

- If the choice is a market based on the infrastructure business model, an important role to be played by public and multilateral institutions is the structuring of complex projects for the private sector. Electricity projects are difficult to understand for many investors, and these projects share few characteristics with more liquid instruments for project finance. Hence, the regulatory activity should include in-depth discussions with the financial sector in order to implement a feasible contract.
- The technological aspects cannot be disregarded. In particular, some policies may result in specific contract clauses that complicate financing the projects.
- The effects of market design on industrial dynamics must be considered. The previous recommendations assumed a market model based on long-term contracts. On the other hand, if the utility business model is discouraged, technological flows channelled through utilities will face difficulties.





Florence School of Regulation  
Robert Schuman Centre  
for Advanced Studies

European University Institute  
Via Boccaccio, 121  
50133 Florence  
Italy

Contact:

email: [fsr@eui.eu](mailto:fsr@eui.eu) website: [fsr.eui.eu](http://fsr.eui.eu)

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