

# Public Policy Recommendations to Encourage the Development of a Distributed Solar Generation Market in Sao Paulo

—Transcript of a webinar offered by the Clean Energy Solutions Center on 6 December 2018—  
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**Moderator**      To encourage the development of the distributed solar generation market in Sao Paulo. Before we begin, I'll quickly go over some of the webinar features. For audio, you have two options. You may either listen through your computer or over the telephone. If you choose to listen through your computer, please the mic and speakers' option in the audio pane. If you want to dial in by phone, please select the telephone option and a box on the right side will display the telephone number and audio pin you should use to dial in.

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Today's webinar agenda is centered around the presentation from our guest speaker Rodrigo Garcia who has joined us to discuss suitable policies and conditions to nurture a competitive market for photovoltaic distributed generation, PV DG, with an emphasis on the commercial industrial CNI market. Before we jump into the presentation, I will provide a quick overview of the Clean Energy Solutions Center. Then following the presentation, we will have a question and answer session where the speaker will address

questions submitted by the audience. At the end of the webinar you will be automatically prompted to fill out a brief survey as well. So thank you in advance for taking a moment to respond.

The Solutions Center was launched in 2011 under the Clean Energy Ministerial. The Clean Energy Ministerial is a high-level global forum to promote policies and programs that advance clean energy technology, to share lessons learned and best practices and to encourage the transition to a global clean energy economy. 24 countries and the European Commission are members contributing 90 percent of clean energy investment and responsible for 75 percent of global greenhouse gas emissions.

This webinar is provided by the Clean Energy Solutions Center which is an initiative of the Clean Energy Ministerial. The Solutions Center focuses on helping government policy makers design and adopt policies and programs that support the deployment of clean energy technologies. This is accomplished through support and crafting and implementing policies relating to energy access and no cost expert policy assistance and peer-to-peer learning and training tools such as this webinar. The Clean Energy Solutions Center is cosponsored by the governments of Australia, Sweden and the United States.

The Solutions Center provides several clean energy policy programs and services including a team of over 60 global experts that can provide remote and in person technical assistance to governments and also government supported institutions. No cost virtual webinar trainings on a variety of clean energy topics, partnership building with development agencies and regional and global organizations to deliver support and an online library containing over 2,500 clean energy policy related publications, tools, videos and other resources. Our primary audience is made up of energy policy makers and analysts from governments and technical organizations in all countries. But we also strive to engage with the private sector, NGOs and civil society.

The Solutions Center is an international initiative that works with more than 35 international partners across its suite of different programs. Several of the partners are listed above and include research organizations like IRENA and the IEA, programs like SE4ALL and regionally focused entities such as the ECOWAS Center for Renewable Energy and Energy Efficiency.

A marquee feature that the Solutions Center provides is the no cost expert policy assistance known as Ask an Expert. The Ask an Expert service matches policy makers with one of the more than 60 global experts selected as authoritative leaders on specific clean energy finance and policy topics. For example, in the area of solar energy we are pleased to have Katherine Wright, senior associate at \_\_\_\_\_ serving as one of our experts. If you have a need for policy assistance in solar energy policy or any other clean energy sector, we encourage you to use this valuable service. Again, the assistance is provided free of charge. If you have a question for our experts please submit it through our simple online form at [cleanenergysolutions.org/expert](http://cleanenergysolutions.org/expert). We also invite you to spread the word about this service to those in your networks and organizations.

Now I'd like to provide a brief introduction for today's speaker, Rodrigo Garcia who is the founder and managing director of ImplementaSur. He is a renowned consultant with more than 16 years of experience in the area of energy and climate change. Among the clients that Rodrigo has been able to assist during this period are the German Society for International Cooperation, GIZ, the World Bank, the United Nations Development Program, UNDP, and the US Department of Energy's National Renewable Energy Laboratory or NREL. And with that introduction, I'd like to welcome Rodrigo to the webinar.

**Rodrigo Garcia** Many thanks. I'm going to share my screen now. Go directly to the presentation that we have prepared for this. Can you see the deck, right?

**Moderator** Yeah.

**Rodrigo Garcia** Great.

**Moderator** Thank you.

**Rodrigo Garcia** First thanks to NREL and the Clean Energy Solutions Center for relying on ImplementaSur to assist the consortia of western municipalities of the Sao Paulo state in Brazil, CIOESTE. In order to advise them on the specific recommendations to foster the development of distributed generations and in particular solar distributed generation. This is the agenda of how we're going to approach this presentation. Very briefly I'm going to give you insight of what does ImplementaSur is assisting on, what are the types of services.

Then I'm going to jump into an introduction of the type of advisory that we deliver to CIOESTE through the Ask an Expert of the Clean Energy Solutions Center. And then we're going to jump into the market context of distributed generation, photovoltaics \_ what has been going on in the last few years. Then we're going to dive into the specific competitiveness metrics for the PV DG market and what are the financial challenges. Then some very broad revision of the case studies that we use to advice CIOESTE on how they can approach this challenge. And finally, some recommendations on a policy roadmap to encourage an accelerated deployment of PV DG.

So first about ImplementaSur, our most important motive is to turn climate change and to adjust the matter of risk but also into a value creation opportunity, an opportunity where some organizations can address this transition or create value. We are assisting companies into first providing a risk assessment, business models and accessing financial instruments for the adaptation and mitigation actions that different partners and actors can require in Latin America. Today we are exposed to physical risks from climate change such as acute and chronic effects but also transition risk from a low carbon position from regulations or market competitions of low carbon technologies or reputation effects from the customer side or from investors.

To address these type of risks we have a three-step approach that is led by first an assessment of the climate related risks that influence investment on projects. We help to formulate the business opportunity through business

models and policy recommendations to open these market niches. And finally, we come together with our customers to enable the mobilization of financial resources through \_\_\_\_\_ funding. So this set of services helps the migration of resources that are exposed to a specific risk into new sustainable investments.

From our experience we can pitch briefly that we have been advising several multilateral international organizations, private market actors such as EHP, Google among others and different organizations such as the Chilean ministry of transportation or the Chilean forestry service. We have advised successfully into approving funds from the green climate fund and government programs or multilateral corporation with the government of the Netherlands, so the government of Canada. Our team encompasses that are coming from the, from financial institutions, multilateral institutions and local government agencies but also that have a long track record in consultancy within the area of climate change and sustainable energy.

So now getting into the topic of today's webinar this challenge, the need of CIOESTE which is a consortia of ten municipalities in the state of Sao Paulo has, they have reached the Clean Energy Solutions Center through the free of charge Ask and Expert model to assist them in the design or the recommendation of specific policies, to encourage the deployment of PV DG. This is a picture actually of one of the first installations in that state, in the state of Sao Paulo. And the final objective is to come with a specific set of policies and options to nurture our market. This is a first approach for this customer that can help them start to frame a more clear scope of analysis.

So the scope of work or the scope of the advisory that we provided to CIOESTE is structured in three levels. First a diagnostic of the level of competitiveness that PV DG has in the municipalities of CIOESTE and at the state of Sao Paulo with specific focus in commercial and industrial customers. We provided an assessment of the financial gaps that are still not covered by the federal and state level programs and the state of the local suppliers which are a very important share of this equation and share in the effort to foster PV DG. Second, we leveraged some of the lessons from four international cases to understand really what is the potential applicability to the CIOESTE context. And finally, we deliver a set of recommendations to construct a policy roadmap that could help CIOESTE implement a more aggressive program for the, for fostering PV DG.

So Brazil, it has an excellent solar horizontal irradiation as you can see from the map from NREL. It has a range among 1,500 and 2,300 kilowatt per square meter per year which also has a very good fit with countries load profile. And although it has a lot of very good basic natural conditions, the rate of adoption of PV DG has not been as fast as expected and not necessarily responded from the quality of the resource. So far, the most important policies are the policies that have taken, been longer time available are those that were meant to attend remote consumptions, remote users like the PRODEEM program or the LUZ PARA TODOS program which are very constrained to small applications.

But then in 2012, very, very new regulation came into play with the possibility of allowing customers to discount part of their energy bills through a net metering resolution, resolution 482. And then later resolution 687 from 2015 which really set the basic regulatory framework for net metering. And I'm going to discuss that further in the later slides. So also, thanks to the rapid deployment and the cost of the technology, a lot of the expectations in the growth increased very rapidly.

So the main government actor that makes the planning, the energy planning in Brazil have to update their forecast very rapidly from one year to another. From an expectation that in 2014 they forecasted that in 2024 there's going to be an installation of a total PV DG capacity of 1,300 but it then jumped to an expectation that in the same year there was going to be an installation of 2,500. And very likely this forecast, it will need to be updated again.

So in the Brazilian context let's see what type of PV DG categories are available. So first we have the microgeneration which are all those very small applications below 75 kilowatts of capacity that are connected to the secondary distribution voltage. And then we have those that are on a higher level of capacity can provide a supply to higher levels like mini generations, mini-generation which is in the range of above 75 kilowatts but below 5 megawatts connected to the primary distribution voltage level. And in order to understand and to really structure this assessment we followed a framework, we built up a conceptual framework that could have three main elements.

First, the tax incentives that could facilitate the adoption of PV DG. Second, the financial incentives such as state or federal incentives like loan or loan guarantees. And then the assessment of all of the regulatory business conditions for self-supply solutions that could drive the demand for public institutions and private customers. So one of the things that we learned is that actually none of these elements framed the competitiveness of PV DG by themselves. Instead it is the proper balance within these three elements that will actually give place to a healthy adoption and growth of the PV DG market.

Indeed, a recent study from the department of economics of the \_\_\_\_\_ University of Rio DeGennaro on the climate policy initiative highlights the fact that demand side factors like population, like income and the electricity tariffs are definitely some of the most important factors driving the competitive deployment of PV DG. So based on that we started making a lower view of what was the market context for this set of ten municipalities and how they compared with the rest of the Sao Paulo state.

So first there is a very important database of information which is built by the country's electricity regulator, ANEEL, which has a very complete DG, distributed generation database. And thanks to this, we were able to compare the loads, the energy demand, how has the energy demand evolved in time between 2014 and 2016. We could see that there is a fall in the consumption between these years, a very, very low fall but actually a fall. So it shows that any type of PV DG project will have to monitor very clearly what's the real

load that's expected in the long run to make sure that these projects are bankable.

Second, we found out that CIOESTE represents a very small share of a total Sao Paulo demand. Although CIOESTE is important in industrial region but it's not necessarily covering the largest load because the city of Sao Paulo itself is not included in this set of municipalities. So it's not necessarily covering the largest level of the load.

The annual growth rate for CIOESTE also we also found that has been five times lower than the rest of the municipalities in the Sao Paulo state. There is actually a drop for example between 2015 and 2017. The annual growth rate of PV installations was 1,500 per year like growing a lot. But in CIOESTE this has been just 360, three multiple for the installation of PV DG. Showing a little bit of signs of delay compared to other regions and other municipalities that have potential better conditions. So we came to understand what was the reason behind that.

Also, CIOESTE has shown a larger space for growth in the segment of micro generation. We remember micro generation being all those installations that have a capacity lower to 75 kilowatts. And this is responding to the fact that as we can see in the chart in the case of CIOESTE in blue there is a much lower share from the total installations compared to the rest of Sao Paulo where micro, the micro capacity installations of PV DG has a larger importance. So in CIOESTE micro installations have around 50 percent of the total installation capacity and 50 for the mini generation \_\_\_\_\_ where in the rest of the Sao Paulo municipalities the distribution is almost 90 percent for micro generation and 10.3 percent for mini generation. So this leaves a huge space for growth in that segment.

What type of incentives are in place? There are some incentives that have a federal scope, federal reach such as the ProGD program. It's the program that is important to the \_\_\_\_\_. This is a program that was launched in 2015 and it's a very broad framework to foster the deployment of distributed generation projects, specifically solar. And it has estimated that until 2030 thanks to this program they will invest for than 30 billion new DG projects with the capacity to provide 48 million megawatt hours generated in that period, in the whole period from the implementation of the program until 2030.

It's a very ambitious program but it doesn't necessarily have like a very clear narrative to the local conditions of each municipality and each concession for the distribution companies. There are also some tax incentives in place, taxes that apply to the energy retailing from these PV DG units like \_\_\_\_\_ ECMS from 2013 and ECMS 16 for 2015 which replaced the previous one. ECMS 16 has more status in the net energy from PV DG units into the grid. And Sao Paulo is geared to this agreement. This is a discount on that tax so allows a more, a better competitive condition for PV DG units. There's also a discount on the PIS/COFINS taxes which are taxes that are applied from the government to maintain social programs. And there's also a discount on the EP, the tax for industrialized products that is applied to all national and import products.

So also there is important to mention that there are some financial institutions in the country at the federal and state level that have a specific low cost loans that can help to accelerate the deployment of PV DG such as those programs from BNDES, from Caixa, from the Agencia de Desenvolvimento Paulista, from Desenvolve Sao Paulo and some of these programs have specific conditions that part of the components of the beneficiaries of the projects from the beneficiaries have to have some level of local content. Most of the funding from this financial incentives have gone directly to large utility scale projects. And there's still some road ahead to promote further the development of PV DG.

So I mentioned previously very briefly about the changes in regulation for metering net changes that are built in the resolution 687. And these changes allow a better leverage for another site for PV DG and its attractiveness that can help to improve its attractiveness beyond self-supply solution. So the value of the surplus generation that goes beyond the energy use that is discounts from the energy bill has a better market value now since the new resolution allows the option to use the surplus energy for up to 60 months. So you can actually transfer the surplus generated by PV DG facility through 60 months in the future instead of the 36 months that were the conditions of the previous regulation.

Then also it has allowed now capacity of PV DG units for net metering that can reach up to 5,000 kilowatts so that allows significant economies of scale, especially for the OPEX of the cost structure. This new resolution also allows to include other business models such as where the consumer for example can use the credits, their surplus availability from the unit, from the facility to pay for the electricity bills on other properties, on other areas that they own. And the energy generated from different consumer units, from different users can also be aggregated and discounted the cost from different consumers.

The \_\_\_\_\_, the energy \_\_\_\_\_ the CCEE which is meant to participate in the regulatory process of the retail of electricity has been studying recently the regulatory options to actually have this surplus generation access the retail market and not necessarily be able just to have a value from the distribution company. So what is the status of the market of suppliers, the supply side? As we can see on this map that represents all the different states in Brazil. The concentration of suppliers. It's very strongly correlated with the area of the CIOESTE municipalities. We can see that 48 percent of the suppliers according to a study from \_\_\_\_\_ is located in the southwest, southeast area of Brazil which is actually where the CIOESTE municipalities are.

So the reason why there has been a delay on the CIOESTE catch up on PV DG might not be the number of suppliers but rather up type of reaches. So on this chart we can see the different type of marketing options and commercial options that suppliers actually have in Brazil so far. And we can see that there is a large share of the type of models recognized by \_\_\_\_\_ that are concentrated on turnkey contracts, in cash agreements, installments with or without bank debt. Very, very few models are relying on a PPA or a leasing

or an escrow model which could have the benefit of sharing part of the risk with the off taker and potentially distribute the capex through tariff in time.

So also, something that we want to highlight is that the market of suppliers is generally represented by very, very small companies that don't have enough working capital that are built of very few members and therefore don't have the capacity to invest in the projects or neither have a very aggressive market approach or go to market strategy. In addition to this in terms of the capacity and the quality of this market of installers and suppliers and based on data from \_\_\_\_\_ for the Sao Paulo state we can see that there are real financial barriers that prevent these installers and suppliers to actually use business models that are less intensive on capital like a leasing model or escrow model. And a large part of these suppliers still does not have enough projects.

Although this is not official information provided by the government or a third party in identifier, this is a good proxy to recognize the large share of suppliers that still do not have projects or that still do not have enough experience. So in terms of the theoretical competitiveness that the PV DG market can have compared to the distribution tariff, to cost of electricity for users connected to the distribution network, we can see from the graph on the right-hand side that there is potentially great parity for a very, very broad set of distribution companies all around the different areas of Brazil which represent here more than 96 percent of the distributed market.

And highlighted in red in these boxes we can see those concession companies, distribution companies that are representing the CIOESTE area. This shows the differences among the prices for electricity show and tariff show the different type of exceptions that some companies can, sorry, some concession companies could have. Also, the effect of the rate for example related with the drop in certain areas or the cost for the expansion of the system of the distribution network. And so that's why we have different tariff prices at different concession zones.

And the different PV DG costs also respond to the different types of financial incentives that interplay at the federal, state and municipal level. It is more likely – this shows it is more likely to find that PV DG can reach a tipping point of competitiveness with the grid. Still every project, every PV DG project has to be studied and analyzed on its own merit. And this is by no means, this graph is by no means a categorical statement of the competitiveness. However, it gives us a proxy for what is the current reality and that there are several factors that can dynamically influence the economic feasibility of these projects like the exchange rate of course which is definitely very influential in Brazil, the installation cost and most important the electricity tariff for the CNI consumers.

Indeed, some references point out that the PV DG investments in some areas of Sao Paulo state could confront a very long payback of more than 20 years. So it all depends on what type of assumptions are we using, what type of conditions are we confirming. The indeed the EPE which is the planning agency for Brazil's energy market states that only consumers with high purchasing power and an average consumption of 400 to 1,000 kilowatt per



month will have potentially the proper conditions to become the adopters of PV DG.

There are some specific factors that restricts the development. Some customers could be exposed to distribution tariffs that are reduced because of local regulations such as law 12.783. And some CNI customers, commercial investor customers could be potentially tempted to migrate from a regulated tariff structure into the wholesale market. And therefore, they might have better options for renewable energy supply in the long run.

So in terms of financial challenges given that we now understand what is the status of the market and what is the status of the gaps that the market has to deploy PV DG there are – for this type of very atomized unit and small units of generation, there are high transactional costs mainly because of the high due diligence costs that these type of – that clients in these investments could confront. There is limited acceptability from the banks of the collaterals that these CNI customers such as MSNE companies could provide especially relying on the value of the contract for the supply of energy and the savings that they can create thanks to a PV DG project. Also, the other financial institution in emerging countries in general don't have the proper specialized knowledge on renewables. Therefore, they're going to hardly believe that these type of contracts can be a good collateral or can be a good guarantee of expected revenues. But if we are able to actually cut down the financial cost into 20 percent expectations from different local references this could reduce the cost of PV DG projects by six or ten percent.

So what is the – there are potential market actors that can actually play that role of reducing the financial cost and cover part of that risk. These are market actors that can aggregate demand, that can identify all the potential customers in different levels and standardize their contracts and that can translate the initial capital into a tariff or a lease through time. Therefore, through this type of model the final customer just will have to pay a monthly fee and will be able to reduce the capital intensity of the investment. And it will also allow significant economics of scale since one single transaction could cover several assets.

Nevertheless, this market is not necessarily very simple to create since developers of these type of aggregated investments still have to go through a capital resource intensive origination process. They will have to standardize the assets to minimum requirements set from financial institutions. And some of these aggregators might still be small and medium enterprises that don't have enough initial capital to start this type of process or start attracting other sources of private capital.

So what can we learn from what has been going on abroad and what type of alternatives do we have that could compliment the local regulation on net metering and this idea of having aggregators for the investments? First of all, one example, one particular case comes from the property assessed clean energy program that started in the US originally which is called PACE. This is a mechanism where beneficiaries of these type of programs will entirely add an assessment to their property tax bill. So all equipment PV DG

equipment and the debt related to that are attached to the value of the property and not to the specific owner.

So it can offer a repayment at the low interest rate just like a mortgage. This would work out as very similar to a long-term loan and it would be – and this has been applied to energy efficiency and renewed energy facilities. So this implies an up-front cost to the project property owner. It can have a potential or access to potential savings from the tax, from taxes in case the local regulation allows it to. And the treasury would recover all the value and have that local housing tax include the extra cost for the PV DG facility. So this would be a way to easily transfer the additional cost into, through time through the lifetime of the unit.

So the as we can see in the chart here, the energy savings that can be expected from this type of sustainable energy investments can represent an amount that's higher than the amortization and that would be transferred as a surcharge on the real estate taxes. In this way, this of course this would require some normative changes to the municipal real estate taxes. And that is something that CIOESTE would have to confirm if they're capable of doing it. Alternatively, this can also operate through the banks through a mortgage loan and modifying the mortgage loan for a house.

Some of the benefits that the PACE program has accomplished in the United States. For example, in the United States this is our source coming from PACE nation. It has covered already 33 states, around 80 percent of the total population of the United States that is included in these 33 states. And it's covered more than \$5,500 million installations at the residential level and the commercial level. So it has been a very successful program historically.

The banks can use the property to include PV DG installation and use that as a valid collateral for the loan they are providing just like happens with a standard mortgage loan. And it generally would not require a credit check, just having the ownership of the property. This would leverage the standard type of PACE modeling would leverage the existing collection systems or tax collection systems that municipalities and counties have and it would increase the value of the real estate properties since it would be adding a new asset from the PV DG plant.

Other cases studies, well, specific case studies that applied the PACE models are the Sonoma County Energy Independence Program which allowed the implementation of pace through the capitalization from green bonds that were purchased by Sonoma county's treasury through also receiving funding from the water agency and also from private actors. This programs also implemented a marketplace to attract providers, to attract different financial options and achieve the total of 11.3 megawatts of installed capacity, almost \$54 million of investment since ten years ago.

The Boulder County ClimateSmart loan program was the first PACE program implemented that also addressed energy efficiency opportunities and covered loans from a range of \$3,000.00 to a maximum of between the value of \$50,000.00 and the 20 percent of the property value. This achieved a total

of \$9 million of investments up to almost 230 projects. And it also was funded through the issuance of green bonds.

The Connecticut Commercial Property Assessed Clean Energy Program was connected with the Connecticut Green Bank to make the issuance of the green bonds and facilitate the capitalization of the program. This is focused on nonresidential real estate assets which is very close to what CIOESTE wants to do. And the achievements by early 2018 C-PACE had reached up to 200 projects with a total investment of \$114 million of investments.

The finally the other model that we covered in our study to CIOESTE is the India Solar Municipal Bonds model that has a very ambitious target from the India government to reach to a total installation of 40 gigawatts of solar PV DG projects by 2022. Very ambitious target where municipalities are operating as aggregators of PV DG capacity and also as issuers of green bonds into the capital markets. So it's a very similar models than the one that, or a very similar role that municipalities have than the one described under the other PACE programs. Here municipalities can leverage the proximity to the customers. They can leverage the fact that they have in India healthier credit profile that most of their customers have stronger balance sheets. So they can give the financial institutions a better guarantee to access cheaper source of financing to facilitate \_\_\_\_\_ and the deployment of these type of facilities.

So now we jump into what were the recommendations that we gave and policy roadmap that we gave to CIOESTE based on all the different descriptions that we provided and the case studies. So first to set a clear business plan for what is going to be the market niche here with giving you an example of how could this business plan be shaped. There is a specific market segment of CNI customers with high daily load for electricity consumption and good credit worthiness. This could be a good off taker to facilitate the standardized test standardization and aggregation of investments of the CNI level. The value proposition would be the generation of savings, the reduction of greenhouse gas emissions through local initiatives and increased value of the property since the property would have now a new PV DG facility.

Some of the demand parameters could be to choose the specific customers would be the income level, the credit rating, the load consumption, the potential of emission reductions. And if some of these customers have actually an internal price of carbon or have some condition from their market. Some of the industry distribution channels in order to reach out to customers could be the municipalities themselves that could build up specific organizations to originate the pipeline. The revenue structures would come from the delivery of feasibility studies or the payment for the assets or payment for a specific services through \_\_\_\_\_ model or even through a similar type of structured paid through the property tax like we explained by the PACE model. Finally, the cost structure is going to be built up from financial cost for the initial capital, dissemination materials, etcetera.

Some of the steps that can help to design financial instruments that can reduce the risks of these types of programs and aggregation of economized assets

needs to follow the next steps that we are numbering here. These steps come from NREL's guidelines on designing financial incentives. First, frame the design of the financial instruments. What is the risk policy, the exit policy from this type of program that could be led by the municipalities of CIOESTE for example? Then second involve the private sector to confirm what would be the source of capital that could leverage the funding of this program.

Third, establish expected life of the instrument, how long it will last and when it's going to be adopted by the market. Fourth, establish the political feasibility to make sure that there's no institutionality risks in the implementation of that program. Fifth identify the articulation, the concatenation of this instrument or this program with other existing instruments. In the case of Brazil, we talked about projects there. We talked about the normative conditions for net metering. We talked about the financial incentives from local financial agencies. And we would need to make sure that this program does not replicate any type of, any of those efforts.

Six, the consider resources for the marketing of the financial instrument and to build up the portfolio. And so, door to door collecting and gathering this aggregation of PV DG opportunities and track finally the performance of the instrument once its implemented. Track the performance in terms of energy reductions, revenue stream, etcetera. This chart shows what are all the different dimensions to reach out to market, the areas of intervention from the capital provider and into the renewal energy opportunity for example or energy efficiency opportunities. And it's a very, very good simplification to actually identify that some of the most important financial mechanisms are going to be in the second level and in the risk management mechanisms so that these can easily channel additional sources of capital. From commercial banks or from established government financial instruments.

So primarily in a context where there are already a lot of instruments in place and financial products in place the recommended option would be to study in what way risk management instruments could facilitate the aggregation process and the origination process of competitive pipeline of PV DG. Finally, to structure the policy and to build up all these inputs we recommend CIOESTE to follow these steps, make sure there is a political, legislative, institutional coordination, make sure that they can build up a standard of suppliers to insure the quality and solvency of the investments contractually. Third, confirm that municipalities don't have obstacles to act as financial entities and that can promote the generation of energy.

And also, here we are measuring – we are including the fact that it's important to study the capacity of property taxes of those municipalities to include the additional cost of PV DG facilities so as to facilitate the implementation of a PACE program. Finally, sorry, fourth level finance, make the financial assets and the assessment of flexibilities and institutional structures to receive the funding for example from multilaterals or from the green climate fund or impact investors to actually capitalize the operation of these programs.

On the fifth level, set the financial terms and conditions for those that are going to be benefitted such as some of the CNI companies or PV DG installers that will be potentially delivering part of the capital of these projects. So these beneficiaries will be following a set of terms and conditions including the MRV system of monitoring, reporting and verification system and potentially a framework for environmental and social safeguards. Therefore, set a strategy for the capitalization. Once we have defined the specific financial instrument we can go and attract donors and potential other funding international organizations to join the program.

Seventh come up with the actual pipeline origination. This could be moderated through energy outreach for example by reading exactly what is going to be the load profile of the niche market that we will focus on and identify the capital requirements of installers and aggregators. And finally implement the PV DG program through building up the origination of the project, then financing the structure of those projects to happen, collect it and then collecting the payments for this. These are my contact details. Happy to share more of the insights of this brief advisory that we did to CIOESTE. And happy to receive now questions during the rest of the webinar.

**Moderator**

Thank you Rodrigo for that outstanding presentation. As we shift to the Q&A, I'd like to remind our attendees to please submit questions through the question pane. I actually see one already and I will pass that to you now. Why the impact of energy storage in fostering PV DG is not considered in this study.

**Rodrigo Garcia**

Yeah. So thanks for the question. So initially this was requested a good set of months ago. CIOESTE didn't have that in mind yet and there weren't a lot of examples on battery solutions or storage solutions as the distributed energy resources level that could give us a hint of how competitive that type of combination could be. So we prefer to focus on the assessment of the PV DG niche although this type of business models or financial mechanisms could be applied to encompass PV plus storage solution.

**Moderator**

Thank you Rodrigo. Ok. I have one more here and then we'll wrap up after that. Let's see. Could you give an example as to understand when it's convenient to use one financial instrument over another to boost these extra projects?

**Rodrigo Garcia**

Sure. Sure. So generally, for example the standard debt instruments from commercial banks will have a larger interest rate and they will be suitable for investments that don't have much risk that are already for example already built or in operation of have more predictable revenue streams. Whereas very risky endeavors where you are aggregating different assets, that you are studying a pilot initially, you would require potential funding from actors that are aiming to get higher level of margins, higher returns and are also more likely to take higher risks like capital providers or private equity firms, etcetera.

So that would be in terms of the type of source of funding, source of capital provider. And the type of the specific risk management mechanisms, it really

all depends on the status of maturity of the specific intervention. It actually just requires for example a loan guarantee to cover the risk of the conduction or if there is really the need of covering another type of risk, a commercial risk where the loan guarantee might need to be escalated.

## **Moderator**

Thank you again for that informative Q&A session. For any questions that we didn't get time for, we'll connect to those attendees offline after the webinar. On behalf of the Clean Energy Solutions Center, I'd like to extend a thank you to Rodrigo and to our attendees for participating in today's webinar. We very much appreciate your time and hope in return that there were some valuable insights that you can take back to your ministries, departments or organizations.

We also invite you to inform your colleagues and those in your networks about Solutions Center resources and services including no cost policy support through our Ask an Expert service. I invite you to check the Solutions Center website if you would like to view the slides and listen to a recording of today's presentation as well as previously held webinar. Additionally, you'll find information on upcoming webinars and other training events. We are also now posting webinar recordings to the [Clean Energy Solutions Center YouTube channel](#). Please allow for about one week for the audio recording to be posted.

Finally, I would like to kindly ask you to take a moment to complete the short survey that will appear when we conclude the webinar. Please enjoy the rest of your day and we hope to see you again at future Clean Energy Solutions Center events. This concludes our webinar.