Leveraging Financial Futures, Making Energy Affordable in The Caribbean and Latin America

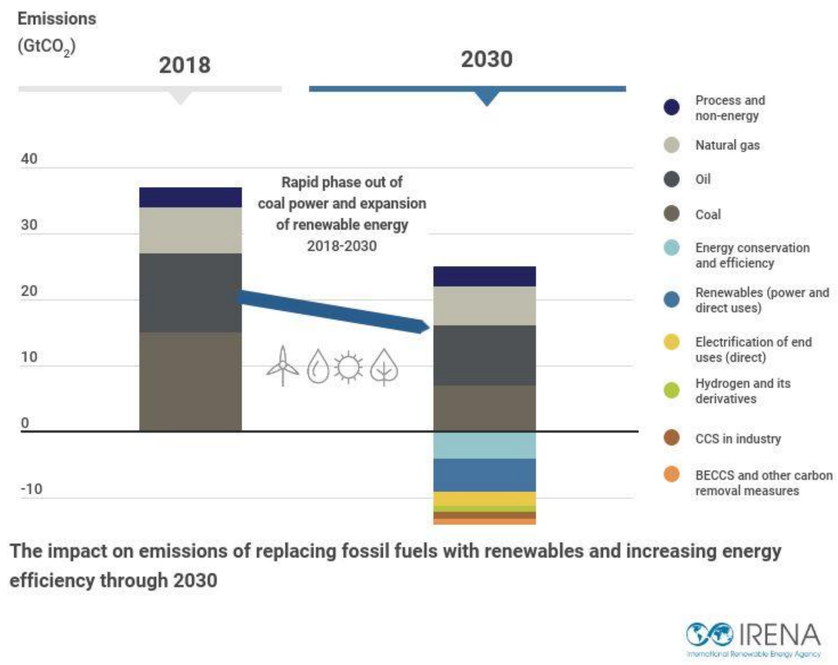
ABSTRACT

Access to affordable and reliable energy presents a significant challenge in many countries across Latin America and the Caribbean (LAC), particularly exacerbated by climate change disruptions and the economic impacts arising from the COVID-19 pandemic. Implementing renewable energy generation projects, such as solar, geothermal, wind, and hydro, can offer clean and dependable energy sources while reducing overall carbon emissions. However, financing solar distributed energy resources (DER) in LAC remains challenging, and requires support from all sectors, especially financial institutions.

This paper explores the utilisation of Solar Power Purchase Agreements (SPPAs), Certificates of Emissions Reduction (CERs), and Renewable Energy Credits (RECs) as mechanisms for financing solar DER projects in LAC. SPPAs, CERs, and RECs are revenue streams generated by solar DER projects and can be traded in various markets, providing revenue for project developers and investors.

Furthermore, making use of SPPAs, CERs, and RECs can catalyse the development of solar DER projects in LAC by reducing financial risk and making them more attractive to investors. The paper also discusses the necessary policies and regional cooperation to foster an inclusive and transparent investment environment for renewable energy development in LAC. In conclusion, leveraging SPPAs, CERs, and RECs provides a viable mechanism for financing solar DER projects in LAC, thereby promoting sustainable economic development in the region.

Keywords: Solar Power Purchase Agreement (SPPA), Certificates of Emissions Reduction (CER), Renewable Energy Credits (REC).



The impact on emissions of replacing fossil fuels with renewables and increasing energy efficiency through 2030

Fig.1
IRENA "World Energy Transitions Outlook: 1.5°C Pathway", page 22, Executive Summary

METHODOLOGY AND RESULTS

To determine the most suitable algorithm for predicting the outcomes of our research is dependent on many factors, a requires careful consideration, including but not limited to data availability, model assumptions and answers to specific questions, such as "Raising Financing for Renewable Energy Projects in the Region from the Sale of these Financial Futures".

While many models can be used for such a purpose, and we will name a few: Vector Autoregressive Analysis, Structural Equation Models, Bayesian Structural Time Series, these algorithms may not necessarily be the best alternative. In context, and environment of limited resources, the best suited model for this purpose is the Monte Carlo simulation.

Monte Carlo Simulation:

Set the number of simulation iterations: N

For i=1 to N:

I. Generate a random sample for energy consumption: ECi
II. Generate a random sample for solar energy generation: SEGi
III. Generate a random sample for market prices: MPi
IV. Calculate the generated CERs: CERi = f(ECi,SEGi)
V. Calculate the generated RECs: RECi = g(ECi,SEGi)
VI. Calculate the simulated revenue: $Revenue_i = CER_i \times CER\_Price + REC_i \times REC\_Price$

Statistical Analysis:

I. Calculate the mean of the simulated revenue

$$Mean\_Revenue = \sum_{i=1}^{N} Revenue_i$$

$\mu EC = N1 \sum i=1 NECi$
$\sigma EC = 1N-1 \sum i=1 N(ECi-\mu EC)2 \sigma EC = N-11 \sum i=1 N(ECi-\mu EC)2$

II. Calculate the standard deviation of the simulated revenue:

$$StdDev\_Revenue \text{ or } \sigma = \sqrt{\frac{1}{N-1}} \sum_{i=1}^{N} (Revenue_i - Mean\_Revenue)^2$$

III. Calculate the confidence interval for the revenue:

$$Confidence\ Interval = [Mean\_Revenue - (1.96 \times \frac{StdDev\_Revenue}{\sqrt{N}}),\ Mean\_Revenue + 1.96 \times \frac{StdDev\_Revenue}{\sqrt{N}})]$$

Iteration	Energy Production in Megawatts per Year	CER / Price per Ton	REC / Price per Ton	SPPA Price per Milowatt	Total per Year
1	8410	USD 120,000.00	USD 1,682,000.00	USD 841,000.00	USD 2,643,000.00
2	8000	USD 109,000.00	USD 1,600,000.00	USD 800,000.00	USD 2,509,000.00
3	9000	USD 130,000.00	USD 1,800,000.00	USD 900,000.00	USD 2,830,000.00
4	8100	USD 110,000.00	USD 1,620,000.00	USD 810,000.00	USD 2,540,000.00
5	9100	USD 130,000.00	USD 1,820,000.00	USD 910,000.00	USD 2,860,000.00

CONCLUSIONS

The employment of Monte Carlo Model for analyzing revenue streams generated by DER projects in Latin America and the Caribbean offers crucial insights into potential outcomes and variability. Using this approach, we get results that enable informed decision-making, comprehensive risk assessment, and thorough evaluation of the financial feasibility of projects. This methodology equips investors and stakeholders with a deep understanding of the different scenarios involved and aids in crafting strategies to mitigate risks effectively. As the renewable energy sector continues to grow, leveraging such advanced tools and concepts becomes indispensable for maximizing returns and ensuring sustainable success in this dynamic and promising market.

Ignacio R. Smith [1]* , Peterson Clarke [2]
[1] The Private Financing Advisory Network, Wagramer Strasse, Vienna, AUSTRIA.
[2] SM Solar, #10 Second Street, East Rowland Avenue, Trincity, TRINIDAD AND TOBAGO.