GENERACIÓN Sole



The business opportunity of

Distributed Solar Generation in Panama

Financial mechanisms for the commercial banking sector

UN environment programme 50 1972-2022

Euroclima+ Funded by the European Union

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REPÚBLICA DE PANAMÁ — GOBIERNO NACIONAL —

MINISTERIO DE LA PRESIDENCIA
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Growth Factors for Distributed Solar Generation

National potential of investment in distributed solar generation

Conclusions and recommendations

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For more information about initiatives of the EUROCLIMA+ Program on Climate Change and renewable energy, visit the website: www.euroclimaplus.org

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About Generación Sole

“GENERACIÓN SOLE” is a platform created by the United Nations Environment Program to promote distributed solar generation and distributed energy resources in Latin America and the Caribbean**.**

This platform provides the dialogue for the regulation of self-generation of renewable energy, promote the adoption of distributed energy resources and constitute a community of practice for interested parties in the region.

Generación Sole is a necessary action in the fight against climate change.



www.generacionsole.org

About this Report

This document forms part of the regional Generación Sole initative implemented by the Office for Latin America and the Caribbean for the (UNEP), in collaboration with the National Energy Secretariat of Panama, and relies on the support of the Spanish Agency for International Development Cooperation (AECID).

This initiative is envisioned to become to a catalyst for private finance for climate initiatives corresponding to National Determined Contributions (NDC) of Panama and other countries in Latin America and the Caribbean, contributing to ongoing regional work on the objectives established by the Paris Agreement and the United Nations Sustainable Development Goals.

The results of this project are expected to become a useful tool and support for the design and execution of more financial programs for distributed solar energy, collaborating with the implementation of the Banking Association of Panama's Sustainable FInances Protocol of Panama and other initatives of the Working Group for Sustainable Finances. Accompanied by the public initiative for energy innovation, the investment and private finance will lead a paradigm shift in the energy system of Panama, in line with the transformation of the society in a more resilient, sustainable and equitable.

Complete version of the study available at:
https://www.generacionsole.org/financiamiento-gsd-panama/



Objectives

- Evaluate the market investment potential of distributed solar photovoltaic generation for the private sector, with special focus on the banking sector (commercial banks), for the residential, commercial and industrial segments.
- Identify main barriers, risks, challenges and opportunities to catalyze private investment in the market for distributed solar generation systems.
- Analyze existing mechanisms of finance (national and international) and make recommendations for the design of financial products for DSG systems.

Index of Graphs

11 Graph 1. Matrix of electricity consumption in Panama, 2020
12 Graph 2. Evaluation of the installation of DSG systems in Panama, 2013-2021
12 Graph 3. Distribution of DSG installations by size (kWp), 2021
15 Graph 4. Investments in DSG technically and economically viable systems, by size and segment (in MUSD)
17 Graph 5. Payback period of DSG systems in Panama (in MW, by segment)

Index of Table

15 Table 1. Techno-economic Potential of installation of DSG systems in Panama

Index of Figures

8 Figure 1. Main characteristics, economic, social and environmental benefits of DSG
9 Figure 2. Objective of CO_2 emissions reduction of the energy sector set in the revised NDC of Panama for 2030 and 2050
10 Figure 3. Main aspects of the regulatory framework that supports DSG
14 Figure 4. Types of potential renewable systems installation
16 Figure 5. Geographic distribution of technically and economically viable DSG installations



Growth Factors for Distributed Solar Generation

Distributed Solar Generation (DSG) systems provide significant economic, social and environmental benefits to the general population and the national electricity system.

DSG systems are solar photovoltaic systems connected to the distribution grid that generate electricity for self-consumption in homes, businesses, industries, and public buildings.

Figure 1. Main characteristics, economic, social and environmental benefits of DSG

Main characteristics

- **Local generation,** near the point of consumption;
- **Automatic exchange with the electricity grid** (surplus generation injected to grid for a compensation);
- **Simple and secure installation,** through a qualified professional;
- **Multiple installation possibilities** on roofs, decks or on the ground;
- Investment with a **lifespan of more than 25 years;**
- **Simple, secure and inexpensive maintenance;**
- **Scalable system**, desde pequeños sistemas residenciales, hasta grandes instalaciones industriales.

Socioeconomic benefits

- **Economic savings** for the electricity user, enabling an essential role to the consumer in the electricity sector;
- **Encourage private investment, boosting economic growth and job generation**, (direct and indirect);
- **Support the creation of a national solar industry** throughout the value chain;
- **Improved electricity system,** , diminishing losses in transport and distribution;
- **Reduce electricity subsidies,** redistributing public resources in other areas like education, health, housing and natural spaces;
- **Deferral of public investments** to improve and expand the transmission grid
- **Diversification of the energy matrix**, and reduced dependence on imported fossil fuels

Environmental benefits

- **Avoided GHG emissions** by replacing electricity generation from fossil fuels.
- **Savings in water use** on large hydroelectric plants.
- **Avoided air pollution** near to large fossil fuel power plants.
- **Improve the adaptation of the electricity system** reducing the impacts of natural disasters on the electricity infrastructure.

Energy, environmental and financial education

The installation of DSG systems converts to the consumer into a new actor in the electricity system, fostering conscious use of economic resources and a more rational use of energy.

DSG as a strategic sector to attract investment, economic growth and job creation.

The decarbonization of the energy sector, the cornerstone for the fulfilment of the objectives of Paris Agreement.

Enhance GHG emissions objectives for the energy sector set in the revised NDC in December 2020.

Objective: Reduction of greenhouse gas emissions (GHG) in the energy sector with respect to the trend scenario from **11.5% and 24% to 2030 and 2050**, respectively (>60 million tonnes of CO_2 accumulated to 2050) – **Figure 1.**

The Energy Transition Agenda establishes the roadmap for the energy sector in the next decade.

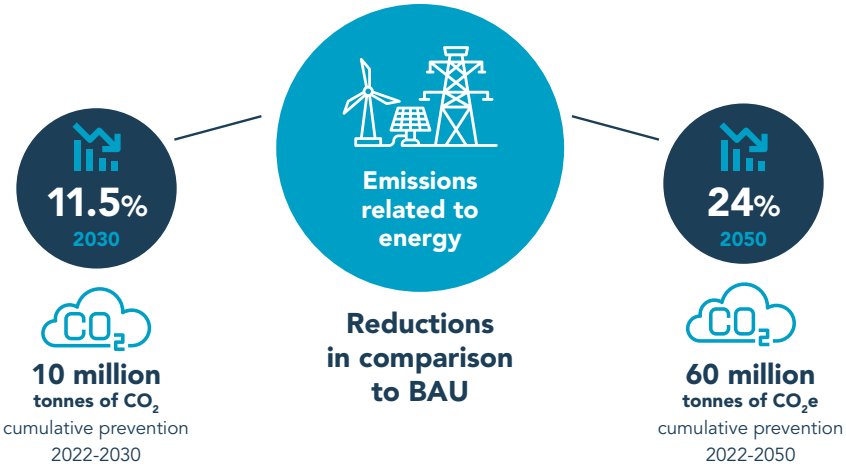
Through eight national strategies, the SNE has the objective to achieve **affordable, accessible, reliable, secure and sustainable energy.**

For this, strategic lines of work have been presented with concrete objectives of technological innovation, business and finance models, **distributed generation from renewable sources** being one of them.

Distributed generation constitutes a pilar of transformation for the Panamanian energy sector.

The **National Distributed Generation Strategy** has an objective of installing up to **1,700 MW** (escenario optimista) **of solar generation by 2030**, equivalent to more than a third of the current installed capacity of the national electricity system. Additionally, it also includes improvements in the connection processes, redesign of electricity tariffs and strengthening of technical standards.

Figure 2. Objective of CO_2 emissions reduction from the energy sector set in the revised NDC of Panama for 2030 and 2050

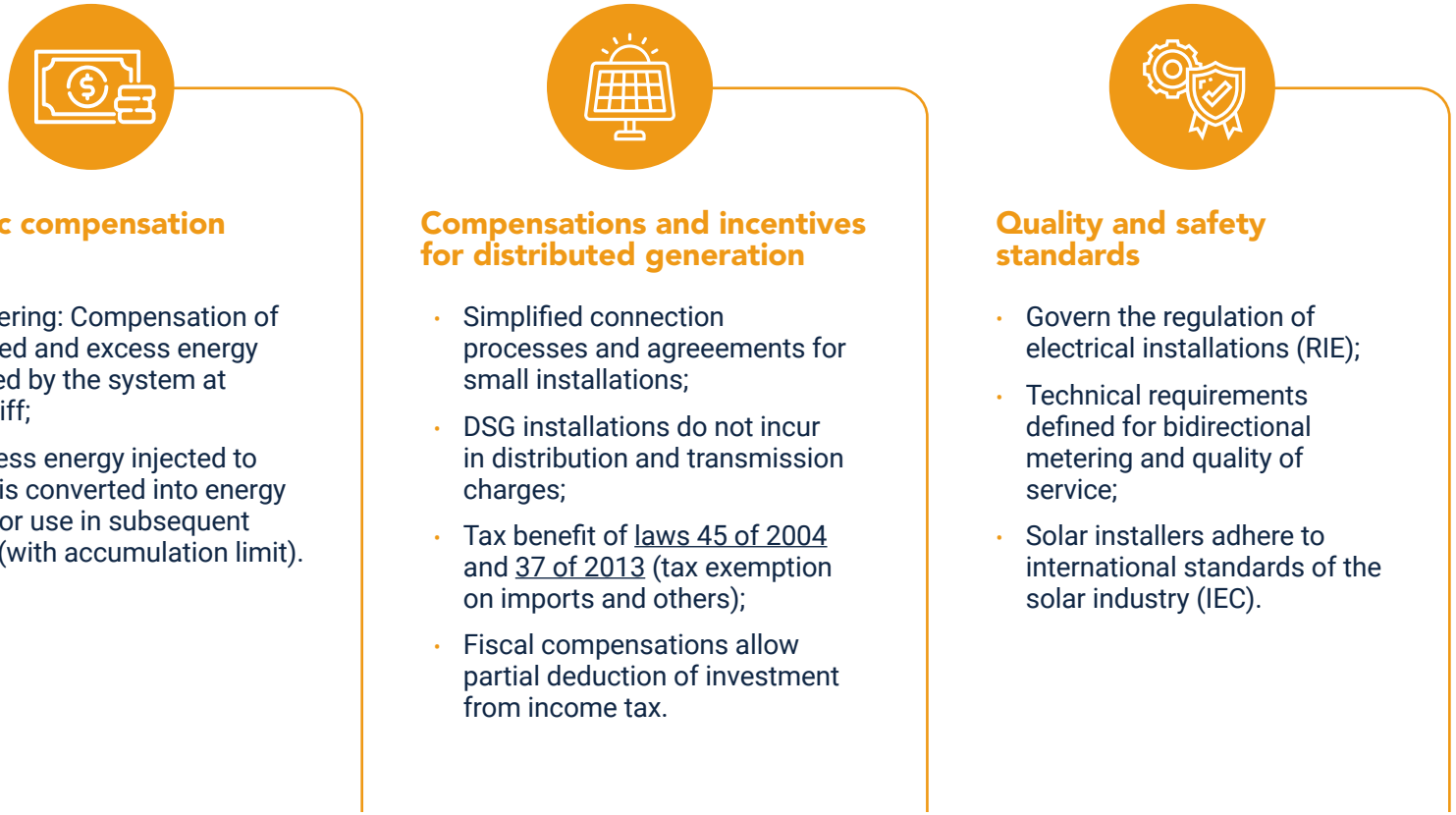


Source: UNEP, from data of the Ministry of Environment (2020)

The existing regulatory framework for DSG assures long-term certainty for investments.

The National Distributed Generation Strategy is expected to strengthen these mechanisms and improve the conditions for massive deployment in the market.

Figure 3. Main aspects of the regulatory framework that supports DSG



Source: UNEP, based on information of the Resolution AN No. 10206 – Elec de 2016 (ASEP), its annexes and amendments.

The characteristics of the Panamanian electricity market are very favorable for disruptive growth of DSG.

98% of users correspond to small residential and commercial consumption, representing more than half of the energy sold annually. **Large opportunity for small-scale self-consumption.**

A favorable solar resource for the development of solar energy across the country.

The Panamanian PV potential is close to the global average and is constant across its territory. Highest potential in Chiriquí, Veraguas and Herrera.

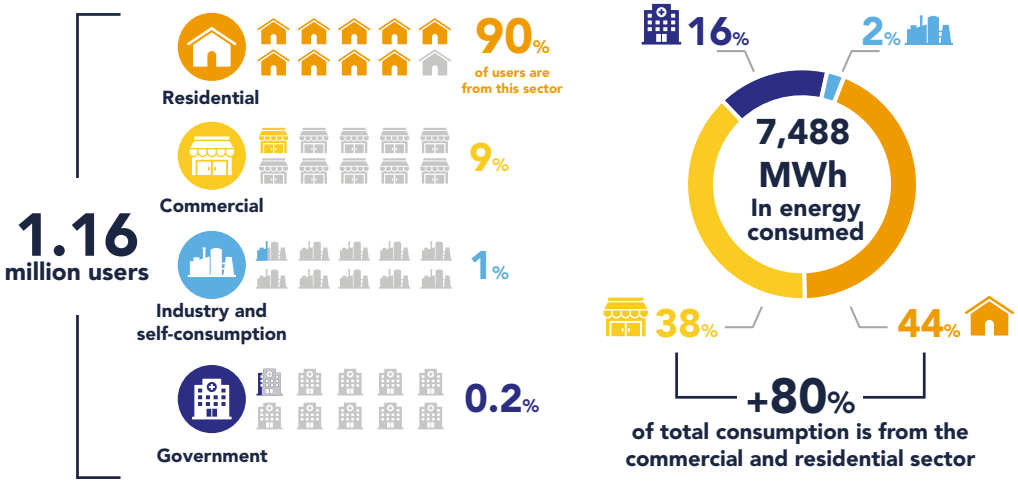
The cost of DSG systems has fallen up to 85% globally in the last 10 years. The Panamanian market follows the same trend.

A continued reduction of the costs of DSG systems is projected, reaching an additional 15% to 35% reduction by 2024, which will attract even more investment.

The DSG systems have reached, in some cases, grid parity.

The cost of energy generated by DSG systems is currently lower than electricity tariffs for certain types of users.

Graph 1. Matrix of electricity consumption in Panama, 2020



Source: Own production from data of the SNE and ASEP

Concentration in electricity consumption and geographic distribution of consumers.

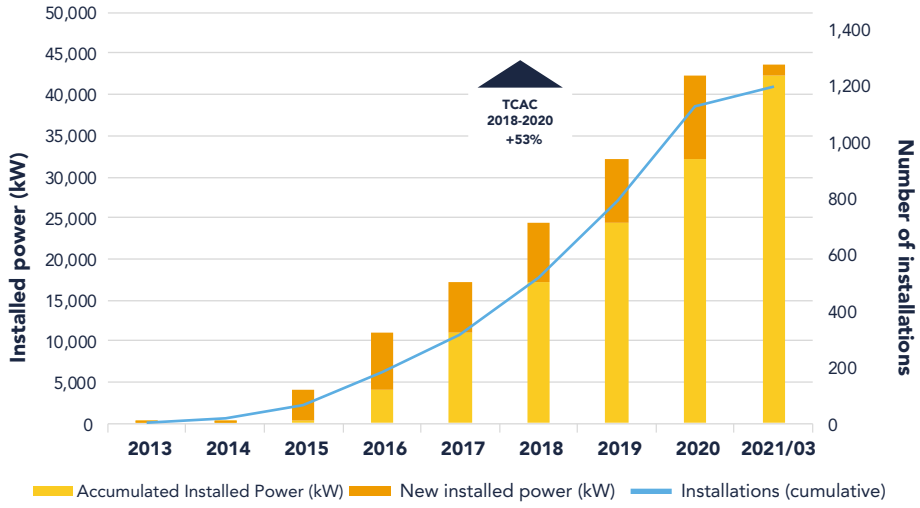
72% of electricity consumption is located in the Panama and West Panama provinces, followed by Chiriqui (8%) and Colon (6%).

Building characteristics, mostly single story, make many houses and businesses suitable for the installation of DSG systems on rooftops.

DSG shows firm growth thanks to the current regulatory framework, a decrease in the cost of the technology, and national development of the solar industry.

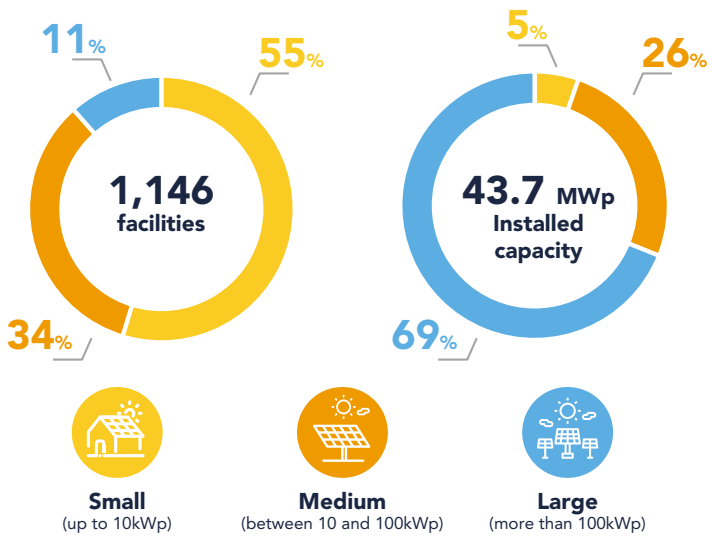
In March 2021, 1,146 DSG system installations with a capacity of 43.7 MW existed. Despite the COVID-19 pandemic, the growth rate in 2020 was 43%.

Graph 2. Evaluation of the installation of DSG systems in Panama, 2013-2021*



*March 2021. Source: Own production from data of the SNE

Graph 3. Distribution of DSG installations by size (kWp), 2021



Source: SNE

Systems installed across the country

60% of installations are located the the central zone of the country, mainly West Panamá, Coclé and Veraguas (EDEMET distribution grid). 29% of the installations are located in Panamá and Colón (ENSA grid), and the remaining 11% in the Chiriquí province (EDECHI grids).

The majority of the installations are small (55%), up to 10kWp. However, 95% of the installed capacity (in KW) corresponds to installations above 10kWp.



National potential of investment in distributed solar generation

To estimate the market potential of DSG in Panama, the sector has been analyzed in detail using a proven methodology.

Generación SOLE has carried out an exhaustive analysis of the electricity market, the regulatory framework, the current costs and tariffs to project attractive profitable investments.

Methodology adapted to analyze the current potential of distributed generation for self-consumption

Based on proven methodology (used by NREL* and other national and international organizations), adapted to optimize the analysis of information available in the country..

The analysis carried out is at the user level (bottom-up) and considers the current conditions of the market as well as housing which allows for information disaggregated by segment, tariff or province to be obtained.

Technical Potential

The total installation potential is considered as a function of the natural conditions of the country (temperature and irradiation), the number of electricity consumers by type and province, as well as their monthly and annual electricity consumption. Lastly, the building suitability for the installation of a GSD system.

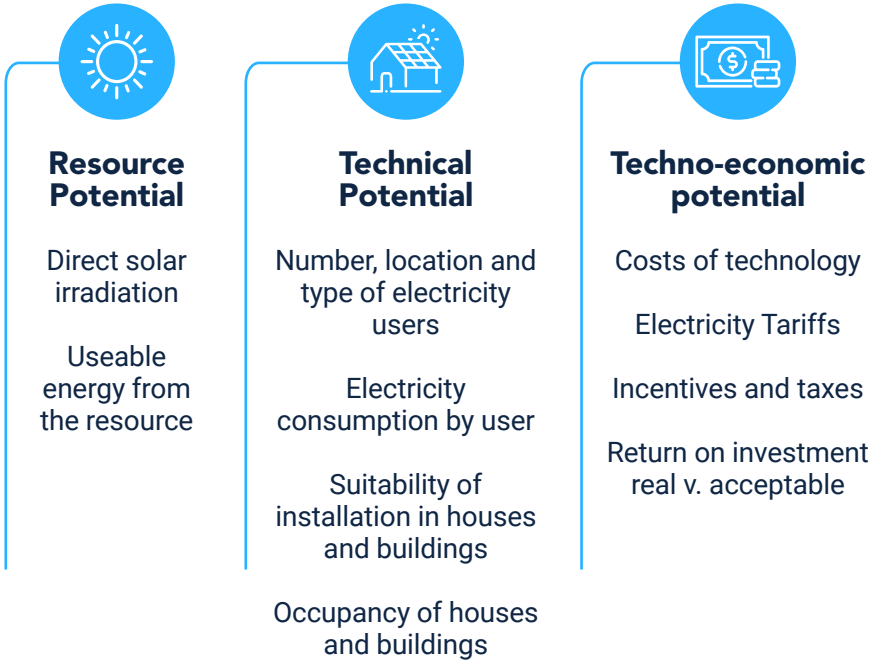
Techno-economic Potential

The market investment potential of DSG is shown in millions of USD by type of user and region. It is calculated based on Technical Potential, considering the economic feasibility of the DSG systems by type of user. It is calculated using the electricity tariffs by type of user, DSG incentives and the associated costs for the installation and mantenance of a DSG system (CAPEX and OPEX).

Payback Period

A simple payback period of up to 7 years has been established to consider economic viability of the projects, in line wirh international standards and the financial conditions of the national market.

Figure 3. Types of potential renewable systems installation



Own elaboration adapted from NREL, 2016.

*Brown et al., Estimating Renewable Energy Economic Potential in the United States: Methodology and Initial Results, NREL, revised version, August 2016

The market investment potential of DSG in Panama is more than 2,000 million dollars.

More than 137,000 DSG systems for a total 1,450 MWp are technically and economically viable in the current market conditions.

The opportunity to decarbonize the electricity sector, with many economic benefits

These systems could generate 2 TWh of renewable distributed energy annually, corresponding to 21.7% of energy sold by distributors in 2019.

Table 1. Techno-economic Potential of installation of DSG systems in Panama

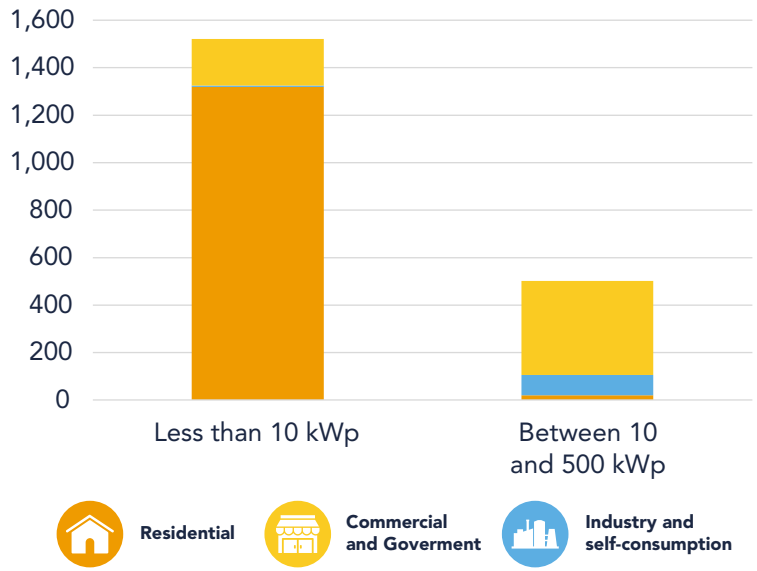
Type of user	# installations	Investment range for DSG system (USD)	Total Investments (MUSD)
Residential	121,792	4.6k – 15.4k	1,339.0
Commercial	15,459	8.3k – 500k	590.3
Industrial	534	15.4k – 500k	88.4
Total	**137,785**		**2,017.7**

Source: Own production

Distributed investments potential in all segments

Two thirds of these installations are small-scale (less than 10kWp), while a third are medium and large-scale (between 10 and 500 kWp).

Graph 4. Investments in DSG, technically and economically viable systems, by size and segment (in MUSD)



Source: Own production

All regions of the national territory offer an important investment potential.

The installation of DSG systems is attractive to different types of users in the different regions of the country.

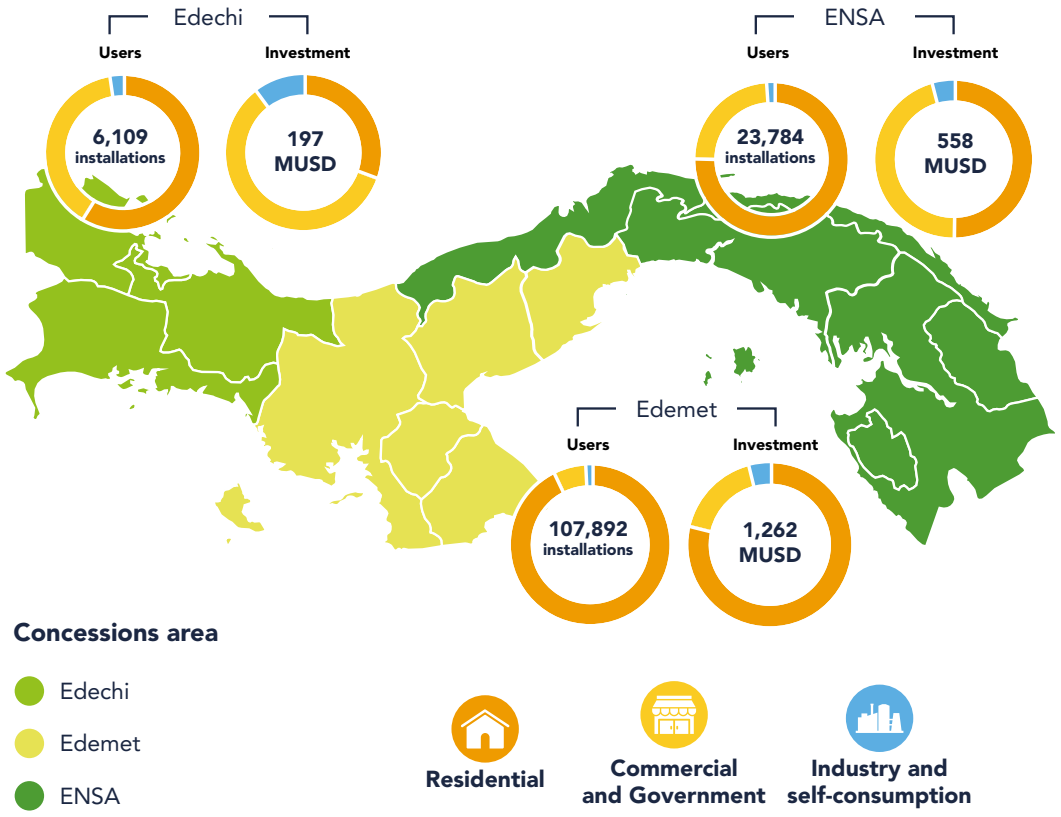
Geographic distribution of the techno-economic potential

59% of the potential investment is found in the EDEMET connection zone (West Panama, Cocle and Veraguas). 30% of the potential is found in the ENSA zone (Panama and Colon), while the remaining 11% corresponds to users connected to the distribution grid of EDECHI (Chiriqui).

Prioritzing self-consumption

The size of the projects has been scaled by segment, geographic region and type of user, prioritizing self-consumption and minimizing the exchange of excess energy with the distribution grid.

Figure 5. Geographic distribution of technically and economically viable DSG installations (number of installations and investment potential in millions of USD)



Source: Own production

The investment potential could grow up to 3,300 MUSD in the near term, continuing current trends in the solar photovoltaic industry.

112,600 additional installations, totalling 835 MWp, have a payback period between 8 and 9 years, for which the potential investment could increase by 1,280 MUSD (63%) compared to the current potential.

Opportunity for more installations to become economically and financially viable

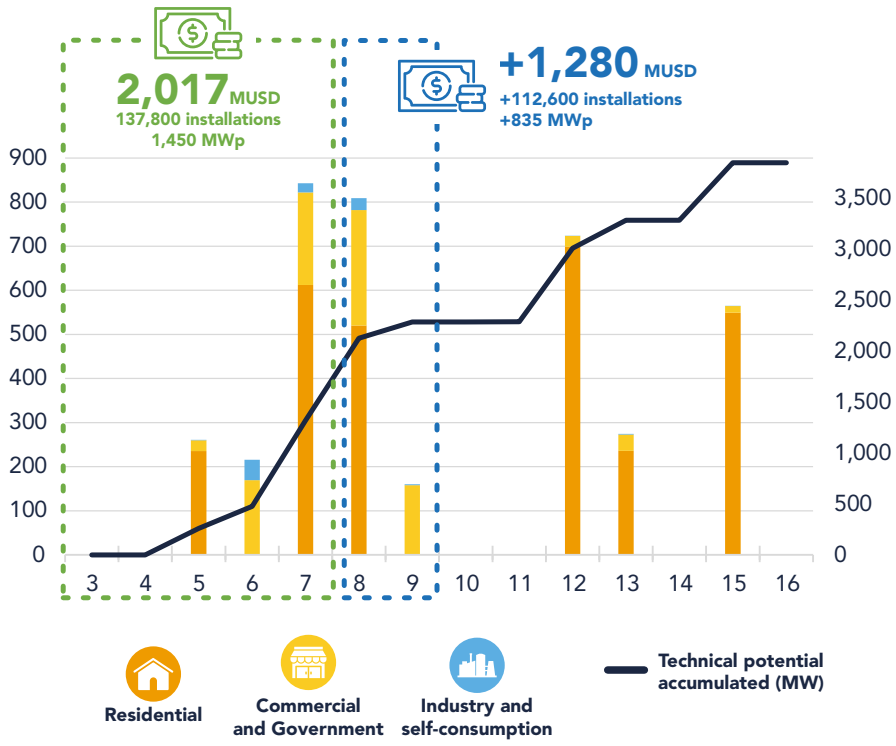
The continuity of current trends and cost reduction of the technology, could reduce the payback periods in the installations of DSG. The technically viable installations, mainly in the residential and commercial sectors, that have returns between 8 and 9 years, could have economic viability with additional incentives.

The financing availability and feasibility to obtain fiscal benefits directly impacts in the payback period and is key to increase investments

A large number of users with potential to install DSG systems compare future credit payments with the monthly electricity bill savings before deciding to purchase a system. **An improvement in current financial conditions (interest rates or rebates) should have a significant impact on energy consumers' decision-making.**

Additionally, simplifications on the requirements to obtain fiscal benefits, mainly for legal persons and entitites subject to the payment of income taxes, would improve the payback period and positively impact the investment decision-making of these users.

Graph 5. Return periods of DSG systems in Panama (in MW, by segment)



Source: Own production



Conclusions and recommendations

The financial sector, and in particular, commercial banking, can be a key actor in the deployment of DSG systems.

A large interest from banks to finance DSG systems has been detected. However, there are challenges to resolve.

The characteristics of the investment make access to financing important

- The capital needed for this type of installation prevents many users from accessing their system, given the significant disbursement required at the start of the project for the purchase and installation of the system. Then, the costs of operation and maintenance are very low.

Currently, financing of this type of system is addressed through traditional products

- Panamanian banks has experience financing solar energy projects, mostly utility-scale, whose owners are generally energy sector companies.
- DSG system installations are mainly financed with the user's own resources, or with regular consumer loans (persons), corporations (entities), mortgages (both segments), and in smaller measure through financial leasing.t
- The offer of specific financial products is still in the early phase. **However, commercial banks are beginning to outline strategies to take advantage of the detected business opportunity.**

Main detected challenges



Creditworthiness of electricity user-generator (difficult to access collateral, insufficient guarantees or credit history).



Quality of the installations.



Lack of **track-record** of DSG integrators and installers.



Bank's limited capacity to perform project technical risk analysis, and high cost (associated with the number and total amount of the projects).



Lack of experience and knowledge from banks and potential clients (users) with respect to benefits of the technology and the functioning of the systems.

Sustainable Finances Protocol

In July 2018, the Panamanian Banking Association (ABP) signed the "Sustainable Finances Protocol of Panama" through which banks committed to the adoption of practices that promote sustainable development and conserve and protect the environment.

Simplifying and standardizing risk analysis processes will allow banks to create scalable products for quick adoption of DSG systems.

Proposals and recommendations to address detected challenges and capture the opportunities in distributed solar generation that the Panamanian market offers (I).

1. Optimize the evaluation process of project technical risk to facilitate credit issuance, while diminishing perceived risk for the bank.

- The **availability of aggregated and reliable information**, with respect to the track-record of installers and performance of the systems at the national and regional level, will increase confidence from end-users and financial institutions.
- The **association with external evaluators** with experience in the industry will allow the bank to focus solely on credit risk evaluation, enabling the financing of viable projects and quality systems only. This association could be individual for each institution, or collectively through the ABP or other organizations.
- Establishment of a **guide of good practices** for DSG installations accepted nationally that serves to carry out an objective evaluation of the installations and avoid differences in interpretation by evaluators.
- Creation of a **quality certification for suppliers and installers**, issued by an independent institution respected among all actors, for banks to use as a reference when evaluating the sector.



The use of existing tools will allow the rapid creation of new financial products, diminishing the cost of implementation.

Proposals and recommendations to address detected challenges and capture the opportunities in distributed solar generation that the Panamanian market offers (II).

2. Create new sale channels and optimize existing ones to increase reach to end-users, diminishing risk and transaction costs of projects.

- Use of existing technological tools to simplify and standardize risk evaluation processes (technical and financial) and ensure rapid adoption of the products
- Alliances with other market participants to finance projects indirectly (installers, distributors, energy companies), additionally transferring installation associated risks (design and performance)
- The presence of a secondary market of assets (equipment) will allow financial institutions to improve the profile of risk and collateral requested for the credits.





3. Take advantage of synergies with existing financial products improving credit conditions while maintaining a solid collateral structure.

- **Introduce the financing of DSG systems leveraging existing credit lines**, with low perceived risk, for example: external commercial lines of the agricultural sector and the agroindustry, mortgage credits.
- These credit lines generally have better financial conditions due to knowledge of these clients and their collateral, often having limits which are greater than the capital required to purchase a DSG system.

Awareness about the benefits of DSG will diminish perceived risk for banks and generate interest of potential users.

Proposals and recommendations to address detected challenges and capture the opportunities in distributed solar generation that the Panamanian market offers (III).



4. Diminishing the risk exposure of banks through implementation of proven tools, incorporating mechanisms used in other markets.

- Creation of **specific funds and innovative financing** can help users with low access to traditional banking finance. The development multilateral banks, and international organizations could collaborate with the local banking sector to adapt successful cases in other countries.
- Specific **solar industry insurance mechanisms** for the bank and installer (security of design or performance) are successfully used in other countries in the region to minimize the main project risks.
- The **creation of investment funds** to group projects and liabilities (within a bank or between banks), could be a valuable tool to diminish the exposure of a bank. incorporating other types of actors such as private funds and minor investors can also liberate funds for new projects.

5. Collaborate with generating awareness and education of users about the economic, environmental and social benefits of the DSG system.

- The **existing capacity of commercial bank executives** in risk assessment and commercial areas (personal and commercial banking) will improve the capacity to absorb future demand of this specific type of credit.
- An increase of **visibility of projects and successful cases to the general public**, can help disseminate knowledge on the economic, environmental and social benefits of the projects.
- The **creation of pilot projects** by actors in the industry (bank, government, private sector) as proof of technical and financial viability will accelerate the development and implementation of products at a commercial scale.



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