

Latin America PV Playbook

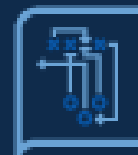
Q4 2017 Market Update

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January 2018



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About the Author



Manan Parikh, Analyst, Solar | GTM Research

Manan Parikh is a Solar Analyst for GTM Research covering the downstream Latin American markets. Prior to GTM, his work has been extensively research based, centering upon alternative fuels infrastructure development and Low Carbon Fuels Standard (LCFS) policy models for the Schatz Energy Research Center and UC Berkeley in Northern California. In California, he was also an ambassador to startup teams within the Cleantech Open accelerator, as well as a consultant to DOE SunShot Catalyst Award winner PVComplete. In Washington, D.C., he worked on biomass policy at the American Council on Renewable Energy. He is an alumnus of The University of Texas at Austin, where he graduated with a bachelor's of science in biochemistry.

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Glossary of Terms and Acronyms

ACESOL: Chilean Solar Energy Association

ANEEL: Brazilian National Electricity Agency

BNDES: Brazilian National Bank for Economic and Social Development

CAGR: Compounded average growth rate

CAMMESA: Wholesale Power Market Administrator, Argentina

Capex: Capital expenditures

CCEE: Electric Energy Trading Chamber, Brazil

CDEC: National Electric Coordinator, Chile

CEL: Clean Energy Certificate, Mexico (1 CEL = 1MWh)

CFE: Federal Electricity Commission, Mexico

CENACE: National Center for Energy Regulation, Mexico

CNE: National Energy Commission, Chile

COD: Commercial operation date

CREG: Energy Regulatory Commission and Gas

C&I: Commercial and industrial

DAC: Large residential consumer tariff class, Mexico

DC: Direct current

EMGESA: Second-largest generator in Colombia

EPE: Energy Research Company, Brazil

FODER: Government-funded renewable energy fund, Argentina

H-M: Industrial tariff class, Mexico

ICMS: Tax operations related to goods and interstate transport, Brazil

IDB: Inter-American Development Bank

IPP: Independent power producer

IRENA: International Renewable Energy Agency

LCOE: Levelized cost of electricity

NEM: Net energy metering

O-M: Industrial tariff class, Mexico

PMGD: Small to medium-sized DG projects, Chile

PPA: Power-purchase agreement

PRODESEN: Annual electricity planning roadmap for Mexico

RenovAR: Renewable Energy Plan, Argentina

ROI: Return on investment

SADI: Argentina Electric Sector

SENER: Energy Secretary, Mexico

SIC: Central Interconnected System, Chile

SIEPAC: Electric Interconnection System for Central American Countries

SING: Northern Interconnected System, Chile

UPME: Mining and Energy Planning Unit, Colombia

1. Executive Summary

Our Coverage of Latin America Is Evolving

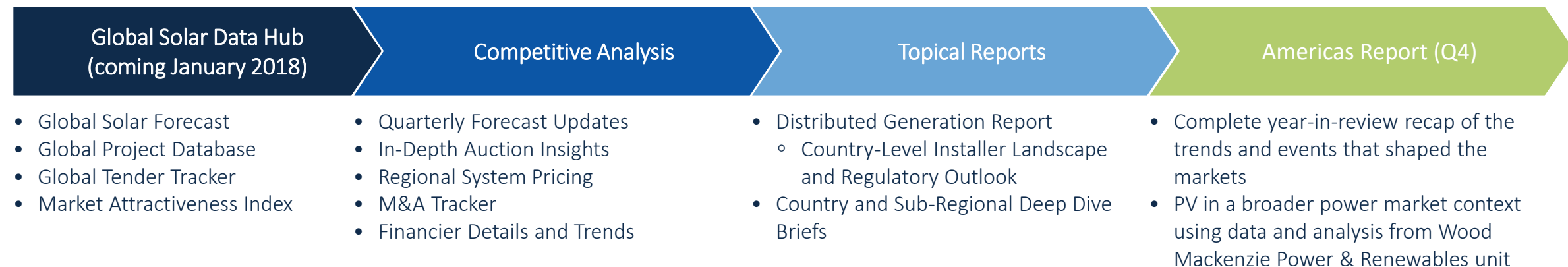
Why?

Latin America is one of the most dynamic solar markets in the world, and evolving market policies and procurement mechanisms are rapidly changing the competitive landscape and market opportunities. We want to provide insights and data that reflect that dynamism. These service changes will enable timelier insights combined with newly accessible online analytics via our Data Hub, as well as a regular quarterly update of market activity and forecasts.

Enhancements to existing Latin America solar coverage areas:

- Quarterly forecasts, updates and trend analysis will now be delivered via our quarterly *Global Demand Monitor* report series, showcasing the region in a global context
- Online access to global solar forecasts, project database, and tender tracker via our Solar Data Hub, which offers customizable visualizations and data downloads

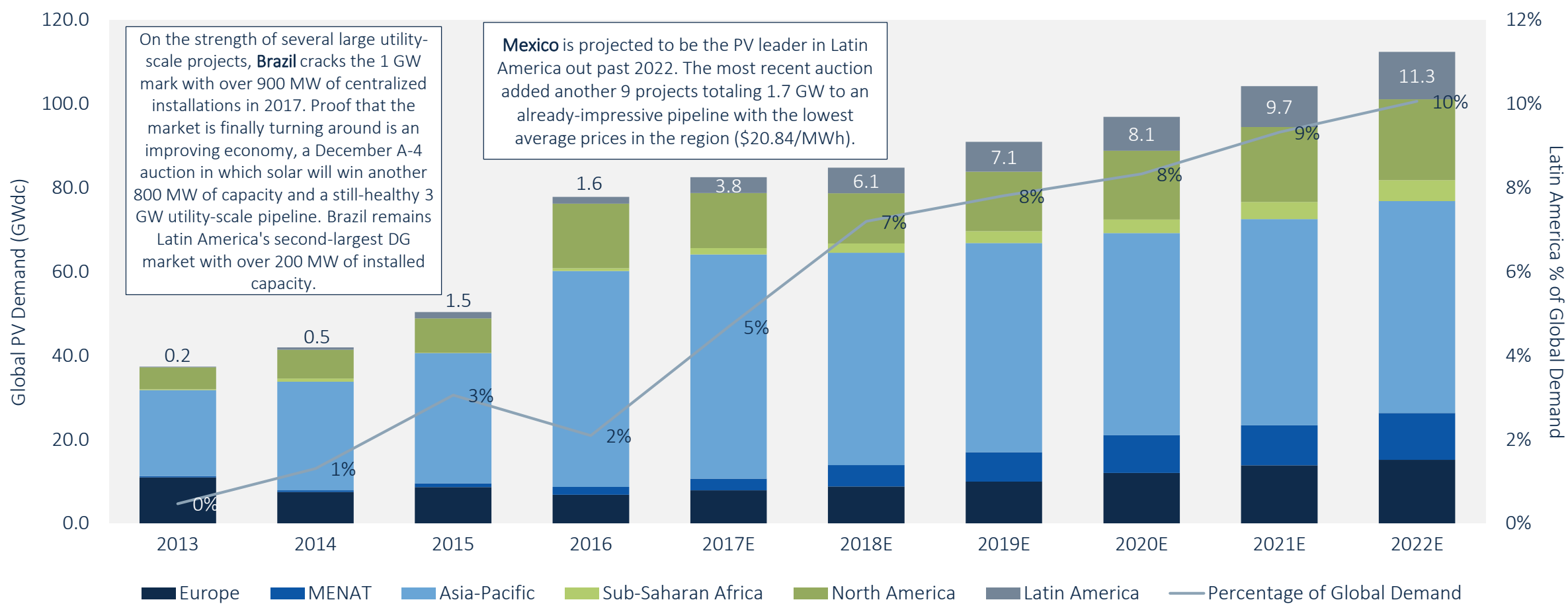
New coverage areas, reports and tools covering Latin America Solar PV



Please contact your account manager or sales@greentechmedia.com with any questions

Latin American Auctioned Capacity Contributes to 3% Increase in Global PV Demand Share

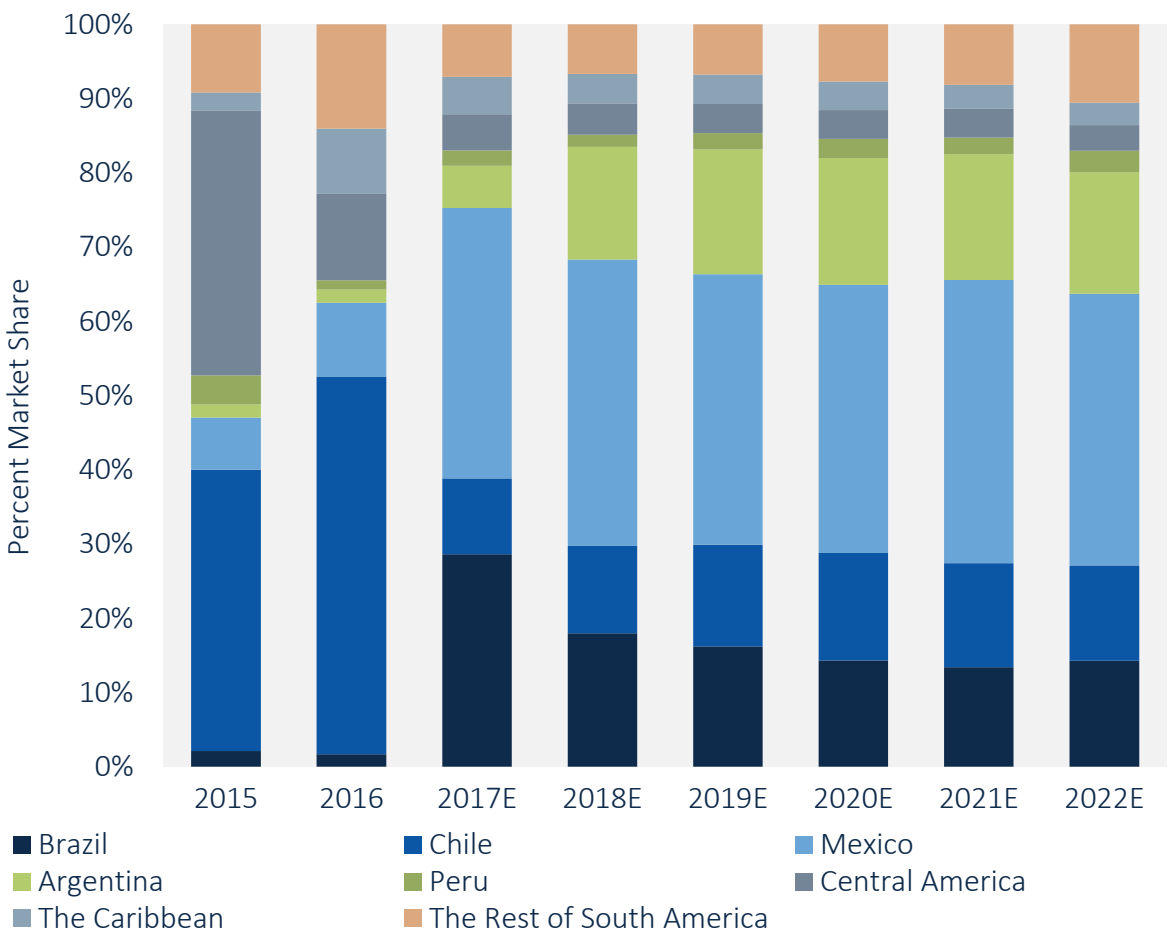
Latin America PV Demand as a Share of Global Demand, 2013-2022E



Source: GTM Research Global Solar Demand Monitor Q4 2017

Executive Summary: Brazil, Mexico Surpass 1 GW on the Heels of a Strong Finish to 2017

Individual Market Share as a Part of Latin America, 2015-2022E



- Through five auction rounds in Q4 2017, the major markets of Mexico, Chile, Argentina and Brazil added over 3.4 GWdc of projects to the pipeline with commercial operation dates (CODs) spanning from 2020 (Mexico A3) to 2024 (Chile).
 - Energy ministries are assessing their current generation resources with respect to many of their clean energy targets in the countries.
 - In Mexico, there has been a sharp increase in clean energy mandates out to 2025 (35%). Meanwhile, in Chile, there is already a critical mass of PV, wind and hydro projects on a saturated grid, forcing officials to further space out contracted projects.
- Brazil dominated the utility installation landscape with several large-scale utility projects that have been in the works since 2014, adding up to almost 1000 MW of capacity and pushing it over the 1.1 GW mark (in conjunction with distributed generation development in the country).
 - Project owners in Brazil leveraged local content requirements that were key to unlocking low-interest development bank financing.
- Not to be outdone, Mexico is expected to have installed 1 GW in 2017 alone with the massive 754 MWdc Villanueva 1 & 3 project in Coahuila, as well as ~400 MW of DG.
- Distributed generation lags behind utility-scale development in most regional markets due to a lengthier payback period and a lack of financing schemes. Mexico and Brazil still account for the majority of distributed solar installations in Latin America.

Executive Summary: The Big 4 LatAm PV Markets Are All Showing Promise

Latin America Markets Outlook, Q1 2018

Brazil



Outlook: Rising

- Brazil might finally be breaking out of its economic hangover, with a year of recovery following eight consecutive quarters of contraction.
- For the PV industry, this meant the completion of several large-scale contracted PV plants and a renewal of the PV supply auction scheme.
- As a result, regulatory agency ANEEL invalidated less PV capacity than originally expected as the real currency rebounded.

Chile



Outlook: Neutral

- Chile's free-market approach means that solar will always compete with fossil fuels at prices potentially lower than the regional average.
 - Most recently, Enel hedged its bets on a \$21/MWh PPA beginning in 2024 from the latest CNE auction.
 - As system and electricity costs decline in the country, developers are increasingly having to use future spot prices to competitively bid on projects with CODs 7 years later.

Mexico



Outlook: Strong

- Average PPA prices from competitive procurement auctions have come down 56%, from \$48/MWh to \$20.84/MWh since 2016.
- The total addressable market for distributed generation in Mexico is around 4.5 million unsubsidized retail customers; over 90% are unsubsidized C&I consumers.
- GTM Research forecasts the Mexican market to have close to 16 GW of cumulative PV installed capacity by 2022, with an upside of close to 20 GW.

Argentina



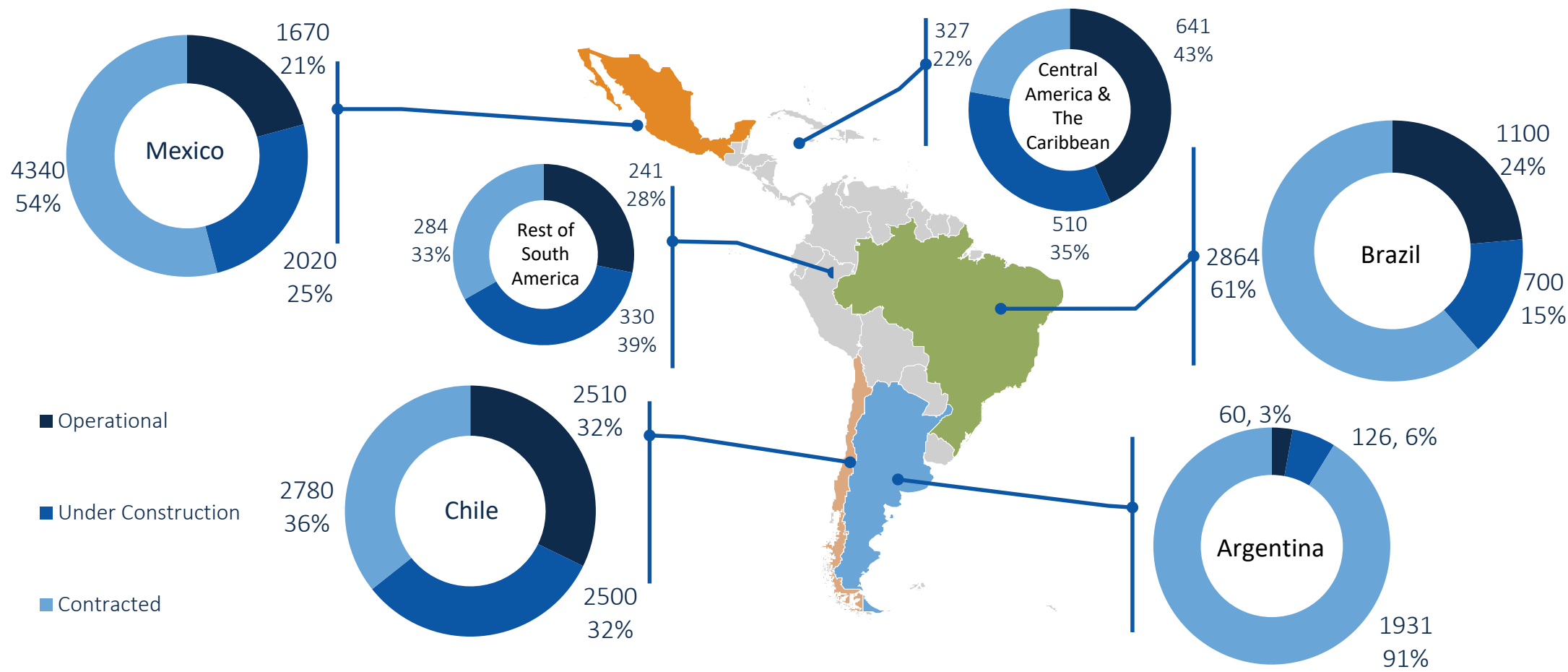
Outlook: Rising

- Inflation fell nearly 17% year-over-year
 - This opens up project financing from commercial and private banks that otherwise shy away from high-inflation economies.
- The program RenovAR's Rounds 2 and 2.5 added an additional 900 MWdc of PV to the pipeline from a diverse portfolio of developers at a \$43/MWh average.
- Distributed generation law passed in Argentina's legislature, establishing interconnection, billing and funding guidelines.

Source: GTM Research, Wood Mackenzie: *Americas economic outlook H2 2017*

Executive Summary: Chile Leads Operational Capacity With 2.5 GWdc

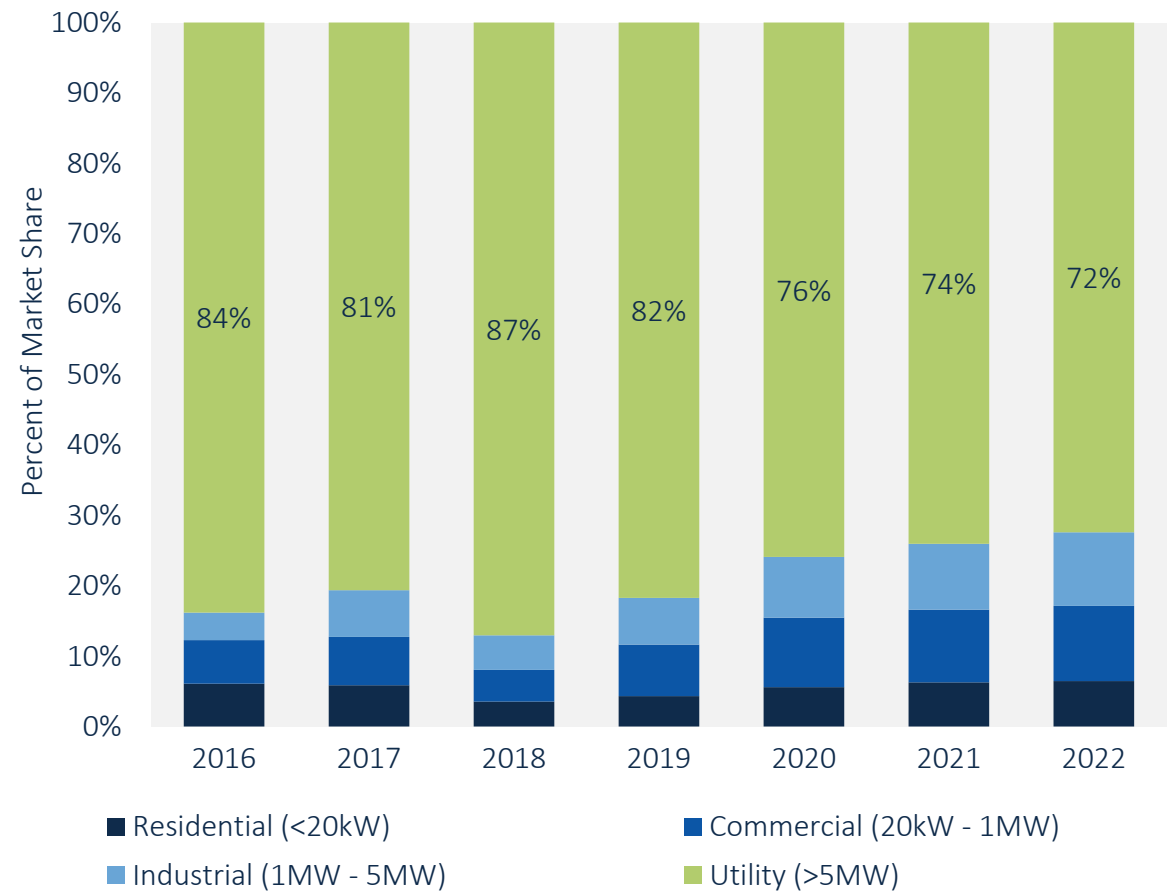
Latin American Market Project Pipeline (MWdc)



Source: GTM Research: Latin America PV Project Tracker

Executive Summary: Distributed Solar Shows Promise in Several Key Markets

Latin America PV Market Segmentation, 2016-2022E



Distributed generation lags behind utility-scale development in most regional markets due to a lengthier payback period and a lack of financing schemes. Mexico and Brazil still account for the majority of distributed solar installations in Latin America.

- Of all DG markets, **Mexico** has the highest upside out to 2022, with residential system costs at \$1.27/Wdc, a figure that is far more competitive than residential system costs in the U.S. (\$2.95/Wdc).
 - Total addressable market for distributed generation (DG) in Mexico is around 4.5 million unsubsidized retail customers
 - Approximately 10% of that opportunity comes from the residential DAC tariff class. The DAC rate is applied when the average of the last 6 bills is over the CFE-stipulated consumption of the subsidized tariff class a customer falls under
 - The remainder 90% of those unsubsidized customers are within the commercial and industrial sector (T-2, T-3 rate classes for commercial and O-M, H-M for industrial)
- **Brazil** passed the overall 1 GWdc PV mark, with DG taking approximately 15% of the cumulative total and half of the installations concentrated in Minas Gerais and Ceara.
 - Installations vary based on ICMS tax exemption on system components, leading to payback periods in the four- to five-year range on 1-3 kW microgeneration projects
- **Argentina** recently passed a distributed generation law that establishes interconnection timelines and the FODIS fund for financing projects.

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Pricing Information

The full report can be purchased [here](#) for \$1,995.

The Latin America PV Playbook is also available as part of GTM Research's annual [Global Downstream Solar Service](#). This program provides access to all of GTM Research's global solar market reports and data, including our global project tracker and forecasts which include data on more than 120 countries.

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