

Drivers Insights



- The country recorded 1% real GDP growth in 2019. Growth was stronger in 2018 but slowed in 2019. The outlook is subdued with growth expected to reach 2% in the medium term. 1.8
- Total public debt is estimated at 86.8% of GDP (A\$138.8 million) in 2018 and is mostly denominated in local currency.¹
- The Government has undertaken a number of reforms since 2004 that have enabled it to capitalize on the resumption of phosphate mining and high levels of assistance. It has run balanced budgets and significantly reduced Government debt as well as introduced reforms in the financial sector, state-owned enterprises' restructuring, utilities, transport infrastructure and governance reforms.¹⁰



- Under the Nauru Energy Road Map (NERM) 2018-2020, one of the key targets is to supply 50% of grid electricity from renewable energy sources.^{2,5}
- Work is underway, with assistance from development partners, on solar power generation capacity addition that will generate as much as 50% of electricity needs.¹
- The government is also moving to cleaner fuels for its vehicles.¹
- The Nationally Determined Contribution (2015) for 2020-2030 intends to replace existing diesel operated plants with large-scale grid connected solar systems with an estimated cost of USD 42 million.⁵
- Technological Feasibility
- Owing to relatively high levels of average solar irradiation (GHI) of 5.880 kWh/m²/day and specific yield of 4.651 kWh/kWp, a strong technical feasibility is envisaged for solar projects in Nauru.⁹



- Governance challenges are significant and are exacerbated by limited public sector capacity.
- Nauru is yet to have legislation relating to environmental approvals, electrical safety, power quality and standards.⁶



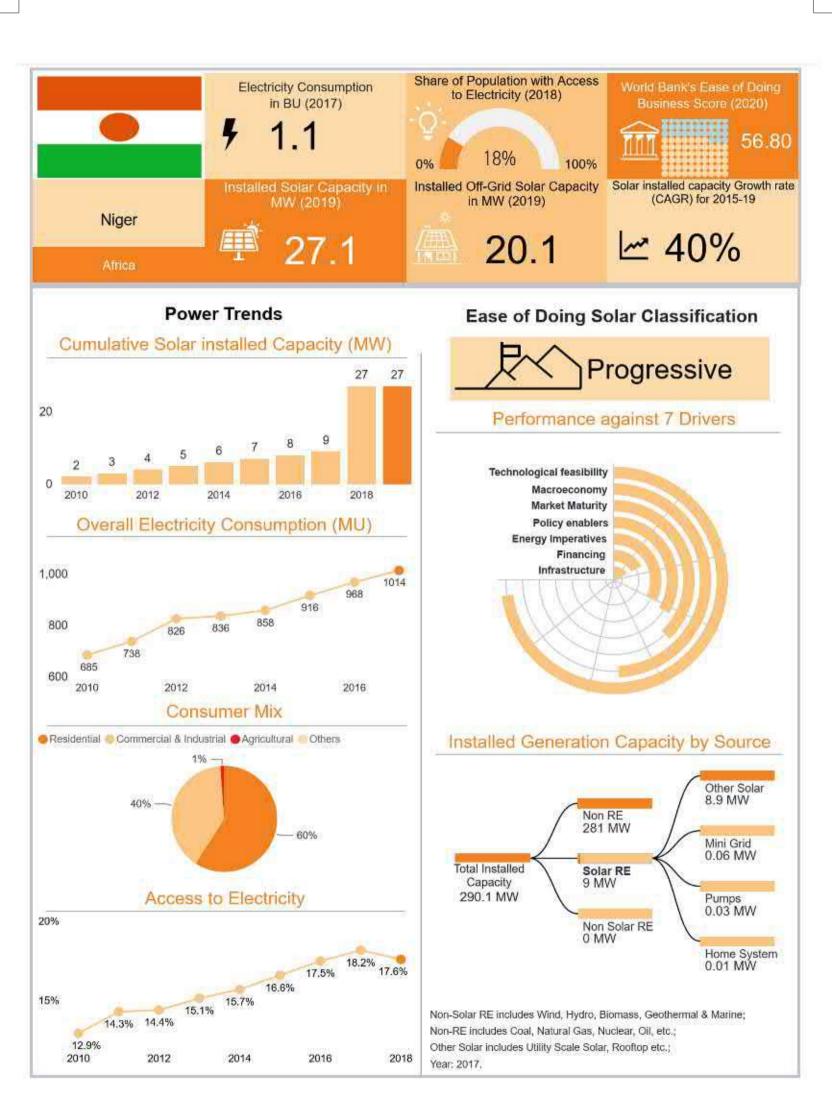
- The Rehabilitation Corporation has rehabilitated 5 hectares of land and has started work on a further 6 hectares to clear land for solar projects.¹
- Progress in integrating climate change strategy into budget planning is lagging due to capacity constraints and lack of coordination between agencies.¹
- The construction of the 11-33KV transmission line across the island, provides better integration and stability to accept more grid integrations, thereby complimenting further Energy mix. The ADB funded 6 MW Solar farm project will also strengthen the control systems and overall system monitoring.
- Large-scale Solar Procurement, from Independent Power Producers, is not seen as a immediate priority due to the relatively small size of Nauru's demand.⁶

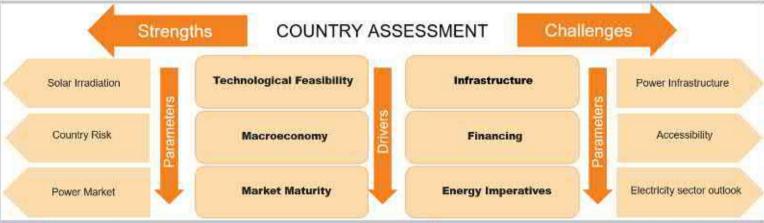


- Efforts in financial sector reforms are commendable but challenges remain. The Bendigo Bank Agency, the sole financial institution and provider of financial services in Nauru has helped in re-establishing trust in the financial sector by contributing to improvements in financial inclusion and payment services.¹
- Availability of formal credit products is expected to support private sector growth.[†]



- Imported petroleum products are the primary source of energy in Nauru.
- The country is 100% electrified and renewable energy contributed around 1% to electricity supply with the remaining 99% provided by diesel generators during 2016.²
- Nauru generated 24 MUs of electricity as of 2016 (covering 108% of its annual consumption needs).^{3,5}
- Inauguration in November 2019 of a 1.1 MW ground-mounted solar PV project funded by the Government of New Zealand and the European Union (EU). The addition of this project raised the RE penetration in Nauru's energy mix to around 10%. ADB is financing the 6 MW Nauru Solar Development, which will bring RE penetration from around 10% to ~47%.





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- Niger is a landlocked country in West Africa and a member of the Economic Community of West African States (ECOWAS).³
- GDP (at current prices) has grown with an annual rate of 5.83% in 2019.
- Economic growth is on account of strong performance by the primary and tertiary sectors and growth in the private sector.



- Niger's National Renewable Energy Strategy aims to increase the share of RE sources, in the installed capacity, by adding 205 MW of RE (including large hydro) by 2020 and 402 MW by 2030. The plan also outlines the concurrent objective of connecting 15% of the population to off-grid renewables by 2020 and 30% by 2030.⁷
- The strengthening of democratic institutions and the government's commitment to attaining its goals is expected to help the country stay on a high growth trajectory over the next few years.1
- In 2017, the Nigerian government introduced 100% import duty exemption to equipment and components required for generating electricity from RES.⁷



Owing to relatively high average solar irradiation level (GHI) of 6.265 kWh/m²/day and specific yield 4.837 kWh/ kWp, strong technical feasibility is envisaged for solar projects in Niger.⁹



- Niger rationalised its legal framework in 2016 with the establishment of a Regulatory authority and implementation of Electricity Code.
- Broadening access to electricity is a National development objective. As of 2018, less than 20% of the
 population had access to electricity with only 12% access to electricity in rural areas.⁸
- Niger remains a 100% cash market with no PAYGo sales. The Niger Solar Electricity Access Project (NESAP), supported by the World Bank, is likely to improve this trend.⁴
- Niger's economic future hinges on developing its still nascent domestic private sector. Currently, it accounts for less than 10% of GDP.⁶



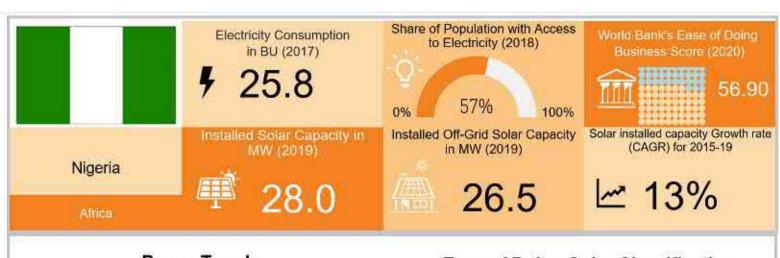
- Niger is witnessing a strong growth in total rural population with a growth rate of 3.9% per year implying need for a higher electrification rate.⁵
- The existing power infrastructure is developing and the country continues to depend on imported electricity from neighbouring country, Nigeria.
- Domestic private sector needs strengthening to ensure sustainably higher living standards and provide jobs for Niger's rapidly growing labour force.⁶



- Niger's banks are stable but, at ~14% of GDP, private sector credit is feeble; measures are needed to
 enhance financial intermediation and encourage banks to extend more credit to the private sector.⁶
- High dependence on external finance and low domestic capacity in implementing large projects could lead to macroeconomic slippage.¹
- Income levels in the country is low. Hence priority is given to mobilization of grants, followed by soft loans and Public-Private Partnerships.²
- The investment outlook is promising as several large-scale projects financed by the private sector and donors are giving strong momentum to the economy.⁶



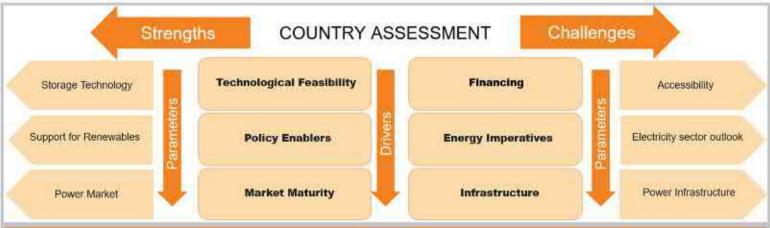
- Electricity prices are now at par with those in the United States, yet power cuts are pervasive.⁶
- Niger began issuing tenders for solar projects in 2016 under the Electricity Law including hybrid projects.
- The government is looking to put out more RE tenders to diversify the sector away from a reliance on Nigerian imports which are set to increase in coming years.
- Niger's Solar Home Systems sales recorded the largest percentage increase in the region with an impressive 325% and reaching record volumes of 14,000 units sale from Jul'19 to Dec'19 period.⁴



Power Trends Cumulative Solar installed Capacity (MW) 28 19 19 18 17 20 16 15 15 0 2010 2012 2014 2016 2018 Overall Electricity Consumption (MU) 25.8K 25K 25.3K 25.2K 25.1K 24.4K 23.4K 23.5K 20K 20.7K 2010 2012 2014 2016 Consumer Mix Residential @ Commercial & Industrial Agricultural Others 41% 59% Access to Electricity 60% 59.3% 56.5% 55.9% 55.6% 54.9% 54.4% 53.3% 52.5% 50% 48.0% 2010 2012 2014 2016 2018

Ease of Doing Solar Classification Influencer Performance against 7 Drivers Technological feasibility Policy enablers **Market Maturity** Macroeconomy Infrastructure **Energy Imperatives** Financing Installed Generation Capacity by Source Non RE 10390.8 MW Home System 8.7 MW Non Solar RE Total Installed 2124.2 MW Capacity Other Solar 8.2 MW 12534 MW Solar RE 18.9 MW Mini Grid 1 MW Pumps 1 MW Non-Solar RE includes Wind, Hydro, Biomass, Geothermal & Marine; Non-RE includes Coal, Natural Gas, Nuclear, Oil, etc.; Other Solar includes Utility Scale Solar, Rooftop etc.;

Year: 2017.



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- GDP (at current prices) is USD 448.12 billion and has grown at an annual rate of 2.2% in 2019.^{5,6}
- The Government launched Economic Recovery and Growth Plan 2017-20 (ERGP) to improve the economy and increase real GDP growth rate to 3.3% by 2021.⁸



- The Government of Nigeria approved the feed-in tariff regulations in 2015 that mandates electricity distribution companies to source at least 50% of their electricity requirements from renewables.¹¹
- In 2016, Nigeria adopted the Mini-Grid Policy in order to regulate the mini-grids and speed up electrification process.¹¹
- Approved in 2018, Nigeria Electrification project, with a commitment of USD 350 million, aims to implement solar hybrid mini grids for rural economic development, stand-alone solar systems for homes and sustainable power to public educational institutions.¹⁰
- The Renewable Energy Master Plan (REMP) intends to increase the supply of renewable electricity and targets 500 MW solar PV installed capacity by 2025.¹¹



- Owing to relatively high levels of average solar irradiation (GHI) of 5.44 kWh/m²/day and specific yield of 4.29 kWh/kWp, strong technical feasibility is envisaged for solar projects in Nigeria.²
- Stand-alone solar photovoltaic (PV) systems offer pay-as-you-go (PAYGo) business models in areas where mini-grids are not sustainable.⁴



- 57% of population had access to electricity as of 2018. Country is set to achieve a target of universal electricity access by 2030.^{3,4}
- Renewable energy share, in total electricity consumption, is 83% as of 2017.3
- Renewable generation is 23%, of total electricity generation, in 2018 and is targeted to increase to 36% by 2030.^{7,11}



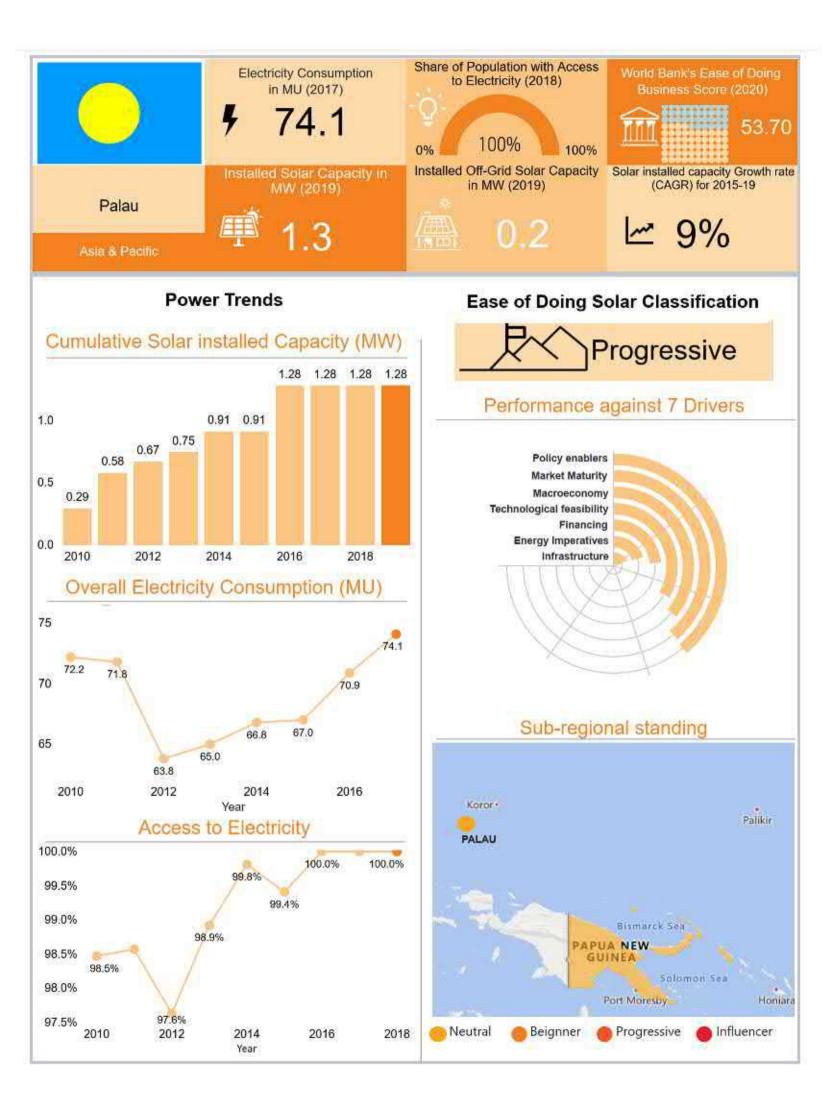
- Approved in 2018, The Nigeria Electricity Transmission Access Project (NETAP) pledged a commitment of USD 486 million aiming to increase the capacity of the transmission network in Nigeria.
- The Power Sector Recovery Operation (PSRO) for Nigeria was launched in 2020 to improve the reliability
 of electricity supply and to ensure that at least 4,500 MWh (megawatt hour) of electricity is supplied to the
 distribution grid from 2022 onwards which is necessary for grid stability.¹⁰

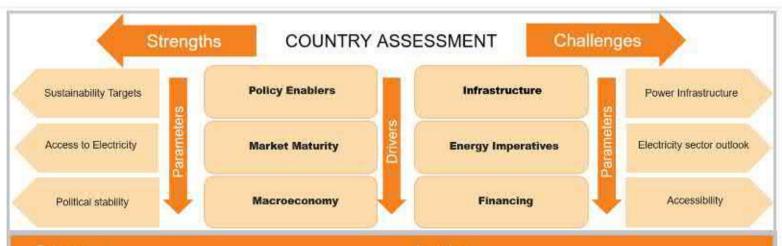


- International financial flow, in 2017, was USD 5,075.7 million (in PPP terms) to support clean and renewable energy.⁵
- Nigeria has been one of International Finance Corporation's (IFC) fastest growing portfolio and represents IFC's fifth largest global country exposure with a committed volume of USD 1.8 billion.⁹



- Nigeria's per capita electricity consumption of 152 kWh is significantly lower in comparison to the global average.¹
- 31% of rural population had access to electricity in 2018.3
- Nigeria's total installed capacity was 13,089 MW in 2019 with 16% (2,152 MW) share of renewables.
- Hydro dominates the renewable with 2,111 MW capacity whereas solar constitute for 28 MW capacity as of 2019.⁷
- The Rural Electrification Agency (REA) has been authorized to establish a Rural Electrification Fund (REF) to promote fast and cost-effective expansion of electricity access in rural areas through on-grid, mini grid and off-grid electrification solutions featuring renewable energy and hybrid power systems.⁴





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- GDP (at current prices) has grown at an annual rate of 0.5% (in 2019).^{13,14}
- Palau is heavily dependent on tourism and foreign grants making economy vulnerable to external factors
 due to global and regional volatility. It is also vulnerable to climate change and natural disasters.^{6,7}
- The economic growth slowed down due to decrease in tourism in 2019, tourism being a significant contributor to the economy.^{6,7}



- More than 99.7% of the island's electricity is generated using imported fossil fuels. Palau aims to reduce this dependence by increasing RE adoption.³
- Palau's has enacted the Net Metering Act in 2009, emphasising net metering as a catalyst for the growth of solar PV in the country.¹⁰



- Owing to moderate level of average solar irradiation level (GHI) of 4.98 kWh/m²/day and specific yield 4.01 kWh/kWp, moderate technical feasibility is envisaged for solar projects in Palau.
- Palau has high dependence on costly fuel imports which makes a strong business case for increasing solar contribution in the energy mix.³



- There is no independent energy regulator in Palau. Palau's Public Utilities Corporation (PPUC) is a sole entity which generates, transmits, and distributes electricity in Palau.^{3,2}
- 100% population in Palau has access to electricity as of 2018.
- ENGIE EPS is building a 100 MW solar power plant (micro grid supported with energy storage) for the Government of Palau.
- In addition, request for proposals for Independent Power Producer (IPP) to develop solar and storage system have also been floated in 2019.¹⁰



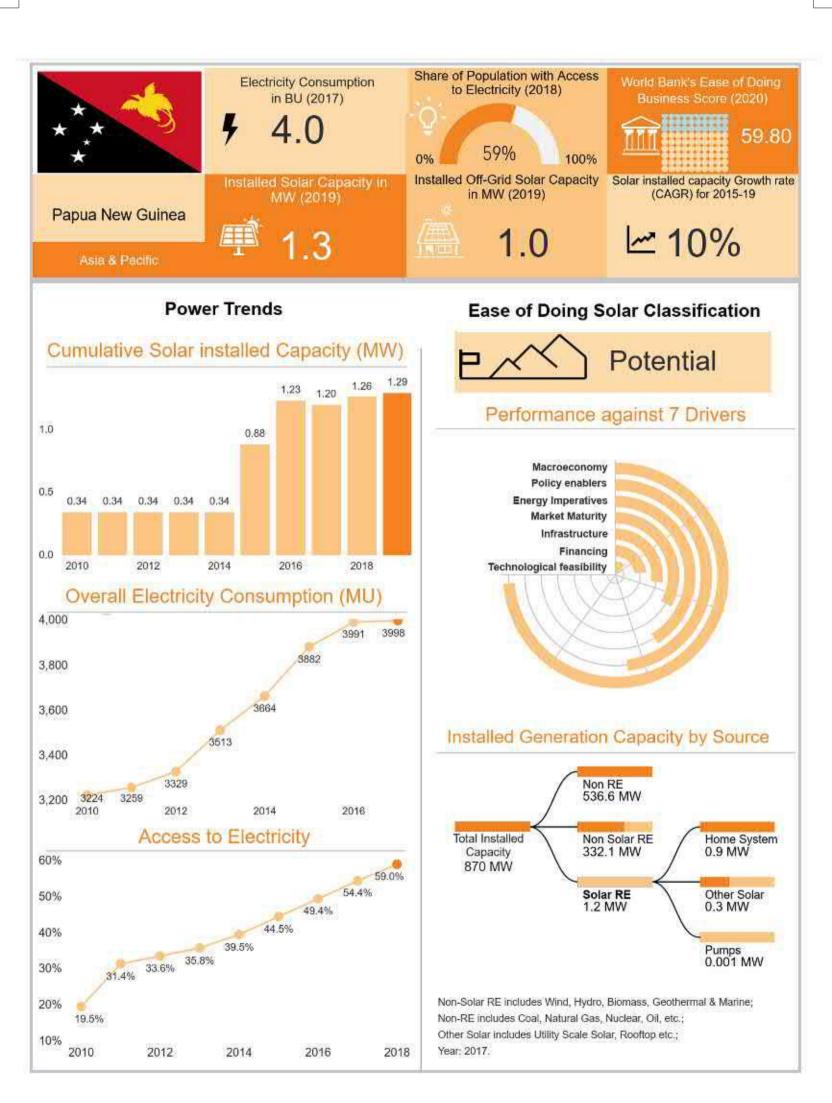
- Transmission and distribution losses in Palau, at 20%, are moderate and may not be a significant area of concern.³
- National grid integration, covering all the parts of the island nation, is a major challenge.³
- Currently the infrastructure is inadequate and needs to be scaled up to meet current requirements and future capacity addition plans.¹⁰
- Maintenance of the solar installations has proven challenging due to shortage of spares and skilled technicians.¹⁰

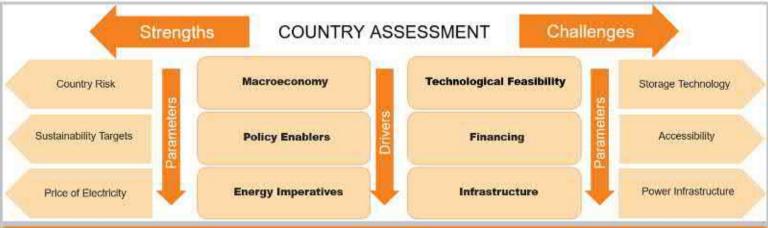


- Financing from National Development Bank of Palau (NDBP) is available for purchase and installation of renewable energy equipment for homes and businesses.
- Palau is establishing an infrastructure reserve fund and is entering into public private partnerships (PPP)
 regime for sustainable development.¹⁰



- 95% of the power is generated from imported fossil fuels making RE a good alternative for meeting future energy demand.³
- The installed generation capacity has grown at a CAGR of 10% between 2014 and 2017.
- Palau has set RE goal to meet 20% of electricity demand from renewable sources by 2020.3





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- GDP (at current prices) grew at a rate of 5% and was poised at USD 24.97 billion in 2019.
- Real GDP growth is expected to rebound from an expected contraction in 2020 to an expansion of more than 3% in 2021.⁸



- Long-term support to Papua New Guinea was outlined in May 2019 when the World Bank and Papua New Guinea Government agreed on the 2019-2022 Country Partnership Framework for the country.⁶
- The Government of Papua New Guinea (GoPNG) places a high priority on accessing climate finance for mitigating its contribution to climate change. It is aptly supported by existing policies and strategies such as the Vision 2050 Plan, National Strategy for Responsible Sustainable Development for PNG, PNG Climate Change Management Act and National Climate Compatible Development Management Policy.
- Papua New Guinea has been a member of the Global Green Growth Institute (GGGI) since 2012. GGGI
 has recently started providing Readiness and Preparatory Support to facilitate fund access from the Green
 Climate Fund.⁷



- Owing to relatively moderate levels of average solar irradiation level (GHI) of 4.48 kWh/m²/day and specific yield of 3.59 kWh/kWp, a moderate technical feasibility is envisaged for solar projects in Papua New Guinea.²
- PNG Power is implementing a pilot rooftop solar power project with the International Finance Corporation (IFC) in Port Moresby with an aim to use rooftop solar to generate 2% of peak demand for electricity in the capital.⁹
- IFC's successful off-grid solar programme, Lighting PNG, which enabled around 20% of the population to gain access to basic lighting.⁹



- 59% of population had access to electricity as of 2018.3
- Renewable energy share in total energy consumption was 50% as of 2017.3
- Papua New Guinea aims to derive 32% of its electricity from renewables by 2030 to become fully carbonneutral by 2050 under the Paris Agreement.⁹



- The country has an abundance of natural energy resources hydropower, natural gas and solar. Most of these are underutilized for instance, less than 250 MW of its hydropower potential of 15,000 MW is harnessed.⁸
- Only about 13% of the population has access to on-grid electricity and remaining electrified population relies on off-grid electricity. The cost of service delivery is high, and the supply of power is less reliable.⁸

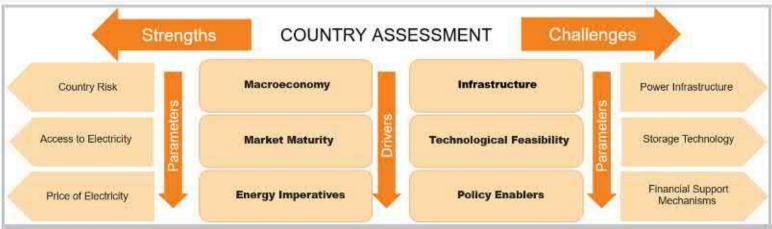


- International financial flow in 2017 was USD 260.9 million (in PPP terms) to support clean and renewable energy.³
- In 2017, The IFC launched a pilot (with Origin Energy PNG) to support renewable energy use in off-grid communities through Pay-as-you-Go (PayGo) model helping make clean distributed energy affordable and accessible.⁹



- Papua New Guinea's Per capita electricity consumption of 460 kWh as of 2019 is relatively low in comparison to the global average.¹
- The government has set an ambitious goal to reach 70% grid electrification rate in the country by 2030 through the National Electrification Rollout Plan (NEROP).⁸





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- GDP (Real) has grown at an annual rate of 0.2% in 2019.1
- Paraguay is an upper-middle-income country with a GDP per capita of USD 5.414 in 2019.^{2,3}
- Agriculture, retail and construction sectors are the main contributors to the economy.
- The GDP (current) is recorded at USD 38.14 billion as of 2019.4



- The "National Development Plan 2030" aims to increase the consumption of renewable energy by 60% and reduce fossil fuel consumption by 20% in the total national energy consumption.¹⁵
- The "National Climate Change Plan and Mitigation Strategy (2014)" is formulated to promote renewable energy generation by strengthening institutional capacity, increasing access to finance and adopting favourable policies.¹⁷
- In 2006, a law was implemented to allow Independent power producers in the country with aim to attract private sector investments in the sector.¹⁹



Owing to relatively high average solar irradiation level (GHI) of 5.08 kWh/m²/day and specific yield of 4.24 kWh/kWp, strong technical feasibility is envisaged for solar projects in Paraguay.⁵



- As of 2018, 100% of the population had access to electricity in Paraguay.³
- Despite having significant potential, solar doesn't have any contribution to the total generation as of 2019.6
- In 2018, Paraguay has become the fourth largest exporter of electricity in the world with more than 70% of the total generation in the country exported to Brazil and Argentina.¹²



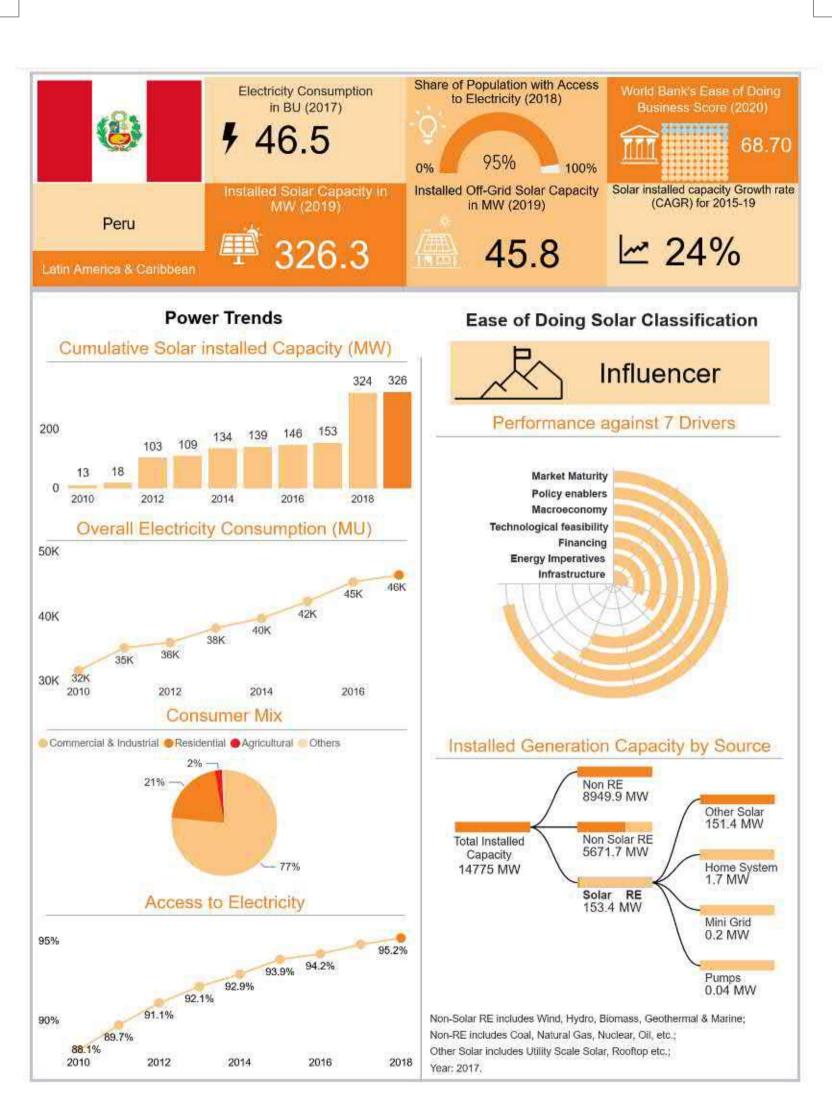
- The National grid is well connected with Brazil and Argentina through high voltage interconnectors.
- The Development Bank of Latin America has approved a loan of USD 250 million to National Electricity Administration (ANDE) in 2019 to modernize the national power grid and to improve the quality of electricity supply service.¹⁴
- As of 2014, Transmission and distribution losses stand at 6.5% of output indicating a considerably robust power network.¹⁶
- Under the "Power Sector Expansion Plan 2014 23", Paraguay plans to add 2,833 km transmission line length and 9,215 MVA of transformer capacity with an investment of USD 2,148 million by 2023.

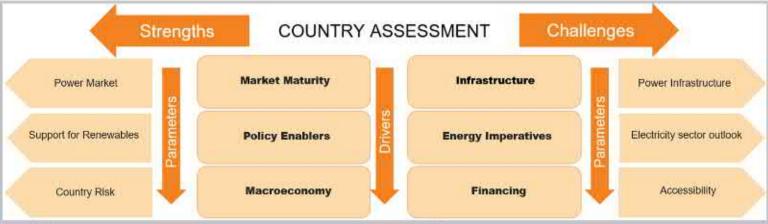


- Paraguay has a credit rating of Ba1 with a stable outlook in 2020.8
- According to UNCTAD's World Investment Report 2020, Paraguay has recorded FDI inflows of USD 478 million in 2019.⁷
- Paraguay has an Ease of Doing score of 59.1 (out of 100) and ranks 125th among 190 countries in 2020.
 Businesses face challenges in getting credit, construction permits, enforcing contracts, access to electricity, paying taxes, and trading across borders.²⁰
- Paraguay has recorded a public debt at 21.6% of GDP and fiscal deficit of 1.3% of GDP in 2018 and 2.8% inflation in 2019.^{10,11}
- All the banks are fully compliant with the IFRS9 standards.¹⁰



- Per capita consumption of 2200 kWh is relatively low in comparison to the global average.⁹
- Owing to large water reserves, hydropower production contributes nearly 100% in the generation mix as of 2019.6
- As per "Power Sector Expansion Plan 2014-2023", the electricity demand is expected to reach 4,369 MW by 2023, growing at a CAGR of 5%.
- As of 2019, the residential sector accounts approximately 43.1% of the total electricity demand in the country.¹³





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- Peru's GDP (Real) has grown at an annual rate of 2.2% in 2019.¹⁸
- Peru is an upper-middle-income country with a GDP per capita of approximately USD 6,977 in 2019.
- The major sectors, contributing to the Peruvian economy, are tourism, telecom, agricultural and mining industry. Gold and copper accounted for approximately 41% of the total products exported in 2019.²²



- Since 2008, accelerated depreciation benefit of up to 20% is being provided on machinery, equipment and civil construction for RE generation to attract investors and increase RE capacity.⁹
- Peru's Legislations allows mandatory dispatch for all grid connected RE generators.
- National Rural Electrification Plan 2013-2022 aims to invest USD 1,280 million in rural electrification systems with USD 294 million in solar PV.¹¹
- RE generators receive a premium price if the spot price is lower than the price offered in the auctions.5



- Owing to relatively moderate levels of average solar irradiation level (GHI) of 4.67 kWh/m²/day and specific yield of approximately 3.77 kWh/ kWp, a moderate technical feasibility is envisaged for solar projects.
- Challenging topography such as steep slopes and large forest areas could be a deterrent for the installation of large-scale solar parks.¹³
- Theoretical potential for Solar is estimated to be 260 GW. 12,13



- The transmission sector was entirely privatized by 2010. The distribution segment also has significant private participation.¹
- Peru has an active power market comprising of bilateral contracts and a power market. Open access regulations offer a high level of transparency in procedures, market prices, quantities, and settlements.⁵
- As of 2018, 95% of the population in Peru has access to electricity with 82% population in rural areas having access to electricity.⁷
- The price of solar power has fallen from USD 220 per MWh in the first auction held in 2009 to USD 48.39 per MWh in a recent auction in 2016.8



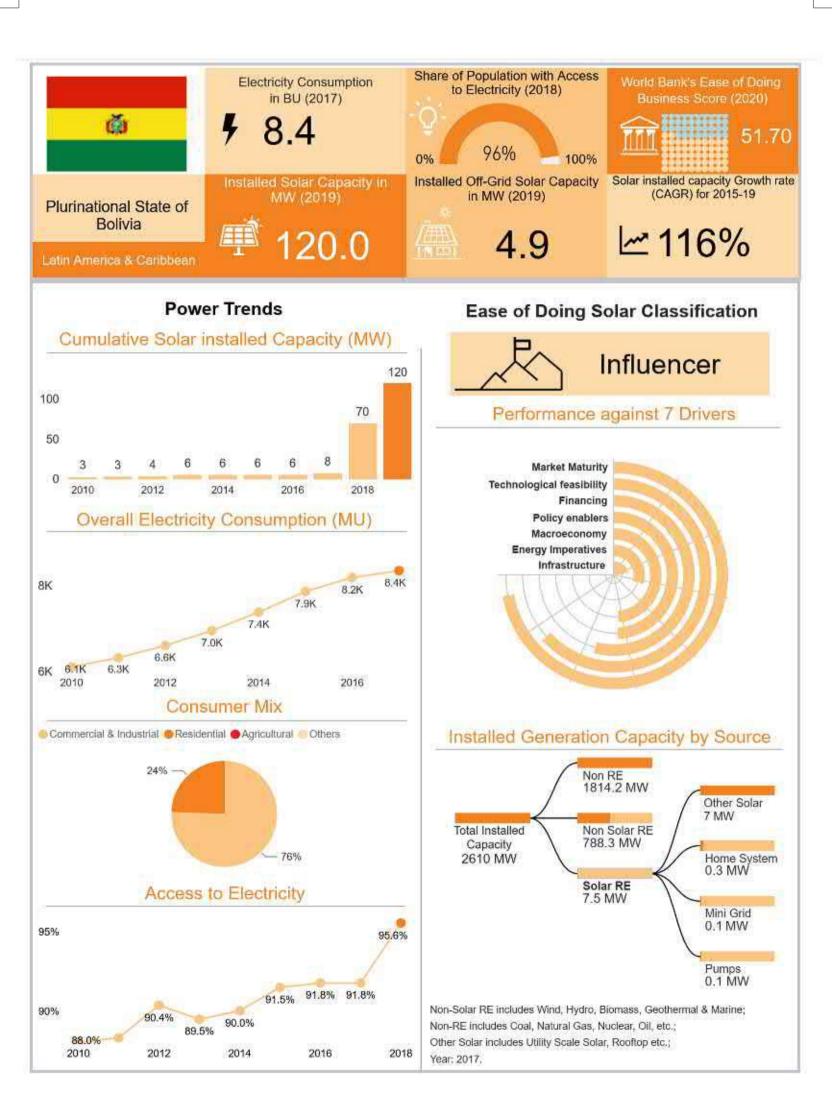
- Peru and Ecuador are jointly constructing a High-voltage transmission line to connect the national grids.
 The project is expected to be operational by 2024.⁶
- Transmission projects, worth USD 144 million, were awarded in 2019 and projects worth USD 270.7 million are expected to be awarded in 2020 including strengthening of the Peru-Ecuador cross-border interconnection network.⁴
- The Central and Southern regions are often prone to congestion due to weak transmission infrastructure.5
- The country has established a centralized transmission planning process and concession contracts to identify the system's expansion needs.⁵

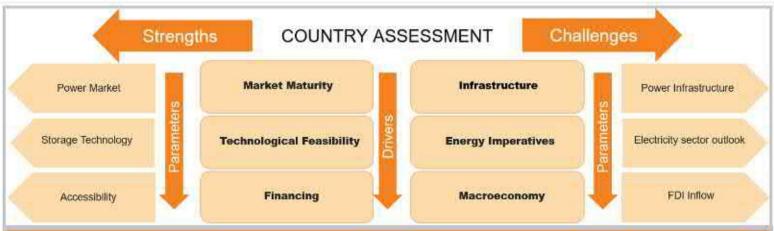


- Credit rating of A3 with a stable outlook in 2020 is a positive indicator for the investors.
- PPP law, reformed in 2015, allow access to domestic financial instruments to raise funds from the private sector for infrastructure projects.³
- Electric Social Compensation Fund was established in 2004 to promote private investment for off grid RE power in rural areas through subsidies.²
- According to UNCTAD's World Investment Report 2020, FDI inflows has increased from USD 6,488 million in 2018 to USD 8,892 million in 2019.¹⁴



- Per capita consumption of approximately 1,700 kWh is relatively low in comparison to the global average of 3,400 kWh in 2019.²⁰
- Solar contributed a mere 1% in the total generation of 57,155 MUs in 2019.^{12,13}
- The industrial sector accounts for a significant share of (57% in 2017) of the total electricity demand.²¹
- Owing to large water reserves, hydropower plants constitute 55% in the total generation in 2019.
- With industrial development, steady economic growth and improving standards of living, the power consumption is expected to reach 72.3 BUs by 2025 growing at a CAGR of 3.9%.²¹





Drivers Insights



- · Bolivia is a low-middle-income economy as per World Bank's classification; 1,2
- For the 10 consecutive years, till 2018, Bolivia witnessed a GDP growth of more than 4% year on year. However, this trend ended in 2019, when GDP (Real) grew at an annual rate of 2.8%. 1.2



- Decentralized Infrastructure for Rural Transformation (IDTR) programme ran until 2011. The project saw investments of USD 10.15 million in solar PV resulting in installation of 10,174 solar PV systems between 2003 and 2011.³
- In 2014, the second phase of the IDTR project named Electricity and Renewable Energy Access programme, was launched with a World Bank loan of USD 21.3 million.³
- Under Bolivia Electric Plan 2020-2025, the country aims to install 183 MW of RE capacity of which 20 MW will be Solar PV.⁴
- Ministry of Hydrocarbons and Alternative Energies had authorised import duty tax exemption for the equipment donated by the European Economic Community through the Euro-Solar programme.⁵



- Bolivia has one of the highest levels of solar irradiation in Latin America.
- Owing to high levels of average solar irradiation levels of 5.42 kWh/m²/day and specific yield of 4.52 kWh/kWp, a strong technical feasibility is envisaged for solar projects in Bolivia.⁶



- 96% population had access to electricity as of 2018.⁷
- In 2010, the Bolivian Government nationalised the three biggest electricity generation companies representing about 80% of total generation capacity.¹⁵
- The Inter-American Development Bank (IDB) has approved a USD 51.6 million loan for Bolivia which will strengthen sustainable development of the electricity sector including the promotion of RE such as geothermal, solar and wind power.¹⁹



- A 60 MW Solar PV plant has been built in the Bolivian highlands (Altiplano) which is the largest salt desert in the highlands of the world.¹⁶
- Bolivia has commissioned a 50MW photovoltaic (PV) plant in the western region of Oruro in Sept 2019.¹²
 About 70% of the total budget of EUR 86 million for this solar power plant project was financed by AFD, 10%
 by the European Union and 20% by the Central Bank of Bolivia.^{12,17}
- There are no restrictions on foreign ownership of electricity assets if the electricity company is established under Bolivian regulations.⁸



- FDI inflows decreased slightly in 2019 reaching USD 1.38 billion from USD 1.46 billion in 2018.
- Concessional loans from international donors, for the development of renewable energy projects, are accepted by law on a case-by-case basis.⁸



- Per capita electricity consumption in 2019 was 891 kWh, relatively low in comparison to the global average.⁹
- The Solar PV market grew from 3 MW in 2010 to 120 MW in 2019.
- Electricity generation from solar PV was 189 MUs, 1.86% of the total electricity generation.
- Off-grid Solar is an economical option for more than 360,000 rural Bolivian households in remote areas with limited access to the grid.
- Bolivia is primarily dependent on gas-based power generation which accounted for 61.8% of its total generation in 2019.¹¹