

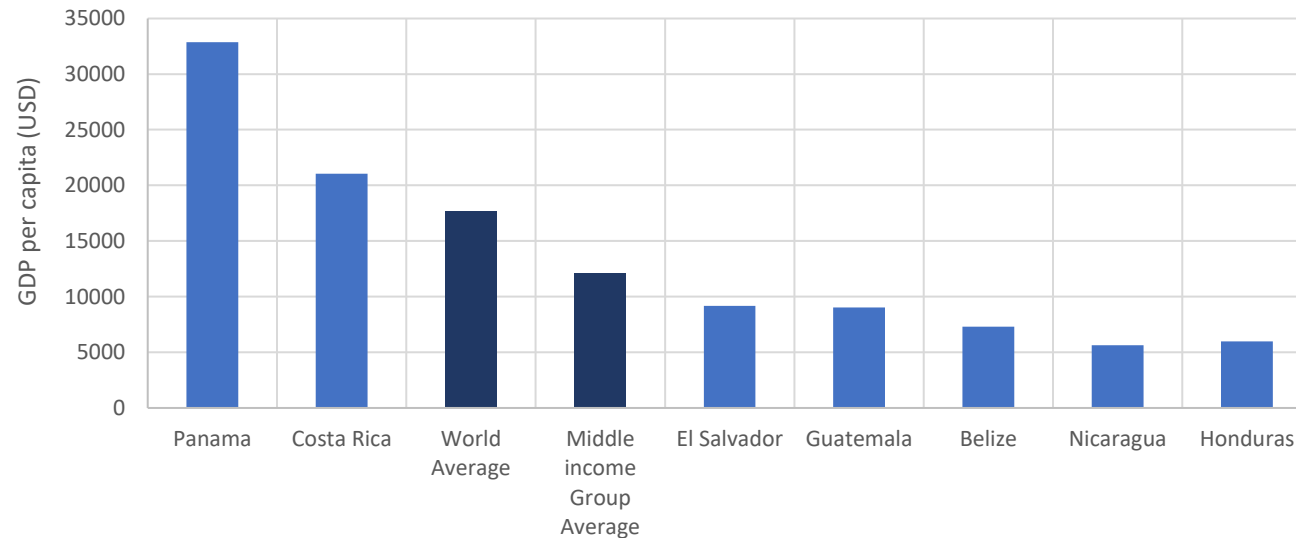
Central American Electrical Interconnection System (SIEPAC)

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The Central American region

Year: 2019

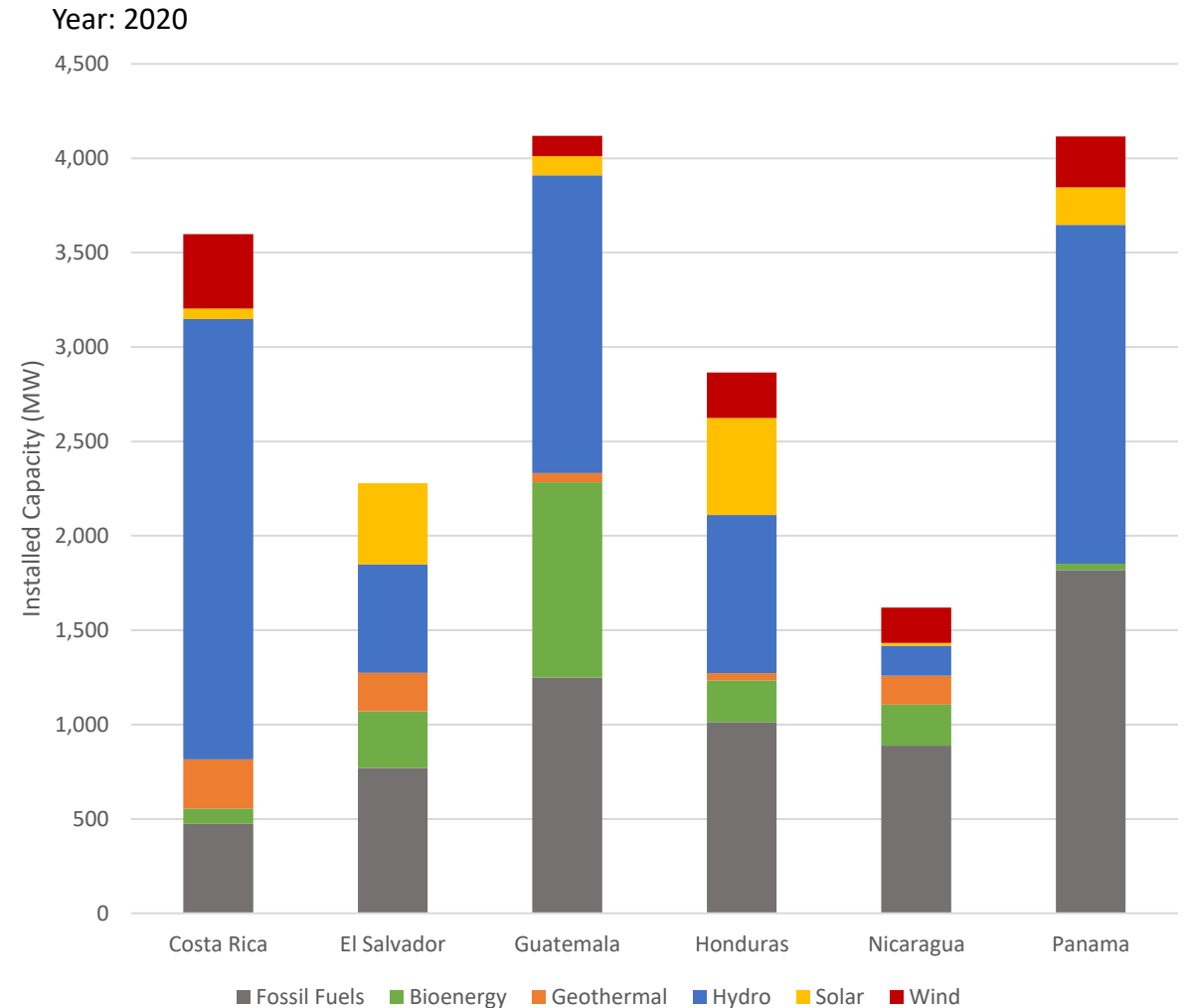


Source: World Bank, World Development Indicators (July 2021)

- Composed by 7 countries: Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama
- Total population of around 49 million (2019). Guatemala accounting for the largest share - 34%
- Cultural and geographic similarities
- All countries are categorised as middle-income countries
- GDP coming mainly from services, commerce, tourism and trading sectors

Central American Energy Sector

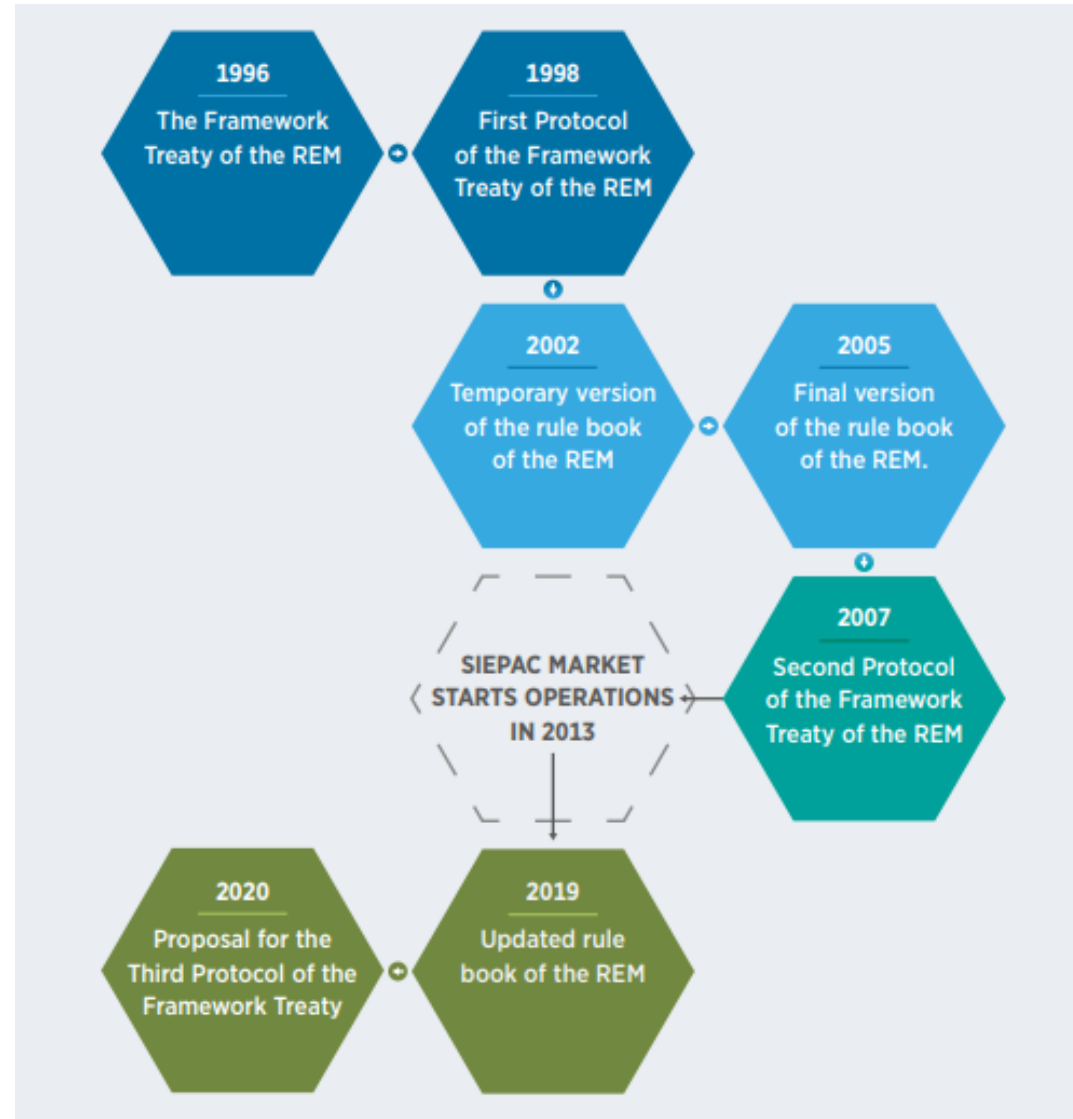
- The six countries part of the electricity market reached 19 GW of installed capacity in 2020.
- Renewable energy accounts for 81.9% of total installed capacity.
- Hydropower is the largest renewable energy resource accounting for 30% of installed capacity and almost 50% of electricity generation
- Since 2015, VRE plays an important role in the energy mix of the countries in the region



Source: IRENA Statistics

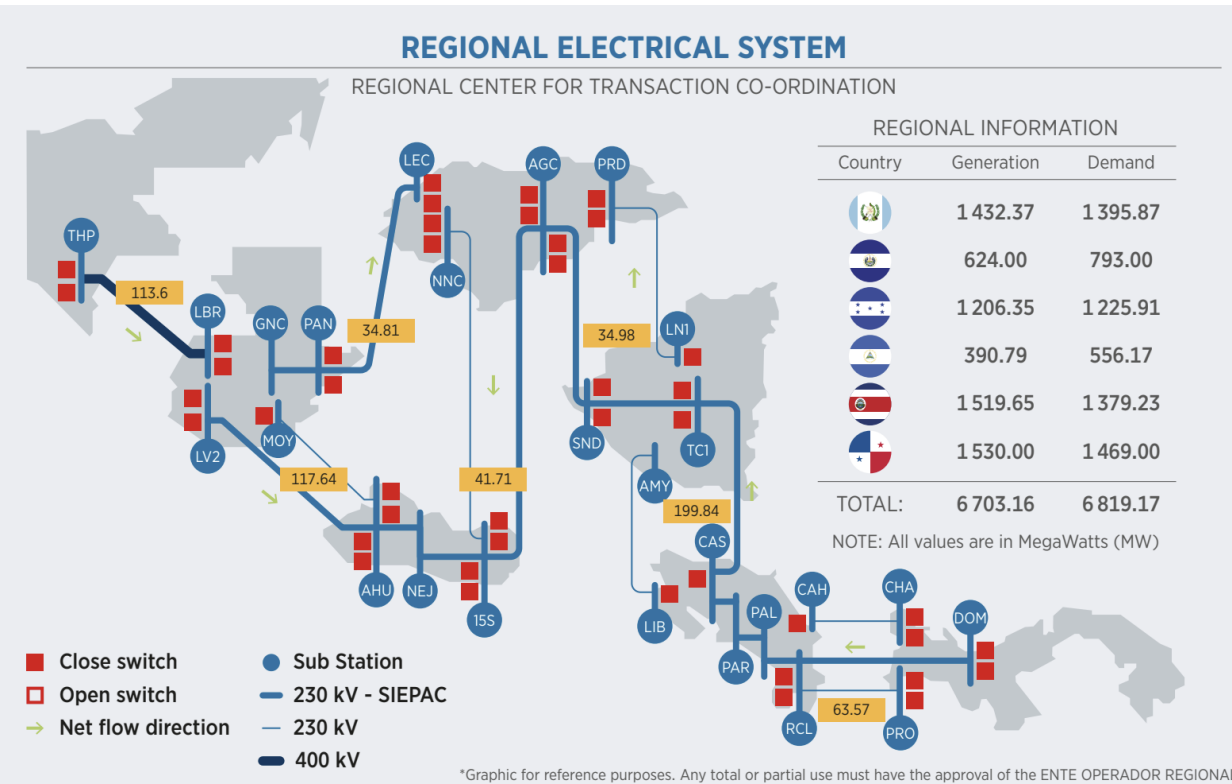
Evolution of interconnectivity in Central America

- Regional integration initiatives started in the 50s
- In 1993, the Central American Integration System (SICA) was created as a regional economic and political organisation
- The **Framework Treaty** established the Regional Electricity Market (REM), the creation of the SIEPAC line, and the regional organisations part of REM
- Drivers for regional market:
 - ✓ Improve operational efficiency
 - ✓ Reduce dependence to fossil fuels
 - ✓ Improve competition (national and international)
 - ✓ Reduce electricity prices
 - ✓ Attract private investment



Source: IRENA and KEEI (2021), Renewable energy and electricity interconnections for a sustainable Northeast Asia, International Renewable Energy Agency, Abu Dhabi.

Regional market infrastructure



Source: IRENA and KEEI (2021), Renewable energy and electricity interconnections for a sustainable Northeast Asia, International Renewable Energy Agency, Abu Dhabi.

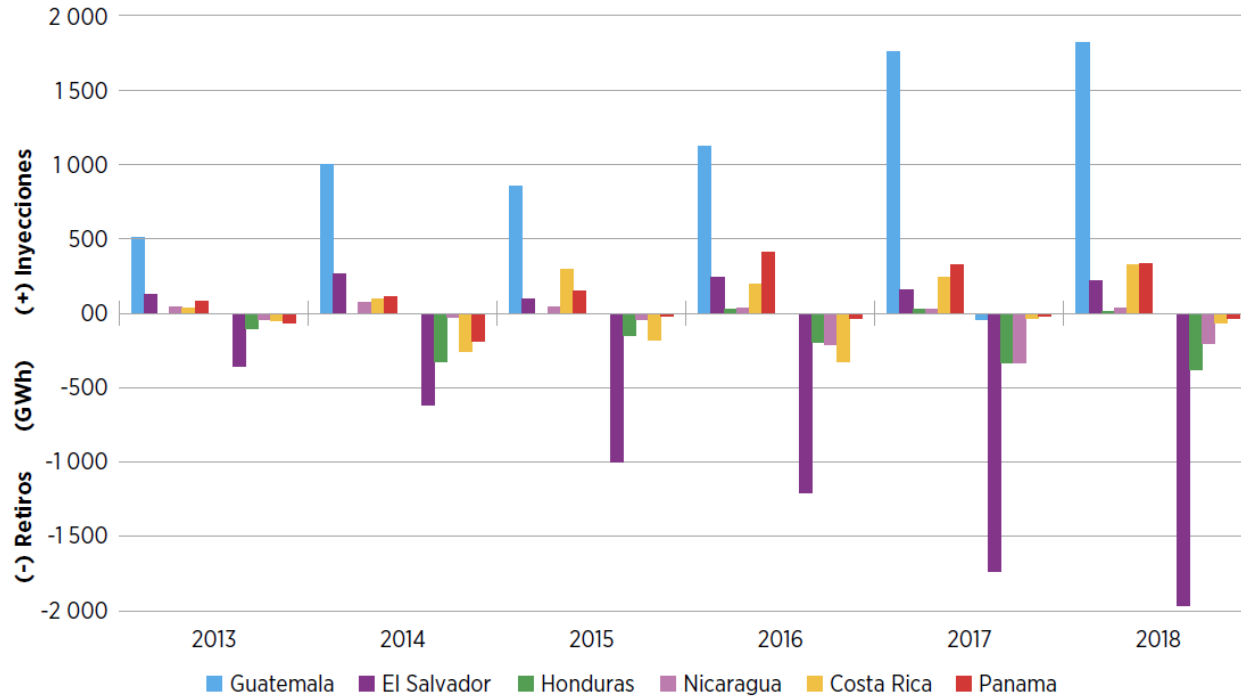
- Cross-border interconnections has been developed in the region since the 70s
- The SIEPAC line started construction in the late 90s by the Regional Operations Entity (EPR)
- SIEPAC was finance by the Interamerican Development Bank (IDB), Central American Bank for Economic Integration (CABEI), Development Bank of Latin America (CAF), and private banks – total investment was around USD 505 million
- First phase of construction aimed to reinforced existing national grids and cross-border interconnections
- SIEPAC is a 230kV power grid from Guatemala to Panama, with a length of 1790km, and carrying capacity of the single-circuit line is 300 MW
- **SIEPAC started operations in 2013**

Institutional Framework

- The Framework Treaty established all regional institutions for the development of the REM:
 - **SICA's Council of Ministers of Energy:** Develop guidelines for the regional energy policy.
 - **Regional Operations Entity (EPR):** It is a public-private company aiming to design, build and sustain the SIEPAC interconnection system.
 - **Regional Operating Entity (EOR):** The entity proposes procedures for the operation of the market and correct use of regional grid; ensure the correct criteria of operation and regional dispatch; undertakes commercial management of transactions; develops expansion generation and expansion plans, among others
 - **Regional Commission for Electrical Interconnections (CRIE):** It is the independent regional regulatory agency, responsible for regulating commercial relations and for setting rates.
 - **Board of Directors of the Regional Electricity Market (CDMER):** This body is the REM board of directors, which develops the REM and facilitates of the Treaty Framework's commitments. Additionally, it coordinates interrelation between regional organisations.



Operation of the REM



Source: IRENA (2020), IRENA Renewable Readiness Assessment: El Salvador, International Renewable Energy Agency, Abu Dhabi

REM utilises a 6+1+1 model: the six national markets plus one superposed regional market function the same as one regional market

- REM member-state agencies conduct transactions with each other in three ways: 1) spot transactions, 2) firm, or 3) non-firm contracts
- The REM includes actors from each member country: generators, distribution companies, transmission entities, electricity dealers, agents, and large-scale consumers
- To participate in the REM, all agents must have guarantees of payment at the liquidating bank
- Every day, EOR issues the regional pre-dispatch where the allocated and non-allocated purchases and sales appear.

Challenges and upcoming projects

Challenges

- Need to further develop national and regional infrastructure
- Address growing implementation of VRE in the region
- Insufficient coordination between national and regional generation plans

Upcoming projects

- New draft protocol for REM aiming to:
 - ✓ Strengthen governance and leadership
 - ✓ Enhance coordination of planning processes (generation and grid)
 - ✓ Establish mechanism for harmonisation of national markets
 - ✓ Include interconnections and extra-regional exchange
- SIEPAC line upgrades
- Interconnection Panama-Colombia

IRENA's Clean Energy Corridor of Central America (CECCA)

Promote the accelerated development and cross-border trade of renewable power in Central America

- » *endorsed by the Energy Ministers of the region in December 2015*
- » *piloted in Panama*
- » *key component of the 2030 Energy Strategy for the SICA countries*



Pillars of Implementation

Five Pillars of Implementation

Enabling Frameworks for Investment

Support a reliable and affordable power system transformation (technical and regulatory)

Country and Regional Planning

Cost-effective renewable options in power generation in national and regional plans

Resource Assessment and Zoning

Identification of high resource zones for renewable energy development

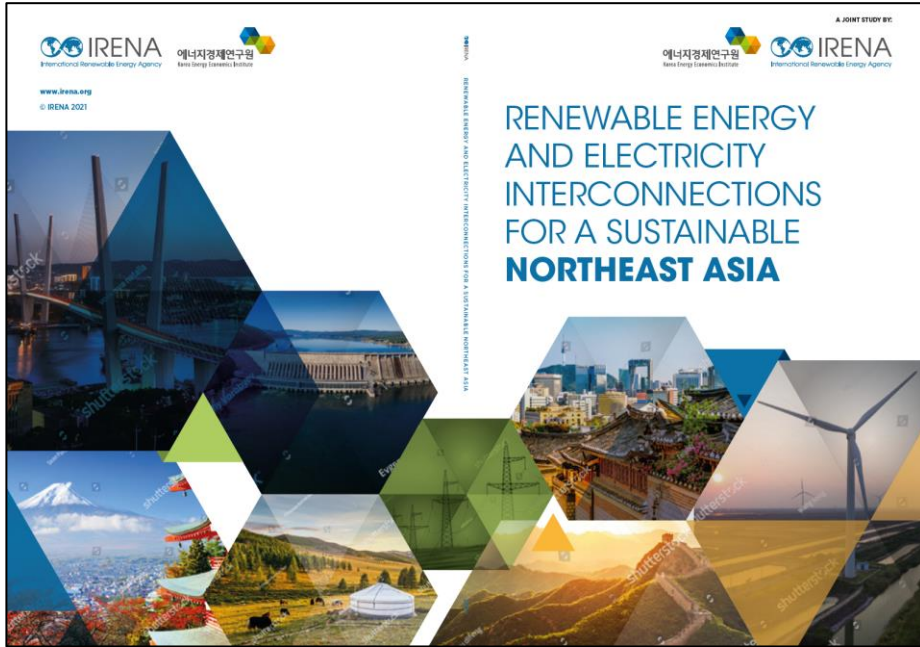
Capacity Building

Increase skills to manage power systems with higher shares of renewables

Awareness-raising and Political Support

Public information on CECCA's support for a regional energy transformation

Joint Study on RE and Electricity Interconnection in Northeast Asia



Available at www.irena.org/publications

- IRENA has conducted a joint study with KEEI for faster-pace developments of power grid interconnections and power trade in Northeast Asia region.
- By reviewing the outcomes of selected interconnection plans for integrating power systems in NEA, this report aims to provide stakeholders with an updated view of NEA interconnection.
- The report has also reviewed existing cases for cross-border interconnections and regional markets, particularly capturing the case in WAPP (shallow integration), SIEPAC and Nord Pool (deep) to draw success factors and implications for NEA region.

Thank you

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