

# Platts 20th Annual Central American Energy Conference

## THE ROLE OF GEOTHERMAL ENERGY IN THE CENTRAL AMERICAN ELECTRICITY MARKETS

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# **Overview of Energy Markets in Central America (generation, renewables and SIEPAC regional market, electricity demand, ).**



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## ELECTRICAL SECTOR INDICATORS, 2016

|               | Installed capacity | Peak demand | Electrification Index (2015) | Losses T & D. (2015) | Population (thousands) |
|---------------|--------------------|-------------|------------------------------|----------------------|------------------------|
|               | MW                 | MW          | %                            | %                    |                        |
| Centroamérica | 16 496,6           | 8 290,2     | 88,7                         | 17,7                 | 46 222,9               |
| Guatemala     | 4 201,0            | 1 701,6     | 92,0                         | 16,5                 | 16 702,6               |
| El Salvador   | 1 674,9            | 1 093,0     | 95,4                         | 11,9                 | 6 324,3                |
| Honduras      | 2 436,5            | 1 514,8     | 74,0                         | 32,5                 | 8 182,6                |
| Nicaragua     | 1 378,2            | 688,3       | 81,6                         | 24,7                 | 6 152,3                |
| Costa Rica    | 3 466,7            | 1 674,6     | 99,3                         | 11,9                 | 4 869,8                |
| Panamá        | 3 339,3            | 1 618,0     | 93,9                         | 13,1                 | 3 991,3                |

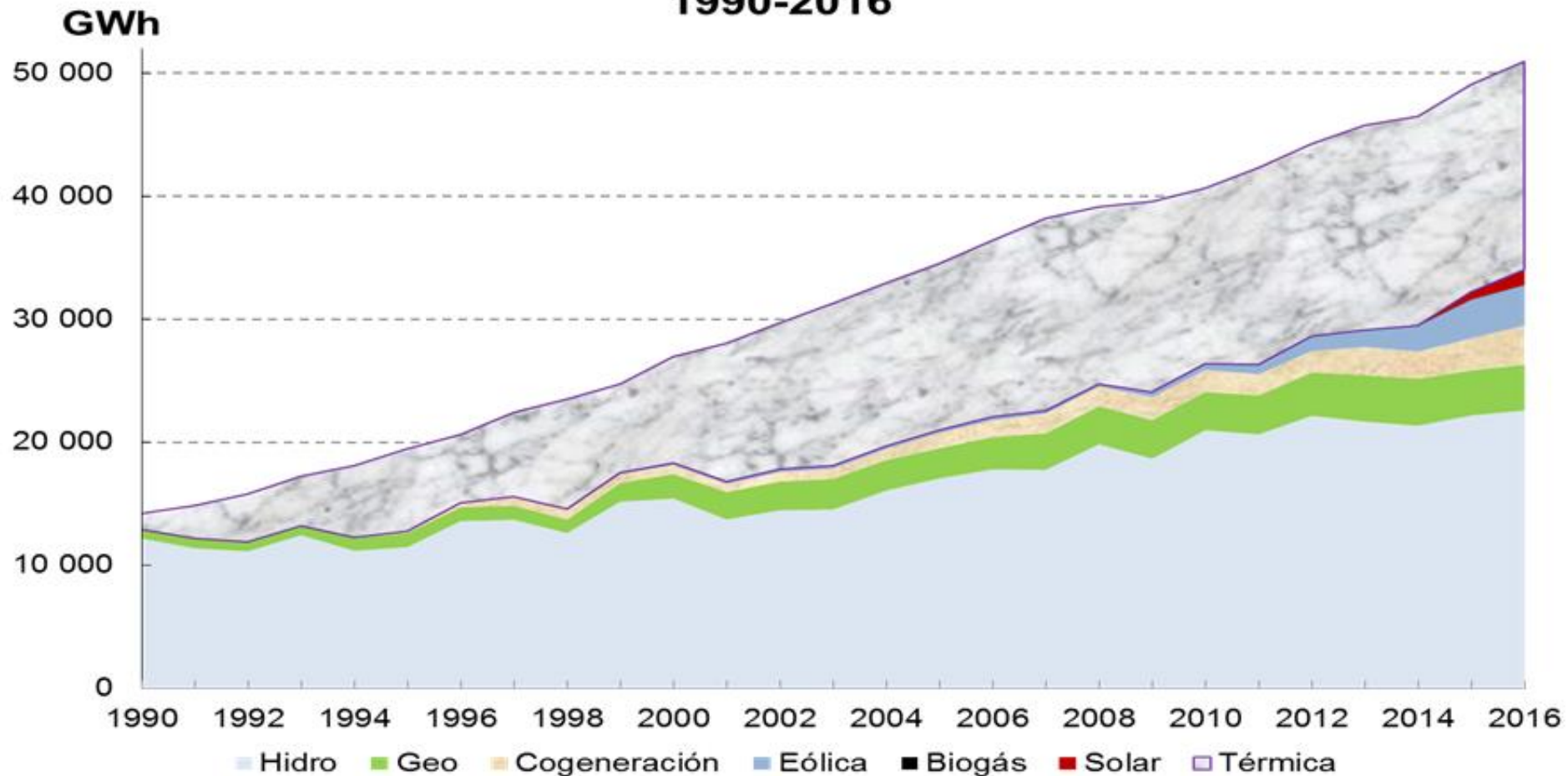
Source: ECLAC, on the basis of preliminary official information.



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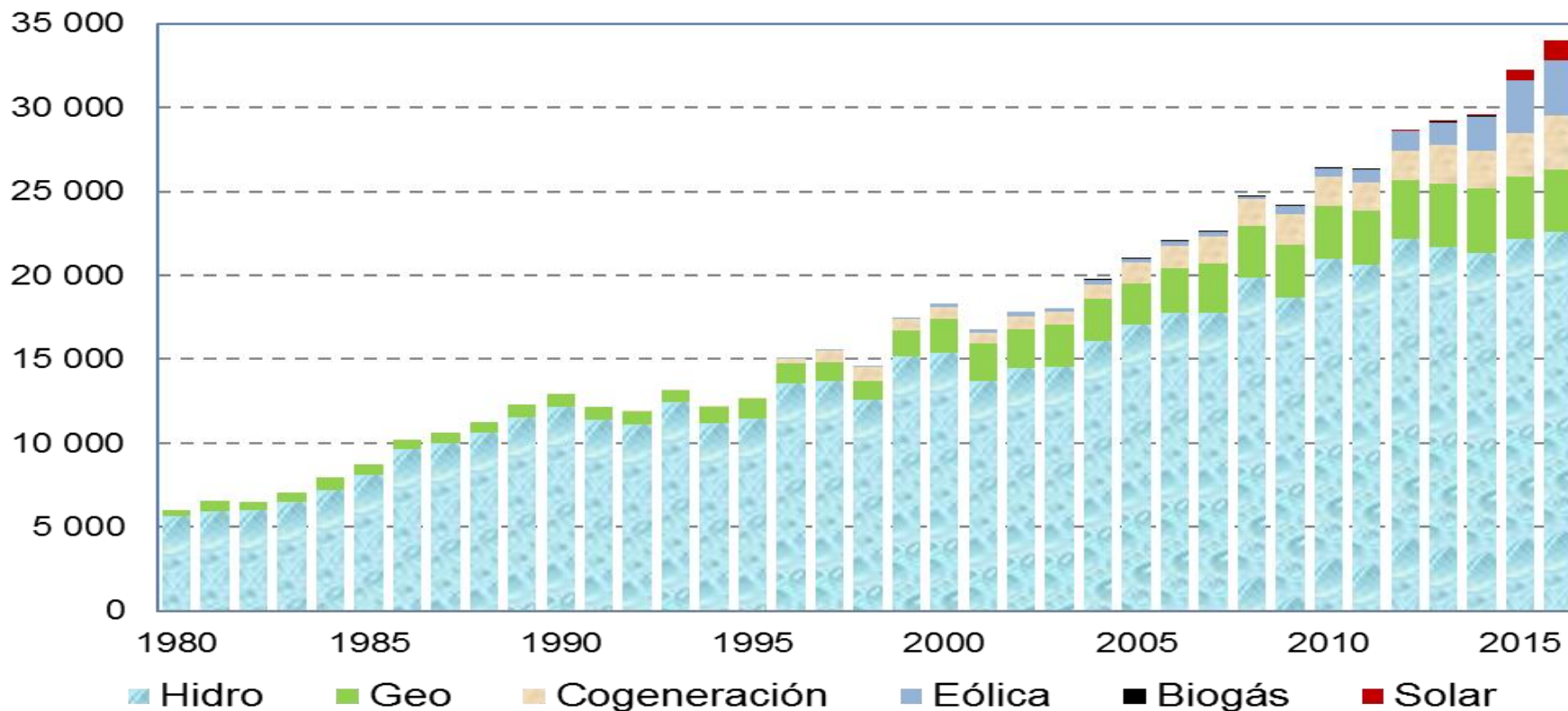
# Central America: total production of electricity by source 1990-2016



Source: ECLAC, on the basis of preliminary official information.

# Central America: evolution of renewable electric energy production, 1980-2016 (GWh)

CENTROAMÉRICA: EVOLUCIÓN DE LA PRODUCCIÓN DE ENERGÍA ELÉCTRICA CON ENERGÍAS RENOVABLES, 1980-2016



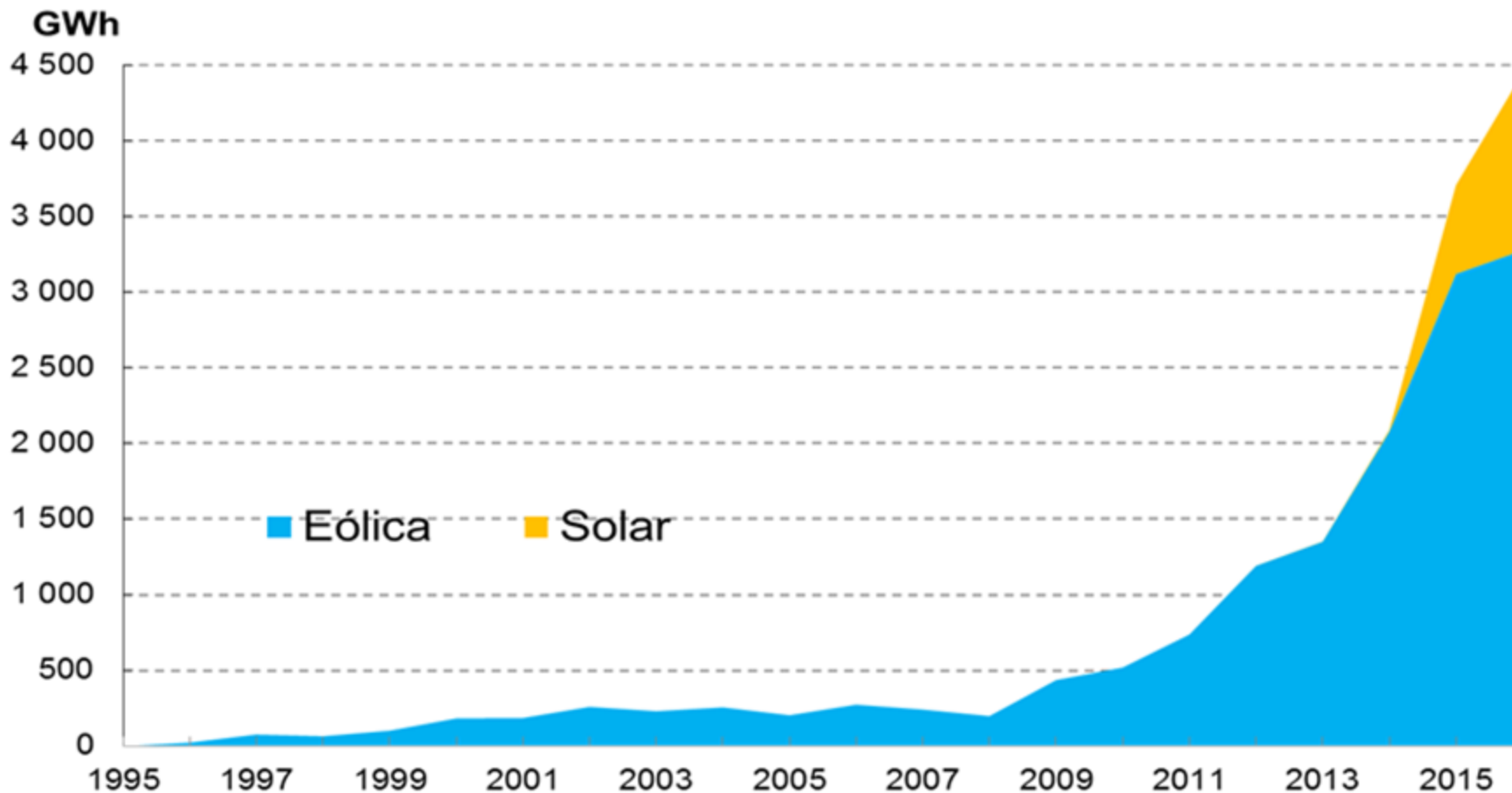
Source: ECLAC, on the basis of preliminary official information.



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# Central America: evolution of the participation of wind and solar energy



**Geothermal development has been slow (165 MW in 1990, 405 in 2000, 558 in 2010 and 615 in 2016).**



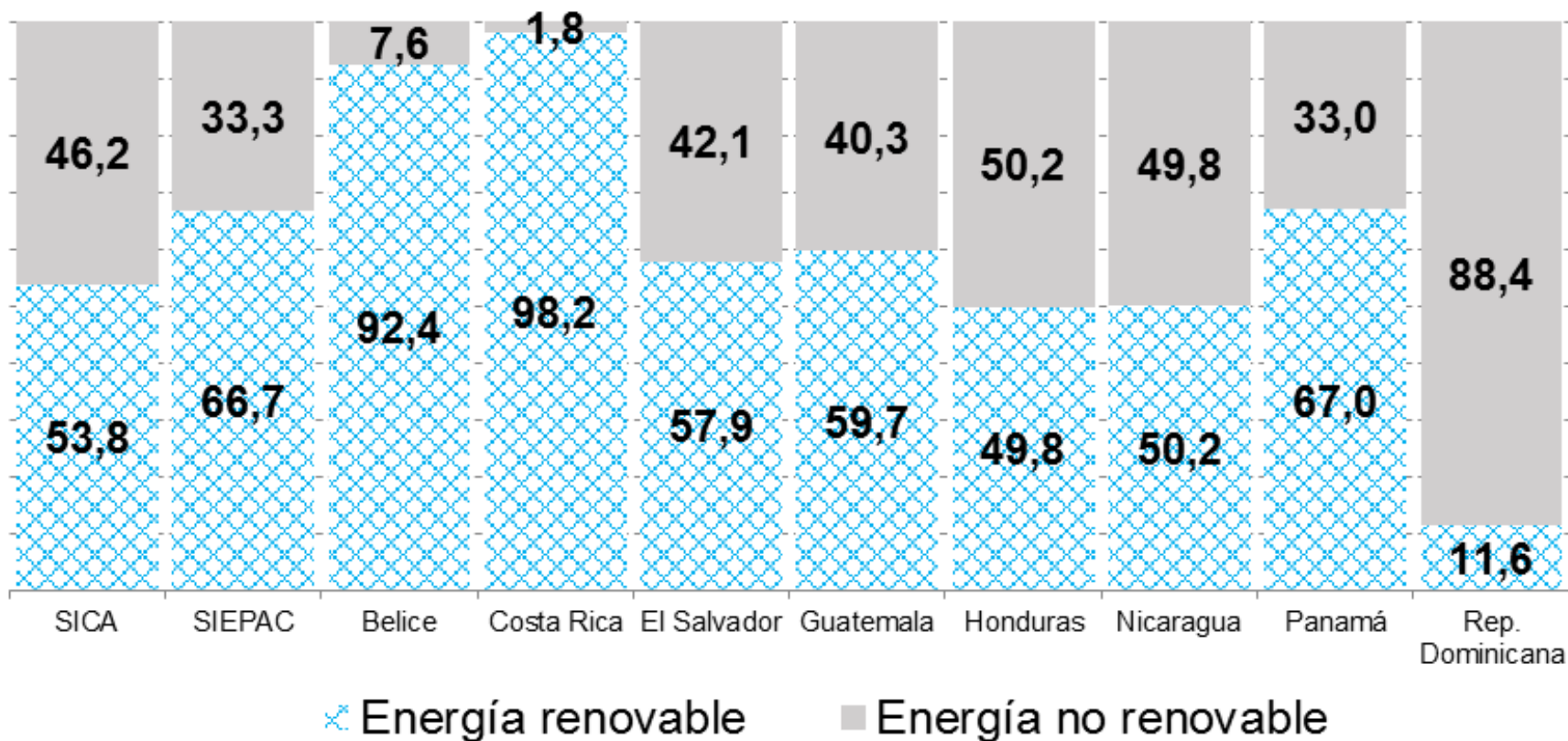
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Source: ECLAC, on the basis of preliminary official information.



## SICA: PERCENTAGE COMPOSITION OF THE GENERATION OF ELECTRICITY (RENEWABLE AND NON-RENEWABLE), 2016



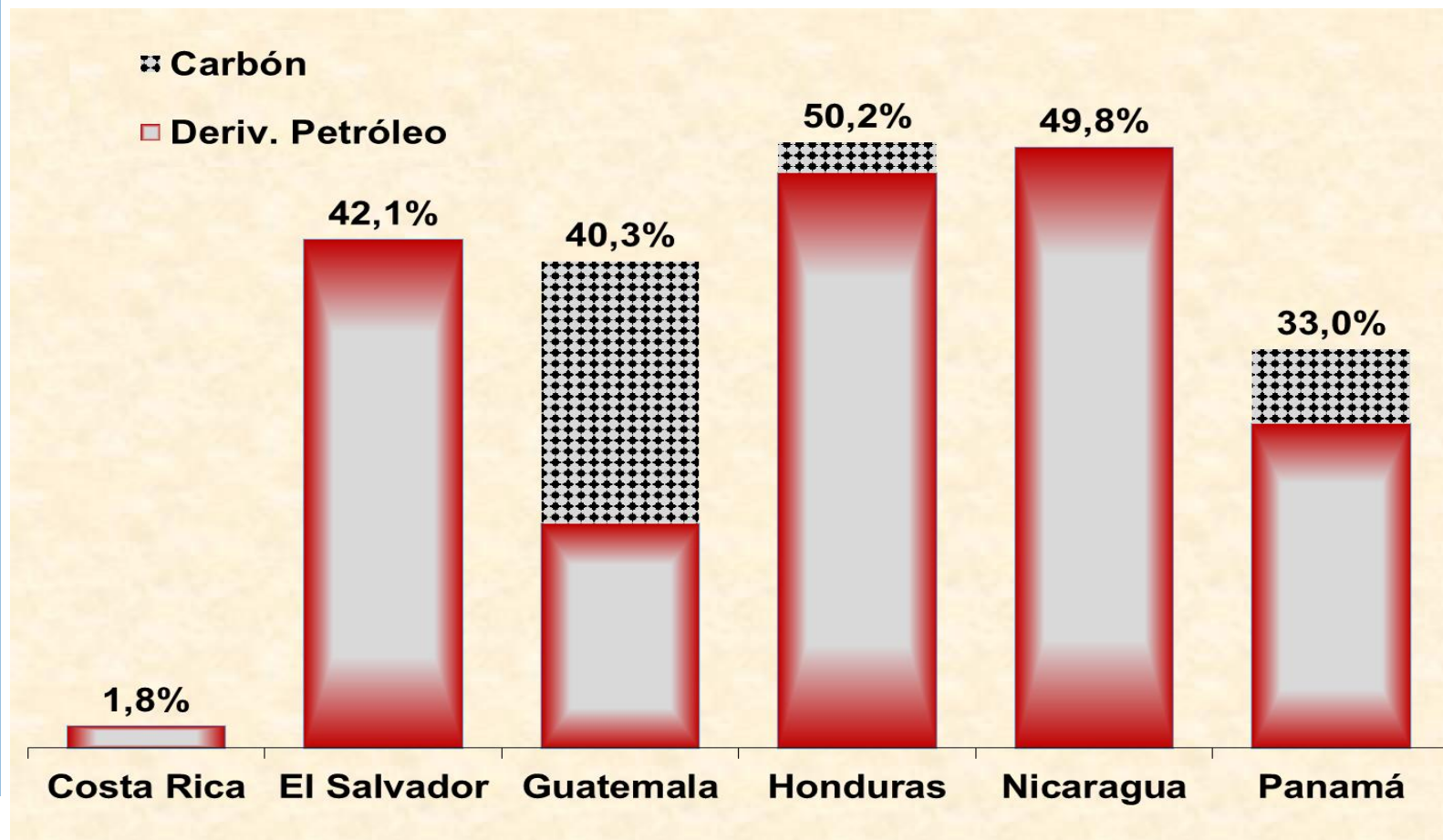
Source: ECLAC, on the basis of preliminary official information.



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# GENERATION WITH FOSSIL FUELS, 2016



Preliminary data..



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**CENTRAL AMERICA: EVOLUTION OF INTRAREGIONAL  
ELECTRICITY TRADE, 1990-2016**

**(Imports + Exports, GWh )**

|      | Centroamérica | Guatemala | El Salvador | Honduras | Nicaragua | Costa Rica | Panamá |
|------|---------------|-----------|-------------|----------|-----------|------------|--------|
| 1990 | 821,0         | 20,3      | 20,3        | 340,6    | 74,4      | 218,2      | 147,3  |
| 2000 | 2 945,9       | 963,8     | 919,4       | 300,6    | 117,0     | 497,7      | 147,4  |
| 2005 | 1 122,8       | 358,6     | 359,9       | 61,1     | 30,8      | 151,0      | 161,2  |
| 2010 | 1 062,2       | 501,2     | 263,2       | 35,4     | 53,5      | 100,5      | 108,2  |
| 2014 | 3 654,3       | 1 895,2   | 796,3       | 282,5    | 71,3      | 321,3      | 287,8  |
| 2015 | 3 515,3       | 1 672,0   | 1 027,6     | 151,7    | 55,0      | 452,5      | 156,4  |
| 2016 | 4249,0        | 1749,7    | 1143,1      | 211,3    | 222,7     | 494,6      | 427,7  |

Source: ECLAC, on the basis of preliminary official information.

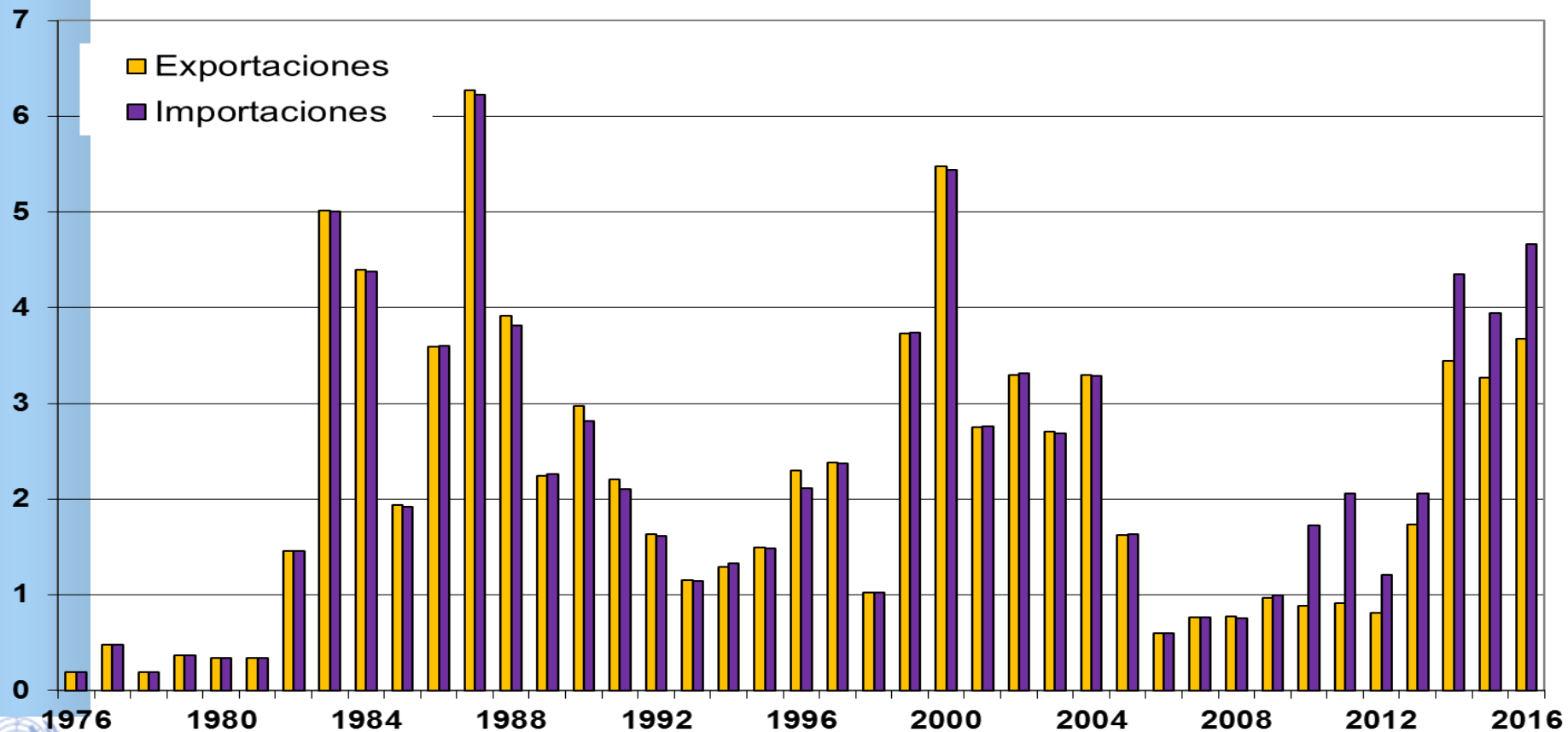
Note: Guatemala has exchanges with Mexico since 2010.



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# CENTRAL AMERICA: EXPORTS AND IMPORTS OF ENERGY AS A PERCENTAGE OF TOTAL NET PRODUCTION, 1976-2016 (%)



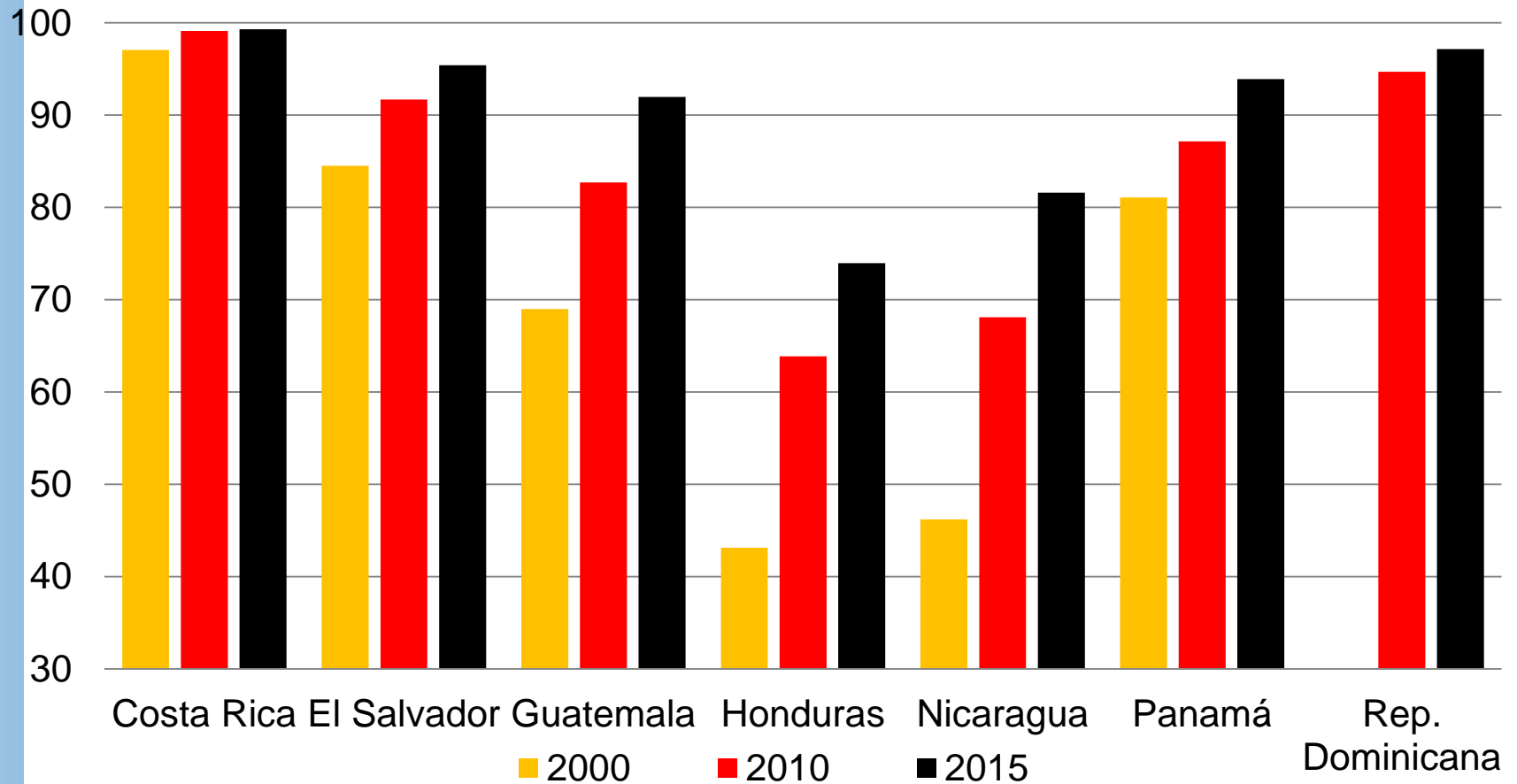
Source: ECLAC, on the basis of preliminary official information.



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# Evolution of electrification (electric coverage)



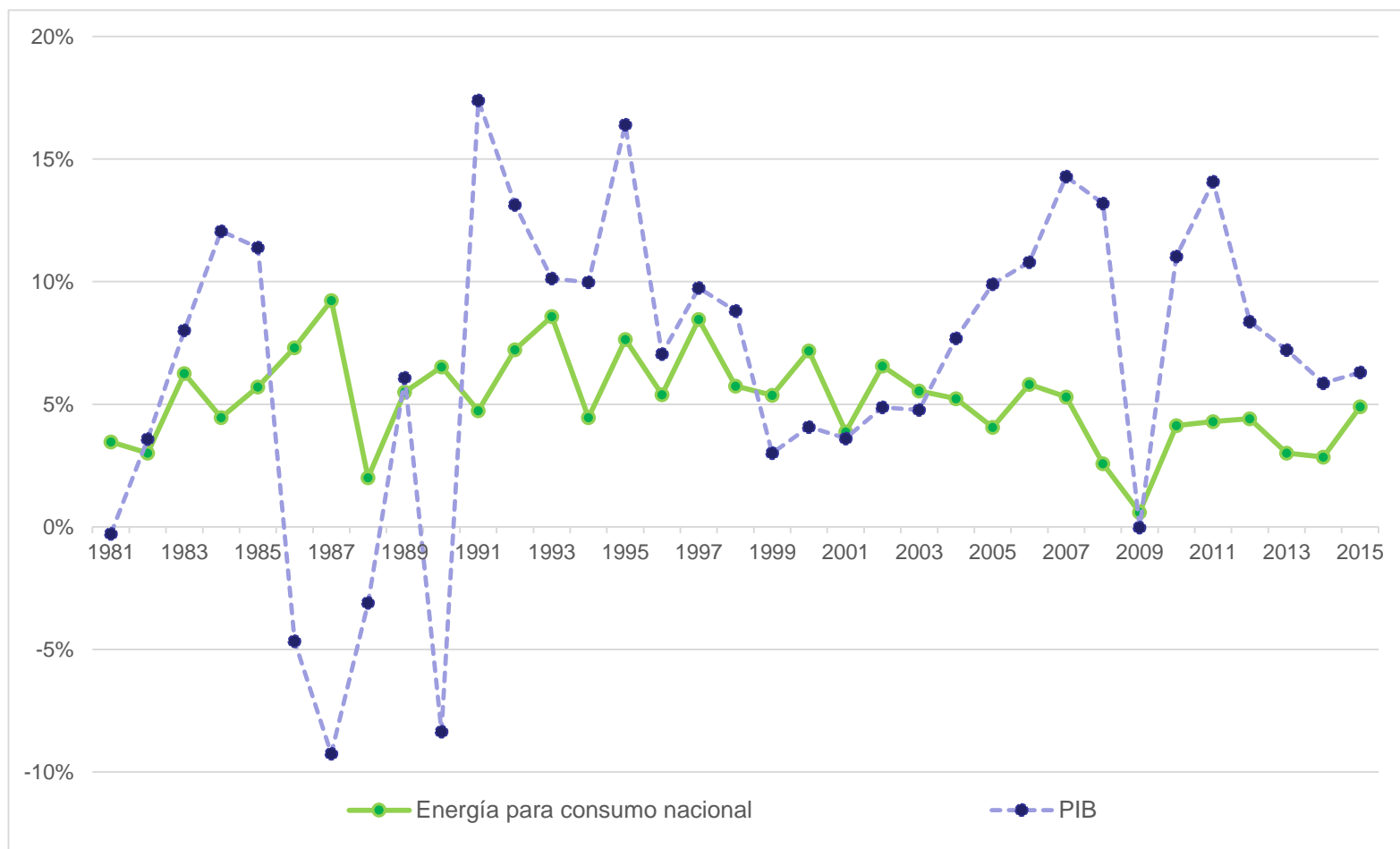
Source: ECLAC, on the basis of preliminary official information.



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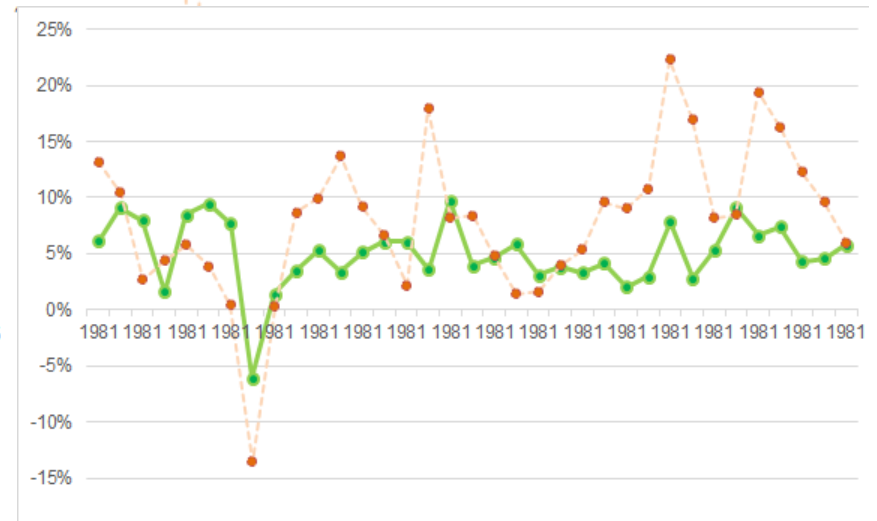
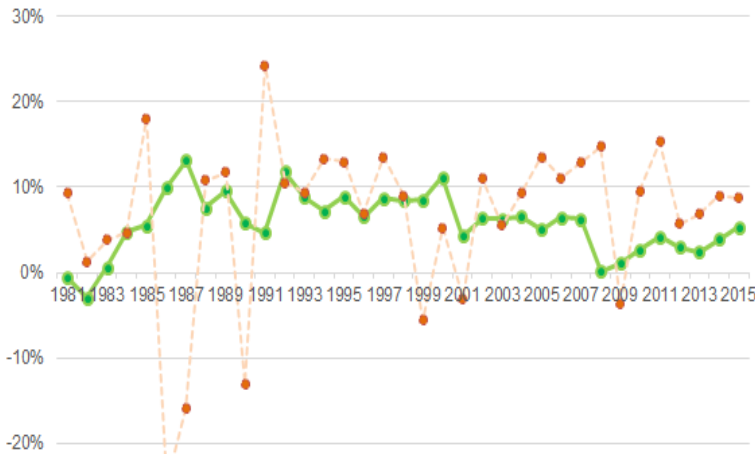
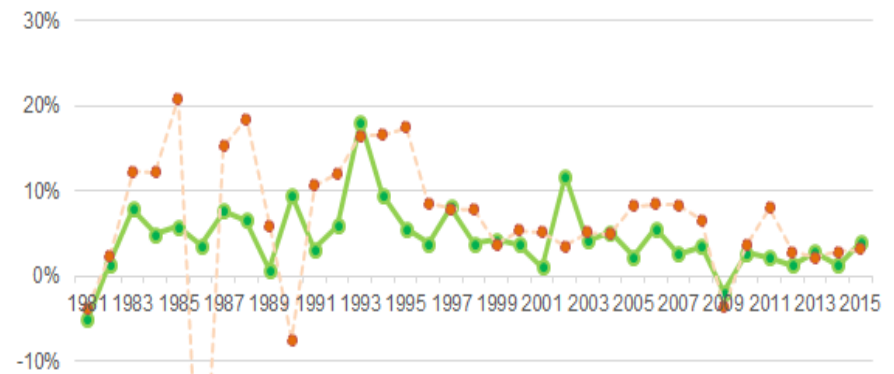
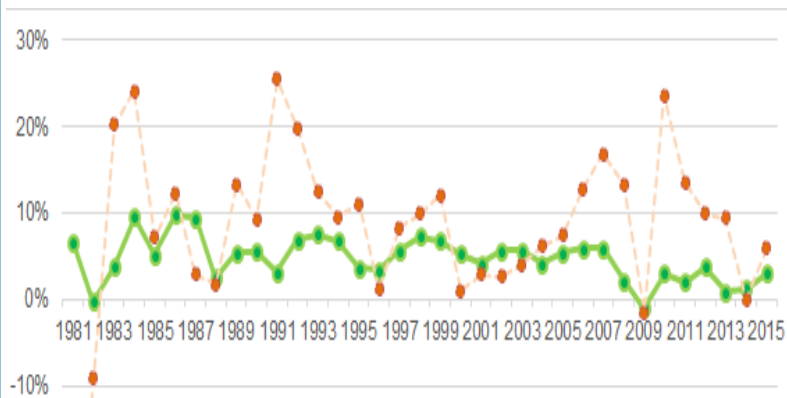
# CENTRAL AMERICA: ANNUAL PERCENTAGE VARIATION OF GDP AND CONSUMPTION OF ELECTRICITY, (1981-2015)



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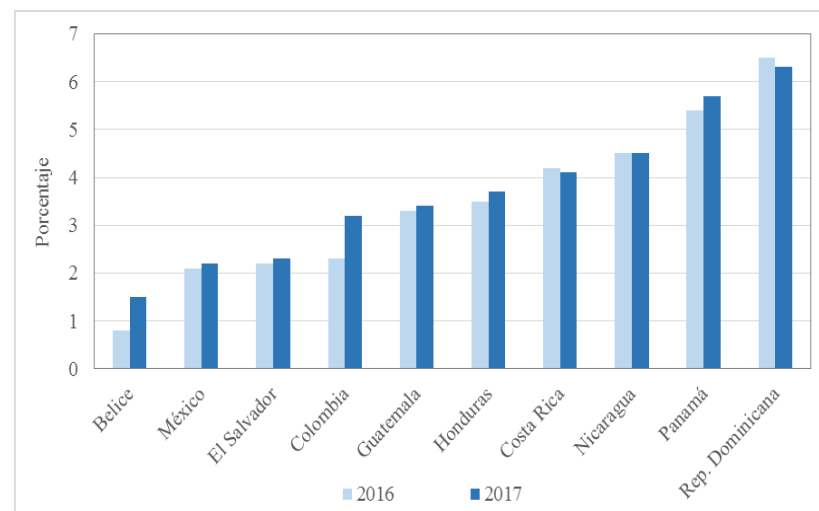
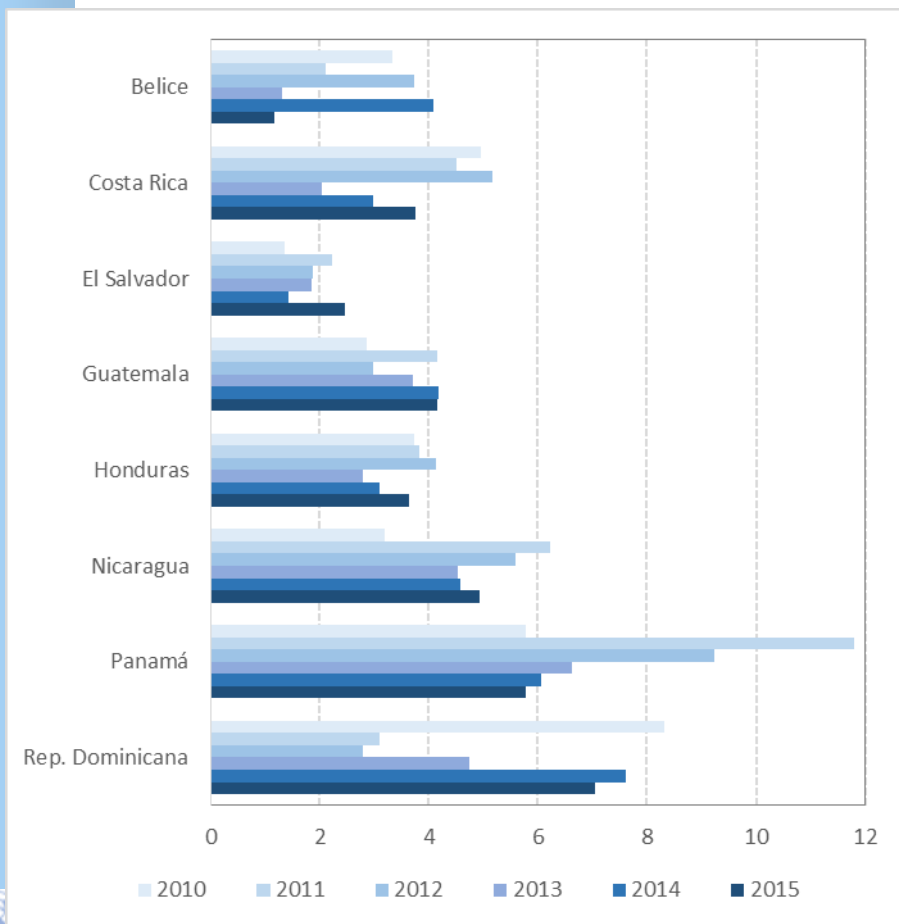
# Costa Rica, El Salvador, Guatemala y Panamá



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# Historical and expected growth of economies



Source: ECLAC, on the basis of official figures and estimates by ECLAC

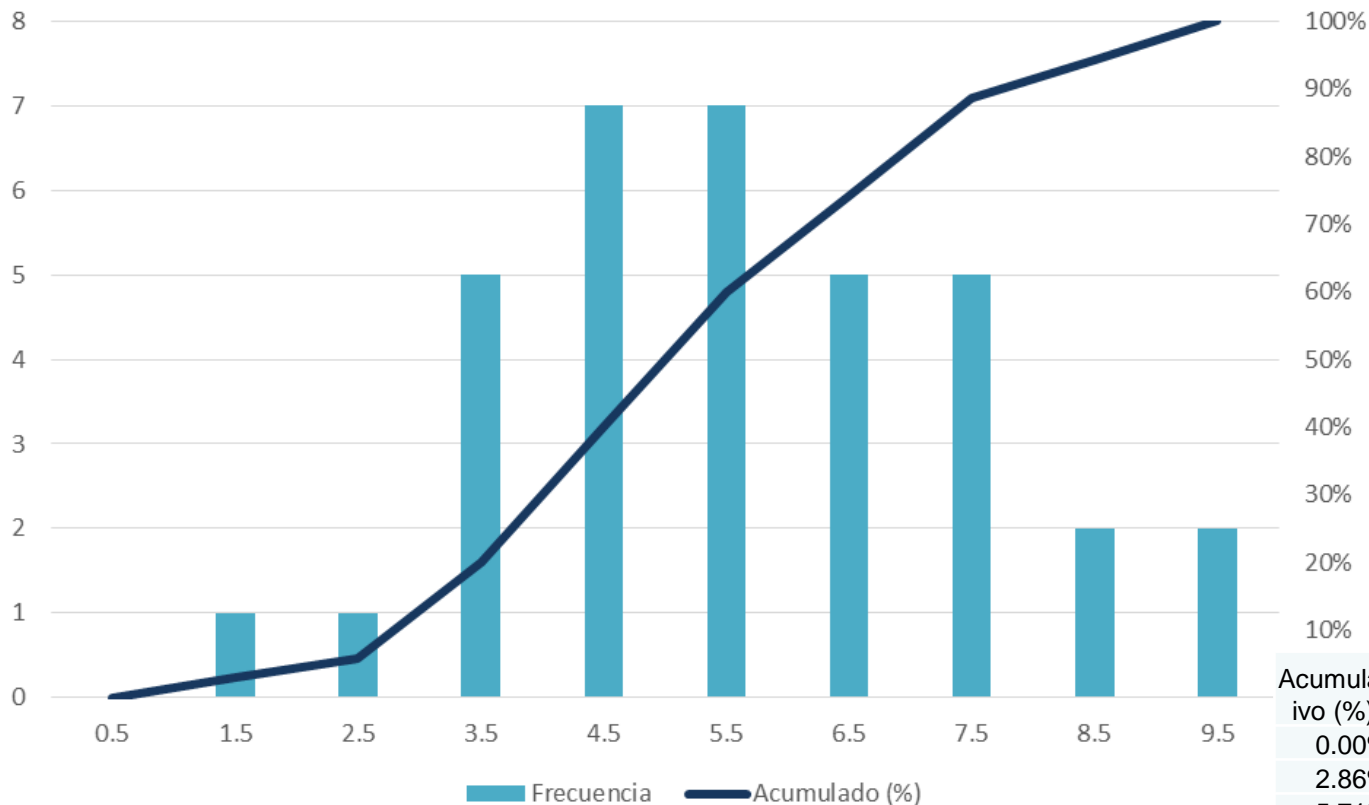


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# CENTRAL AMERICA: HISTOGRAM OF ANNUAL GROWTH OF CONSUMPTION OF ELECTRICITY



| Acumulativo (%) | Bin  | Frecuencia | Cumulativo % |
|-----------------|------|------------|--------------|
| 0.00%           | 4.5  | 7          | 20.00%       |
| 2.86%           | 5.5  | 7          | 40.00%       |
| 5.71%           | 3.5  | 5          | 54.29%       |
| 20.00%          | 6.5  | 5          | 68.57%       |
| 40.00%          | 7.5  | 5          | 82.86%       |
| 60.00%          | 8.5  | 2          | 88.57%       |
| 74.29%          | 9.5  | 2          | 94.29%       |
| 88.57%          | 1.5  | 1          | 97.14%       |
| 94.29%          | 2.5  | 1          | 100.00%      |
| 100.00%         | 0.5  | 0          | 100.00%      |
| 100.00%         | More | 0          | 100.00%      |



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# How much will demand and supply grow?

- In the last five years the average growth of electricity consumption in the region was 3.9%. The peak demand (not coincident) grew around 225 MW per year.
- Considering two scenarios of growth (3.5% and 5.5%), in the period 2017-2030, an average annual growth between 365 and 665 MW would be expected.
- In addition, it would be necessary to add (or subtract): Power capacity withdrawals, mainly thermoelectric plants, due to aging and obsolescence.
- Unconventional renewables will continue to grow, however hydroelectric development could be slowed down especially by the growing problems they face for their social and environmental licensing. This is one of the biggest challenges facing the development of renewable energies in Central America



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# How much will demand and supply .....

- Also consider:
- a) greater participation of geothermal and non-conventional renewable energies (solar and wind power),
- (b) better use of SIEPAC interconnections (strengthening national networks; the Second circuit of SIEPAC, and the interconnections with Mexico and Colombia);
- Growth of distributed generation (especially low-voltage photovoltaic solar, connected in primary and secondary distribution networks);
- Growth derived from electric cars and electrification of public transportation and impacts of others initiatives (energy efficiency, sustainable mobility, etc.).



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# Regional interconnection and interconnections with neighboring countries

- Continued operation (24 hours) of Mexico-Guatemala Interconnection and discussions and coordination for a better use of the Mexico-Guatemala-SIEPAC link.
- Reinforcement of national networks to recover the capacity of SIEPAC.
- The Second Circuit of SIEPAC.
- Mexico-SIEPAC Electric Interconnection Commission was created in 2016 (its main objective: the Mexico-SIEPAC interconnection).
- In the south, the Colombia - Panama interconnection.



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# Final Thoughts and Reflections

- The Central American countries have significantly increased the share of renewable energies, but should double their efforts to achieve the goals of a 70% participation by 2020 (Strategy 2020) and 80% or more (Agenda 2030). In particular, the problems associated with the social and environmental licensing of hydroelectric plants could slow down the advance of renewable energies.
- Demand for electricity continues to grow (rates between 3% -5% or more).



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# Final Thoughts and Reflections ....

- With this scenario, conventional thermoelectric generation needs (based on oil, coal or natural gas derivatives) will also continue to increase, possibly at rates higher than those observed in this millennium.
- Only the geothermal resource will be able to offer a renewable electric energy supply, with the qualities of firmness and predictability, to advance in the Central American energy transition. It will be necessary to advance the preinvestment studies for the development of geothermal fields and to form a portfolio of viable geothermal projects in the Central American electricity market



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**Thank you very  
much!**

**// Muchas gracias!**

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