

# Intro to Sustainable Energy:



## Costa Rica in Perspective

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Earth Education International

Costa Rica



# Depletable vs. Renewable Energy

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**Fossil  
Fuels**



Coal



Petroleum



Natural Gas



Nuclear



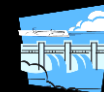
Solar



Wind



Biomass



Hydrospheric



Geothermal

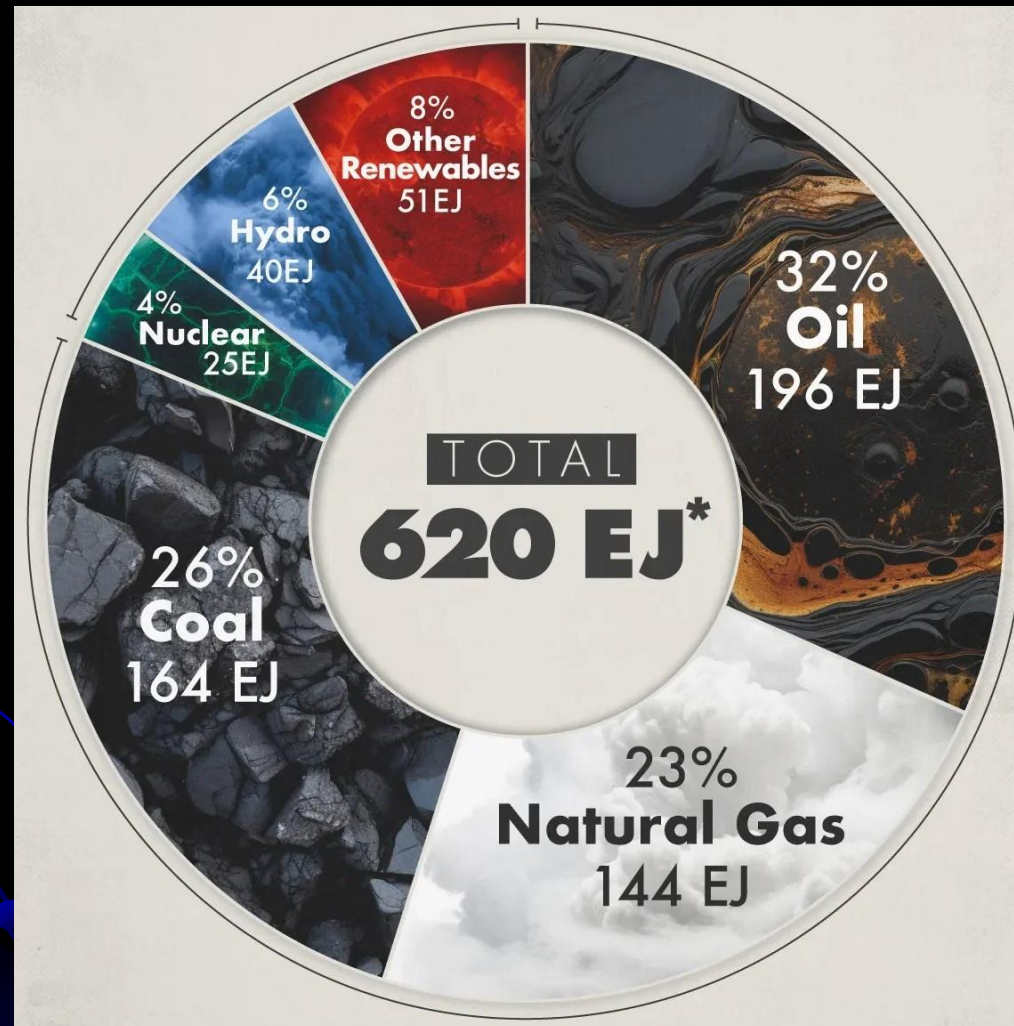
# Depletable vs. Renewable Energy



Global

Depletable: 86%

Renewable: 14%



# Depletable vs. Renewable Energy



**Global**

**Depletable: 86%**

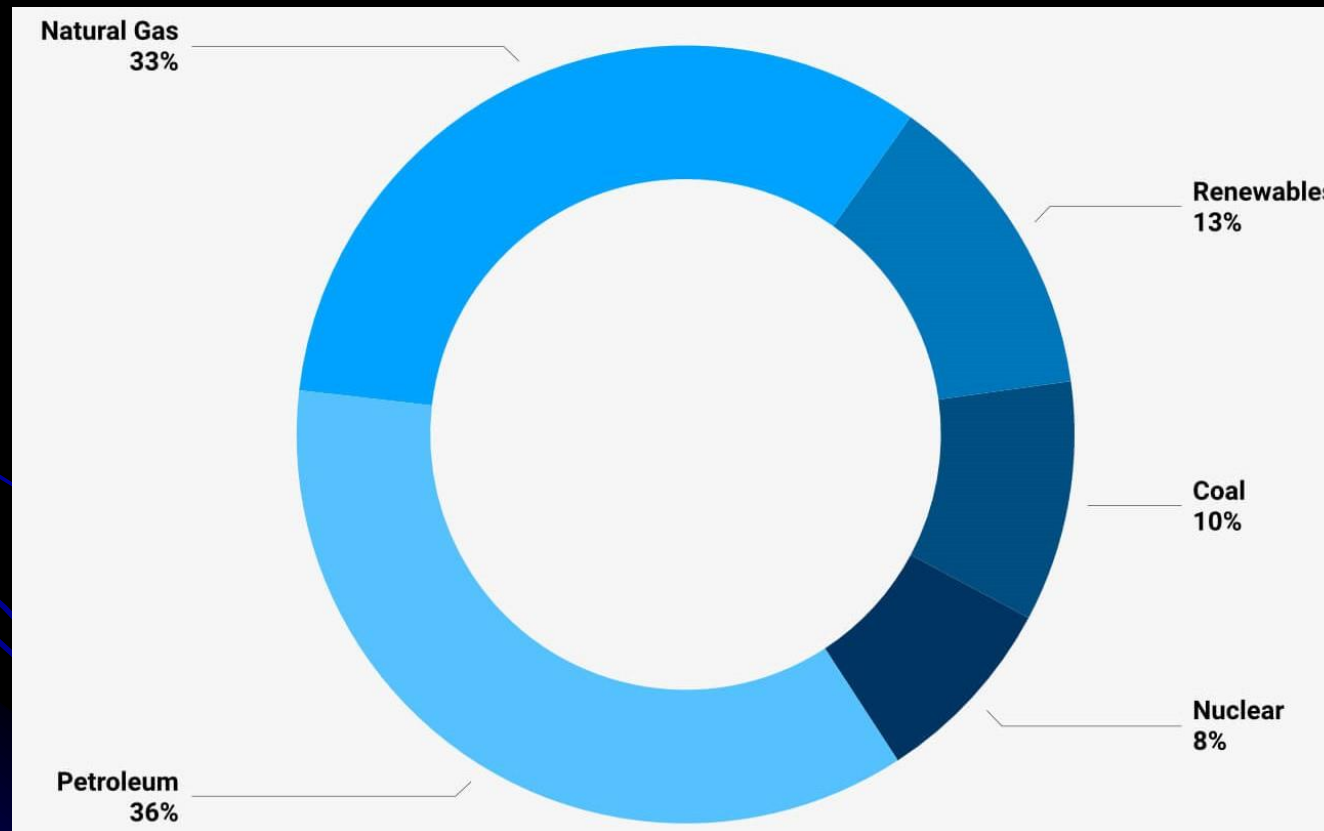
**Renewable: 14%**



**U.S.A**

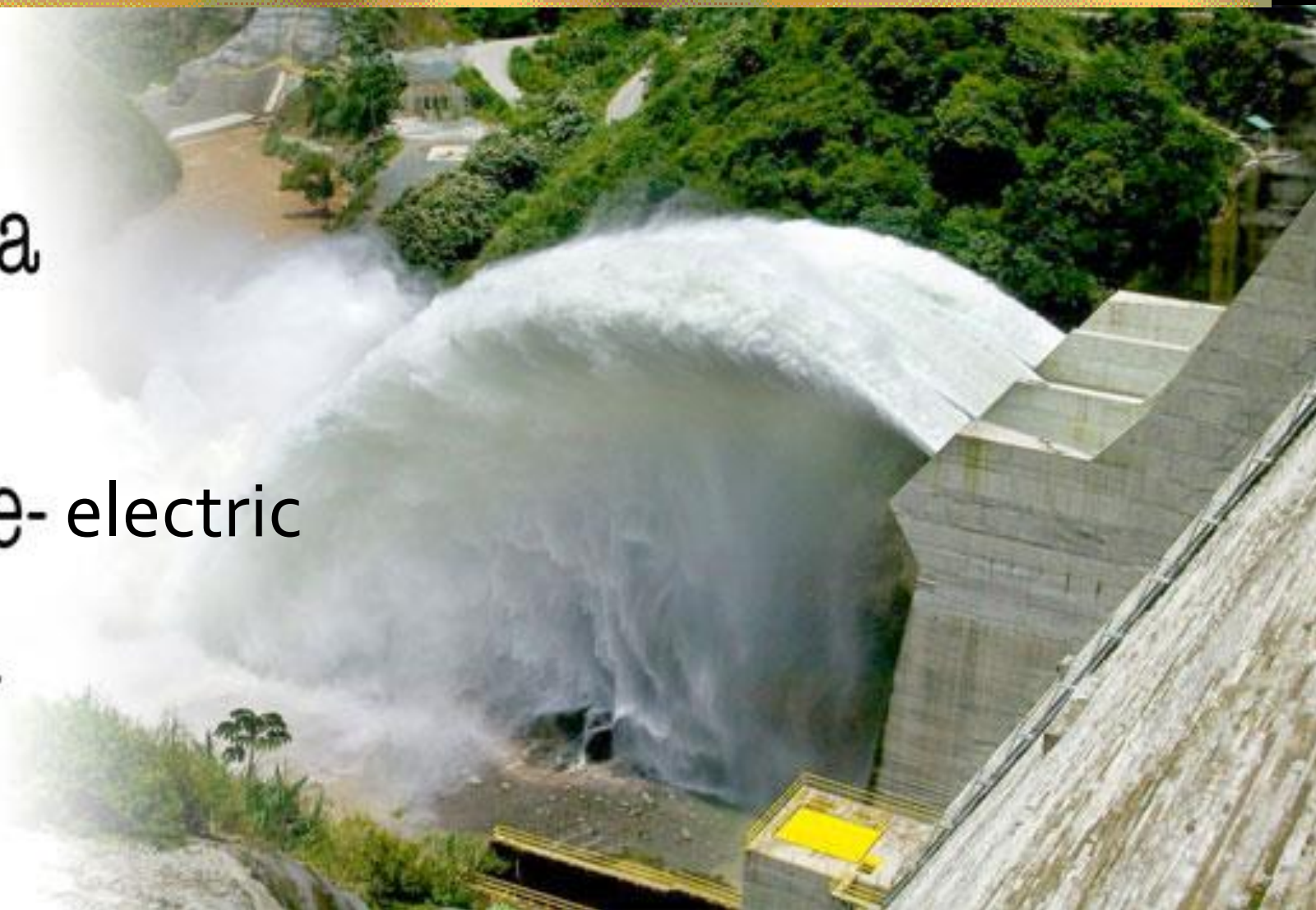
**Depletable: 87%**

**Renewable: 13%**

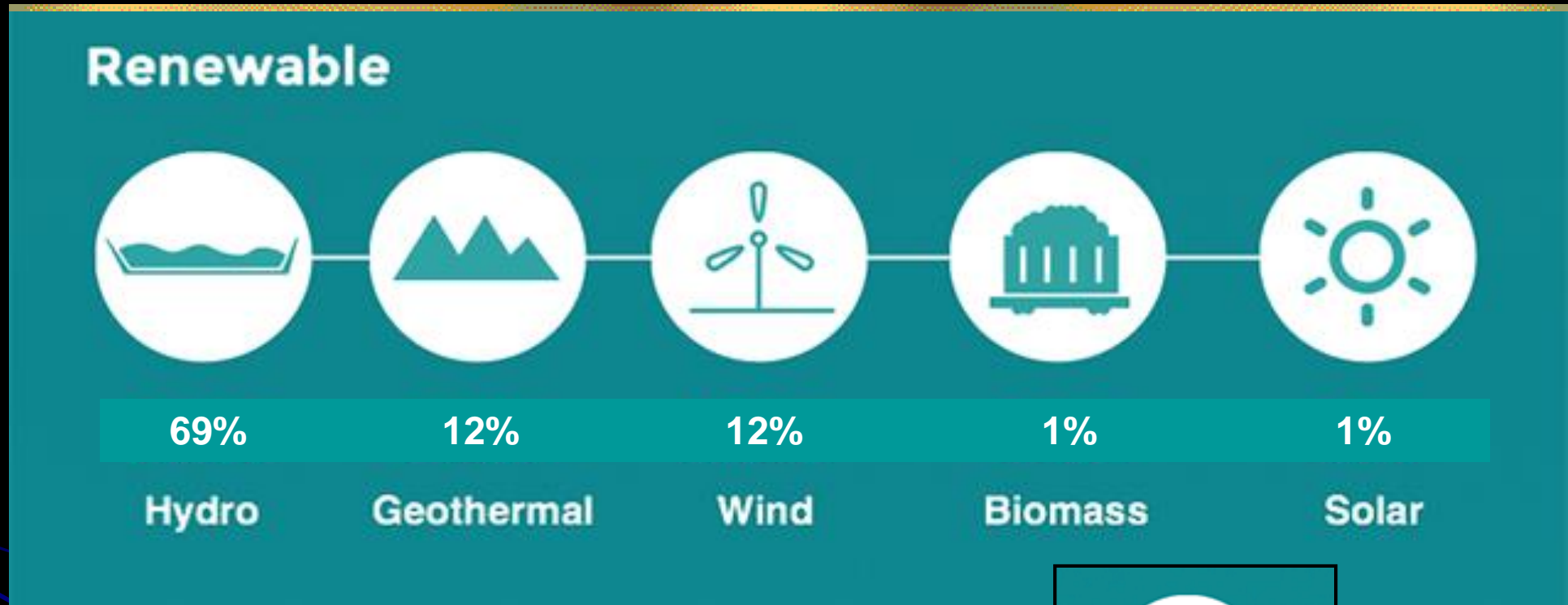


# Costa Rica Renewables

Costa Rica  
is 98%  
renewable- electric  
powered



# Costa Rica Electricity Mix



# Costa Rica Renewables

theguardian

🏠 UK world sport football opinion culture business lifestyle fashion environm

home > world > americas asia australia africa middle east cities development e

Costa Rica

## All that glitters is not green: Costa Rica's renewables conceal dependence on oil

Costa Rica produced 98.6% its electricity last year without fossil fuels but the sustainable success story unravels with the rising demand for gasoline and cars

# Depletable vs. Renewable Energy

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**Global**

**Depletable: 86%**

**Renewable: 14%**



**U.S.A**

**Depletable: 87%**

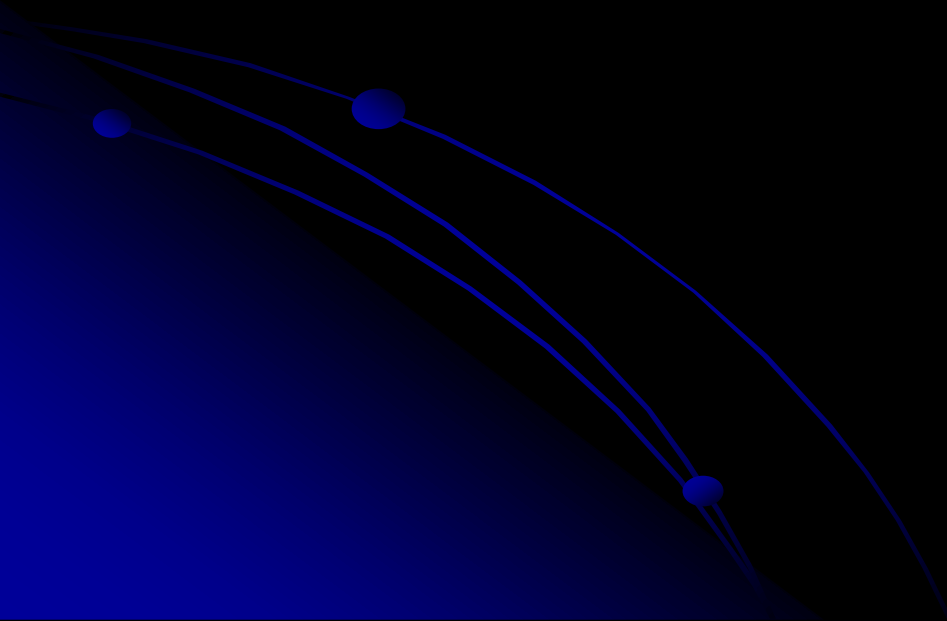
**Renewable: 13%**



**Costa Rica**

**Depletable: \_\_%**

**Renewable: \_\_%**



# Depletable vs. Renewable Energy



**Global**

**Depletable: 86%**

**Renewable: 14%**



**U.S.A**

**Depletable: 87%**

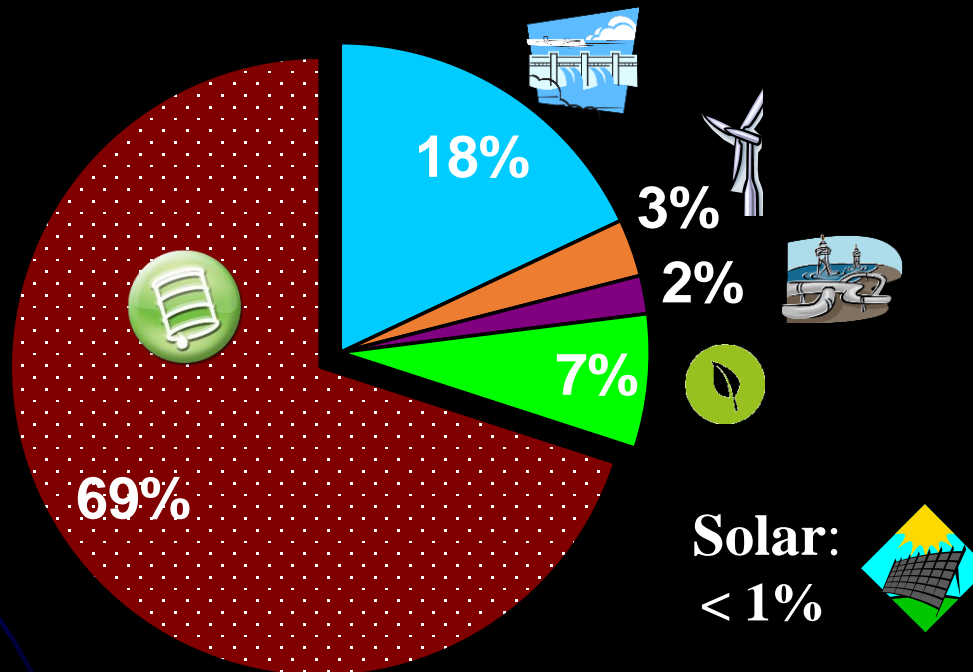
**Renewable: 13%**



**Costa Rica**

**Depletable: 69%**

**Renewable: 31%**



# Hydrospheric Energy in Costa Rica (18%)

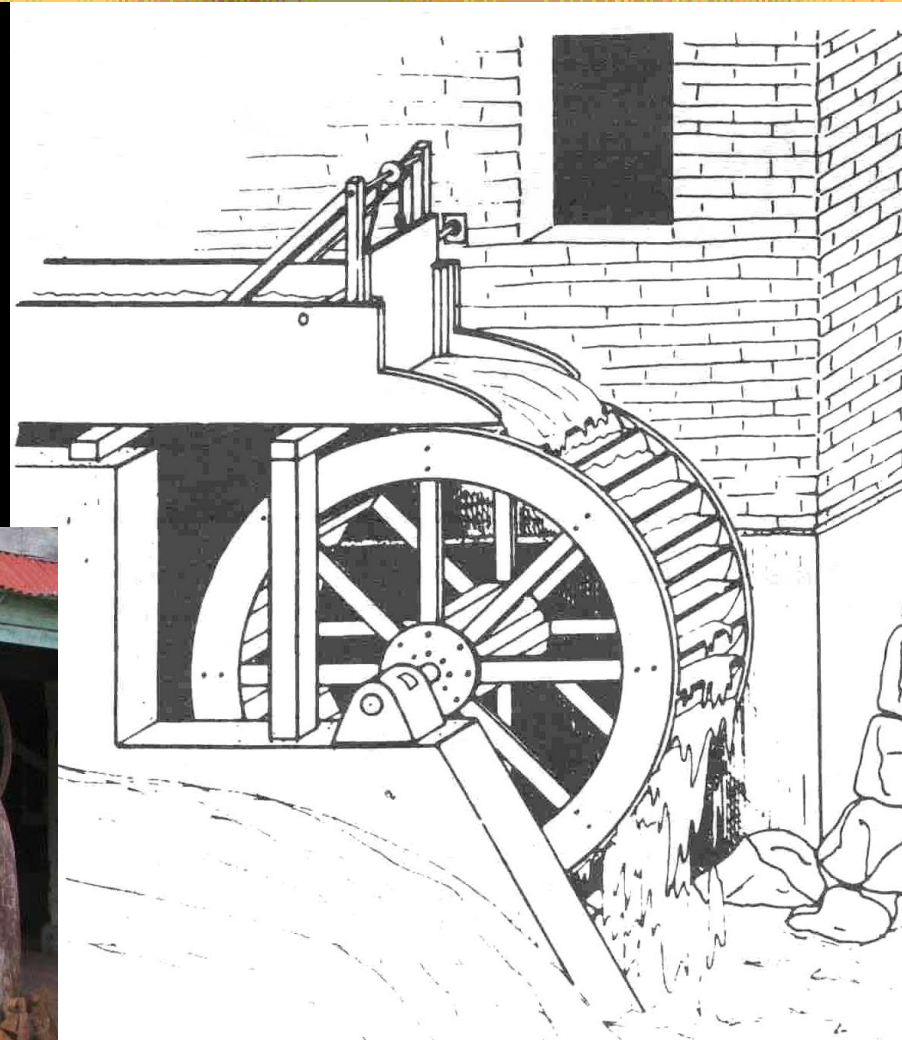


> Hydroelectric: La Fortuna field presentation & hydro plant visit <

# Sarchi: Hydro-Mechanical Woodshop

**Hydro Design:**  
Overshot wheel

**Power distribution:**  
Belts, pulleys, axels



# Biomass Energy in Costa Rica (8%)



# Types of Biomass

## Direct



## Indirect

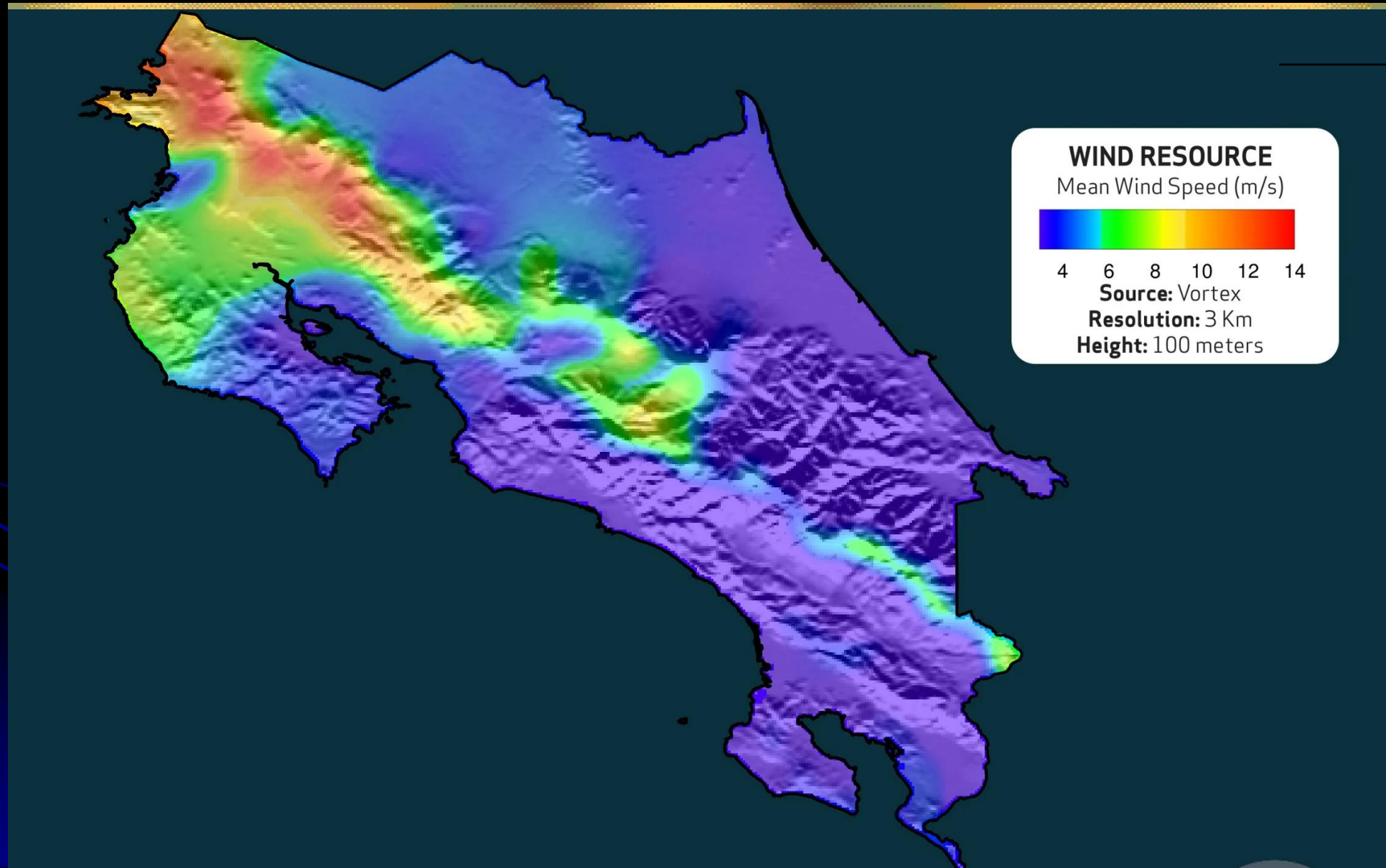
Biodiesel & ethanol from sugar cane, palm oil, vegetable oil, etc.



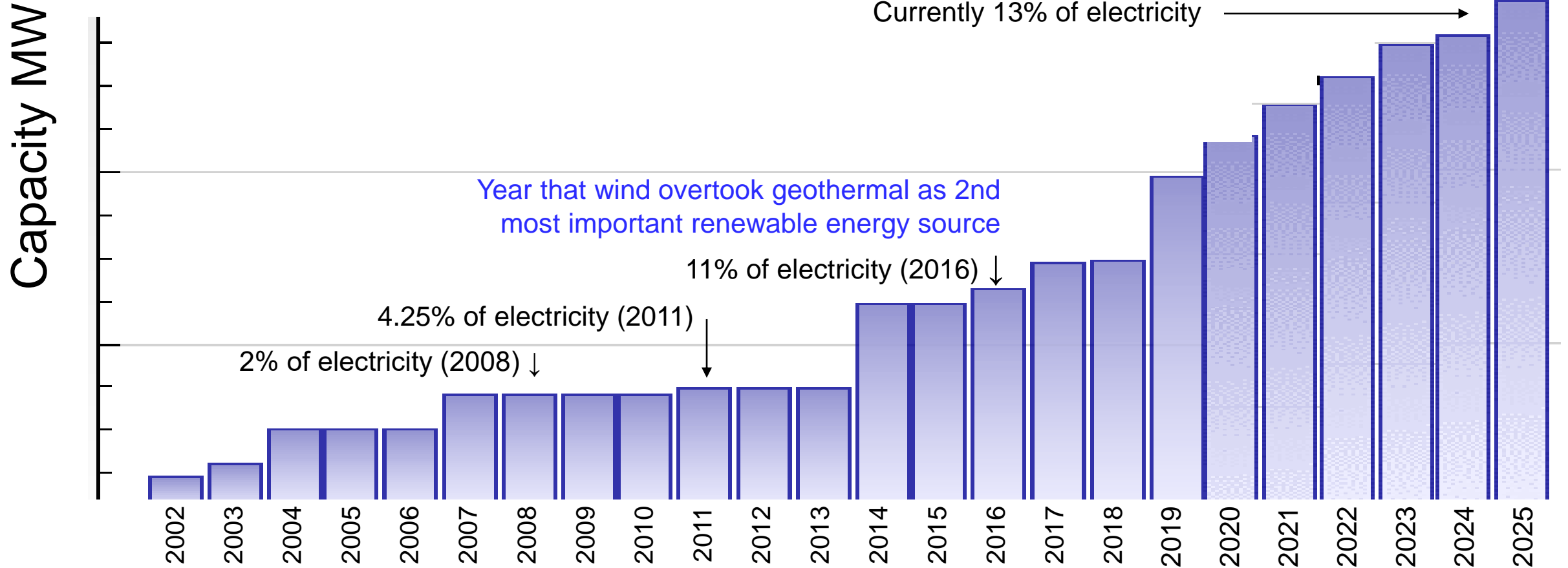
# Wind Energy in Costa Rica (3%)



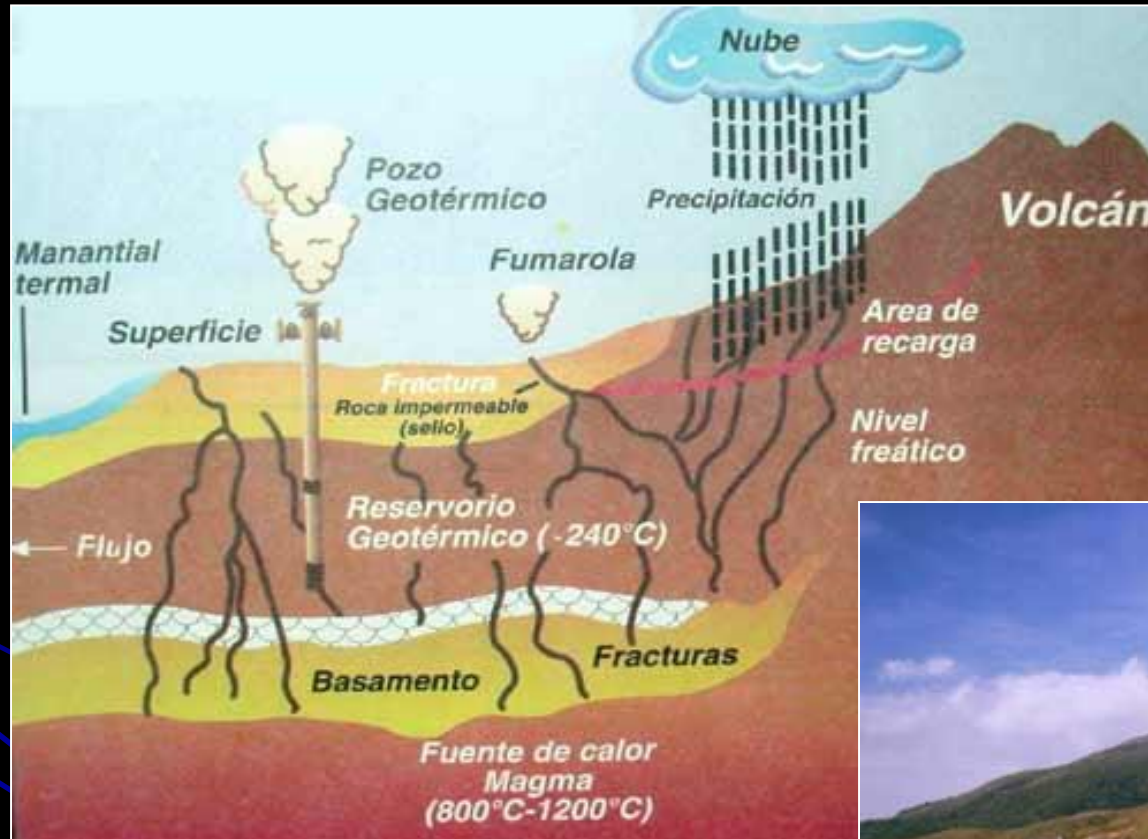
# Costa Rica: Wind Resource



# Costa Rica: Installed Wind Capacity (MW)



# Geothermal Energy in Costa Rica (2%)



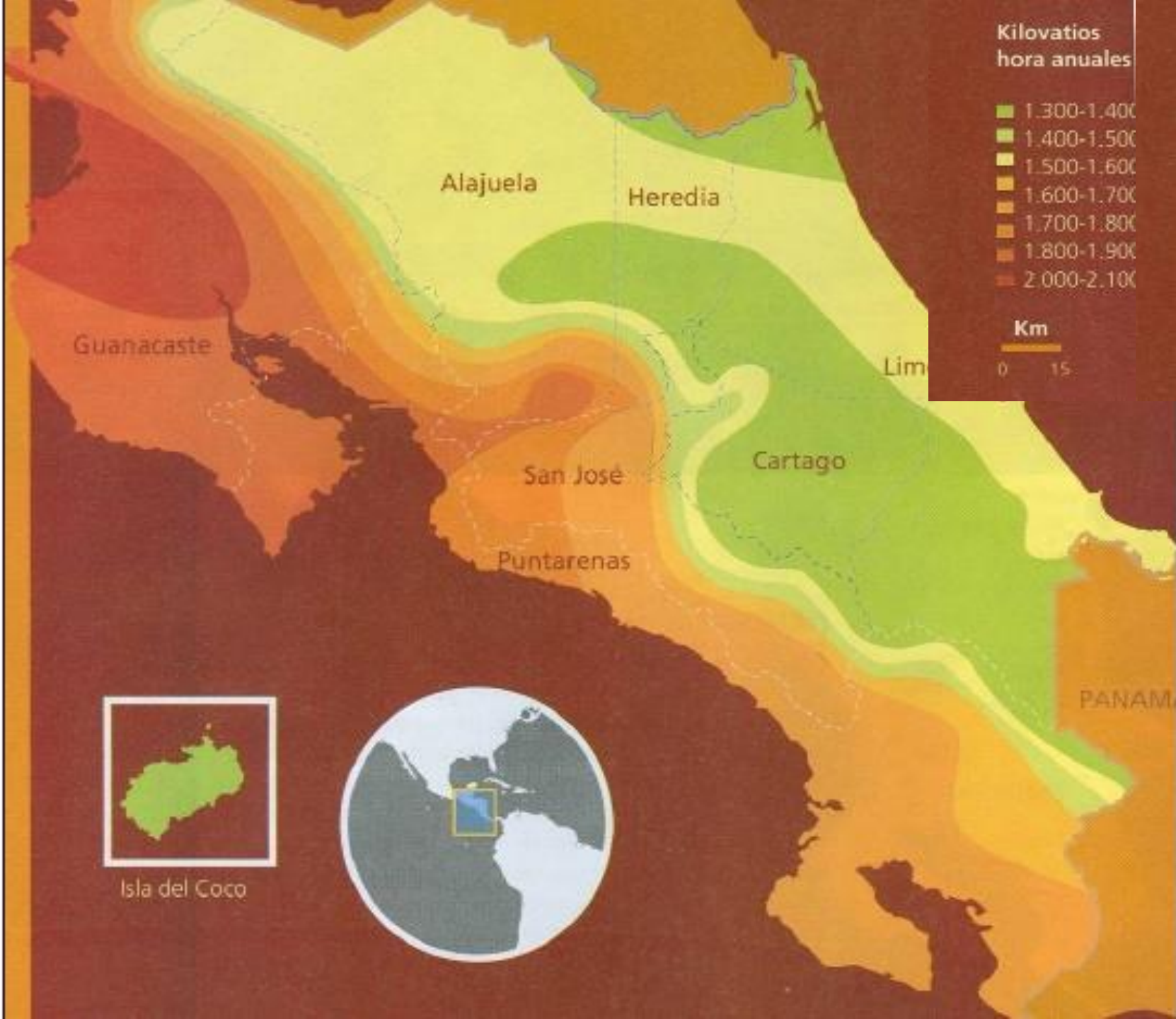
# Costa Rica: Geothermal Energy

➤ **Currently:**  
13% of electricity  
207 Mw

➤ **Potential:**  
9,000 Mw



# Costa Rica: Solar Energy (<1%)



# Solar Thermal

Hot Water



Cooking

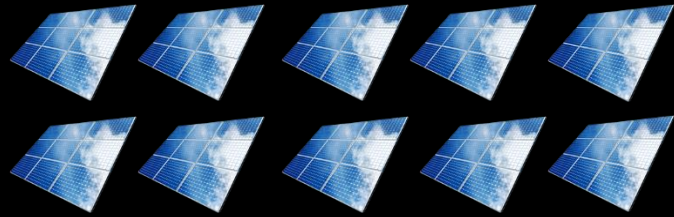


Drying

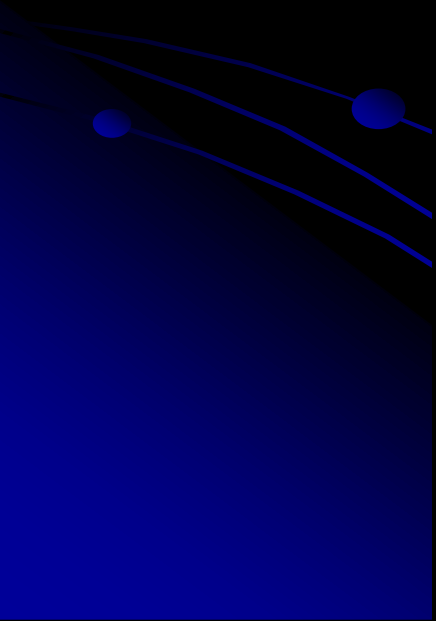


# Solar Electric: Typical Grid-Intertie System

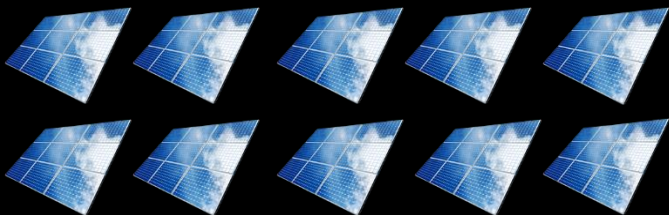
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Solar photovoltaic panels/arrays



# Solar Electric: Typical Grid-Intertie System



Solar photovoltaic panels/arrays



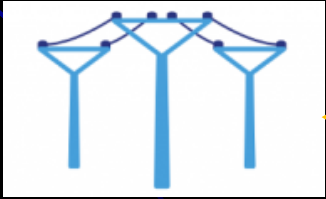
DC-AC inverters

**DAY**

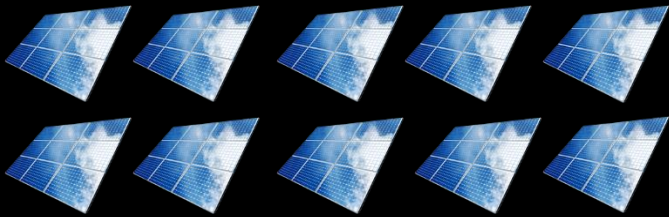


Net (dual) metering

Electric grid (ICE)



# Solar Electric: Typical Grid-Intertie System



Solar photovoltaic panels/arrays



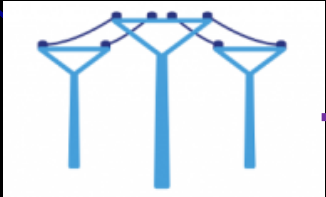
DC-AC inverters

**NIGHT**



Net (dual) metering

Electric grid  
(ICE)



# Las Musas Solar Photovoltaic



# Local Small-Scale Photovoltaic Grid-Intertie Systems

Las Musas Ecotourism Project : 67 panels x 338W each = 22.7KW



**Annual production: 29 Mwh**  
(~10 Costa Rican homes)

# Local Small-Scale Photovoltaic Grid-Intertie Systems

Las Musas Ecotourism Project : 67 panels x 338W each = 22.7KW



**Annual production: 29 Mwh**  
**(~3 U.S. homes)**

# Local Small-Scale Photovoltaic Grid-Intertie Systems



**Installation Date:** August, 2021

**System Cost:** \$33,000 + loan, insurance, maintenance = \$54,000 (9 years)

**Annual Savings** ( $\leq 9$  years): \$5,600/year

**Annual Savings** (year 10+): \$7,200/year

# Local Small-Scale Photovoltaic Grid-Intertie Systems



**Payback Period:** Actual (w/ loan): 9 years (potentially 5.8 years)

**Long-Term Savings:** \$165,600 (over estimated 25 year lifetime)

# Sustainable Energy for the Future: Costa Rica & Beyond

