



Where to locate a solar plant in Chile?



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Let's review the video "Solar Energy in Chile".



Where to locate a solar plant in Chile?

- Why is it important to consider solar energy as an alternative to provide electricity?
- What factors affect the production and distribution of electrical energy generated by solar plants, according to what is indicated in the video?



Problem

What would be the best place to locate a solar plant that delivers electricity to Concepción: the Atacama Desert or the surroundings of Concepción?



Problem

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What does it take to make the decision?



Available Information

	Plant in Atacama	Plant in Concepción
Power if the Sun per m ² on the external surface of the atmosphere	1,4 kW	1,4 kW
Percentage of light that is absorbed by humidity before reaching the solar panel	54%	61%
Hours of sunshine per day	12	12
Sunny days per year	349	296
Percentage of light that is lost in the panel in heat and other effects	80%	80%
Percentage of energy lost in transmission cables	9%	0%

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Inicial amount

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← This power is reduced before reaching the solar panel's surface due to the atmosphere's humidity, which varies between Atacama and Concepción.

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Energy is measured in kWh (kilowatt hours), corresponding to the multiplication of power measured in kW by the number of hours.

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It is desired to compare the amount of electrical energy that reaches Concepción from each solar plant **daily**.

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The panels cannot convert all of the energy received into electrical energy since 80% of it is dissipated as thermal energy.

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← In the case of the Atacama plant, part of the electrical energy produced is lost when transmitted to Concepción due to the resistance of the cables that carry it.

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Is it possible to determine which is the most convenient place to locate the solar plant?

Activity

Let's work on the following questions:

- 1. Calculate the power that reaches the solar panel on each plant, considering what is lost due to the humidity of the atmosphere.**

Activity

1. Calculate the power that reaches the solar panel on each plant, considering what is lost due to the humidity of the atmosphere.

- The sun's power that reaches each Atacama plant solar panel is $1,4 \cdot 0,46 = 0,644$ kW.
- The sun's power that reaches each solar panel at the Concepción plant is $1,4 \cdot 0,39 = 0,546$ kW.

Activity

2. One way to measure energy is in kWh (kilowatt hours). If there are 12 hours of sunshine per day on each plant, how much energy reaches the panel daily on a sunny day on each plant?

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- To a solar panel in Atacama, they arrive daily $0,644 \cdot 12 = 7,728$ kWh of energy.
- While $0,546 \cdot 12 = 6,552$ kWh of energy arrives daily at a solar panel in Concepción.

Activity

3. How much energy (kWh) reaches a solar panel in a year, considering the number of days with sun on each plant?

- A solar panel in Atacama annually receives $7,728 \cdot 349 = 2\,697,072$ kWh of energy.
- A solar panel in Concepción annually receives $6,552 \cdot 296 = 1\,939,392$ kWh of energy.

Activity

4. How much energy (kWh) reaches a solar panel on average per day in each plant?

- An average of $2\,697,072 : 365 \approx 7,389$ kWh of energy reaches a solar panel in Atacama per day.
- An average of $1\,939,392 : 365 \approx 5,313$ kWh of energy reaches a solar panel in Concepción per day.

Activity

5. Of the average daily amount of energy that reaches the panel calculated in the previous question, how much does it arrive as electrical energy to Concepción from each plant?

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Considering heat loss and other effects:

- A solar panel in Atacama produces $7,389 \cdot 0,2 = 1,478$ kWh of electrical energy daily.
- A solar panel in Concepción produces $5,313 \cdot 0,2 = 1,063$ kWh of electrical energy daily.

Activity

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Considering the energy loss in the cables:

- A solar panel in Atacama can transmit to Concepción $1,478 \cdot 0,91 = 1,344$ kWh of electrical energy per day.
- A solar panel in Concepción supplies its city with 1,063 kWh of electricity per day.

Conclusions

A solar plant in Atacama can produce more electrical energy than a plant in Concepción. However, the humidity loss in energy production and the transmission loss from Atacama to Concepción makes it necessary **to compare the amount of energy** that reaches this city from each plant.



Conclusions

To obtain the daily amount of electrical energy that can be supplied to Concepción from a solar panel located in Atacama and another in the city of Concepción itself, we had to perform a series of calculations that involved **rational numbers**.

Conclusions

We obtained the best location for the solar plant from the **available information**. Other variables could affect the production and distribution of energy from each of these solar plants.

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