

Date

Name

1. Compare the length of the longest day of the year in Estonia and Brazil.

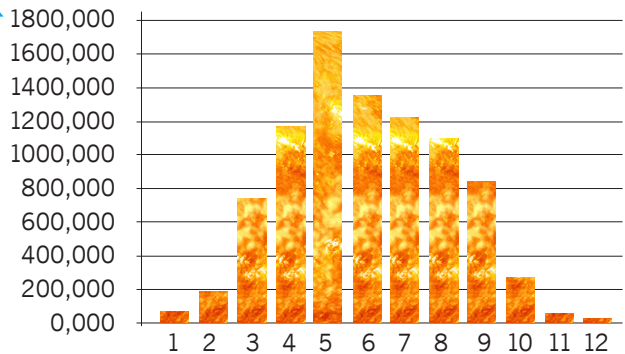
2. Why does a solar panel in Brazil still produce more electricity than a solar panel of the same capacity in Estonia?

3. How can one increase the panel's output capacity?

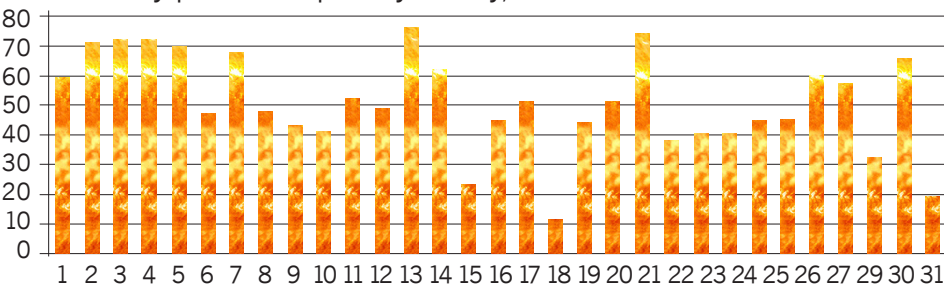
4. What was the sunniest month in 2016?

5. Why does the plant produce so little electricity in the winter months?

Electricity production of a 12 kW-solar power plant located in southern Estonia in 2016 per month

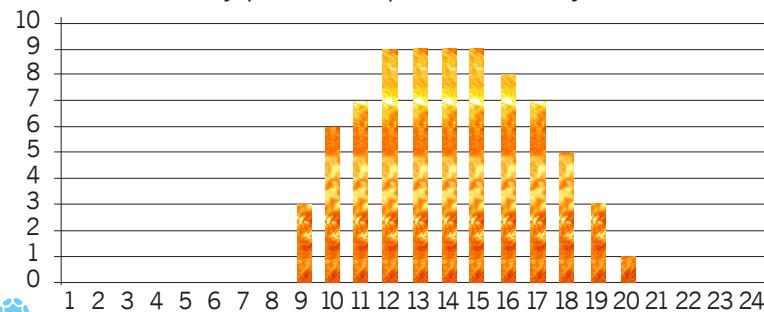


Electricity production per day in May, 2016



6. Why does the plant produce different amounts of electricity on different days?

Maximum daily production per hour in May



Which part of Estonia has the largest number of sunny days?

How many hours is it sunny in a year on average in your home country?

How to produce electricity when there is no sunlight?

7. Why does the station not achieve its full capacity (12 kW)?



1. How much electricity does a wind generator generate in 1 minute when the wind speed is:

3 m/s	
5 m/s	
6 m/s	
8 m/s	

2. Find the weather station nearest to your home from the weather service website. The station must measure and save wind speed.

3. In that weather station, what is:

the yearly average wind speed

the average wind speed

in the windiest month

the maximum wind speed

4. Why can this data not be used to calculate the productivity of a wind power plant to be built?

5. Which Estonian areas are the windiest?

6. Is it true that there are more windy days in Estonia in the months when there is less sunlight?

7. What causes wind? Could we run out of wind?

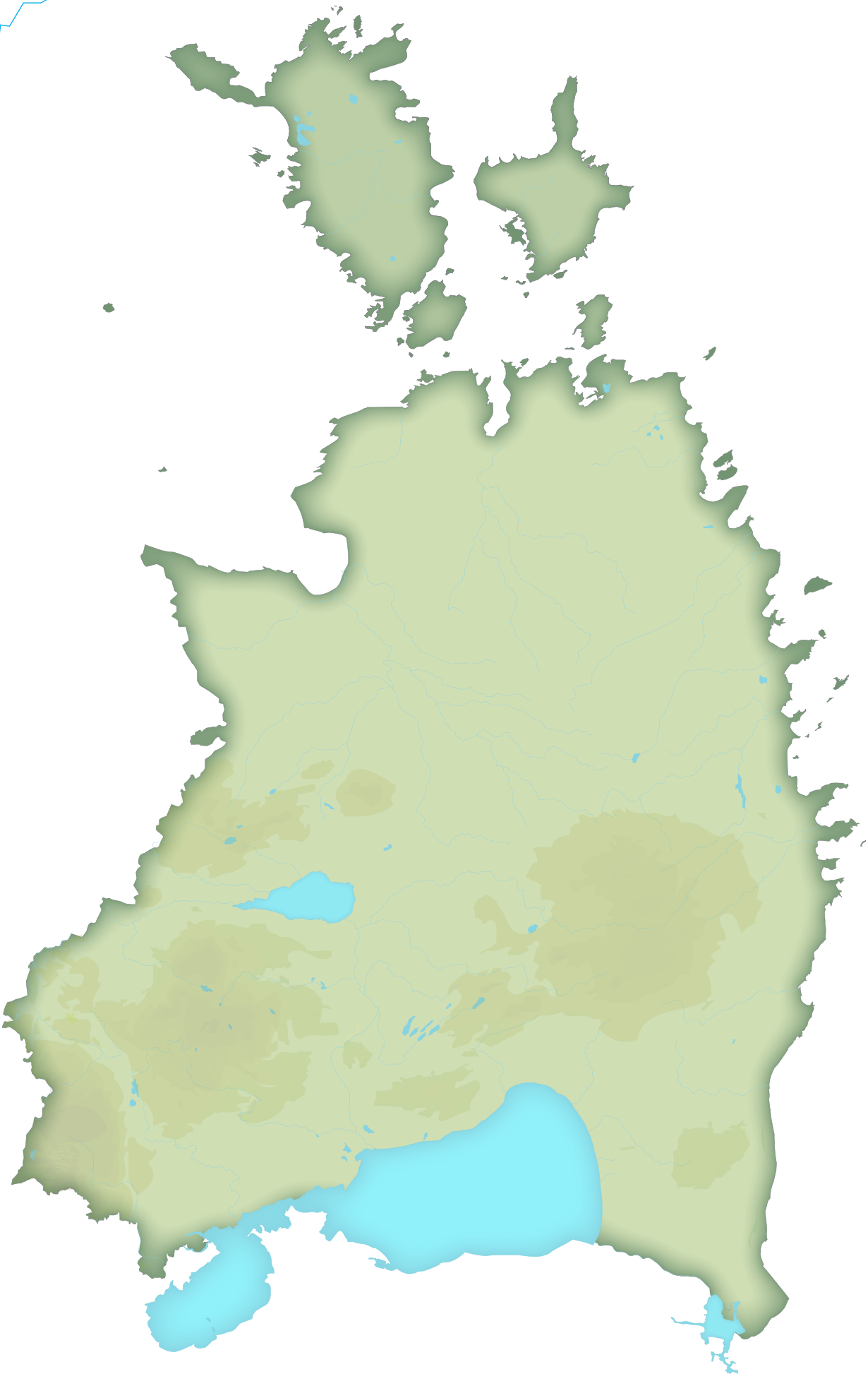


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Plan your own wind farm and solar power plant!

Using the Estonian wind atlas and sunshine map, select the suitable areas for your stations. Mark them on the map.



Provide reasons for your choice!

• What are the prevailing winds in Estonia, according to the wind atlas?



• Discuss the topic of renewable energy!

ADVANTAGES


DISADVANTAGES

Usage opportunities in Estonia



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 Draw a scheme of a pumping station

How many rotations will it take to fill the upper tank?
One hand pump rotation pumps 0.25 litres of water.

How much time did it take?

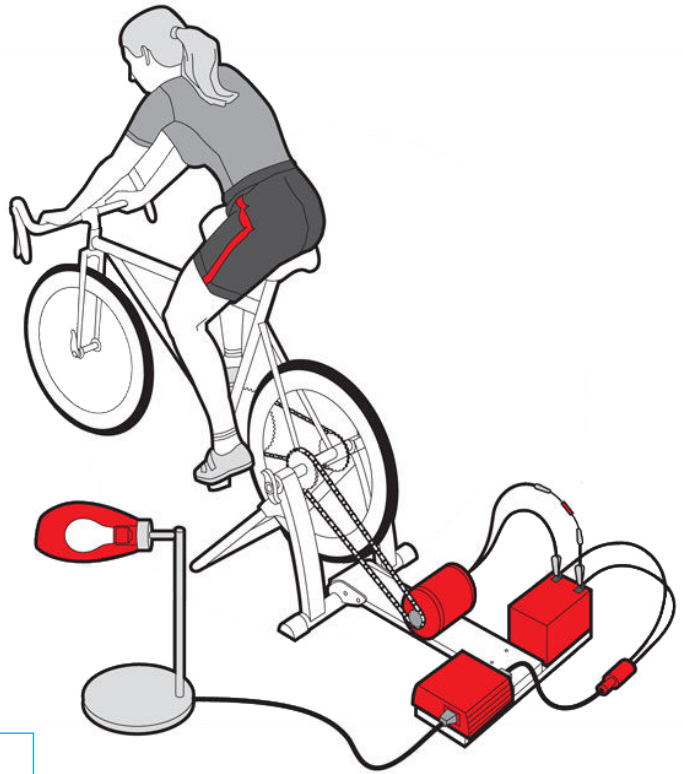
What was your average capacity for pumping water?

How much energy has been stored in the tank for producing electricity if 3.7 m^3 of water must be pumped to a height of 100 m to produce 1 kWh?

How many phone batteries could be charged with the water pumped to the tank? The average phone charger has a capacity of 4 W, and it takes an average of 2 hours to charge a phone battery.



It is possible to charge a flashlight battery with a built-in manual generator. The parameters of the flashlight battery are: capacity 40 mAh, rated voltage 3.7 V, charging voltage 4.2 V, charging current 17 mA. The generator can generate a charge current of 30 mA.



How much energy is stored in a full battery?
 The calculation formula is energy (Wh) = capacity (mAh) × nominal voltage (V) / 1,000

Convert the result to joules. $1 \text{ J} = 1 \text{ W} \times 1 \text{ s}$

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How long does it take for the flashlight battery to fully charge under ideal conditions? Time = capacity / charging current

The actual losses in charging amount to about 20%. How long would it actually take?

Would this small manual generator also be suitable for charging your mobile phone battery? Suppose the voltage used is suitable for the mobile battery; how long would it take to fully charge an average modern cell phone? The average capacity is 2,000 mAh.

You charged your battery at home and now, you are going on a hike. How long can you use the flashlight before the battery is completely empty? LEDs consume 20 mA. Working time = capacity / amperage.

