

“SWITCH COAL”

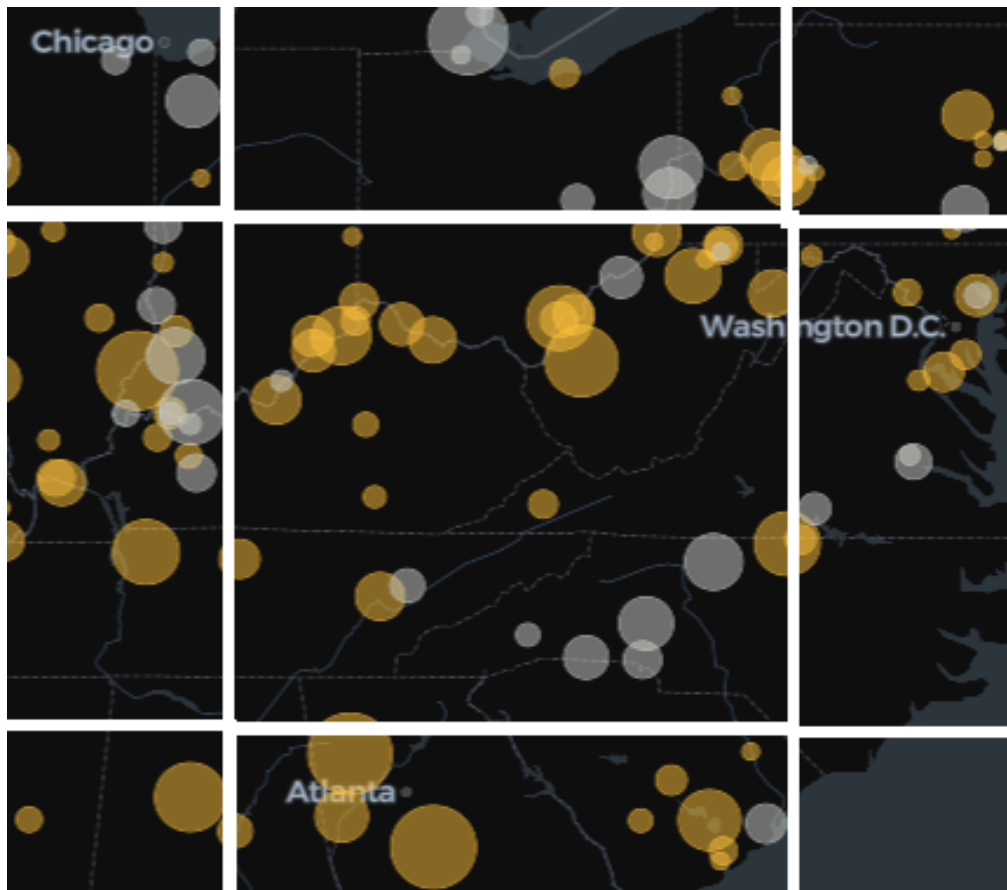
Short description

1) Find a coal plant

<https://www.carbonbrief.org/mapped-worlds-coal-power-plants/>

This website **lists all coal plants** of the world. Find a coal plant in your country by navigating the global map to your country. You can zoom in to see the cities:

(set to year 2019 in the legend box at the left)



If you click on the circle, you will get the BASIC DATA for the coal plant, note down the name of the coal plant you choose.

Now open the webpage www.ZeroEmissionThinkTank.com and go to the switch coal **input mask** <https://zeroemissionthinktank.com/switch-coal-help-us-save-the-planet/>

Scroll down to find the coal plant you chose to research:

1: Select a Coal Plant

Choose a Country, a Province, a Coal Plant and a Location.

Select Country *
United States

Select Province *
West Virginia

Select Plant *
Mount Storm power station

Select Location *
Mount Storm

Latitude & Longitude Position *
39.2005306,-79.2647222

Copy to clipboard

2) Find solar resources

Now start the **global solar map** published by the World Bank www.globalsolaratlas.info

You can now copy the coordinates (arrow "Copy to clipboard") into the search field of the Solar map and click enter.

Write down the 'specific photovoltaic power output' which is the blue data point in the legend (in kWh/kWp), see blue arrow below.

In the example below it is **1401 kWh/kWp**:

The screenshot shows the Global Solar Atlas interface. On the left is a topographic map of West Virginia with a red location pin. On the right is a sidebar titled 'West Virginia' with a 'SITE INFO' section. A table in the 'Map data' section lists various solar resource metrics. The 'specific photovoltaic power output' row is highlighted in blue, with a blue arrow pointing to the value '1401.1 kWh/kWp'. A red box highlights the 'specific photovoltaic power output' column header and the '1401.1' value. A blue arrow also points from the 'Copy to clipboard' button in the first image to the '1401.1' value in the table.

Map data		Per year
specific photovoltaic power output	PVOUT specific	1401.1 kWh/kWp
Direct normal irradiation	DNI	1440.1 kWh/m ²
Global horizontal irradiation	GHI	1449.3 kWh/m ²
Diffuse horizontal irradiation	DIF	625.6 kWh/m ²
Global tilted irradiation at optimum angle	GTI opta	1659.1 kWh/m ²
Optimum tilt of PV modules	OPTA	33 / 180 °
Air temperature	TEMP	7.9 °C
Terrain elevation	ELE	1034 m

Now enter this blue value ("1401") into the **input mask**:
Upload a screenshot (the yellow picture with the results), so we can verify your results by color.

2: Find the Sun

Copy Latitude & Longitude Position to Clipboard>

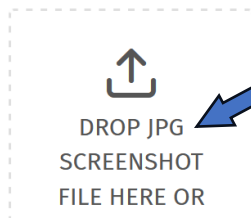
GlobalSolarAtlas.info

Enter Solar kWh / kWp *

1401

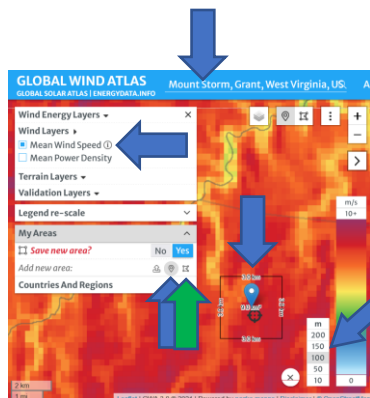
Solar kWh/kWp at site / enter numerical value without unit

Upload Screenshot from GlobalSolarAtlas *



3) Find wind resources

Now start the **global wind map** published by the World Bank www.globalwindatlas.info

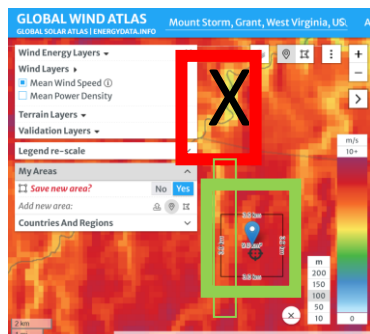


Copy the coordinates of the coal plant into the search field of the Wind map (“Copy to clipboard”), same as above for solar, and click enter.

Click on “Mean Wind Speed” and set the tower height of the wind mills to 150m.

Now, with the cursor, open up a square of approx.. 10km x 10km near the coal plant (right green arrow) or (easier) go for the default 3km x 3km (left blue arrow). Find the highest wind speed for such a 10km x 10km square (1).

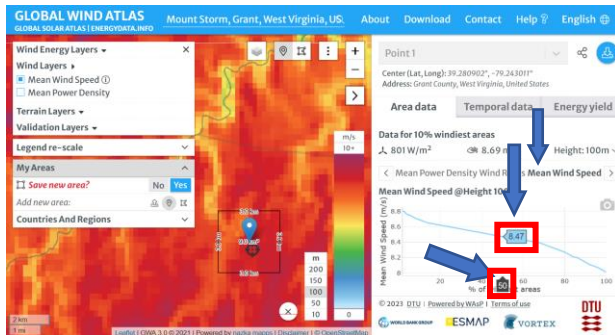
Note: Especially for larger coal plants it would be good to pick a larger square. A detailed description for the procedure is given here, if you have time for it. The results will be more accurate: https://zeroemissionthinktank.com/news/02_switch_coal_2023_instruction.pdf



Note: You may want to select a representative wind speed for the square (green box) and not a much lower wind speed (red box with the X).

Note: it would be good to find a 10km x 10km square close to the coal plant, however good wind speed is more important, so you can search within 100km around a coal plant.

Click on “Mean Wind Speed” on the right half of the screen (upper blue arrow). Adjust the wind speed with the cursor to 50% and note down the wind speed value (8.47m/s in the example):



Go back to the **input mask** and enter the wind speed (8.47m/s). Also upload a screenshot with the square chosen, so we can verify your results by color:

3: Find the Wind

Copy Latitude & Longitude Position to Clipboard>

GlobalWindAtlas.info

Enter Wind Speed *

Wind m/s (150m) at site / enter numerical value without unit

Upload Screenshot from GlobalWindAtlas *

↑
DROP JPG
SCREENSHOT
FILE HERE OR

RESULTS

Site: Mt. Storm, West Virginia, USA

Sun: 1401 kWh / kWp

Wind: 8.47 m/s

That`s all for you!

Thank you so much for helping out with your research. We could not do this solutions study

without you!

With your help, ZETT can now run the economics for each coal plant in the world, based on Bloomberg economic data. We can now find out if it is cheaper to switch to wind-solar-battery systems with 100% renewable energy. We will publish the results in a study on our ZETT webpage later this year.

TAKE HOME MESSAGE: The KEY QUESTION is, is it cheaper?!

If the answer is YES, it is a **no brainer** to act on climate now, because it's cheaper! Money rules the world. No excuses left.

YOUR NAME

You can also enter your name and email, as well as the name you want us to use for the publication. The name for publication can be your own name, but it can also be a phantasy name like "Zebra 35", if you do not want to be named. It is your choice which name to use for the publication.

Note: Your email will only be used to send you periodic updates like our ZETT newsletter, if you choose this option in the menu.

- (1) Note (just for your knowledge): A modern windmill has a rating of 7.5 MW with a 175m rotor diameter ("D"). If we wanted to build a 500 MW wind farm, we need approx.. 66 windmills ($500 \text{ MW} / 7.5 \text{ MW} = 66$). A typical layout for a wind farm is designed with a distance between the windmills of 1.5 D if the wind mostly comes out of one direction (in cross winds / $1.5 \times 175\text{m} = 267.5\text{m}$) and 10 D in the main wind direction ($10 \times 175\text{m} = 1750\text{m}$). If we now take a 6km x 6km square, it is enough for 3 rows ($6000\text{m} / 1750\text{m} = 3$), each with 22 turbines ($6000\text{m} / 267.5\text{m} = 22$). Therefore 3 rows with 22 windmills each gives the 66 windmills needed ($3 \times 22 = 66$). However, not all the space is typically usable, or the windrose may require a different spacing between the windmills, e.g. a 3D x 5D layout, which is why we prudently assume a larger area with 10km x 10km.