



A Sustainable Home

STEM4inclusive schools
WP2



Inovatif ve Girişimci Toplum Derneği
Hüseyin Gürel
President of NGO

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Structure of the activity

A Introduction

about the topic

Sustainability, Renewable Energy, Green Thinking, Clean Energy, Responsible Consumption, Use of Energy3d simulation program.

B Training phase

about the training

Designing a house using renewable energy sources such as solar energy and using the Energy3d simulation program.





Structure of the activity

Objective:

This STEM activity aims to gain a deeper understanding of the benefits offered by renewable energy sources and to raise awareness about sustainability. It also includes developing knowledge and skills on ways to use renewable energy sources such as solar energy and responsible consumption. The activity is structured according to the engineering design process model. The activity includes designing a house/city using solar energy through digital simulation tools such as energy3d.

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Structure of the activity

Energy3d simulation program, laptop / PC computer,

Materials / Supplies:

Additional Materials: Worksheet, colored pencils, ruler, various materials for the house model.

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A: About the topic

A Sustainable Home

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Definition!



What is Renewable Energy?

Renewable energy is energy from natural resources that are renewed at a higher rate than they are consumed. For example, sunlight and wind are constantly being renewed. Renewable energy sources are abundant and everywhere. Renewable energy from abundant and constantly being renewed natural resources is the key to a safer, cleaner and more sustainable world. (United Nations).

<https://www.un.org/en/climatechange/what-is-renewable-energy>

<https://www.un.org/en/climatechange/raising-ambition/renewable-energy>





Some videos about Renewable Energy:



Designed by ChatGPT.

Please watch!



<https://www.youtube.com/watch?v=1kUE0BZtTRc>



<https://www.youtube.com/watch?v=44Wp3WE1AHs>

And more videos on Youtube or other channels.





What are Renewable Energy Sources?

Solar Energy

Bioenergy

Geothermal Energy

Wind Energy

Hydroelectricity

Ocean Energy

Hydrogen Energy

For More;

- https://energy.ec.europa.eu/topics/renewable-energy_en



https://www.youtube.com/watch?v=Giek094C_I4



<https://www.youtube.com/watch?v=VfowJHJz6-s>





Examples of Use of Solar Energy :

Solar energy is used in many areas. Some of these are;

Electricity generation,

Solar cells and generators,

Solar powered ventilation,

Solar heating

And many more areas.

Please see for more details!



<https://www.youtube.com/watch?v=xJe2u2jJq8>

<https://freedomssolarpower.com/blog/51-uses-of-solar-energy>



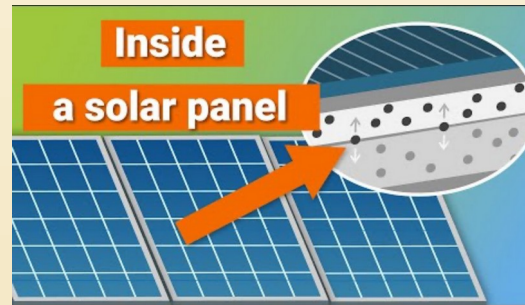
From Solar Energy to Electrical Energy:



Designed by ChatGPT.

Thanks to solar energy technologies, it is possible to convert sunlight into electrical energy. Its use is becoming more widespread and is considered clean energy.

For more:



<https://www.youtube.com/watch?v=g4AJgh552v8>



<https://www.youtube.com/watch?v=Yxt72aDjFgY>





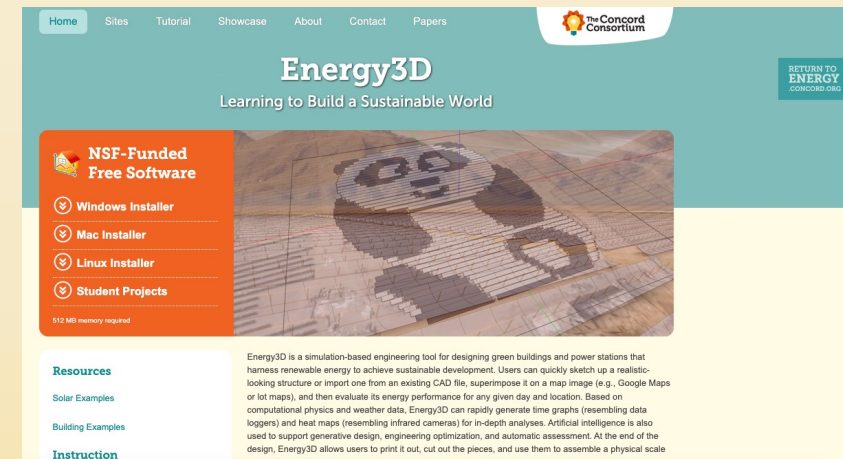
What is the Energy 3D simulator?

The free and open-source Energy3D program is a simulation-based engineering tool for designing green buildings and power plants in 3D that use renewable energy to achieve sustainable development.

In addition, the tool records and analyzes user actions in real time, and calculates and evaluates design artifacts using data mining, artificial intelligence, and computational physics principles.

More information about the Energy3d simulator and its use can be found on this website :

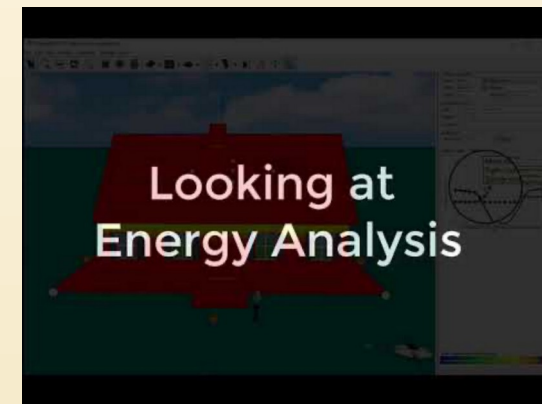
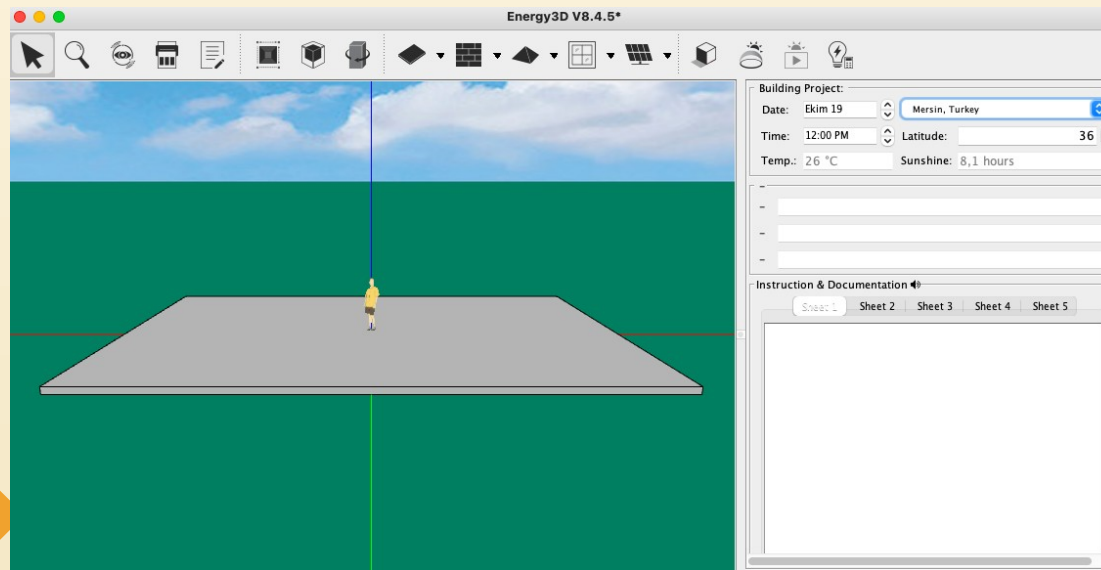
<https://energy.concord.org/energy3d/>





How to use the Energy3D program?

More information on using the program:

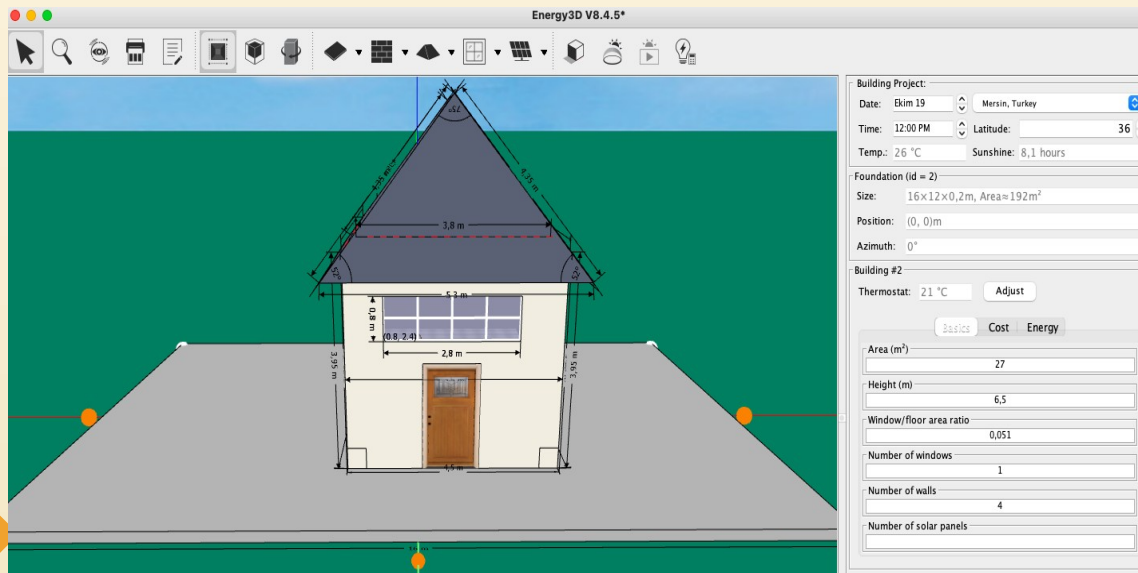


<https://www.youtube.com/watch?app=desktop&v=g8TFZqu7H84>





First home design with Energy3D : Please look!



<https://www.youtube.com/watch?v=XLGwtGrwfHs>

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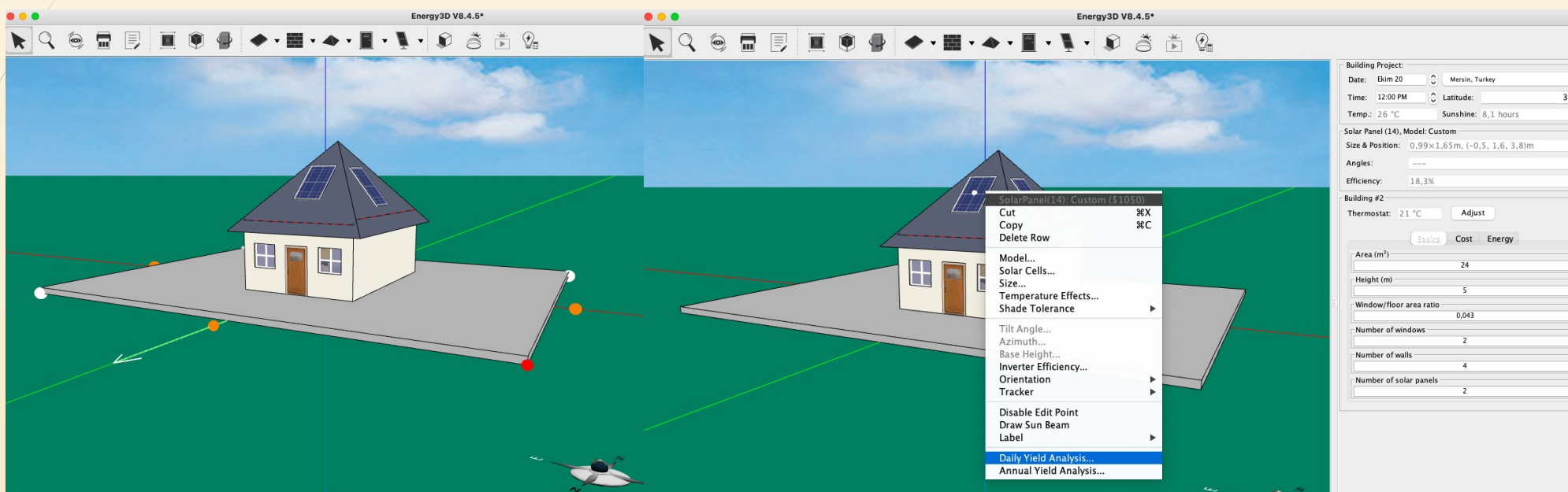


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First solar panel house design and energy efficiency analysis with Energy3D :



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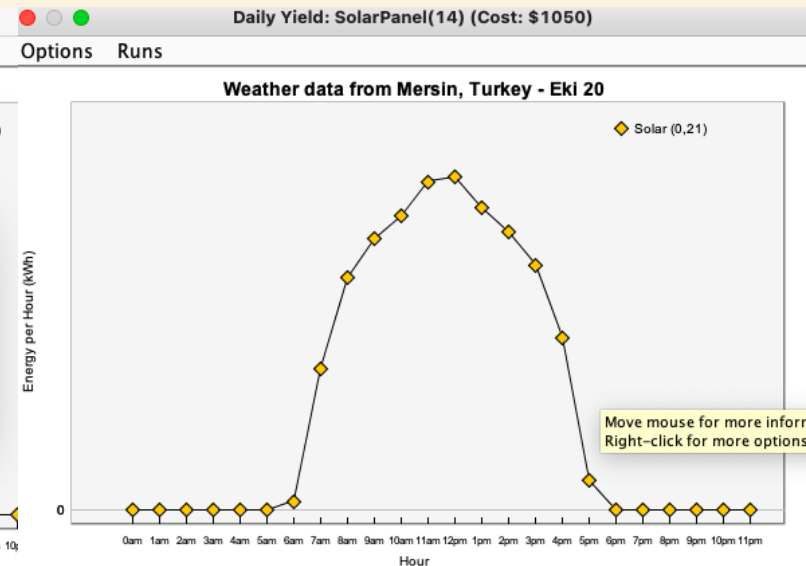
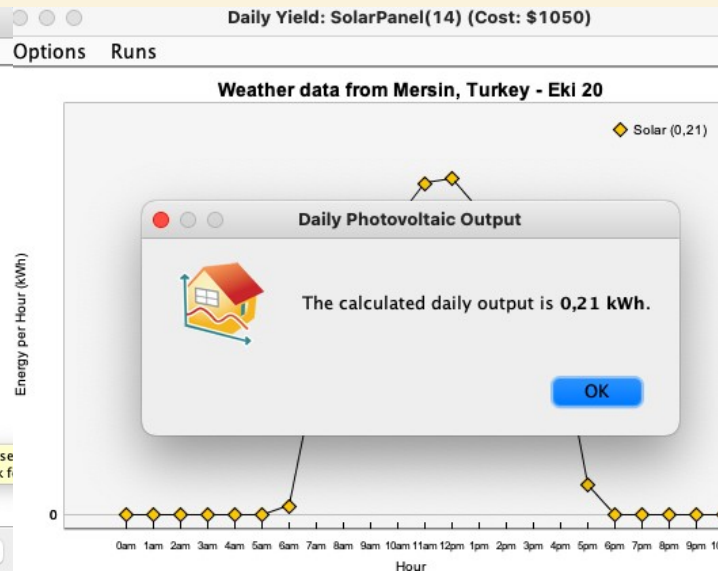
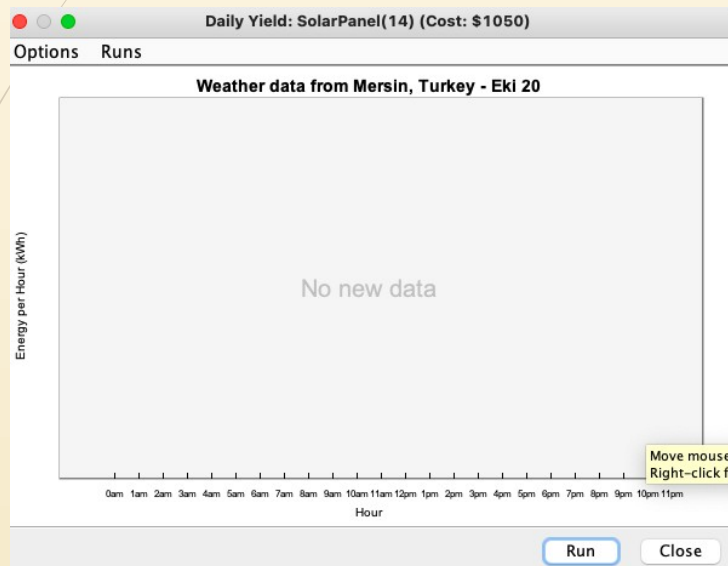


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First solar panel house design and energy efficiency analysis with Energy3D:



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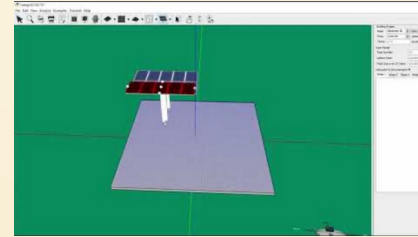


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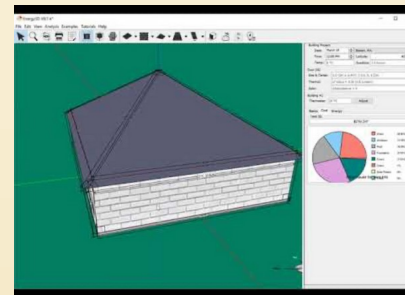


Let's have a look at this
youtube videos on
Energy3d!

More information in the videos



https://www.youtube.com/watch?v=7hfZu_vkqKY



<https://www.youtube.com/watch?v=DbZwWz-aYss>



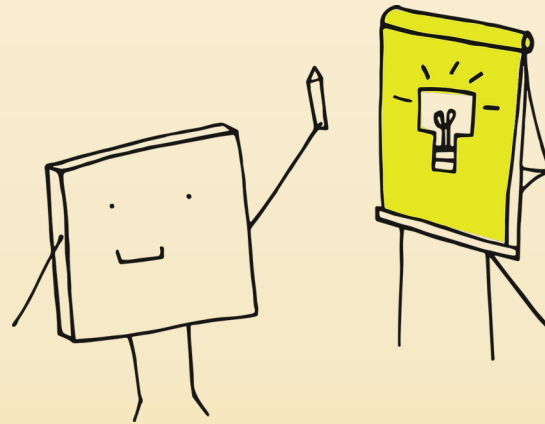
https://www.youtube.com/watch?v=M_DUYRjmjLk



B: About the training



Training phase



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Task / Step 1 – Team Building, Discussing the Problem Scenario and Designing the Plan (80 minutes):

- Work in groups of 2-3-4 people.
- Start the discussion with questions about sustainability, responsible consumption, and renewable energy sources or a problem scenario related to energy consumption in daily life. You have 20 minutes for discussion. After the discussion on the areas of use of renewable energy sources, focus on the production of electricity from solar energy and ways to reduce energy consumption. You have 10 minutes for brainstorming and research.
- Calculate the amount of electricity you consume in your home. As a group, calculate the amount of electricity consumed daily, monthly, and annually. Groups should plan and determine the materials for the design that includes the use of renewable energy to provide the electricity they need. You have 50 minutes for calculation and planning.



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Task / Step 2 – Asking Questions and Investigating the Problem (40 minutes):

- Group leaders guide group members to define the problem of generating electricity from renewable energy sources, thinking sustainably, and reducing energy costs, and group members should ask various critical questions about the problem. You have 20 minutes to discuss the questions and take notes.
- For example;
- What is the problem to be solved?
- What do we want to design?
- What do we want to achieve?
- What are the project requirements?
- What are the limitations? What is our goal?
- Who does the problem affect?
- Do more research to learn all you can about the problem/questions and examine the current status and existing solutions. You have 20 minutes to research from different sources.



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Task / Step 3 – Developing Possible Solutions (40 minutes):



- At this stage, you should develop various solutions to solve the problem as a group. In particular, you should make various suggestions on ways to benefit from solar energy. You have 40 minutes to present and discuss your suggestions.
- The teacher and group leaders should encourage teamwork and building on ideas: Brainstorming ideas and developing as many solutions as possible; Expressing possible solutions in multiple dimensions; Drawing ideas to describe the solution path, etc.



Task / Step 4 – Choosing a Promising Solution (40 minutes):



- Each group should choose the best solution/design.
- As a group, draw a prototype of the solution/design you chose on a poster or on the computer and explain/present it to the other groups.



Task / Step 5 – Build: Building the Prototype (80 minutes):



- As a group, you must create/build the product that represents the solution you designed in a sustainable way (using solar energy for electricity) in the Energy3D program. (It is important to make a house model or prototype to make sure the design works.)



Task / Step 6 – Test Prototype – Evaluate and Redesign as Necessary (80 minutes):



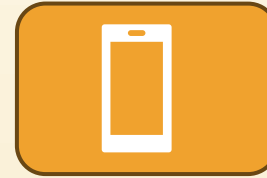
- You should test the solar energy home prototype that you created in the Energy3D program and evaluate how well it works and whether it develops a solution for the need (It should be evaluated in terms of cost to be spent on solar panels and energy efficiency).
- In addition, during the test or as a result of the evaluation, you should talk about what worked and what did not work; you should communicate the results to other groups and get feedback.
- You should decide whether your design is the best possible design and optimize the solution. If you do not have a perfect solution to the problem, you should go back to step one, redesign the parts that do not work and test again.





Task / Step 7 – Presentation and Evaluation (20 minutes):

- Groups should present their designs/solutions to other groups (you can create a physical house model with real materials) and share them with them.
- You can brainstorm ideas that include the use of all the designs developed with other groups on a larger scale. (For example, you can discuss various ideas for a street, factory, school or city.)
- You should take a short quiz/survey to evaluate the information gained during the activity.



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H5P- Task 1: About renewable energy

Renewable energy is energy obtained from natural resources that are renewed at a higher rate than they are consumed.

☐ True

☐ False

☒ Submit

H5P Reuse

I am confused

-25-



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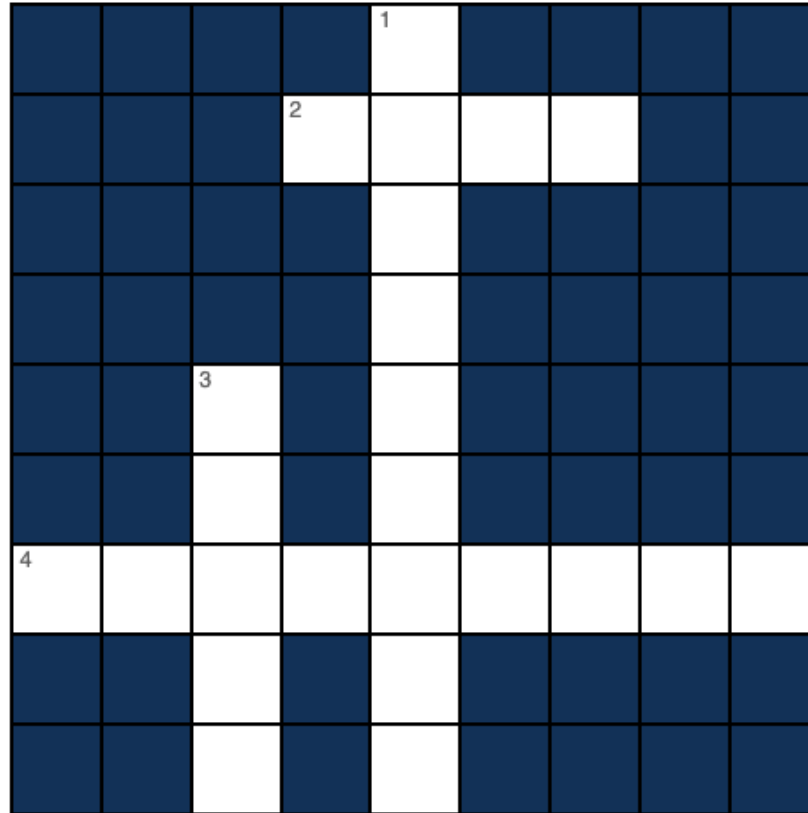


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H5P – Task 2: Types of renewable energy

Find the correct names related to renewable energy sources.



Across

2 It is a form of renewable energy that produces electricity by harnessing the power of the wind. (4)

4 It is a material in which solar energy is stored. (9)

Down

1 It is a form of renewable energy derived from recently living organic matter that can be used to produce transportation fuels, heat, electricity, and products. (9)

3 It is the energy that can be converted from the sun into heat or electrical energy. (5)

✓ Submit

👁 Show solution

↺ Retry

H5P Reuse

I am confused 🤔

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H5P – Task 3: Solar energy usage areas

Solar is used in many areas. Some of these are; generation, solar and generators, solar powered , solar and many more areas.

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H5P – Task 4: About the Energy3D program

Drag the words into the correct boxes

The free and open-source program is a engineering tool for designing buildings and power plants in 3D that use to achieve . In addition, the tool records and analyzes user actions in , and calculates and evaluates design artifacts using data mining, , and principles.

computational physics

Energy3D

green

artificial intelligence

artificial intelligence

Energy3D

simulation-based

renewable energy

sustainable development

sustainable development

green

computational physics

real time

simulation-based

renewable energy

real time

Submit

H5P Reuse Embed

I am confused

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H5P- Task 5: Evaluation of designs in Energy3D program



Fill in the missing words

I can design new houses with the program.

✓ Check



Question: 1 of 5 questions

H5P

Reuse

Embed

I am confused

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H5P- Task 5: Evaluation of designs in Energy3D program



I can design a house that uses only green energy with the Energy3D program.

☐ True

☐ False

Check



Question: 2 of 5 questions

H5P Reuse <> Embed

I am confused

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H5P- Task 5: Evaluation of designs in Energy3D program



I can only do energy analysis with the Energy3D program.

☐ True ☐ False

[Check](#)

[<](#) [>](#)

Question: 3 of 5 questions

[H5P](#) [Reuse](#) [Embed](#) [I am confused](#)

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H5P- Task 5: Evaluation of designs in Energy3D program



I can do monthly energy analysis with the Energy3D program.

☐ True ☐ False

[Check](#)

[<](#) [>](#)

Question: 4 of 5 questions

[H5P](#) [Reuse](#) [Embed](#) [I am confused](#)

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H5P- Task 5: Evaluation of designs in Energy3D program

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Drag the words into the correct boxes

I can do and energy analysis with the Energy3D program. I can also calculate the spent for solar panels. can be encouraged with the program, which shows me ways to provide the energy I need in ways.

Question: 5 of 5 questions



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CONGRATULATIONS...

You are very environmentalist and green thinker. Therefore, you deserve to live in a greener world!

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