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By The Numbers America Uses Energy

Part 3

This presentation created and updated with the best information available
from the **United States Energy Information Administration** July, 2020

Renewable Energy Resources…

…are energy resources that are replaced by natural processes at a rate comparable to their use.

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Question 1

1. Renewable energy is used to power the following sectors of the American economy. Match each sector of the economy with the percent of renewable energy going to it.

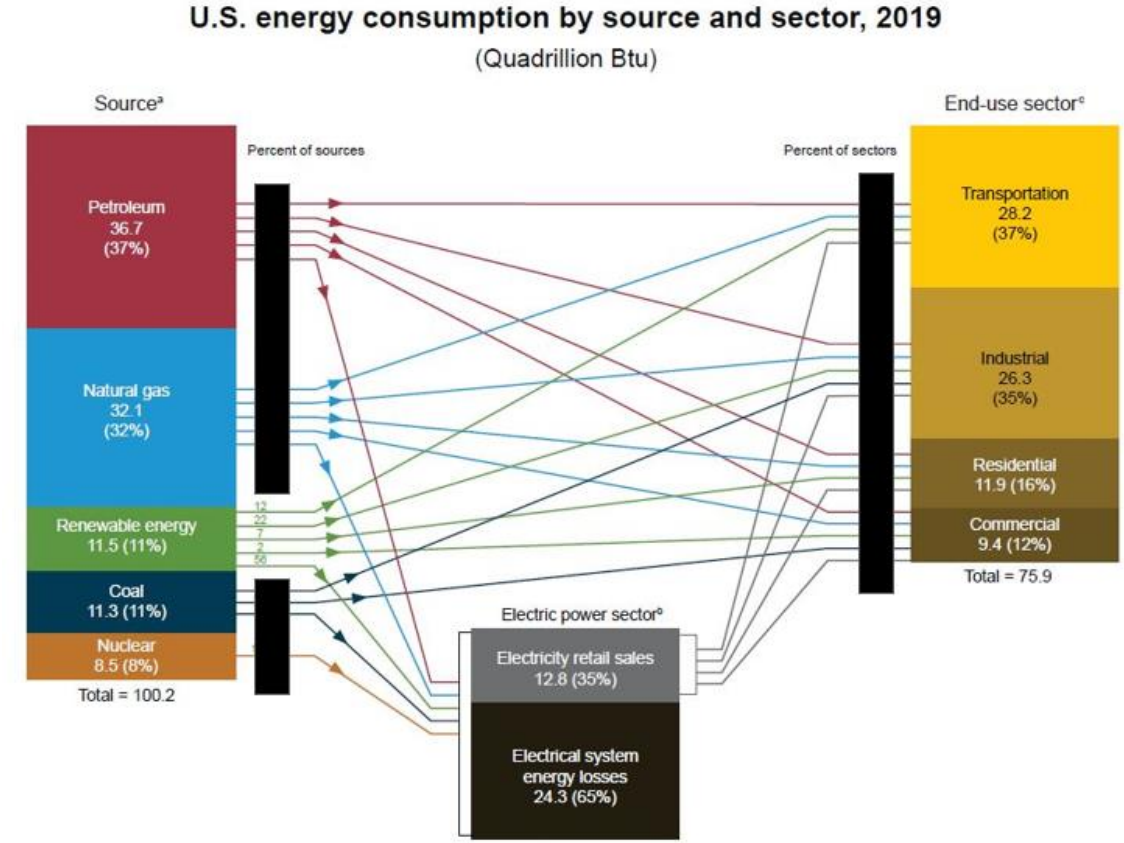
56 %	___	Commercial (a.)
22 %	___	Electric Power (b.)
12 %	___	Industrial (c.)
7 %	___	Residential (d.)
2 %	___	Transportation (e.)

Question 1 Answer 1

1. Renewable energy is used to power the following sectors of the American economy. Match each sector of the economy with the percent of renewable energy going to it.

56 % **Electric Power (b.)**

Renewable Energy Source



Question 1 All Answers

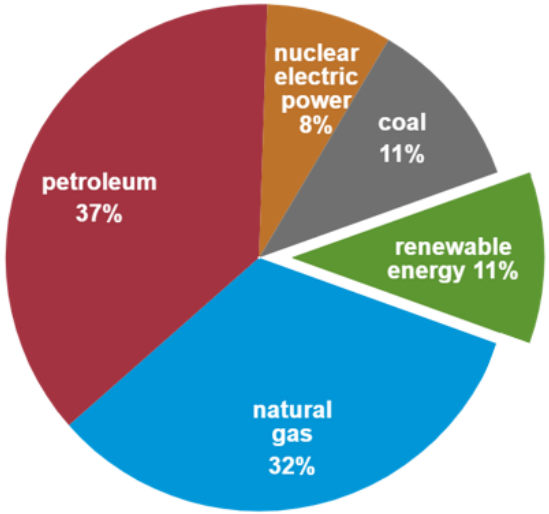
1. Renewable energy is used to power the following sectors of the American economy. Match each sector of the economy with the percent of renewable energy going to it.

56 % Electric Power (b.)
22 % Industrial (c.)
12 % Transportation (e.)
7 % Residential (d.)
2 % Commercial (a.)

Question 2

2. The renewable energy consumed in America is provided by the seven renewable energy resources below. Match each renewable resource to the percentage of energy it provides in the American renewable energy economy.

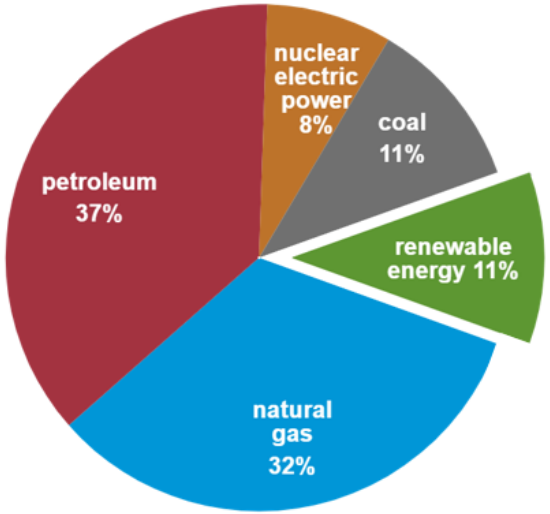
24 %	____	Biofuels (a.)
22 %	____	Biomass waste (b.)
20 %	____	Biomass wood (c.)
20 %	____	Geothermal (d.)
9 %	____	Hydroelectric (e.)
4 %	____	Solar (f.)
2 %	____	Wind (g.)



Question 2 Answer 1

2. The renewable energy consumed in America is provided by the seven renewable energy resources below. Match each renewable resource to the percentage of energy it provides in the American renewable energy economy.

24 % ___ **Wind (g.)**

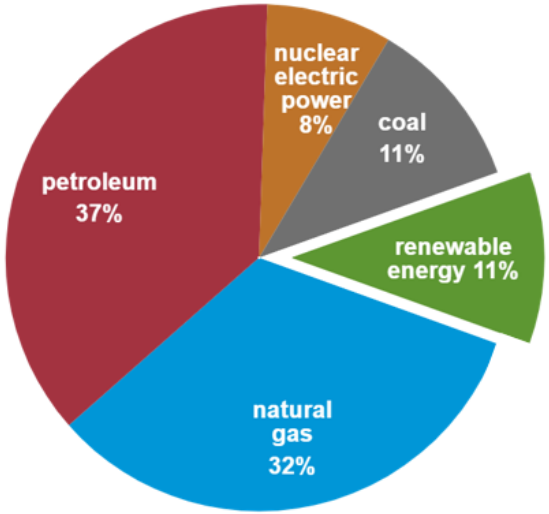


Question 2 Answer 2

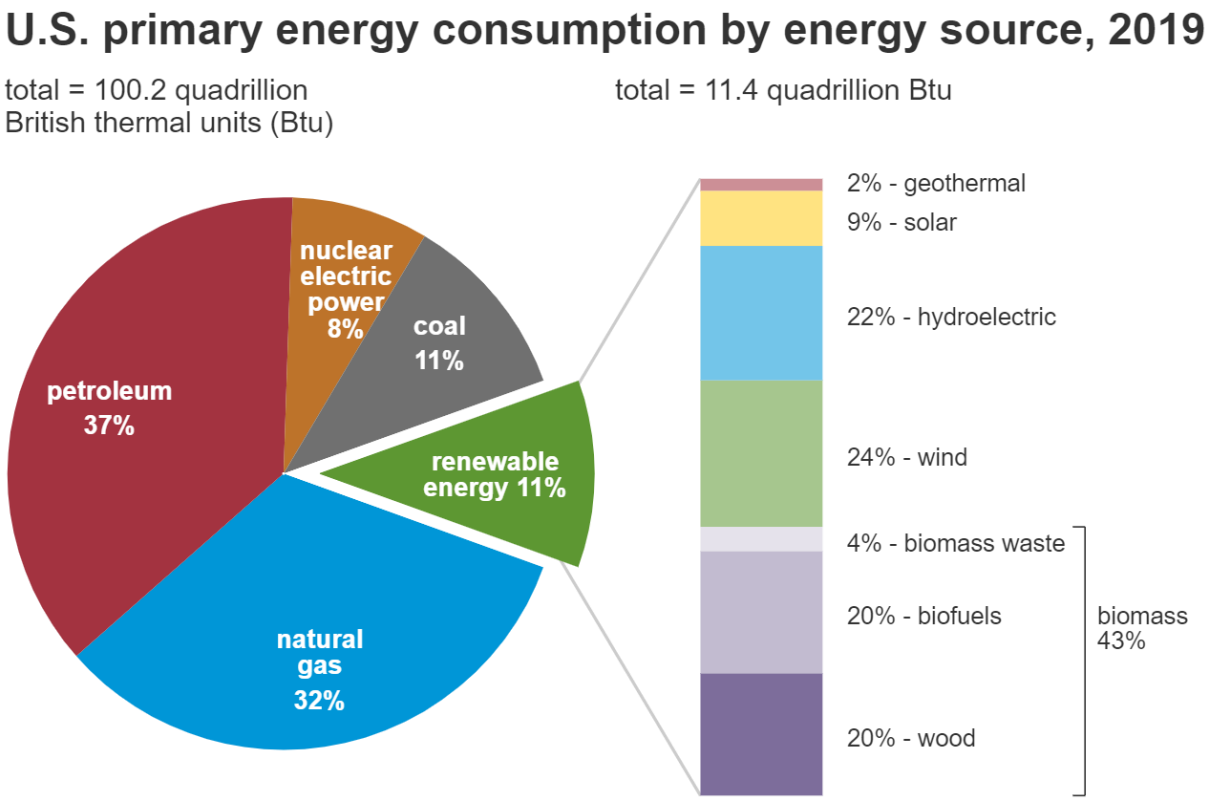
2. The renewable energy consumed in America is provided by the seven renewable energy resources below. Match each renewable resource to the percentage of energy it provides in the American renewable energy economy.

24 % ___ **Wind (g.)**

22 % ___ **Hydroelectric (e.)**



U.S. Primary Energy Consumption by Energy Source, 2019

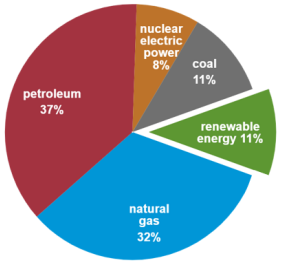


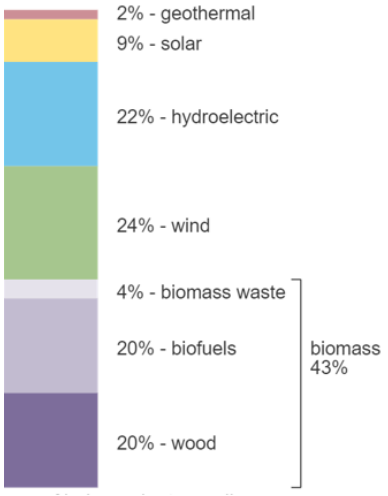
Note: Sum of components may not equal 100% because of independent rounding.
Source: U.S. Energy Information Administration, *Monthly Energy Review*, Table 1.3 and 10.1, April 2020, preliminary data

Question 2 All Answers

2. The renewable energy consumed in America is provided by the seven renewable energy resources below. Match each renewable resource to the percentage of energy it provides in the American renewable energy economy.

24 %	____	**Wind (g.)**
22 %	____	**Hydroelectric (e.)**
20 %	____	**Biomass wood (c.)**
20 %	____	**Biofuels (a.)**
9 %	____	**Solar (f.)**
4 %	____	**Biomass waste (b**
2 %	____	**Geothermal (d.)**





Biomass

Question 3

3. All biomass fuels start with the process of photosynthesis. Plants convert energy from the sun into chemical energy in the form of glucose, a high-energy biomolecule. Glucose is then used by the plants that create it in a variety of ways. That same glucose can also be used to produce biomass fuels. Which equation, below, correctly represents the process of photosynthesis?

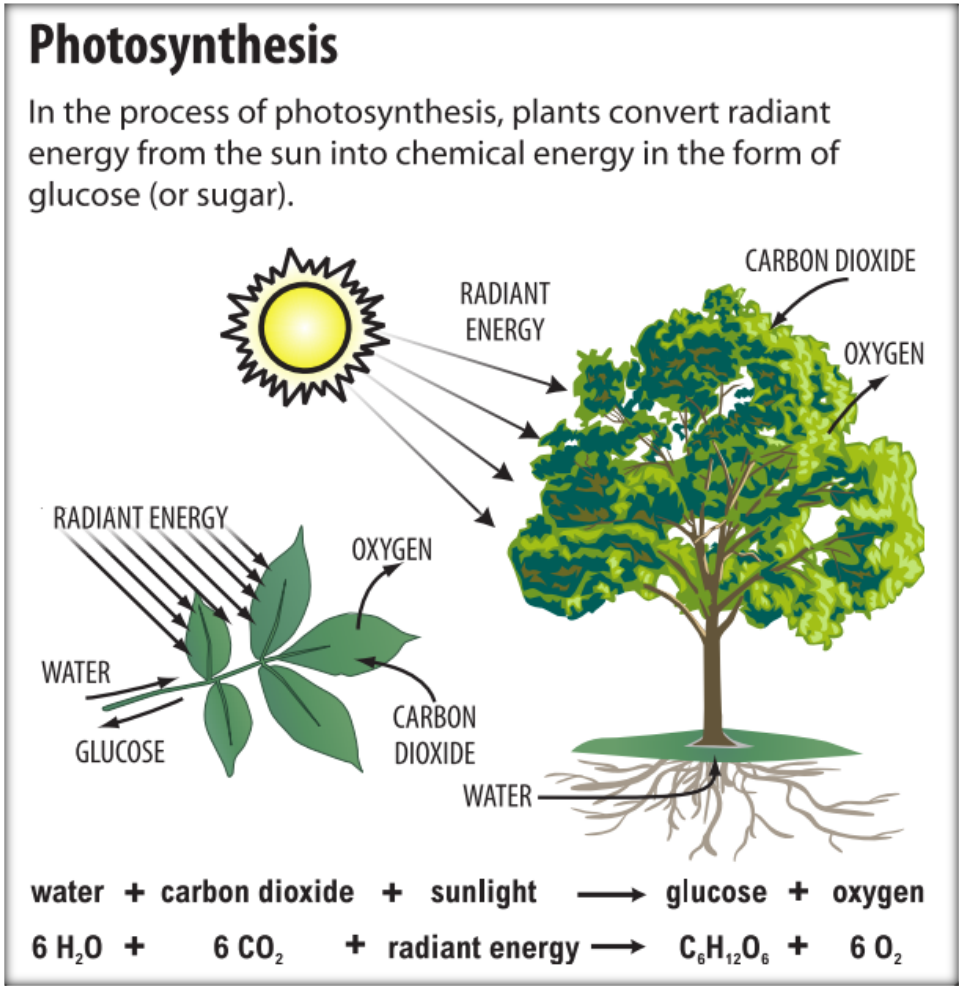
a. $6CO_2 + 6H_2O + \text{radiant energy (sunlight)} \rightarrow C_6H_{12}O_6 + 6O_2$

b. a neutron + U-235 → Ba-140 + Kr-93 + 3 neutrons + energy

c. H-2 + H-3 → He-4 + a neutron + radiant energy (sunlight)

d. $2H_2 + O_2 \rightarrow 2H_2O$

Photosynthesis



Question 3 Answer

3. All biomass fuels start with the process of photosynthesis. Plants convert energy from the sun into chemical energy in the form of glucose, a high-energy biomolecule. Glucose is then used by the plants that create it in a variety of ways. That same glucose can also be used to produce biomass fuels. Which equation, below, correctly represents the process of photosynthesis?

Correct Answer

a. $6CO_2 + 6H_2O + \text{radiant energy (sunlight)} \rightarrow C_6H_{12}O_6 + 6O_2$

Question 4

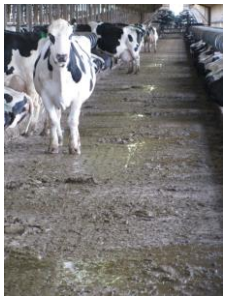
4. In what forms does the United States use biomass to produce renewable energy?

Question 4 Answers

4. In what forms does the United States use biomass to produce renewable energy?

- **Landfill waste**
- **Agricultural crops**
- **Municipal and industrial wastes**
- **Animal wastes**
- **Sewage**
- **Crop and residues**
- **Wood biomass**







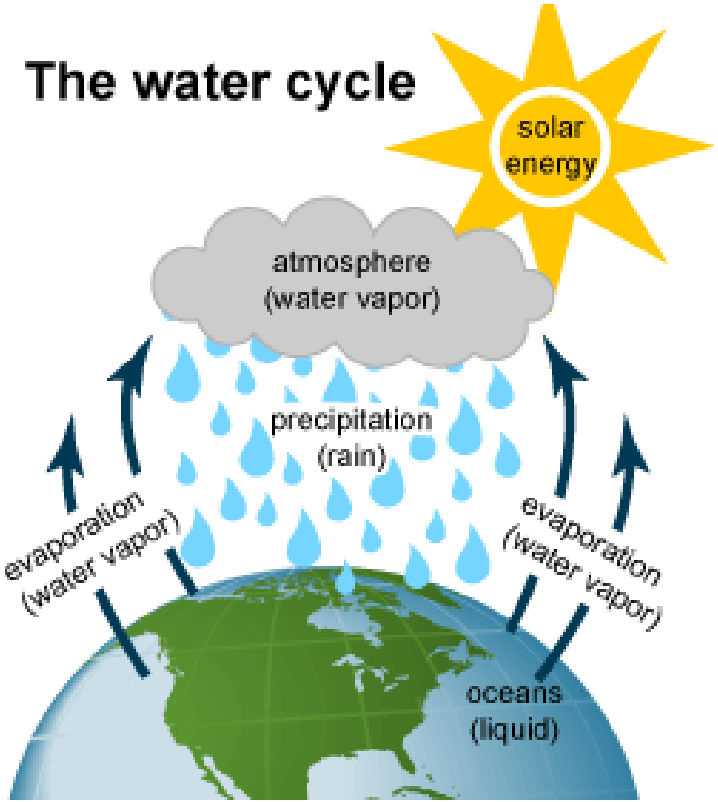
Hydropower

Question 5

5. Which two make hydroelectric renewable power possible?

    a. Wind
    b. Earth revolving around the sun
    c. Sun
    d. Gravity

The water cycle



Question 5 Answers

5. Which two make hydroelectric renewable power possible?

Correct Answers:

c. Sun — evaporating water, raising it into the atmosphere

d. Gravity — pulling precipitation back to the ground

Question 6

6. Rank the following states in order of their hydroelectric renewable energy production.

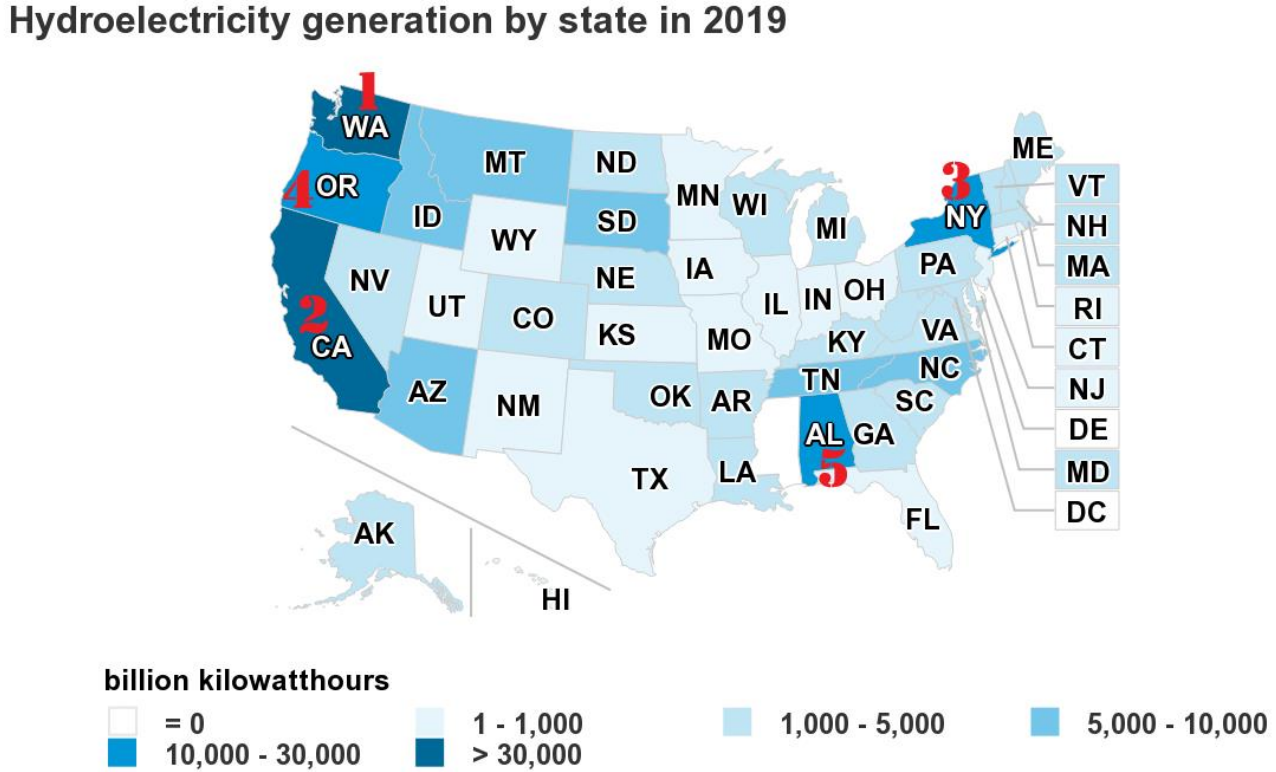
# 1	___	Alabama (a.)
# 2	___	California (b.)
# 3	___	New York (c.)
# 4	___	Oregon (d.)
# 5	___	Washington (e.)

Question 6 Answer 1

6. Rank the following states in order of their hydroelectric renewable energy production.

 # 1 Washington (e.)

Hydroelectricity Generation by State, 2019



Note: Includes utility-scale conventional hydropower.
Source: U.S. Energy Information Administration, *Electric Power Monthly*, Table 1.10.B, February 2019, preliminary data

Question 6 All Answers

6. Rank the following states in order of their hydroelectric renewable energy production.

 # 1 Washington (e.)
 # 2 California (b.)
 # 3 New York (c.)
 # 4 Oregon (d.)
 # 5 Alabama (a.)

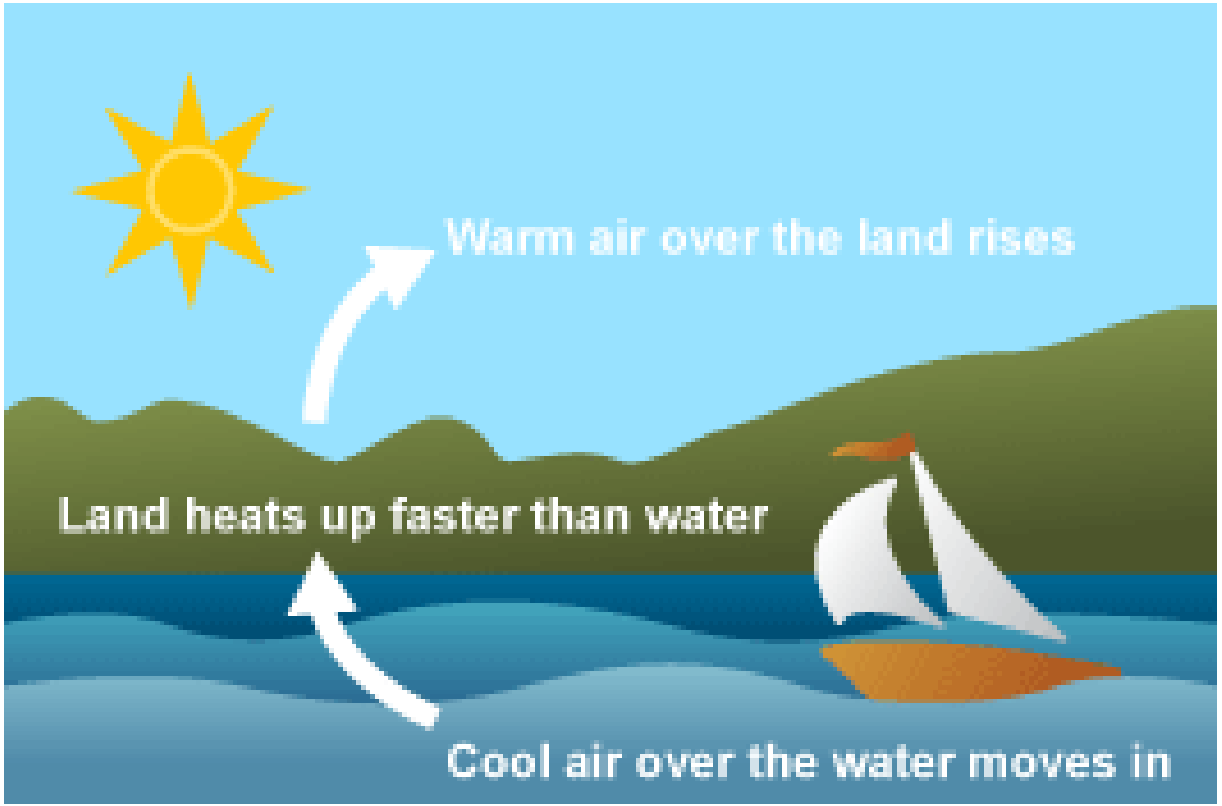
Wind

Question 7

7. What makes wind power possible?

    a. Uneven heating of land and water by sun
    b. Earth spinning on it’s axis
    c. Earth revolving around the sun
    d. Gravity

Wind Cycle


Warm air over the land rises
Land heats up faster than water
Cool air over the water moves in

Question 7 Answer

7. What makes wind power possible?

   a. Uneven heating of land and water by sun
   b. Earth spinning on it’s axis
   c. Earth revolving around the sun
   d. Gravity

Question 8

8. Rank the following states in order of their wind renewable energy production.

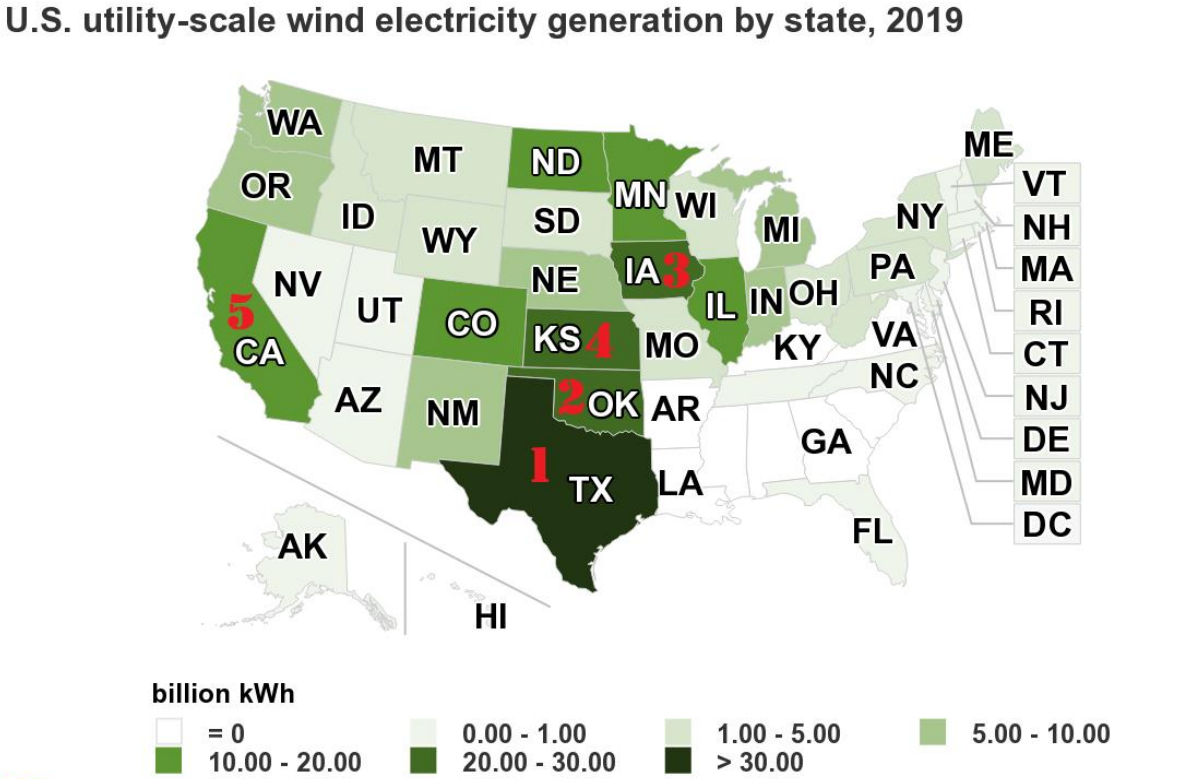
# 1	___	California (a.)
# 2	___	Iowa (b.)
# 3	___	Kansas (c.)
# 4	___	Oklahoma (d.)
# 5	___	Texas (e.)

Question 8 Answer 1

8. Rank the following states in order of their wind renewable energy production.

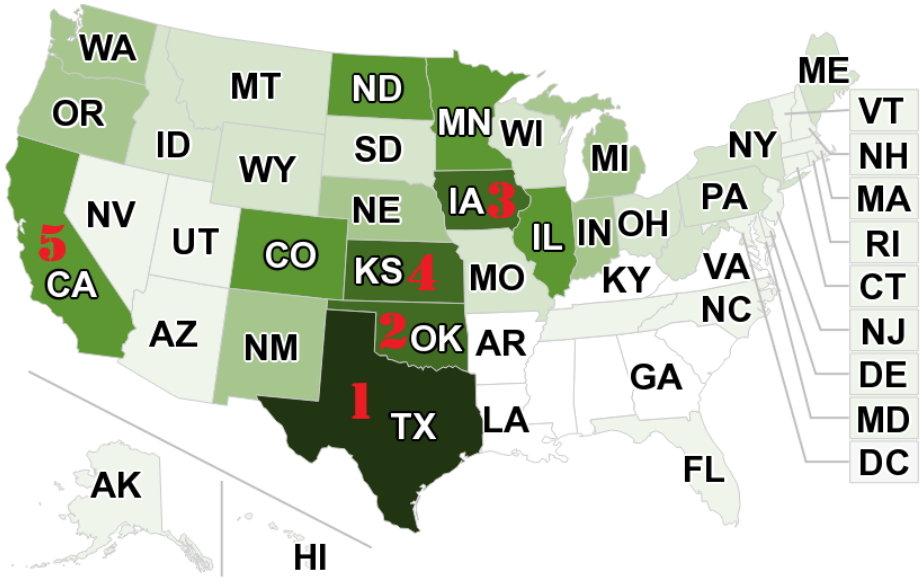
 # 1 Texas (e.)

Wind Electricity Map



Source: U.S. Energy Information Administration, *Electric Power Monthly*, Table 1.14.B, February 2020, preliminary data

Wind Maps


WA
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NM
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LA
WI
IL
MI
IN
OH
KY
TN
MS
AL
GA
FL
SC
NC
VA
WV
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MA
RI
CT
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DC
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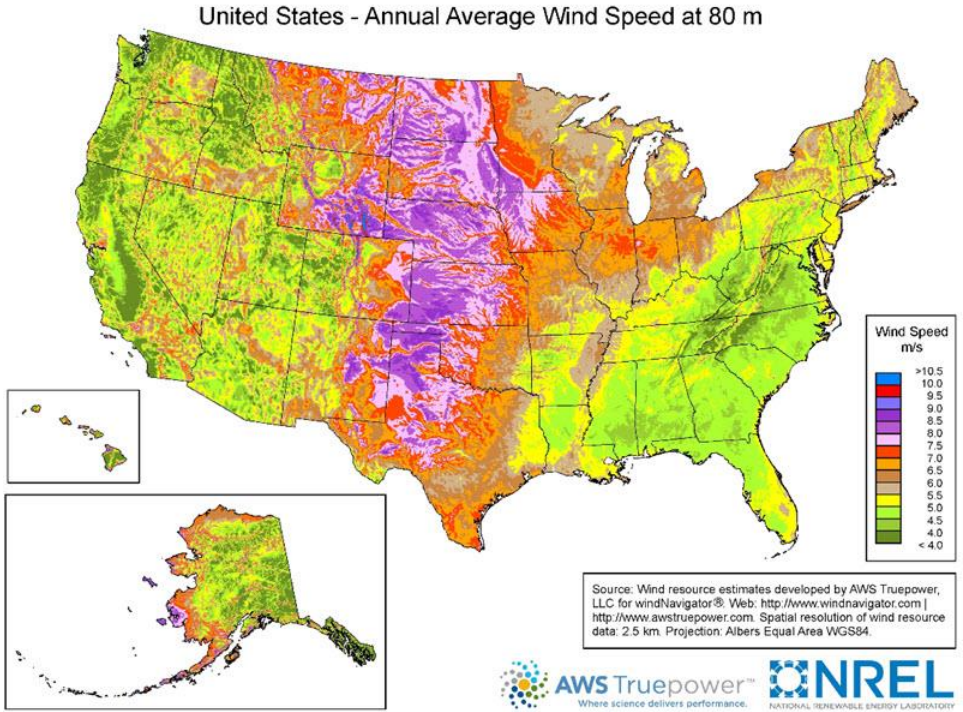

United States - Annual Average Wind Speed at 80 m
Wind Speed m/s
>10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
< 4.0
Source: Wind resource estimates developed by AWS Truepower, LLC for windNavigator®. Web: http://www.windnavigator.com | http://www.awstruepower.com. Spatial resolution of wind resource data: 2.5 km. Projection: Albers Equal Area WGS84.
AWS Truepower
Where science delivers performance.
NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Question 8 All Answers

8. Rank the following states in order of their wind renewable energy production.

 # 1 Texas (e.)
 # 2 Oklahoma (d.)
 # 3 Iowa (b.)
 # 4 Kansas (c.)
 # 5 California (a.)

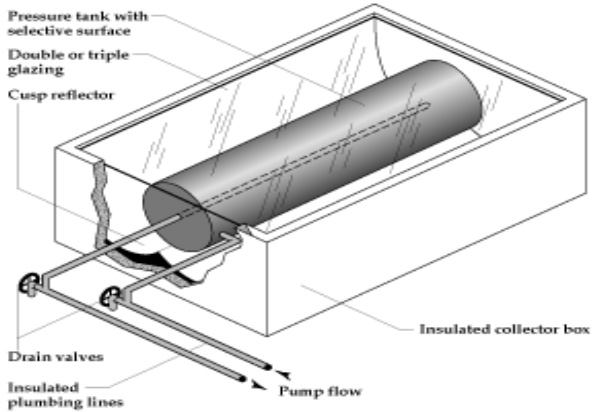
Solar Power

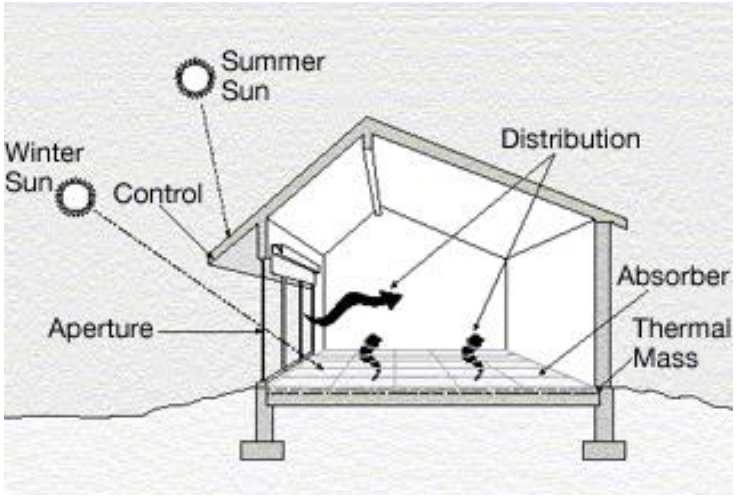
Question 9

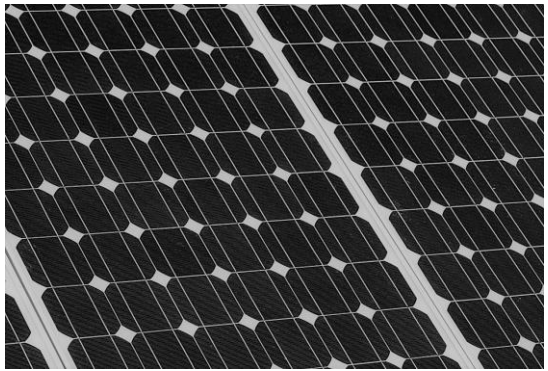
9. Match each type of solar power to its description

Solar PV	___	a.	Sunlight is converted into heat
Solar Thermal	___	b.	Sunlight is converted directly into electricity
Passive Solar	___	c.	Building design features that naturally decrease energy use by taking advantage of: ● the sun ● efficient design features ● energy efficient materials ● natural characteristics of the site

Solar Diagrams



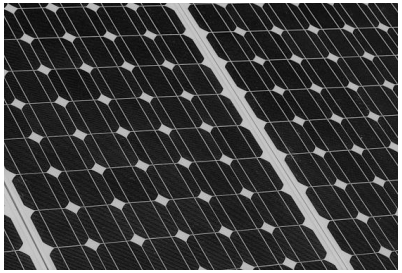


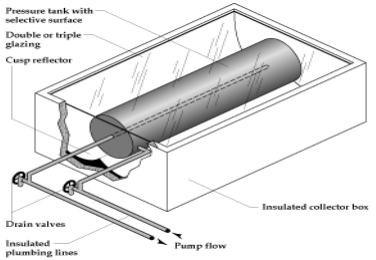


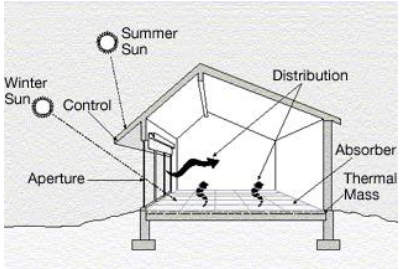
Question 9 Answers

9. Match each type of solar power to its description

Solar PV	**b.**	**Sunlight is converted directly into electricity**
Solar Thermal	**a.**	**Sunlight is converted into heat**
Passive Solar	**c.**	**Building design features that naturally decrease energy use by taking advantage of:** **• the sun** **• efficient design features** **• energy efficient materials** **• natural characteristics of the site**







Question 10

10. Rank the following states in order of their utility-scale solar PV electrical energy production.

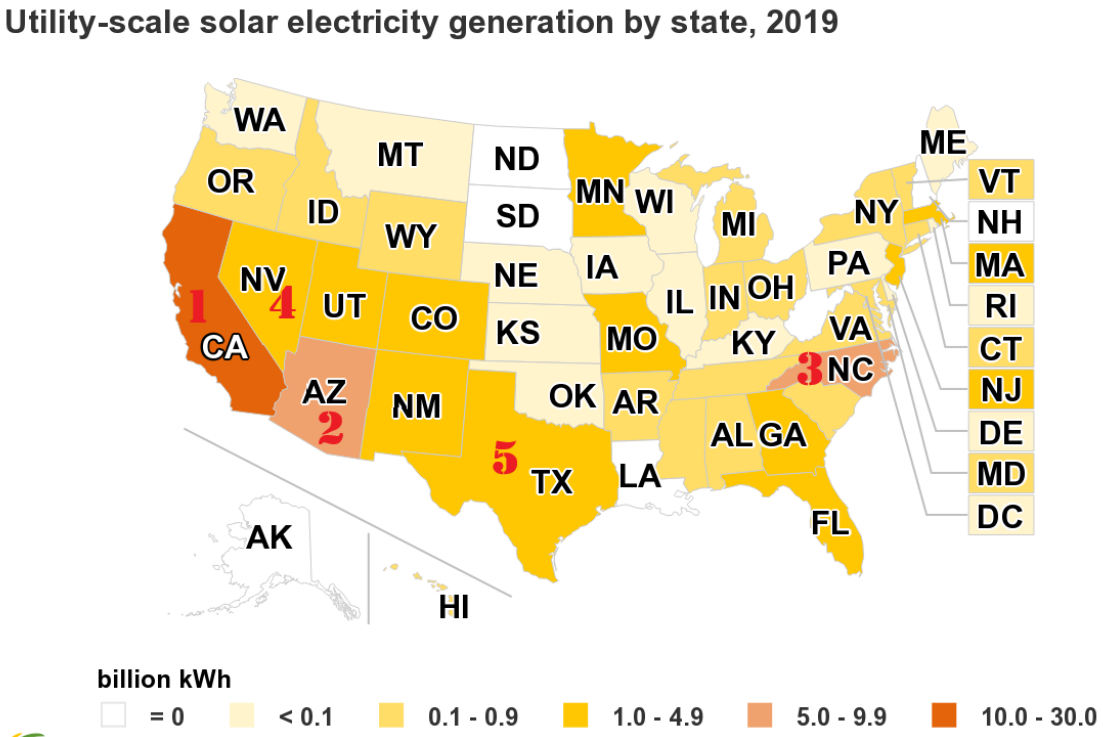
# 1	___	Arizona (a.)
# 2	___	California (b.)
# 3	___	Nevada (c.)
# 4	___	North Carolina (d.)
# 5	___	Texas (e.)

Question 10 Answer 1

10. Rank the following states in order of their utility-scale solar PV electrical energy production.

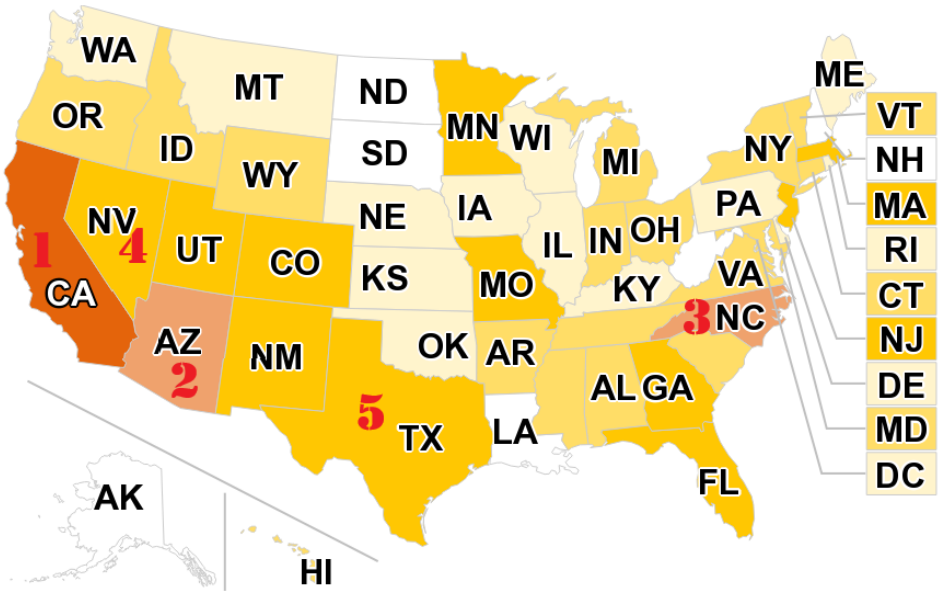
 # 1 California (b.)

Solar Electricity Map



Source: U.S. Energy Information Administration, *Electric Power Monthly*, February 2020, preliminary data

Solar Maps


WA
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OH
KY
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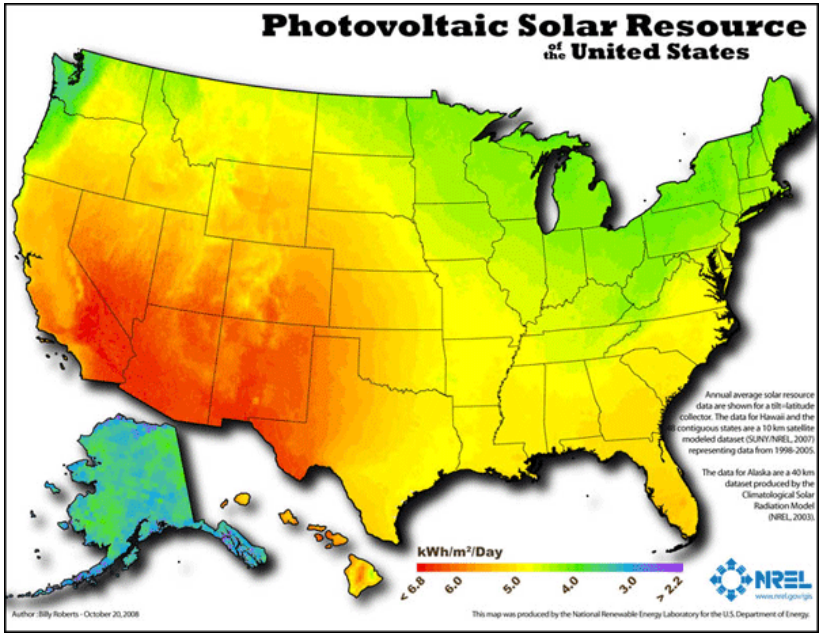

Photovoltaic Solar Resource
of the United States
kWh/m²/Day
< 6.8
6.0
5.0
4.0
3.0
> 2.2
NREL

Question 10 All Answers

10. Rank the following states in order of their utility-scale solar PV electrical energy production.

 # 1 California (b.)
 # 2 Arizona (a.)
 # 3 North Carolina (d.)
 # 4 Nevada (c.)
 # 5 Texas (e.)

Question 11

11. Rank the following states in order of their small-scale solar PV electrical energy production.

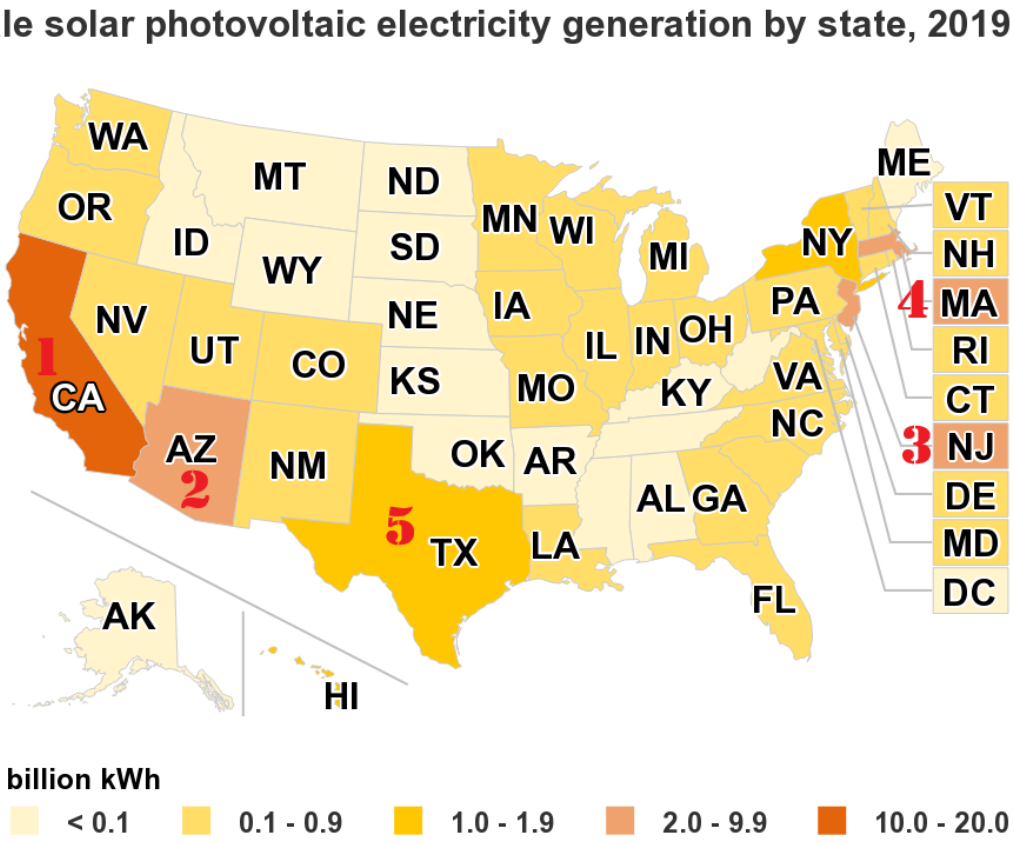
# 1	___	Arizona (a.)
# 2	___	California (b.)
# 3	___	Massachusetts (c.)
# 4	___	New Jersey (d.)
# 5	___	Texas (e.)

Question 11 Answer 1

11. Rank the following states in order of their small-scale solar PV electrical energy production.

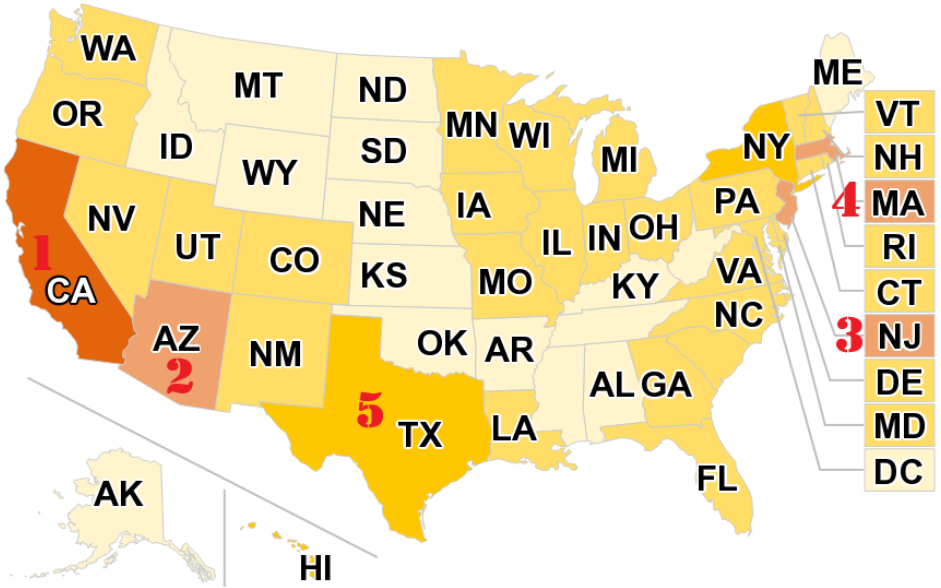
 # 1 California (b.)

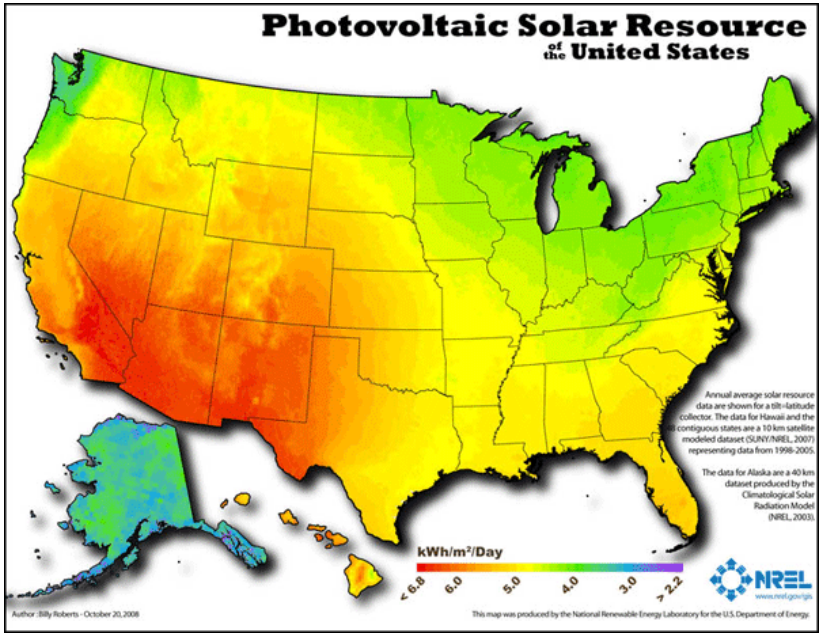
Small-scale Solar Electricity Map



Source: U.S. Energy Information Administration, *Electric Power Monthly*, February 2020, preliminary data

Small-scale Solar Maps





Question 11 All Answers

11. Rank the following states in order of their small-scale solar PV electrical energy production.

 # 1 California (b.)
 # 2 Arizona (a.)
 # 3 New Jersey (d.)
 # 4 Massachusetts (c.)
 # 5 Texas (e.)

Geothermal Power

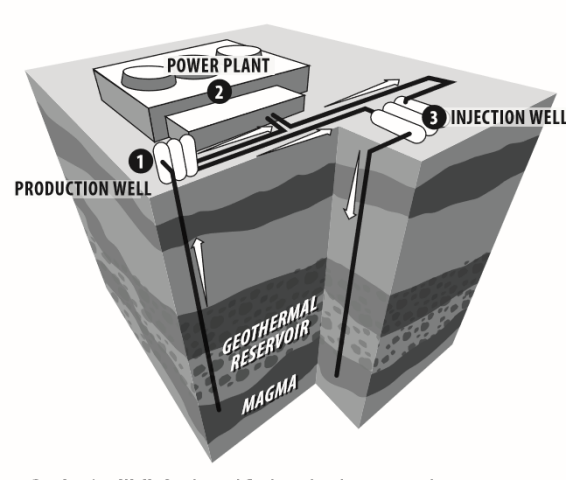
Question 12

12. What are the two types of geothermal renewable energy called?

Question 12 Answer 1

12. What are the two types of geothermal renewable energy called?

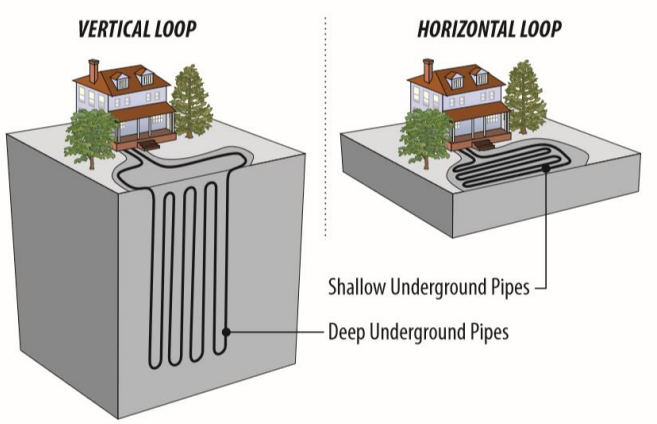
Geothermal power plants use high temperature hot water from much deeper in the earth. The hot water or steam powers a turbine that generates electricity. Some geothermal wells are as much as two miles deep.



Question 12 Answer 2

12. What are the two types of geothermal renewable energy called?

Geothermal heat pumps use the earth's constant temperature to heat and cool buildings. Geothermal heat pumps transfer heat from the ground (or water) into buildings during the winter and reverse the process in the summer.



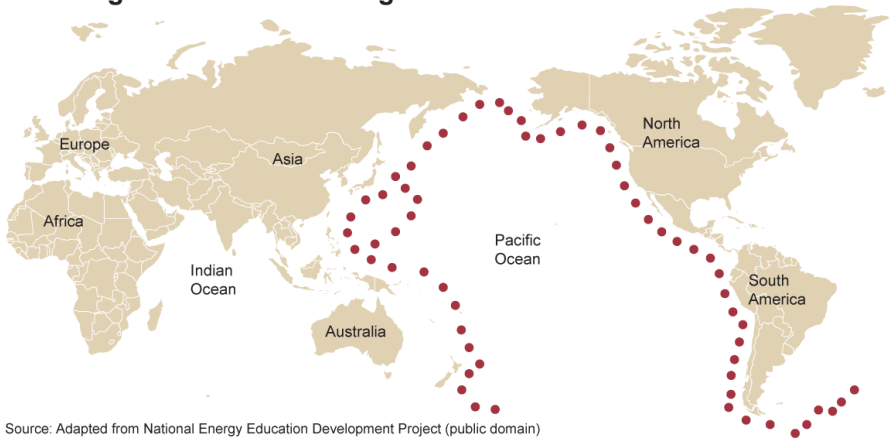
Question 13

13. Which region of the United States has the best potential for harnessing geothermal power for the purpose of producing electricity?

a. East-central States
b. Eastern States
c. West-central States
d. Western States

Ring of Fire Lines

The Ring of Fire lines the edges of the Pacific Ocean.



Source: Adapted from National Energy Education Development Project (public domain)

Geothermal reservoirs are naturally occurring areas of hydrothermal resources. These reservoirs are deep underground and are largely undetectable above ground. Geothermal energy finds its way to the earth's surface in three ways:

- Volcanoes and fumaroles (holes in the earth where volcanic gases are released)
- Hot springs
- Geysers

The most active geothermal resources are usually found along major tectonic plate boundaries where most volcanoes are located. One of the most active geothermal areas in the world is called the **Ring of Fire**, which encircles the Pacific Ocean.

Question 13 Answer 1

13. Which region of the United States has the best potential for harnessing geothermal power for the purpose of producing electricity?

a. East-central States
b. Eastern States
c. West-central States
d. Western States

Question 14

14. Rank the following states in order of their geothermal renewable energy production.

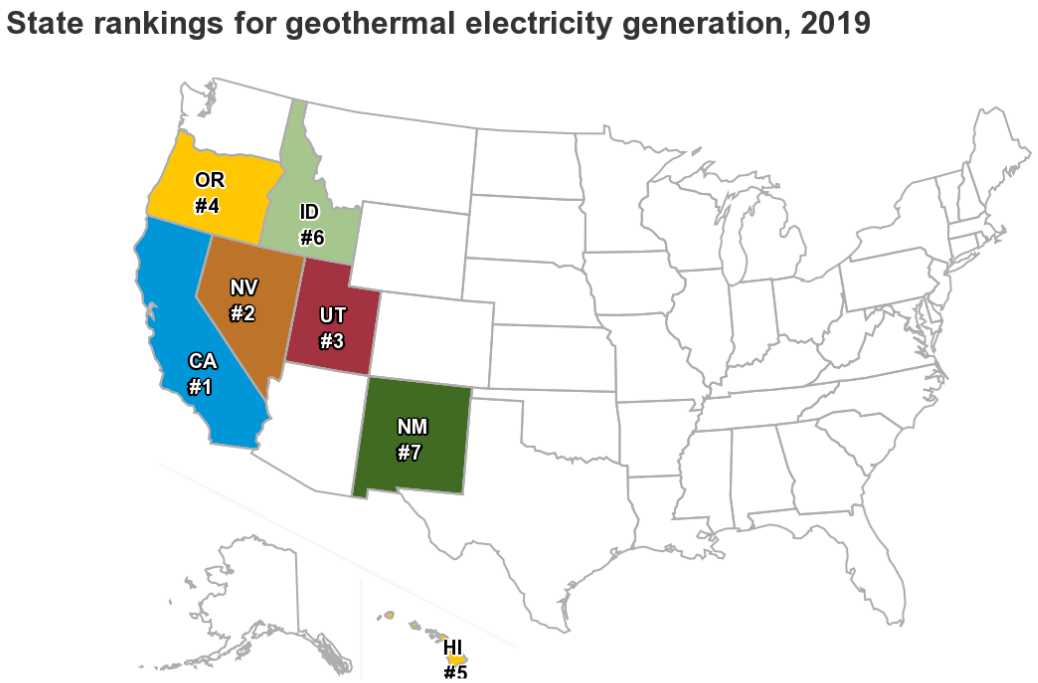
# 1	___	California (a.)
# 2	___	Hawaii (b.)
# 3	___	Nevada (c.)
# 4	___	Oregon (d.)
# 5	___	Utah (e.)

Question 14 Answer 1

14. Rank the following states in order of their geothermal renewable energy production.

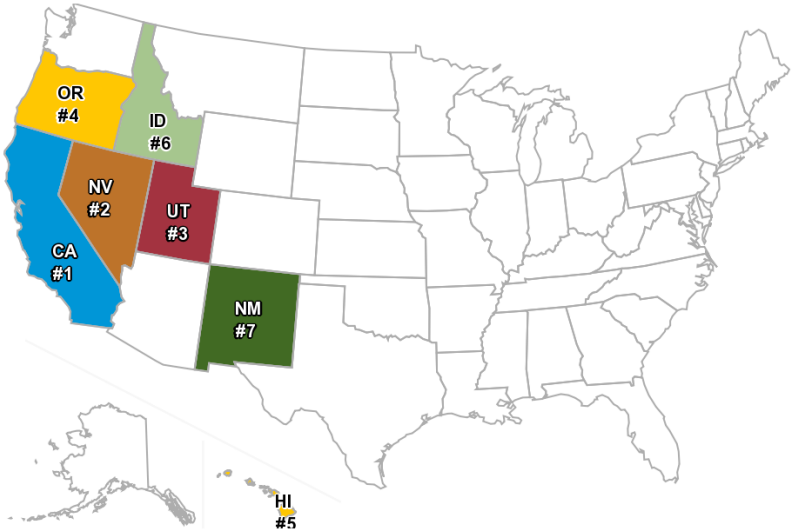
 # 1 California (a.)

Geothermal Electricity Map

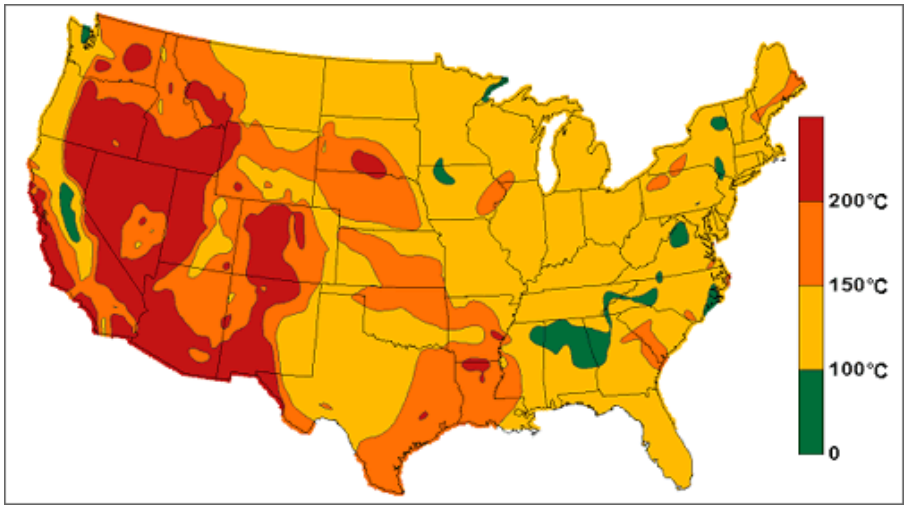


Source: U.S. Energy Information Administration, *Electric Power Monthly*, Table 16.1.B, February 2020, preliminary data

Geothermal Maps



Geothermal resources map



Question 14 All Answers

14. Rank the following states in order of their geothermal renewable energy production.

 # 1 California (a.)
 # 2 Nevada (c.)
 # 3 Utah (e.)
 # 4 Oregon (d.)
 # 5 Hawaii (b.)

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