

Investigating the EU: Green Deal and Hydrogen's Potential in the EU

Stage 1 – Desired Results																	
ESTABLISHED GOALS - Stronger research skills - Greater understanding of a nation or nations in the European Union - Collaboration and teamwork skills - Practice of presentation skills - Awareness of environmental issues affecting Europe.	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr style="background-color: #eee;"> <th colspan="2" style="text-align: center; padding: 2px;"><i>Transfer</i></th> </tr> <tr> <td colspan="2" style="padding: 2px;"><i>Students will be able to independently use their learning to...</i></td> </tr> <tr> <td colspan="2" style="padding: 2px;">Critically think about how different nations work together to make global decisions.</td> </tr> <tr style="background-color: #eee;"> <th colspan="2" style="text-align: center; padding: 2px;"><i>Meaning</i></th> </tr> <tr> <td style="width: 50%; padding: 2px;"> UNDERSTANDINGS <i>Students will understand that...</i> -Global decision making requires a lot of understanding of others in the world and their circumstances </td> <td style="width: 50%; padding: 2px;"> ESSENTIAL QUESTIONS As climate change is starting to cause climate disasters everywhere, how can the EU work together to provide support for countries to reach the Green Deal initiatives by 2050. </td> </tr> <tr style="background-color: #eee;"> <th colspan="2" style="text-align: center; padding: 2px;"><i>Acquisition</i></th> </tr> <tr> <td style="padding: 2px;"><i>Students will know...</i></td> <td style="padding: 2px;"><i>Students will be skilled at...</i></td> </tr> <tr> <td style="padding: 2px;"> -About an environmental issue affecting the EU; climate change -Efforts the EU is taking to combat this issue -Hydrogen's potential as an alternative energy source -Different countries in the EU, how they may work to reach zero emissions by 2050 </td> <td style="padding: 2px;"> -Research -Presentation -Collaboration </td> </tr> </table>	<i>Transfer</i>		<i>Students will be able to independently use their learning to...</i>		Critically think about how different nations work together to make global decisions.		<i>Meaning</i>		UNDERSTANDINGS <i>Students will understand that...</i> -Global decision making requires a lot of understanding of others in the world and their circumstances	ESSENTIAL QUESTIONS As climate change is starting to cause climate disasters everywhere, how can the EU work together to provide support for countries to reach the Green Deal initiatives by 2050.	<i>Acquisition</i>		<i>Students will know...</i>	<i>Students will be skilled at...</i>	-About an environmental issue affecting the EU; climate change -Efforts the EU is taking to combat this issue -Hydrogen's potential as an alternative energy source -Different countries in the EU, how they may work to reach zero emissions by 2050	-Research -Presentation -Collaboration
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Stage 2 – Evidence and Assessment																	
	Assessment Evidence																
	PERFORMANCE TASK(S): Research appropriate information acquired for their presentation Teamwork within their EU nation Participation within the simulation/negotiation Participation in class discussions																
	OTHER EVIDENCE: Collect notes on current energy use Slide presentation Participation in simulation Summation reflection																
Stage 3 – Learning Plan																	
<i>Summary of Key Learning Events and Instruction</i>																	
This lesson will come at the end of my alternative energy unit, so my student will already have an understanding of the science behind creating electricity, climate change and challenges that come with the need to curb greenhouse gasses.																	

DAY 1: Today students will be placed in groups, and given an EU country to learn more about, which will help them embody later this week. (Due to class size, I will be only using 5 countries from the EU)

-Students will be in groups of 2-3; based on the number of countries you wish to use in the simulation on days 3-5.

-Students will then be assigned to one country from the EU.

(I am using: Denmark, Germany, France, Czech Republic, Spain)

-Students will work together to gather the information required about their country. (Worksheet below)

-All work should be shared by group members

-Students will create a 4 slide slideshow with:

-Slide 1: Country name, map, flag

-Slide 2: Country history, historic moments/what its know for

-Slide 3: Introductory information on population, religion, industry, GDP, etc.

-Slide 4: Report on the use of energy production and fossil fuel use

DAY 2: Students today will get an introduction to the EU, why it was created and how it governs. Then each group of students will introduce their country to the rest of the class, or the rest of the EU, to set the scene of our simulation.

-Teacher will introduce what the EU is, their history and values and how it works together to govern (Slideshow attached)

-Teacher will also introduce EU's green new deal and their commitment to being carbon neutral by 2050

-Explain to the students that they now represent their country in the EU Parliament.

-Each group will be given 5 minutes to present their country using their slideshow to the class to help orient the rest of the class with their country

-The rest of the class will take notes on the presentation, and use that information to think how maybe that can help them when the problem is introduced.

DAY 3-5: Today students will be introduced to hydrogen as an energy source which is being pursued by many in the EU for potential renewable energy production. Then students will think about how they can work together to get to zero emissions from alternative power plants by 2050.

-Teacher will return to the slide show to introduce the Green Deal again, and introduce Hydrogen as a green power source

-Students will do the lab Hydrogen Potential (below) and discuss outloud their findings

-Teacher will explain that hydrogen is now being considered as a sustainable renewable energy source if it can be produced in an environmental way.

-Introduce PtX (Green Hydrogen) in the slide show

Simulation (requires both the slideshow and the worksheet below):

-Explain to your students that the EU (for this simulation) has dedicated 1 billion Euros to helping countries prepare for potential shifting to using hydrogen or other renewable energy productions within the EU nations by 2050. (Depending on which countries used and how many you have in the simulation you may wish to change the Euro amount)

-Students must look at how many fossil fuel plants they currently use in their country and how many the EU could help transform into hydrogen power plants or wind/solar farms.

Task: Each country must come up with the solutions they would like to use to help update their energy production in their nation from coal to renewable sources. Each solution has a cost associated with it. Countries must add up the solutions and costs and be ready to present these to the EU council and be prepared to justify and/or negotiate if necessary help their country as well as not go over budget. Students will then have to negotiate with the countries present to see if they can replace any or all of their power plants to renewable energy production.

***Students should look at both the expensive and less expensive alternatives and come up with ways to negotiate.**

-Students will then come up before the parliament expressing their desire for which power plants to invest in, and the overall cost.

-As the teacher, keep track of the funds being requested to make students aware of the total amount they will spend if each country gets their first desires.

-Once all groups have presented, let them know if/and how far over budget they have gone, and set them to try to work together to create a balanced budget.

Reflection: Have students reflect on the EU, the Green Deal and Hydrogen as a renewable alternative, as well as how easy it is to work together to reach their goals.

Slide Show Note Sheet

Name: _____

Country Assigned: _____

Their Flag:

Map of the country:

Facts to learn about the country:

Population: _____

When did it become a country: _____

What other countries border yours: _____

What are the main religions:

What are the main industries/jobs:

What is the GDP of your country:

What are 3 things your country is known for (cultural, historical, significant location):

What are the main societal issues of your country?

How is your country governed?

How does your country produce its electricity? (please use percentages for different sources)

How much fossil fuel is imported? For what sector of their energy use?

Name: _____

Hydrogen Potential

Objectives: Students will produce hydrogen in the classroom to see its potential and discuss its production and challenges.

Materials:

Goggles

Test tube

Test tube rack

1 inch of Magnesium ribbon

1 M Hydrochloric acid

Graduated cylinder

Parafilm

Matches

Procedure:

1. Students will grab a pair of goggles and place them properly over their eyes the whole lab.
2. Using a graduated cylinder, students will measure out 10ml of hydrochloric acid and then pour it into their test tube.
3. Students will then collect a magnesium ribbon strip and a piece of parafilm.
4. Students will drop a magnesium ribbon into their test tube containing hydrochloric acid, and then quickly spread and place the parafilm over their test tube so no gas can escape.
5. Answer the following questions before we move on.
6. What do you notice happening to the magnesium ribbon in the hydrochloric acid?

7. Using the following equation, what type of reaction do you believe is taking place: $\text{Mg(s)} + 2\text{HCl(aq)} \rightarrow \text{MgCl}_2\text{(aq)} + \text{H}_2\text{(g)}$

8. What gas is being produced in your test tube? _____
9. Obtain a match from your match book or box.

10. Working with your partner, you will need to work together quickly and without having too much gas escape. So pay attention.
11. One partner should be prepared to remove the parafilm from the test tube once the other strikes the match.
12. Strike the match, remove the parafilm from your test tube.
13. Move the lit match over the test tube once the parafilm is off and the gas can escape.
14. What do you observe about the gas? (2 observations are required)
 -
 -
15. If you do not notice an audible observation, please replace the parafilm and wait 30 second and try again (as long as the reaction is still taking place in your test tube, you may have to get more magnesium, if it is not).

Analysis:

1. Hydrogen is an incredibly flammable gas, with a high potential for creating heated air quickly. What happened to the match when placed over the test tube? Why? (Think of what fuel needs to burn.)
2. Why do you think the match made a popping sound?
3. Hydrogen also contains a large amount of energy, making it relatively efficient, as in 2.2lbs of hydrogen, there is the same amount of energy as you would find in 6.1lbs of gasoline. Do you think this is a good option when looking at alternative fuels for creating electricity? Why or why not?

Name: _____ **key** _____

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Procedure:

16. Students will grab a pair of goggles and place them properly over their eyes the whole lab.
17. Using a graduated cylinder, students will measure out 10ml of hydrochloric acid and then pour it into their test tube.
18. Students will then collect a magnesium ribbon strip and a piece of parafilm.
19. Students will drop a magnesium ribbon into their test tube containing hydrochloric acid, and then quickly spread and place the parafilm over their test tube so no gas can escape.
20. Answer the following questions before we move on.
21. What do you notice happening to the magnesium ribbon in the hydrochloric acid? **_____ bubbling happening along the hydrogen ribbon _____**
22. Using the following equation, what type of reaction do you believe is taking place: $\text{Mg(s)} + 2\text{HCl(aq)} \rightarrow \text{MgCl}_2\text{(aq)} + \text{H}_2\text{(g)}$
_____ Single displacement _____
23. What gas is being produced in your test tube? **_____ Hydrogen _____**
24. Obtain a match from your match book or box.

25. Working with your partner, you will need to work together quickly and without having too much gas escape. So pay attention.
26. One partner should be prepared to remove the parafilm from the test tube once the other strikes the match.
27. Strike the match, remove the parafilm from your test tube.
28. Move the lit match over the test tube once the parafilm is off and the gas can escape.
29. What do you observe about the gas? (2 observations are required)
 - Caused a popping sound to occur when a match was placed over top of the test tube
 - Pungent, strong scent
30. If you do not notice an audible observation, please replace the parafilm and wait 30 second and try again (as long as the reaction is still taking place in your test tube, you may have to get more magnesium, if it is not).

Analysis:

4. Hydrogen is an incredibly flammable gas, with a high potential for creating heated air quickly. What happened to the match when placed over the test tube? Why? (Think of what fuel needs to burn.)

Match quickly went out after the popping sound due to lack of oxygen
5. Why do you think the match made a popping sound?

This heat imparts kinetic energy to molecules of the gaseous mixture and causes them to expand. The air surrounding the gases also starts expanding very rapidly. This sudden and quick expansion of gas molecules causes a break in the sound barrier. Thus, we hear a pop sound when hydrogen is burned due to the explosion.
6. Hydrogen also contains a large amount of energy, making it relatively efficient, as in 2.2lbs of hydrogen, there is the same amount of energy as you would find in 6.1lbs of gasoline. Do you think this is a good option when looking at alternative fuels for creating electricity? Why or why not?

Answers may vary- should consider production and efficiency

Name: _____

Country: _____

EU Decision Making Prep

Question: Can you work together to get all the EU countries to use all renewable energy sources and work within the EU budget?

1. How many coal power plants are in your country? _____
2. Using the cost breakdown on the board and below, try to determine which of the power plants you would want, and how you can help negotiate if money is tight. And please be prepared to justify your preference based on your knowledge of alternative energy and the greenhouse gas emissions.
 - 20 million E: Hydrogen station to build and operate
 - 17.5 million E: Wind farms (50 turbines) to build and operate
 - 15 million E: Solar farms to build and operate
3. Knowing that some countries may need more help, due to population size, or financial issues, how can you make negotiations within this framework? Can you pick an alternative combination to save funds?
4. In your opinion, can your country afford to update/build their own renewable power station, if another country can not?

Name: _____

Reflection

1. The EU governs 27 countries. This week you represented 5 of those countries. How easy do you think it is to come to consensus on laws, money allocation and other tough decisions? Please use your experience in this simulation to back up your answer.
2. Knowing that the EU has taken strong initiatives to help get to zero emissions by 2050, what do you think that will do for industries and technology around the world that want to work with them? Why?
3. Do you think the EU is a leader in the fight on climate change? Why or why not?
4. Do you think hydrogen will become a leading fuel source in the global economy? Why or why not?
5. What do you want to learn more about after this simulation?

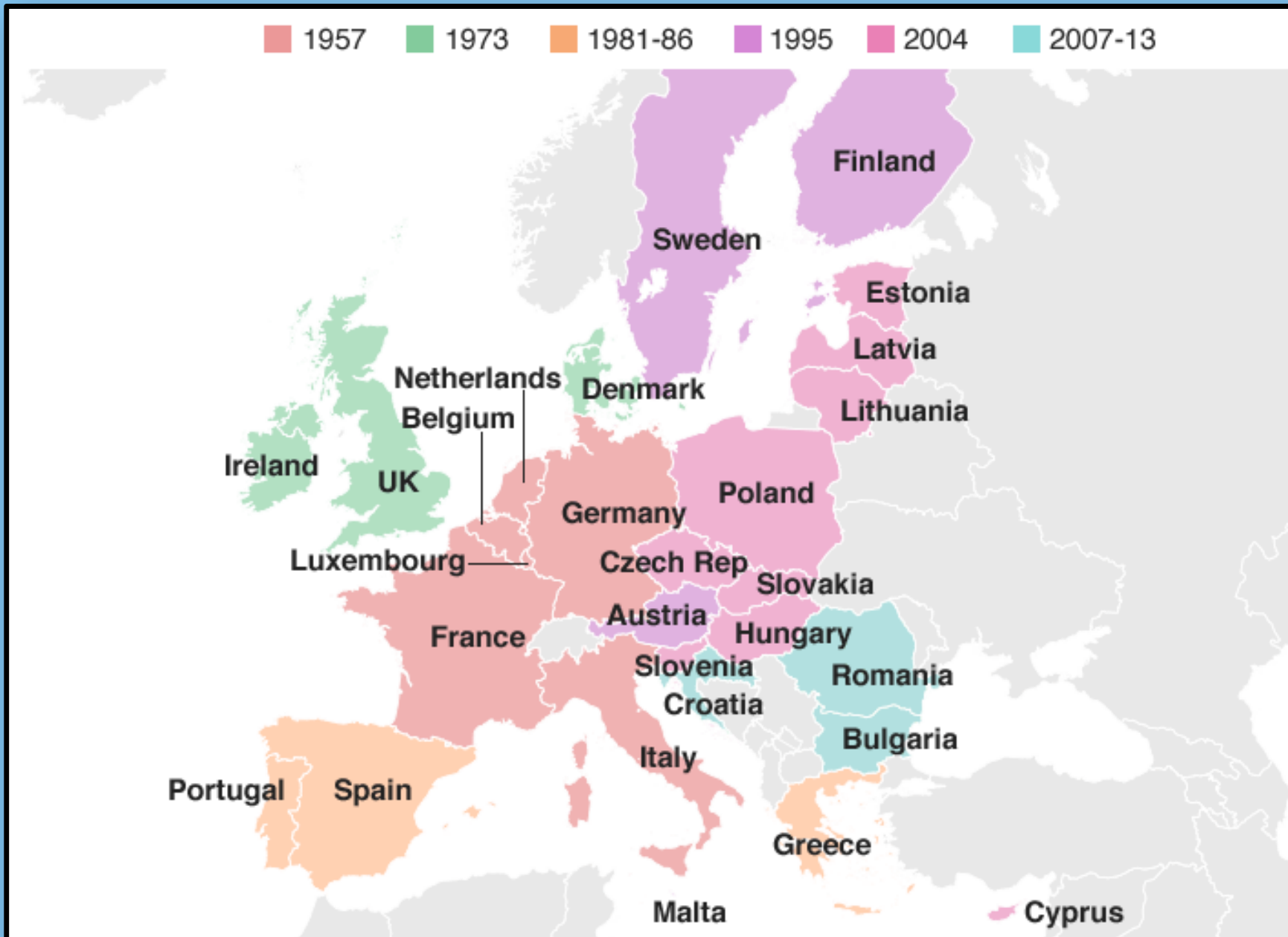
Day 2: Start Here



The
EUROPEAN
UNION

History

- The European Union (EU) is an economic and political partnership between many European countries.
- After WWII ended, France and Germany came up with a plan to ensure the countries would never go to war with each other again.
- The result was a deal signed by 6 countries in 1957.
- In 2019, the EU has grown to 27 members (after the exit of the UK)



*The UK voted to withdraw from the EU in 2016.

The European Union flag was designed by Arsene Heitz and Paul Levy in 1955.



Purpose

- The European Union was originally established to set up free trade among member countries.
- Today, the EU is a powerful trade bloc that makes up 1/5th of the world's trade.
- Goods produced in Europe can move freely, without tariffs, to other European nations, which leads to huge cost savings to consumers and businesses.

Purpose

- Even though the EU's original purpose was to encourage free trade within Europe, it now has several other important interests:
 1. Creating a stable, peaceful relationship between countries
 2. Ensuring the safety and security of its members
 3. Promoting social issues like protecting human rights and preserving the environment
- The European Union members work together for advantages that would be out of their reach if each were working alone.

Together

- The EU believes that when countries work together they are a more powerful force in the world because they involve:
 - more money,
 - more people,
 - and more land areas.
- This helps make small countries more competitive in the world market.

- The US is much larger than separate European countries.
- When the EU countries combine, they have more people and a larger economy, and they can compete in a global economy.

	European Union	United States
Land Area	1,500,000	3,700,000
Population	513,000,000	329,000,000
Gross Domestic Product	\$15.65 trillion	\$15.29 trillion
GDP Per Capita	\$34,000	\$59,000

Benefits

- The EU has built a strong relationship among its member nations.
- Not having tariffs has led to improved trade and higher standards of living among members.
 - Wealthy countries are sharing wealth with poorer countries.
- Citizens are allowed to move freely among member countries in order to find better jobs.
- The EU's strict environmental standards have helped some countries improve their environment.





EU Members

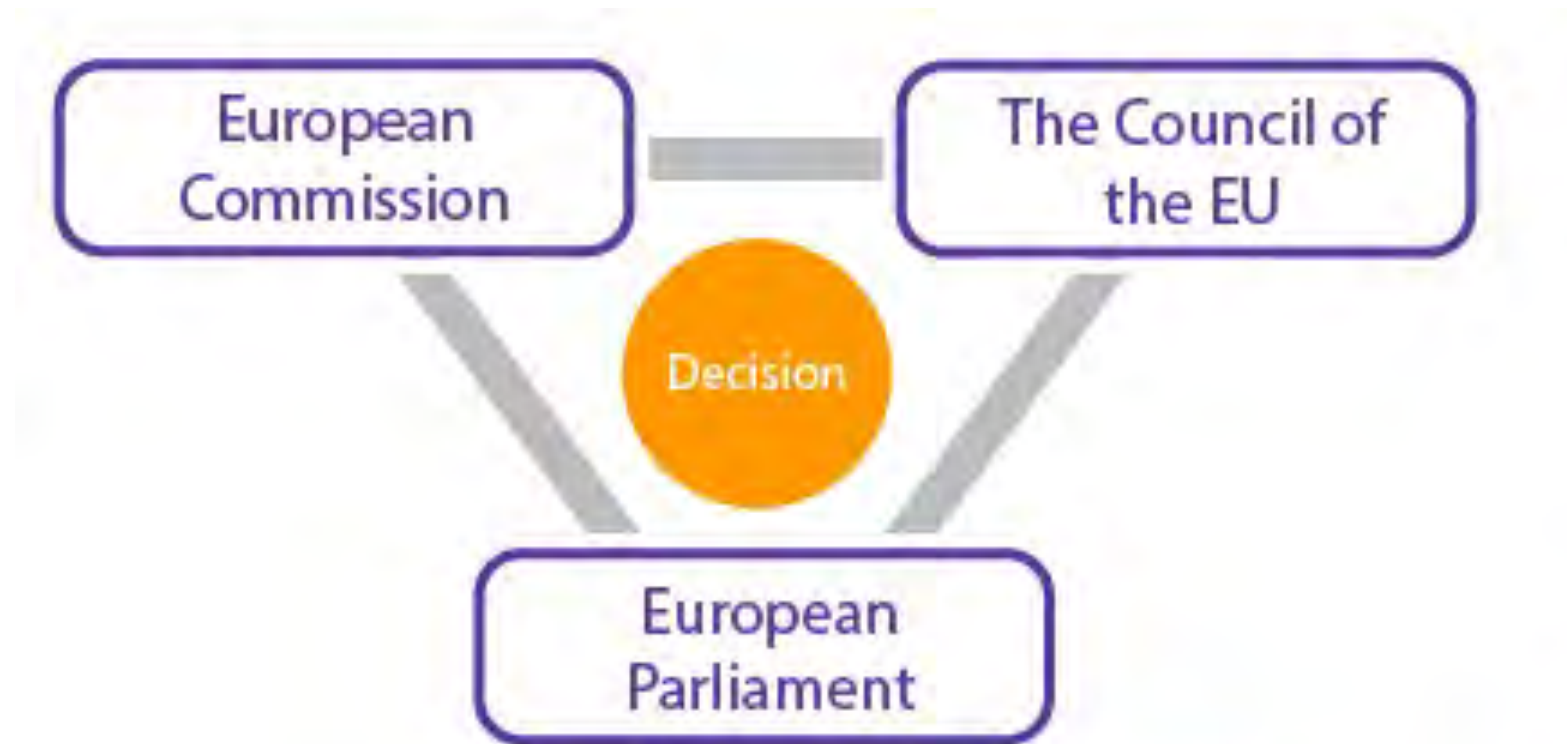
Austria	Belgium	Bulgaria	Croatia
Cyprus	Czech Republic	Denmark	Estonia
Finland	France	Germany	Greece
Hungary	Ireland	Italy	Latvia
Lithuania	Luxembourg	Malta	Netherlands
Poland	Portugal	Romania	Slovakia
Slovenia	Spain	Sweden	United Kingdom*

*The United Kingdom formally left the EU in 2020

Government

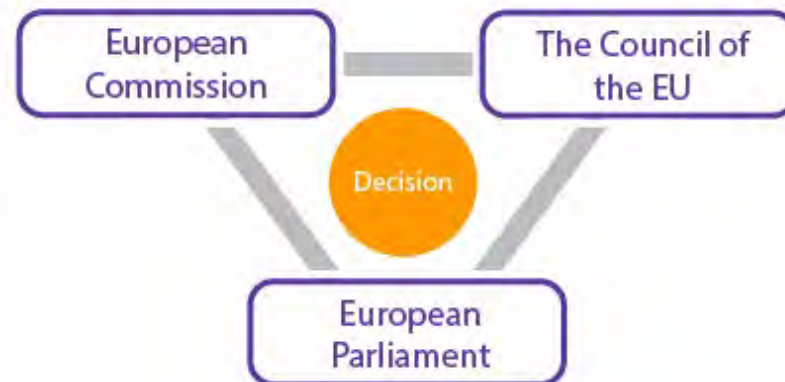
- The European Union does NOT handle all the government business for the members.
- It acts as a confederation.
- Each country still makes its own laws, has a military, and elects its leaders.

The EU is made up of many Governing Bodies



European Parliament

- Directly elected by EU citizens, the Parliament acts as a co-legislator, sharing with the Council of the EU the power to adopt and amend legislative proposals and to decide on the EU budget. It also supervises the work of the Commission and other EU bodies and cooperates with national parliaments of EU countries to get their input.



European Union Parliament Building in Strasbourg, France

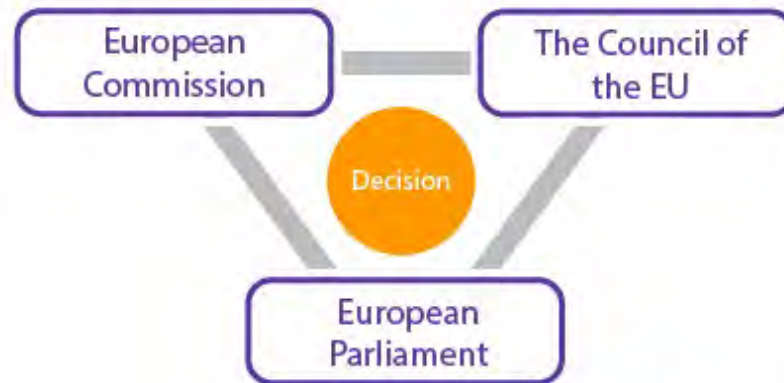


European Union Parliament Building in Strasbourg, France



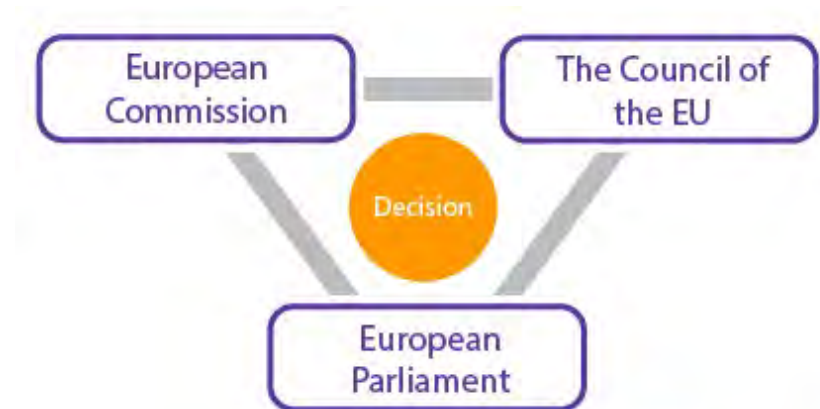
European Commission

The European Commission is the EU's executive arm. It makes decisions on the Union's political and strategic direction. It also proposes legislation to the Parliament and the Council of the EU.



Council of the European Union

Sometimes called the Council of Ministers or just the Council, it negotiates and adopts legislative acts, in most cases together with the European Parliament. It also coordinates EU economic and security policies.



Green New Deal

Climate change and environmental degradation are an existential threat to Europe and the world. To overcome these challenges, the European Green Deal will transform the EU into a modern, resource-efficient and competitive economy, ensuring:

Approved in 2020, is a set of policy initiatives with the overarching aim of making the European Union (EU) climate neutral in 2050.

Green New Deal

The European Commission adopted a set of proposals to make the EU's climate, energy, transport and taxation **policies fit for reducing net greenhouse gas emissions by at least 55% by 2030**, compared to 1990 levels.

Strategy:

https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en

Presentation of Representative Countries

- Students will now share info on the countries being represented in our classroom as part of the EU and the electricity/energy use they consume and produce.



Day 3: Start Here

Green Deal and Energy

Renewables and alternatives to fossil fuels have been a high focus for this ambitious goal



New technologies are also being looked at.

- Push for more renewables: Solar and Wind farms
- Today we will explore one of the technologies they are look at:
Hydrogen
- We will be taking part in a lab, please clean your work station and tie hair back.

PtX: Power to X (insert your need for energy)

PtX is a German company which is trying to sustainably split water molecules to produce hydrogen gas that can then be used to power planes, factories, ships, etc.

Hydrogen produced on the basis of renewable energies, also called green hydrogen, and its reaction products offer the opportunity to promote climate action in those areas in which there are no technological alternatives or more efficient solutions for decarbonisation, such as the steel industry or aviation

What is "Power-to-X"?



It requires renewable energy sources to first split the water molecules

- This could be through wind, solar or possibly nuclear energy
- This is then mixed with CO₂ to move it to the site to be used
- Then it is burned like other fuels to create the energy needed



We have already studied other alternative energies earlier in this unit.

- We will welcome back solar and wind energy production to this simulation in a few minutes.
- Assume that each station or “farm” that we discuss on the next slide will fully take the place of a coal power plant currently in use in your country, in terms of its ability to produce the same amount of energy as the coal power plant.

EU budget and Task

1 Billion E have been allocated for sustainable energy production within your EU countries by the EU Parliament to help cover the costs of building new renewable/sustainable power plants to reach the goal of **0 CO₂ emissions by 2050**.

As a group representing your country, look at how many coal power stations you would need to decommission and what type of station(s) you would want to choose to use in your country.

- 20 million E: Hydrogen station to build and operate
- 17.5 million E: Wind farms (50 turbines) to build and operate
- 15 million E: Solar farms to build and operate

Consider

- How well off is each country to pitch in or build their own power plants (recall their GDP)
 - How many power plants are each country requesting and how much will that require from the budget (many are requesting different amounts, how can you make this fair)
 - How can you maybe scale down and try to work within the budget?
 - How well will your country be able to negotiate to get to zero emissions?
 - REMEMBER you need to speak for your country and its needs!
-
- Use the worksheet to come up with a plan, before you present your proposal before the council.

Let's hear from each country

- Present your needs and then desired plan and cost.

Can we negotiate to reach 1 Billion Euros spent and all 54 stations built?

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MEET EU

an initiative by
UNC-Chapel Hill
University of Pittsburgh
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EUROPEAN UNION