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| **Biology Launch Unit(2020 Environmental Science Students)****1 Week Block/2 Weeks Yearly****This unit is designed for students that have a learning gap in the transition from Environmental Science to Biology.**  |
| **Unit Description** **Disciplinary Core Ideas (Georgia Standards of Excellence – GSE)****SEV3. Obtain, evaluate, and communicate information to evaluate types, availability, allocation, and sustainability of energy resources.****SEV4. Obtain, evaluate, and communicate information to analyze human impact on natural resources.****SEV5. Obtain, evaluate, and communicate information about the effects of human population growth on global ecosystems.****This unit focuses on the different sources of energy that we use and how the availability, the current supply and long-term sustainability of these resources impacts our use of them. Energy resources and other natural resources are impacted by human use and development of them. Without careful management non-renewable resources may run out before we have viable alternative options. The rate at which the human population grows has an effect on global ecosystems.****Unit Resources** Secondary Energy Info Book from Need.org (Natl. Energy Education Dev): <https://www.need.org/wp-content/uploads/2019/10/Secondary-Energy-Infobook.pdf>Energy Around the World from Need.org: <https://shop.need.org/collections/energy-in-society/products/energy-around-the-world>Human Impact AAAS: <http://www.project2061.org/publications/bsl/online/index.php?chapter=3#bm_3CH4>Humans as part of Earth’s Ecosystems AAAS: <http://www.project2061.org/publications/bsl/online/index.php?chapter=5#bm_5DH3>Earth natural Resources AAAS: <http://www.project2061.org/publications/bsl/online/index.php?chapter=4#bm_4BH8>Waste materials and natural resources AAAS: <http://www.project2061.org/publications/bsl/online/index.php?chapter=8#bm_8BH7>Learning Targets ASCD: <http://www.ascd.org/publications/educational-leadership/mar11/vol68/num06/Knowing-Your-Learning-Target.aspx>**Alternate Unit Examples & Resources**Can we feed the growing population? (Concord.org module): <https://authoring.concord.org/sequences/385/sequence_run/36dec570110d766887afaadfe4f467acd07d937d>Will there be enough fresh water? (Concord.org module): <https://authoring.concord.org/sequences/478/sequence_run/7f93b0af99036f1aacddf2793e5f59e52ba63079>What are our choices for supplying energy in the future (Concord.org module): <https://authoring.concord.org/sequences/386/sequence_run/e10298ab26285d2698616291cd3fb98419728364>To use data sets for phenomenon, you can utilize any .csv or .txt file and import it/drag it to the platform for free into the CODAP (Common Online Data Analysis Platform) system <https://codap.concord.org/> (Hint: You may also wish to show your students how to do this so they can do their own data analysis for phenomenon)World Population Data: <https://population.un.org/wpp/Download/Standard/CSV/> (May choose to use this with the free tool above)  |
| **Content Standards*****SEV3****. Obtain, evaluate, and communicate information to evaluate types, availability, allocation, and sustainability of energy resources.**a. Analyze and interpret data to communicate information on the origin and consumption of renewable forms of energy (wind, solar, geothermal, biofuel, and tidal) and non-renewable energy sources (fossil fuels and nuclear energy).* *b. Construct an argument based on data about the risks and benefits of renewable and nonrenewable energy sources. (Clarification statement: This may include, but is not limited to, the environmental, social, and economic risks and benefits.)**c. Obtain, evaluate, and communicate data to predict the sustainability potential of renewable and non-renewable energy resources.**d. Design and defend a sustainable energy plan based on scientific principles for your location.****SEV4****. Obtain, evaluate, and communicate information to analyze human impact on natural resources.*1. *Construct and revise a claim based on evidence on the effects of human activities on natural resources.* ***Human Activities*** *can include: agriculture, forestry, ranching, mining, urbanization, fishing, water use, pollution, desalination, and wastewater treatment.* ***Natural Resources*** *can include: land, water, air, and organisms.*

***SEV5****. Obtain, evaluate, and communicate information about the effects of human population growth on global ecosystems.* *b. Analyze and interpret data on global patterns of population growth (fertility and mortality rates) and demographic transitions in developing and developed countries.* |
| **Big Ideas/Enduring Understandings*** The earth has many natural resources of great importance to human life. Some are readily renewable, some are renewable only at great cost, and some are not renewable at all. Some energy sources may affect the environment more than others.
* Renewable resources can be used sustainably with proper care and management, generally emit less harmful pollutants, but can be expensive to implement and maintain.
* Non-renewable resources are limited by their lack of replenishment, and can emit harmful pollutants, but are often cheaper and more accessible. We can attempt to predict the limits of our non-renewable resources, but it can be difficult to get an exact timetable.
* Human beings can positively or negatively impact the quality and amount of available resources. Resource availability has guided the development of human society.
* The development of new materials and the increased use of existing materials by a growing human population have led to the removal of resources from the environment much more rapidly than they can be replaced by natural processes. Disposal of waste materials has also become a problem. Solving these problems requires systematic efforts involving both social and technological innovations.
* When evaluating solutions, it is important to take into account a range of constraints including cost, safety, reliability and aesthetics and to consider social, cultural and environmental impacts.
* Human beings are part of the Earth’s ecosystems. Human activities can, deliberately or inadvertently, alter the equilibrium in ecosystems – including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change.
* All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors.
* The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. Certain sustainable resources are better suited to different parts of the world, and we can determine what works best for us.
* Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts. Through computer simulations and other studies, important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are modified in response to human activities.
* Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.

**Essential Questions*** Where does the energy we use come from?
* Why is there a distinction between renewable and non-renewable resources?
* How can we ensure sustainability of our natural resources?
* How does human activity impact availability and quality of natural resources?

**Student Learning Targets****SEV3*** I can analyze and interpret data about renewable and non-renewable forms of energy and then communicate information about them.
* I can explain that a scientific argument includes
	+ A **claim** (a statement that answers a scientific question),
	+ **evidence** (scientific data that supports a claim),
	+ and **reasoning** (an explanation that supports a claim by providing a logical connection between the evidence and the claim).
* I can construct an argument using CER (Claim, Evidence, and Reasoning) and data about the risks and benefits of renewable and non-renewable energy sources.
* I can predict the sustainability potential of renewable and non-renewable energy resources by obtaining, evaluating, and communicating about the data.
* I can design and defend a sustainable energy plan based on scientific principles for where I live.

**SEV4*** I can construct an argument using CER based on evidence on the effects of human impact on natural resources.

**SEV5*** I can analyze and interpret data on global patterns of population growth and demographic transitions in developing and developed countries of its effects on global ecosystems.
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| **Science and Engineering Practices** **Those utilized in this unit are in BOLD below****1. Asking questions (for science) and defining problems (for engineering)**2. Developing and using models3. Planning and carrying out investigations**4. Analyzing and interpreting data**5. Using mathematics and computational thinking**6. Constructing explanations (for science) and designing solutions (for engineering)****7. Engaging in argument from evidence****8. Obtaining, evaluating, and communicating information****Crosscutting Concepts****Those utilized in this unit are in BOLD below****1. Patterns****2. Cause and Effect****3. Scale, Proportion & Quantity****4. Systems & System Models**5. Energy & Matter6. Structure & Function7. Stability & Change |
| **Description of Key Content**Teacher Background Information (*Included for your own background knowledge and is not intended for direct student instruction*)* In addition to the unit resources listed for Teacher Background information on the first page, the U.S. Energy Information Administration has a website: <https://www.eia.gov/energyexplained/>
* Students and teachers can use this simplified website to research energy use in the United States and compare states to each other: <http://usofenergy.com/>
* To use data sets for phenomenon, you can utilize any .csv or .txt file and import it/drag it to the platform for free into the CODAP (Common Online Data Analysis Platform) system <https://codap.concord.org/> (Hint: You may also wish to show your students how to do this so they can do their own data analysis for phenomenon)
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| ***Misconceptions*** | ***Proper Conceptions*** |
| * If energy is conserved, we can’t run out of it.
* Energy can be changed completely from one form to another (no energy losses).
* Energy is confined to some particular origin, such as what we get from food or what the electric company sells.
* Energy is a “thing.” This is a fuzzy notion, probably because of the way we talk about newton-meters or joules. It is difficult to imagine an “amount” of an abstraction.
* Resource availability is all about physical supply.
* Population growth will cause the world to run out of resources
* Interconnections between different natural resources occur primarily at a biophysical level.
* Social justice is an important but auxiliary concern in ensuring supply of resources.
* Choosing between resource availability and environmental conservation is a Sophie’s choice.
 | * Energy is conserved in closed systems, but the forms of energy needed to sustain our way of life come from outside of our system, and the forms we use are easily replaced.
* While energy isn’t lost when we use it, the forms it ends up in may limit its usefulness to us.
* Energy comes from a variety of sources, many of the most important are directly or indirectly linked to the sun, but that isn’t the only source of energy available to us.
* Energy is a measure of ability to do work, and as such can come in different forms.
* What matters most are evolutions in technology, preferences, policies and prices.
* Economic growth and development are the major drivers of future resource demand.
* Economic, political and social interconnections between resources also play an increasingly important role in their availability.
* Taking into account social justice and fairness of access is central to ensuring stable production and distribution of resources.
* Resources and the environment are two sides of the same coin, but that also means they may be solved hand in hand.
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| **Instructional Strategies****SEV3a**When this standard is taught with fidelity, students will be able to analyze and interpret actual data to discuss intelligently both the origin of and consumption of the common non-renewable energy sources as well as renewable energy resources, both traditional and cutting edge. They will also be able to compare the U.S. to other countries to predict differences.**SEV3b**When this standard is taught with fidelity, students will be able to construct an argument comparing the relative quality of different energy sources based on both the potential benefits from them and the risks associated with them. Students will research various sources of energy and “text message” about the potential benefits and drawbacks of each. They will have a list of facts regarding each source, but some of the facts may be advantages and some disadvantages. They must analyze their source and defend it.**SEV3c**When this standard is taught with fidelity, students will obtain data to predict sustainability of different energy resources. The students should be able to evaluate the quality of this data and communicate it. Students will research the numbers and methods used to predict the longevity of their assigned energy resource. They should be able to relate this to the availability of the resource in their local area, rather than throughout the world.**SEV3d (Culminating Unit Activity)**When this standard is taught with fidelity, students will design and defend a sustainable energy plan based on scientific principles for their area. To communicate this plan, they will design a trifold brochure with specific requirements aligning to the Claims, Evidence and Reasoning (CER) model.**SEV4a.**When this standard is taught with fidelity, students will be able to construct and revise a claim based on evidence on the effects of human activities on natural resources. They will then study this through live data to test the impact of human activity in their local area. Students will then communicate through Instagram and “post” on social media based on their collected evidence about the effects of human activities on natural resources and how they can make a difference.**SEV5b.**When this standard is taught with fidelity, students will be able to analyze and interpret data on global patterns of population in order to analyze the effects of population growth on global ecosystems including demographic transitions in developing and developed countries. Using current data, students will analyze how OECD (Organization for Economic Cooperation and Development) and non-OECD countries will affect consumption of energy and affect global ecosystems in the future. They will use the comprehensive data and analysis done throughout the unit to then provide a model of the impacts to predict future outcomes. |
| **Differentiation (also included within lesson topics)**Students can be assigned one of the following resource modules which are technology-based and provide scaffolded guidance: * Can we feed the growing population? <https://authoring.concord.org/sequences/385/sequence_run/36dec570110d766887afaadfe4f467acd07d937d>
* Will there be enough fresh water? <https://authoring.concord.org/sequences/478/sequence_run/7f93b0af99036f1aacddf2793e5f59e52ba63079>
* What are our choices for supplying energy for the future? <https://authoring.concord.org/sequences/386/sequence_run/e10298ab26285d2698616291cd3fb98419728364>
* What is the cost of preparing a Thanksgiving Meal? Can be downloaded for free from: <https://shop.need.org/collections/secondary-guides/products/cost-of-a-thanksgiving-meal>
* Simple Poster for Renewable and Non-Renewable Energy Sources: <https://shop.need.org/collections/secondary-guides/products/energy-sidekicks-renewable-nonrenewable-chart>
* Scaffolded lesson for Compare and Contrast Energy consumption based on state populations (see Activity on bottom of page): <https://www.need.org/resources/u-s-energy-geography-teacher-guide/?portfolioCats=34>
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| **Evidence of Learning (Formative Assessments)**By completion of this unit, students will be able to:* Explain the origin of non-renewable and renewable resources and describe our consumption of them.
* Detail the risks and benefits of renewable and non-renewable energy sources.
* Explain sustainability potential of renewable and non-renewable energy sources and communicate that information.
* Design a sustainable energy plan for their home and our community.
* Describe the effects of human activities on natural resources.
* Analyze and interpret data on the effects of human population growth and demographic transitions on global ecosystems.

**Summative Assessments** **Both formative and summative, continual assessments should be conducted throughout the unit to evaluate students’ understanding.** |
| **Web Resources**NEED Project: <http://www.need.org/>United States of Energy: <http://usofenergy.com/>Scientific American article Top 10 Myths about Sustainability: <https://www.scientificamerican.com/article/top-10-myths-about-sustainability/>NSTA CER Rubric for Teachers: <http://static.nsta.org/connections/elementaryschool/201104ClaimsEvidenceRubric.pdf>US Energy Information Administration (EIA) International Energy Outlook Report 2019: <https://www.eia.gov/outlooks/ieo/pdf/ieo2019.pdf>Daily history of Crude Oil prices per barrel (1983 to current): <https://www.eia.gov/dnav/pet/hist/RCLC1D.htm>OECD vs non-OECD countries: <https://usoecd.usmission.gov/our-relationship/about-the-oecd/what-is-the-oecd/>Ck12: <https://www.ck12.org/earth-science/Renewable-vs-Non-Renewable-Energy-Resources/lesson/Renewable-vs-Non-Renewable-Energy-Resources-HS-ES/>KQED Science: <https://ww2.kqed.org/quest/2014/02/13/nonrenewable-and-renewable-energy-resources-2/> |
| **Vocabulary**

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| * Mineral
 | * Reclamation
 | * Nuclear Fusion
 | * Alternative Energy
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| * Ore Mineral
 | * Fossil Fuel
 | * Renewable Energy
 | * Fuel Cell
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| * Subsurface Mining
 | * Electric Generator
 | * Passive Solar Heating
 | * Energy Efficiency
 |
| * Surface Mining
* Subsidence
 | * Petroleum
* Nuclear Fission
 | * Active Solar Heating
* Geothermal Energy
 | * Energy Conservation
* Smelting
 |
| * Placer Deposit
 | * Oil Reserves
 | * Biomass Fuel
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| * Subsidence
* Ocean Thermal Energy Conversion (OTEC)
 | * Nuclear Energy
* Non-Renewable Energy
 | * Hydropower Energy
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| **STEM Career Connections**STEM Energy Career Profiles Short Video Interviews: <https://www.youtube.com/playlist?list=PLfpAlghgRWgJwx-kAbw1cw5ukIPgQAMDj>Energy Careers Excursion: <https://shop.need.org/products/energy-careers-excursion?_pos=1&_sid=e4f49de50&_ss=r> |
| **Lesson Components** |
| **PHENOMENA/ENGAGE** |
| **TOPIC 1: Analyze and interpret the data on the U.S. Energy Consumption by Source Datasheet, 2017. (SEV3a)**Using **U.S. Energy Consumption by Source Datasheet 2017**What trends do you notice in the data?Do you note any concerning trends in the U.S. data? | **TOPIC 2: Research Renewable and Non-Renewable Energy Sources for risks and benefits of each. (SEV3b)**[The total world energy demand is for about 400 *quad*rillion British Thermal Units (BTUs) annually](http://www.energy.gov/). One ‘BTU’ is about the energy and heat generated by a match. Oil, coal, and natural gas supply about 350 quadrillion BTUs. Oil provides most of this, around 41 percent of the world’s total energy supplies (164 quadrillion BTUs). Coal provides 24 percent (96 quadrillion BTUs), and natural gas provides the remaining 22 percent (88 quadrillion BTUs). By the year 2020, world energy consumption is projected to increase by around 50 percent – an additional 207 quadrillion BTUs. As outlined in previous points, renewable energies would not be able to meet this increasing demand. From: <https://developmenteducation.ie/feature/the-energy-debate-renewable-energy-cannot-replace-fossil-fuels/>Why has this happened?  | **TOPIC 3: Obtain, Evaluate and Communicate data to predict the sustainability potential of renewable and nonrenewable energy sources. (SEV3c)**Analyze each of the myths in the **Top 10 Myths about Sustainability Scientific American Michael Lemonick 3-1-09** article while thinking about the sustainability potential or renewable and nonrenewable energy sources. |
| **TOPIC 4: Design and defend a sustainable energy plan based on scientific principles for your location. (SEV3d)**According to the website US of Energy, the state of Georgia is ranked 46th out of 50 in resources (a measure of total energy production and consumption per capita), 26th in market (the cost of consumption, measured in electricity prices and gasoline taxes and 9th in infrastructure (capacity to generate and refine energy sources; miles of pipelines).<http://usofenergy.com/state/georgia/> | **TOPIC 5: Construct and revise a claim based on evidence on the effects of human activities on natural resources. (SEV4a)**Analyze the **Energy Consumption by Source Selected Countries 2016** which compares selected countries around the world with their populations, total primary energy consumption and then calculates an energy per capita for comparison purposes.What do you notice as you analyze this data?Are there any outliers in the data? If so, how do you explain why they are an outlier? | **TOPIC 6: Analyze and interpret data on global patterns of population growth and demographic transitions on global ecosystems. (SEV5b)**The amount of energy used in Irish homes has decreased by 32 per cent since 1990 despite a 50 per cent increase in the average floor area of residential properties. [Renewable energy last year accounted for 21% of the amount used in the electricity sector](http://www.irishtimes.com/news/environment/coal-stockpiling-leads-to-increase-in-fuel-imports-1.2031547), 5.7% of the amount used for heat and 4.9 per cent of that used in transport. <https://developmenteducation.ie/feature/the-energy-debate-renewable-energy-cannot-replace-fossil-fuels/> |
| **EXPLORE** |
| **TOPIC 1: Analyze and interpret the data on the U.S. Energy Consumption by Source Datasheet, 2017. (SEV3a)**What are the causes behind the overuse of natural resources? What are some possible solutions at the individual and the global levels to address overexploitation of resources? | **TOPIC 2: Research Renewable and Non-Renewable Energy Sources for risks and benefits of each. (SEV3b)**Using **Energy Sources Renew Non-Renew Research Sec Energy Source p. 10-50 SEV3b**For each of the 10 types of renewable and nonrenewable energy sources, find data to support both risks and benefits of each source. Use the **Compare and Contrast** **Graphic Organizer** for the Renewable and Nonrenewable comparisons.**Differentiation:** Using **Energy Forms Student Summary Notes Template Sec Info Act p. 13-17 SEV3b** as a guide to make notes, then fill out the **Compare and Contrast Graphic Organizer.****Teacher Answers:**Use **Teachers Answers Energy Forms Renewable Non-Renewable Sec Info Activities p. 42-46 SEV3ab** | **TOPIC 3: Obtain, Evaluate and Communicate data to predict the sustainability potential of renewable and nonrenewable energy sources. (SEV3c)**Thinking about the myths you read earlier and using the actual U.S. Energy data and Timeline from the **Energy Production vs Consumption U.S. from Energy Analysis p. 11-14,** analyze what has happened over time to U.S. energy in terms of renewable and nonrenewable energy sources. |
| **TOPIC 4: Design and defend a sustainable energy plan based on scientific principles for your location. (SEV3d)**Using an interactive map of Fossil fuels, Renewable fuels and Other (making up the 10 renewable and nonrenewable resources), click on each of the 10 to note how Georgia compares to the other states. This map is located toward the bottom of a page on this website: <https://archive.usofenergy.com/>. You will use what you have discovered to work on a plan below. | **TOPIC 5: Construct and revise a claim based on evidence on the effects of human activities on natural resources. (SEV4a)**Using the **Claims Evidence Reasoning (CER) from Biology Corner Graphic Organizer** analyze how human impact has an effect on resources – not only in the U.S. –now you can include other country data. Think about your prior work to analyze what is happening and then use this to construct a claim supported by evidence and reasoning. **Differentiation:** If students need more direction with CER, they can be given the **Claims Evidence Reasoning Template (CER) Step by Step** to guide their thinking. | **TOPIC 6: Analyze and interpret data on global patterns of population growth and demographic transitions on global ecosystems. (SEV5b)**How do you think Ireland was able to overcome the natural progression of a population increase and increased home size yet decrease usage?In the U.S. we have 4.45% of the world population, yet consume 18.5% of the energy.What factors do you think contribute to this difference? What are some things we can do to balance out our energy use?  |
| **EXPLAIN** |
| **TOPIC 1: Analyze and interpret the data on the U.S. Energy Consumption by Source Datasheet, 2017. (SEV3a)**Provide an initial draft of targeted solutions to help remedy this situation being sure to focus on the cause/effect relationships using a **Cause and Effect Graphic Organizer.** | **TOPIC 2: Construct an argument based on the data gathered about the risks and benefits of Renewable and Non-Renewable Energy Sources. (SEV3b)**Use the **Claims Evidence Reasoning (CER) from Biology Corner Graphic Organizer** to make a claim about the risk OR benefit of one or more of the renewable or nonrenewable energy sources researched. Be sure to use the data gathered. You may also reference the step-by-step guide for CER used during Topic 1 as needed.**Differentiation:** If students need more direction with CER, they can be given the **Claims Evidence Reasoning Template (CER) Step by Step** to guide their thinking. | **TOPIC 3: Obtain, Evaluate and Communicate data to predict the sustainability potential of renewable and nonrenewable energy sources. (SEV3c)**How has per capita consumption of energy changed in the last 50-75 years?How has the percentage of energy we import from other countries changed in the last 50-75 years?How has the mix of energy sources changed in the last 50-75 years for production, consumption, fossil fuels, nuclear energy, and renewable energy sources?Should the U.S. use more energy than it can produce? Why or why not? |
| **TOPIC 4: Design and defend a sustainable energy plan based on scientific principles for your location. (SEV3d)**Your plan for Georgia for sustainable energy must be convincing and use data for evidence and scientific principles for your reasoning to be justified. Use the following quote and what you have now learned about Georgia with sustainability to integrate the cause/effect relationship of choices.Consider this quote from President Obama, March 30, 2011 - “We cannot keep going from shock to trance on the issue of energy security, rushing to propose action when gas prices rise, then hitting the snooze button when they fall again. The United States of America cannot afford to bet our long-term prosperity and security on a resource that will eventually run out. Not anymore. Not when the cost to our economy, our country, and our planet is so high. Not when your generation needs us to get this right. It is time to do what we can to secure our energy future.” | **TOPIC 5: Construct and revise a claim based on evidence on the effects of human activities on natural resources. (SEV4a)**Continue thinking through your CER being sure to include your initial draft of a proposed solution to make changes in energy consumption for the U.S. based on evidence from your research – to then include what you can locally do to make a difference. Are behavioral changes or efficient technologies more important in saving energy? Why? | **TOPIC 6: Analyze and interpret data on global patterns of population growth and demographic transitions on global ecosystems. (SEV5b)**Look at p. 12 (Slides 23 & 24) from the **International Energy Outlook 2019 OECD vs non OECD countries** report from the U.S. Energy Information Administration (EIA). Why is there a large difference between OECD and non-OECD countries?How with this affect energy consumption in future years? |
| **ELABORATE** |
| **TOPIC 1: Analyze and interpret the data on the U.S. Energy Consumption by Source Datasheet, 2017. (SEV3a)**Using resources available to you, are there other countries who are similar to the U.S. with energy consumption? Who are different? If so, would your same solutions fit for each of those situations? Why or why not? | **TOPIC 2: Construct an argument based on the data gathered about the risks and benefits of Renewable and Non-Renewable Energy Sources. (SEV3b)**On the bottom of your CER sheet, outline a plan to convince a U.S. legislator how we should shift our thinking about these resources being used.  | **TOPIC 3: Obtain, Evaluate and Communicate data to predict the sustainability potential of renewable and nonrenewable energy sources. (SEV3c)**To make your explanations easier to “see” by using the data provided, choose which data to graph to prove your point by utilizing both the data charts and the U.S. timeline to assist in providing explanations. You may choose one of two graphic organizers which best represents explanation of your chosen data:**Scale Proportion and Quantity Graphic Organizer**OR**Applying Patterns Graphic Organizer** |
| **TOPIC 4: Design and defend a sustainable energy plan based on scientific principles for your location. (SEV3d)**Your final product will be to create a trifold brochure to put in a local hardware store to convince Georgia customers to adopt your sustainable energy plan. This guide can be created digitally and printed or done by hand. Integrate the data and analysis from prior assignments. For a guide use, **Customers Saving Energy Culminating Unit Product Brochure SEV3d.** | **TOPIC 5: Construct and revise a claim based on evidence on the effects of human activities on natural resources. (SEV4a)**Using the **Instagram Insta Energy Savings** guide, take a photo of yourself saving energy and screenshot it (or post to social media if you choose). Draft your ideas on the guide which must include tips/suggestions for using less energy along with data to support your claims to convince them to make changes. | **TOPIC 6: Analyze and interpret data on global patterns of population growth and demographic transitions on global ecosystems. (SEV5b)**Complete the **Systems and Models Graphic Organizer** being sure to provide evidence from patterns discovered through data. By taking all data and learning through this unit, you should be able to produce a model on this same page which will allow you to make future predictions of the effects of human population growth on global ecosystems.  |
| **EVALUATE (Also see Assessment above)** |
| **TOPIC 1: Analyze and interpret the data on the U.S. Energy Consumption by Source Datasheet, 2017. (SEV3a)**Use the **Claims Evidence Reasoning Template (CER) Step by Step**Respond in writing to the following quote using CER techniques:“When coal came into the picture, it took about 50 or 60 years to displace timber. Then, crude oil was found, and it took 60, 70 years, and then natural gas. So it takes 100 years or more for some new breakthrough in energy to become the dominant source. Most people have difficulty coming to grips with the sheer enormity of energy consumption.”*Rex Tillerson* | **TOPIC 2: Construct an argument based on the data gathered about the risks and benefits of Renewable and Non-Renewable Energy Sources. (SEV3b)**Using the **Student Text Message Debate Pros and Cons Energy Sources Sec Info Act p. 20 SEV3b** fill out what the text between you and a lobbyist would look like as you are trying to convince your legislator to listen to your point of view. Remember that using data to support your claim always helps in a debate. | **TOPIC 3: Obtain, Evaluate and Communicate data to predict the sustainability potential of renewable and nonrenewable energy sources. (SEV3c)**Evaluate student graphs and explanations. Sample Graphs for the teacher answer key are provided in the **Teacher Guide Energy Production vs Consumption U.S. from Energy Analysis p. 15-16 Sample Graphs SEV3c.** |
| **TOPIC 4: Design and defend a sustainable energy plan based on scientific principles for your location. (SEV3d)**Teachers will use the **NSTA Claims Evidence Reasoning rubric** to analyze student work on the trifold brochure. | **TOPIC 5: Construct and revise a claim based on evidence on the effects of human activities on natural resources. (SEV4a)**Teachers will use the **NSTA Claims Evidence Reasoning rubric** to analyze student work on the Insta Energy Savings social media “post.” | **TOPIC 6: Analyze and interpret data on global patterns of population growth and demographic transitions on global ecosystems. (SEV5b)**Teachers will analyze student work on the Systems and Models Graphic Organizer. |