

Today I Learned About Energy & Electricity

Description:

While the terms energy and electricity are often used interchangeably in daily life, understanding the distinction helps students better evaluate energy-related climate solutions. Students explore US energy and electricity data from 2001-2018 to distinguish between the terms and understand their future.

Skills & Objectives

SWBAT

- Explain that energy is a general term, and that electricity is a specific form of energy.
- Understand that electricity is generated from multiple sources whose use has changed over time in the US.
- Understand that each sector of the economy uses energy and electricity in different ways.
- Name one solution that changes US energy and/or electricity use in a way that reduces heat-trapping gases.

Skills

- Reading and interpreting line graphs
- Communication

Students Should Already Know That

- Energy is the capacity of an object or system to do work.
- Electricity is one form of energy.

Standards Alignment:

HS-ESS3-4 Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

CCSS.ELA-LITERACY.RI Informational Texts

CCSS.ELA-LITERACY.RST Science and Technical Subjects

CCSS.ELA-LITERACY.SL Speaking & Listening

Disciplinary Core Ideas:

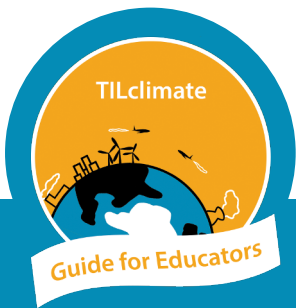
PS3.A Definitions of Energy

ESS3.C Human Impacts on Earth Systems

ESS3.A Natural Resources

ESS3.D Global Climate Change

ETS1.A Defining and Delimiting an Engineering Problem



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How To Use These Activities:



Pages with the circular “TILclimate Guide for Educators” logo and the dark band across the top are intended for educators. Simpler pages without the dark band across the top are meant for students.

Each of the included activities is designed to be used as a standalone, in sequence, or integrated within other curriculum needs. A detailed table of contents, on the next page, explains what students will do in each activity.

Each of the worksheet sets takes about the same amount of time and could be done as stations or in a jigsaw with students sharing their learning.

A Note About Printing

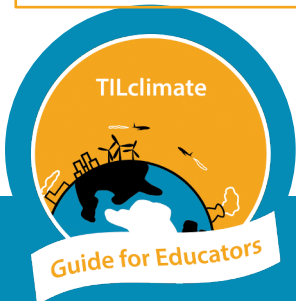
All student pages are designed to be printable in grayscale.

The worksheets do not leave space for students to answer questions. Students may answer these questions in whatever form is the norm for your classroom – a notebook, online form, or something else. This allows you, the teacher, to define what you consider a complete answer.

All data from <https://www.eia.gov/beta/states/data/dashboard/consumption>.

Podcasts in the Classroom: Throughout these Guides for Educators, we invite students to think about how they would share their learning with family and friends. One way to do this is to encourage your students to create their own podcasts - they're shareable, creative, and have multiple options for embedded assessment. We would love to hear any podcasts or see any other projects you or your students create! Email us at tilclimate@mit.edu, Tweet us @tilclimate, or tag us on Facebook @climateMIT.

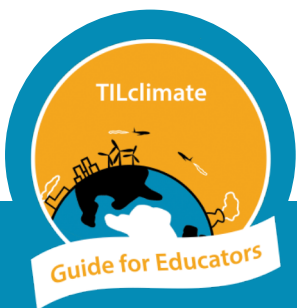
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Detailed Table of Contents

Page	Title	Description	Time (min)
	Podcast Episode	Students listen to TILclimate: Is it energy or electricity?, either as pre-class work at home or in the classroom. https://climate.mit.edu/podcasts/e3-it-energy-or-electricity	10-15
1-2	Electricity	Students study graphs of electricity generation and use and answer questions.	10-15
3-4	Energy	Students study graphs of energy consumption by source and sector and answer questions.	10-15
5-6	Renewables	Students study graphs of renewable electricity and energy and answer questions.	10-15
7	Definitions	Definitions of all energy sources and sectors found in the graphs.	n/a



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Season 2 Collection

Season 2 of TILclimate from MIT covers a series of interrelated energy subjects. The associated teacher guides are structured for maximum flexibility. Each episode's activities could be done as a whole class or as small-group work while other teams work on other topics and share back in a jigsaw. Some activities also can be enrichment or homework, and many as asynchronous assignments for remote work. Activities of similar length could also be set up as rotating stations, with a group discussion at the end of class.

- Introductory activities are quick (15-25 minutes) and require no internet.
- Dive Deeper activities are longer (30-60 minutes) and require internet access.

The City of the Future overall project is flexible in terms of time, space, and materials. It will be engaging whether students have completed all activities in the collection, or just one. If teams of students have been working on one topic each, the City of the Future process will help them share their learning with the rest of the class.

Is it Energy or Electricity?

This Educator Guide includes three short graph investigations. Educators may pick and choose among the pieces of the Guide, as suits their class needs.

Parts of this Guide may align with the following topics:

- Physical science: definitions of energy types.
- Life/environmental science: effects of fossil fuels vs other energy sources
- History/social science: impacts of climate change
- ELA/nonfiction: understanding and communicating complex science topics

MIT Resources

We recommend the following as resources for your own better understanding of climate change or as depth for student investigations. Specific sections are listed below:

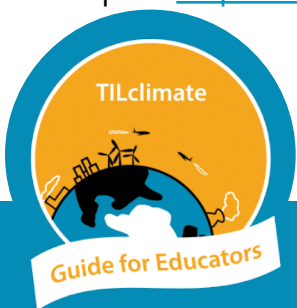
- Climate Science, Risk & Solutions, an interactive introduction to the basics of climate change. <https://climateprimer.mit.edu/>
 - Chapter 02 The greenhouse effect and us
 - Chapter 05 How much of the CO₂ increase is natural?
 - Chapter 10 What can we do?
- MIT Climate Portal Explainers are one-page articles describing a variety of climate topics. <https://climate.mit.edu/explainers>

Greenhouse Gases

Nuclear energy

Biofuel

Renewable Energy



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Wrap-Up Discussion Questions

- In daily life, we often use the terms energy and electricity interchangeably. How would you define the differences?
- Based on what you saw in the graphs and what you have heard about, what do you think is the future of energy in the US?
- The switch to a carbon-neutral future includes both energy shift (moving away from fuels and processes that produce heat-trapping gases) and energy efficiency (using less energy overall.) What is one solution you have heard about or seen?
- Based on what you saw in the graphs, which sectors have the most impact on carbon dioxide emissions in the US?

Climate Solutions

Climate solutions can be thought of as falling into four categories outlined below. Across all categories, solutions at the community, state or federal level are generally more impactful than individual actions. For example, policies that increase the nuclear, solar and wind mix in the electric grid are generally more effective at reducing climate pollution than asking homeowners to install solar panels. For more on talking about climate change in the classroom, see “How to Use This Guide”.

•Energy Shift

How do decision-makers make the switch from carbon-producing energy to carbon-neutral and carbon-negative energy?

•Energy Efficiency

What products and technologies exist to increase energy efficiency, especially in heating and cooling buildings?

•Adaptation

How can cities and towns adapt to the impacts of climate change?

•Talk About It

Talking about climate change with friends and family can feel overwhelming. What is one thing you have learned that you could share to start a conversation?

What solutions are the most exciting in your classes? We would love to hear from you or your students! Images, video, or audio of student projects or questions are always welcome. Email us at tilclimate@mit.edu, Tweet us @tilclimate, or tag us on Facebook @climateMIT.

