



## **Chapter 3: Energy**

Science, Ethics, Spirituality, Action

<http://healingearth.ijep.net/energy>

### *Introduction*

---

The *Healing Earth* team asks that when you use any aspect of this teacher guide or the lesson modules that you please send an email sharing: 1) how you used the resource, 2) how your students responded to the resource, activity, or lesson, and 3) what changes you would recommend for future versions of the guide. Please email Dr. Michael Schuck ([mschuck@luc.edu](mailto:mschuck@luc.edu)) and Dr. Nancy Tuchman ([ntuchma@luc.edu](mailto:ntuchma@luc.edu)). The information that you share will help improve these resources for your and others' use. We appreciate your feedback.

### *Overview*

---

The goal of this lesson is to guide students in their understanding of the science involved with energy, the ethical issues related to energy use, the spirituality connected with energy, and actions that students can take to address issues related to energy. This interdisciplinary approach to energy can help connect many different parts of students' lives such as their feelings of the power of natural storms and their daily use of electricity in their homes. At the end of the chapter, the students should have a broad understanding of the forms and transfer of energy in the natural world according to the laws of thermodynamics, the process of photosynthesis, and the inefficiencies of trophic levels or other energy conversions. The ethics of this chapter should call students to analyze moral issues of energy use and misuse around the world, especially in terms of access to energy. Through the spirituality section, students should come to a deeper appreciation of the spiritual forces of energy that they may have experienced and that many world religions portray as divine. Finally, the action section provides ways for students to act not only in small ways in their own communities but also in large ways through international organizations or governmental programs.

### *Learning Objectives*

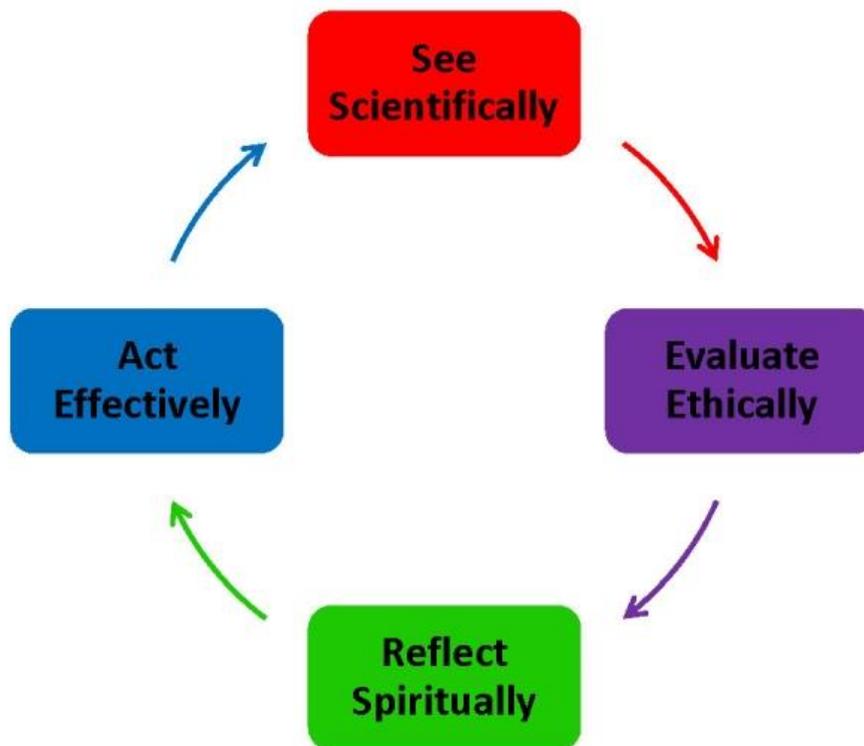
---

1. Investigate a **case study** that raises issues of energy science, ethics, spirituality, and action.
2. Explain the basic **science of energy** including the similarities between energy and work and the distinction between potential and kinetic energy.
3. Describe the different **types of energy** and show **how energy can be transformed** from one form to another.
4. Differentiate between **renewable and non-renewable energy** sources and explain the advantages and potential drawbacks of each.
5. Analyze **ethical issues** concerning energy availability, access, and use.
6. Discover the variety of ways that **energy and spirituality** have been related in world religions.
7. See **environmental actions** people are taking around the world that address energy challenges. Consider actions you can take in your own community.

### *Connection of this Chapter to Ignatian Pedagogy*

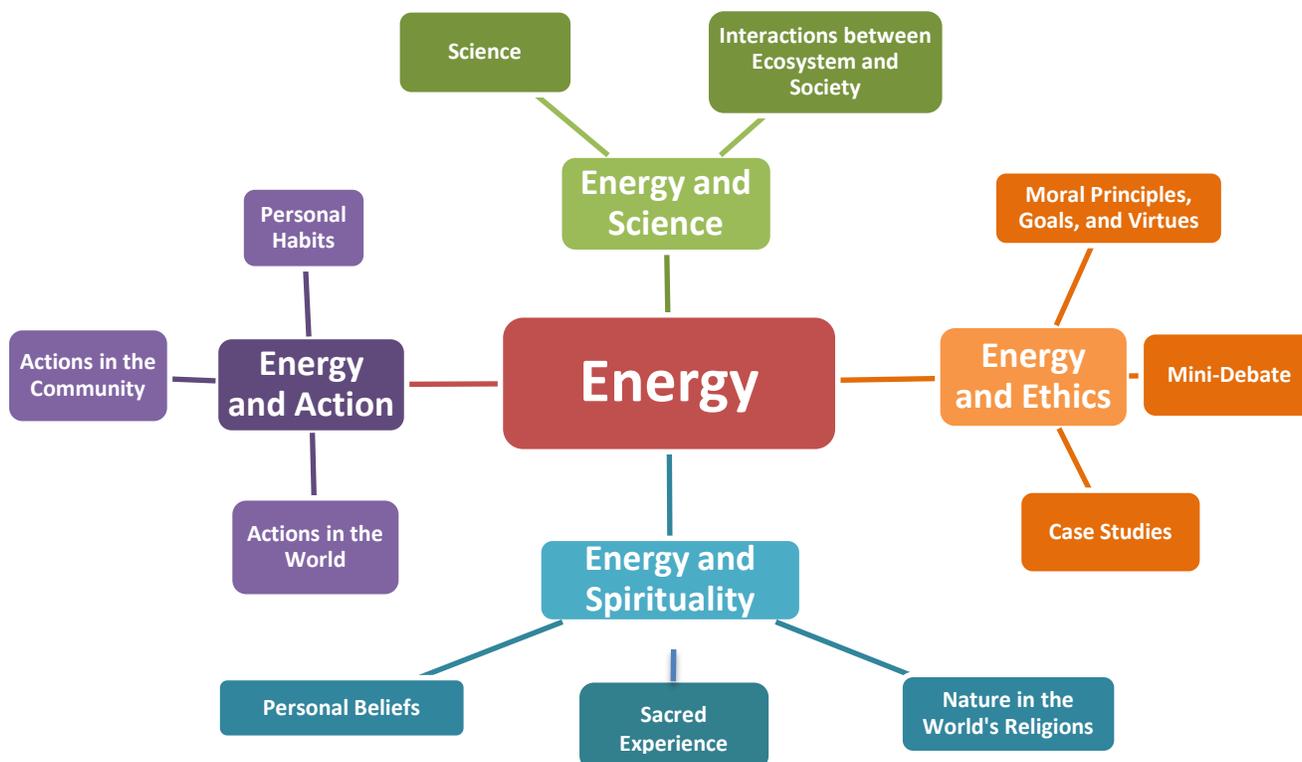
---

As stated above, an integrated understanding of energy engages students more fully because it engages *them* more fully as subjects, as *whole human beings* invited to connect their scientific curiosity, their moral lives, their deepest beliefs, and their energy to act. This follows the spirit of Ignatian Pedagogy, the method at the heart of *HE*. In *HE*, you are first invited to “see scientifically” and relate what you see to your own experience. Next, you are asked to reflect on the values (“evaluate ethically”) and meaning (“reflect spiritually”) that emerge in the study of environmental science. Finally, you are challenged to take the knowledge you have gained and



act to heal the Earth (“act effectively”).

When we elaborate this Ignatian Pedagogy figure with the major topics covered in the Energy Chapter, the following graph emerges.



As teachers, we should be sensitive to the ‘entry point’ into the subject of energy that attracts student attention. Possibly that entry point is science, or maybe a local environmental action linked to energy is a better point of departure. In these cases, we can capitalize on local events and, from there, guide students to energy science. The same can be true of a moral issue in energy. Possibly students have an interest in using solar panels in underdeveloped areas, from which we can bring students to the science of energy. The point to keep in mind is that the major topic areas in each *HE* chapter are movable; you can enter the chapter at any topic area and move along to the remaining topics in the order you find most helpful.

### *Lesson Outline and Suggested Activities*

---

Keep in mind that while the activities below are presented in a linear outline form, *HE* emphasizes an integrated approach that encompasses science, ethics, spirituality, and action. It is important that students do not see these as separate topics but as mutually reinforcing, interconnected dimensions of each subject, whether that be biodiversity, natural resources, energy, water, food, or global climate change.

<b>I. Case Study: El Hierro</b>	<i>Raises scientific, ethical and spiritual questions that will be further explored.</i>
	<p>The chapter opens with a case study to pique students' interests in the hopes and issues surrounding energy sources and uses around the world. Topics that are introduced include but are not limited to:</p> <ul style="list-style-type: none"> <li>• Renewable energy sources</li> <li>• Collective social movements for sustainable technology</li> <li>• The release of CO<sub>2</sub> from energy generators</li> <li>• Spiritual traditions of devotion to the Virgin Mary, Virgen de los Reyes</li> <li>• Impact of oil drilling on ecosystems</li> <li>• Governmental decisions and consumer impact</li> </ul> <p>Use the questions below to introduce the chapter through the lens of the case study.</p> <ul style="list-style-type: none"> <li>• What is energy and what are its main sources currently? What bearing do the laws of thermodynamics have on our understanding of energy? Which forms of energy are renewable and which are non-renewable?</li> <li>• There is intense public debate today around methods of acquiring, using, and distributing energy. What contribution do the moral principles, goals, and virtues of Healing Earth make to this debate?</li> <li>• What examples in the world's religions show a link between spiritual energy and the energies of nature? What are some of the 'inner' energies that human beings experience as spiritually powerful in their lives? How are these energies related to the energies of the natural world? Do you sense any relationship between your inner human energy and the energy of the natural world?</li> <li>• What actions are being taken in the world today that are hopeful signs of a transition to renewable energy? Are there actions being taken in your community to conserve energy and switch to renewable sources?</li> </ul> <p>You may also want to look at the reflection questions given at the end of this chapter and begin to ask some of them in ways related to the case study.</p>
<b>II. Energy and Science</b>	<i>Gain a solid scientific background of energy and the ways people use and obtain energy around the world</i>
	<p>This section contains several major sections:</p> <ul style="list-style-type: none"> <li>• Forms of Energy and Energetic Processes</li> <li>• The Laws of Thermodynamics</li> <li>• Photosynthesis and the sources of energy for living organisms</li> <li>• Trophic Levels and Efficiency</li> <li>• Historical Energy Use by Humans</li> <li>• Renewable and Nonrenewable Energy and Sources</li> </ul>

By the end of these lessons students should be able to explain forms of energy such as kinetic or potential energy, the first and second Laws of Thermodynamics, how energy is transformed in the environment between organisms and substances, the historical trends of energy use by humans, and some details about renewable and nonrenewable energy sources, including benefits and drawbacks of each.

As you are going through the lessons, make sure to pay attention to the “Closer Look” and “Looking Ahead” boxes and expand on these as wanted. Make sure that students are continually reflecting back to the questions and objectives explained at the beginning of the chapter. Try and make connections to the students’ own communities and interests.

*Activities/Projects:*

1. **Solar Cell Production:** A lab-made solar cell can be constructed using Titanium Dioxide, graphite, conductive glass, and basic electronics. One example procedure with example videos is available at: <http://education.mrsec.wisc.edu/289.htm>. Flinn Scientific also offers a kit to make a solar cell. If you cannot complete the lab activity, discussing with your students the process of making a solar cell can still be an important conversation. The use of renewable energy sources may be more efficient and less wasteful, but the production of these technologies includes significant investment of resources and labor.
2. **Thermodynamics Lab:** Relatively simple labs can emphasize the inefficient transfer of energy and heat. Some examples can be found at <http://www.arborsci.com/cool/thermodynamics-the-heat-is-on>. One example is a form of Hero’s engine made from a soda can. Two holes are punched in the side of an empty soda can with a nail, which is bent to the right relative to the bottom of the can in order to orient the holes in a counter-clockwise direction. A small amount of water is added just to cover the bottom of the can. Then the can is suspended from a ring stand or other tall object over a Bunsen burner or candle. As the lit candle or Bunsen burner heats the water, the escaping steam exits the can through the holes, and the can rotates. Efficiency calculations can be approximated by calculating the rotational energy (in Joules) needed to spin the can using the equation  $E_{\text{kinetic}} = 2\pi^2 * (\text{mass of can in kg}) * (\text{radius of can in m})^2 / (\text{average time per rotation of the can})^2$ . This energy can be divided by the energy provided from the candle or Bunsen burner through estimations about the amount of material being burned and the reaction energy of this combustion.
3. **Data Mapping Project:** Is there a relationship among income, energy use, and pollution? Have your students research statistics about your city or region including income, energy use, and pollution levels. Many government offices track income data, and many energy or utility companies (electric or gas) will track usage based on regions. Students can work in groups to map out these data based geography or neighborhoods. As a large group, discuss with your students what relationships they see from their research. Which regions use the most energy? Which use the least? How might income be related to energy use? Connections can be made to ethical questions as demonstrated in the lesson module included with this chapter. How do your class maps compare with other *HE* classrooms in other countries?

4. **Energy Audit:** Help your students to conduct an energy audit of your school or of their own homes. A model lesson for a school audit can be found at [http://learning.blogs.nytimes.com/2011/02/16/how-green-is-my-school-conducting-an-energy-audit/?\\_r=1](http://learning.blogs.nytimes.com/2011/02/16/how-green-is-my-school-conducting-an-energy-audit/?_r=1). To audit energy use in their homes, students can look up the energy use of certain appliances in their home and calculate the cost to run each appliance for a month. It is important to emphasize for your students that reducing certain uses of energy can save more energy than others. Which improvements or actions in their homes or at your school would have the biggest impact?

5. **Virtual Labs:**

Kinetic and Potential Energy:

[http://glencoe.com/sites/common\\_assets/science/virtual\\_labs/PS05/PS05.html](http://glencoe.com/sites/common_assets/science/virtual_labs/PS05/PS05.html)

Energy Transfer through Trophic Levels:

[http://glencoe.com/sites/common\\_assets/science/virtual\\_labs/CT06/CT06.html](http://glencoe.com/sites/common_assets/science/virtual_labs/CT06/CT06.html)

Thermal Energy and States of Matter:

[http://glencoe.com/sites/common\\_assets/science/virtual\\_labs/E17/E17.html](http://glencoe.com/sites/common_assets/science/virtual_labs/E17/E17.html)

6. **Trophic Levels Model:** Conduct this activity after your students read about trophic levels. Provide your students with some simple food material like popcorn, jellybeans, or pretzels. In groups of 3-4, have them construct a 3D model of a trophic pyramid, leaving it up to them to decide how best to represent the energy transitions. Important questions for them to consider include:

- What does your model tell other people about trophic levels?
- Who or what is represented in your model?
- How did you represent the flow of energy between levels?
- How many levels did you depict? Why?

Constructing and explaining models is an important skill for your students to develop. Encourage them to do their best and to recognize that there are limits to every model. Their model does not need to be perfect, but it should teach them and other people something valuable about trophic levels. This activity was adapted from:

[http://www.nabt.org/websites/institution/File/pdfs/2010%20OBT%20Activities/Anna\\_Scott\\_GA%20Share\\_a\\_thon\\_lesson.pdf](http://www.nabt.org/websites/institution/File/pdfs/2010%20OBT%20Activities/Anna_Scott_GA%20Share_a_thon_lesson.pdf)

**III. Energy and Ethics**

*Guide students in their navigation of the principles, goals, and virtues that will allow them to make more informed choices in healing our Earth*

It is important that you understand the logic that holds together the environmental ethic presented in *HE*. As explained in the Teacher Guide Introduction, the ethic is built on three foundations: the intrinsic value of nature, the instrumental value of nature, and the value of sustainability. The value of sustainability should shape how we use of nature (instrumental value); by using nature in a way that neither exhausts nor degrades it, we honor the integrity of the nature world (intrinsic value).

From these foundations a set of moral principles, goals, and virtues are derived that aid us in thinking through moral challenges that surface as human beings interact with the natural world. The foundations, principles, goals, and virtues used in *HE* are rooted in Roman Catholic social thought. You can see how these are presented and employed in such texts as Pope Francis' encyclical [\*Laudato Si'\*](#) (2015), Pope John Paul II's message [\*The Ecological Crisis: A Common Responsibility\*](#) (1990), the Southern African Catholic Bishops Conference's [\*Pastoral Statement on the Environmental Crisis\*](#) (1999), the Australian Catholic Bishops' statement [\*A New Earth: The Environmental Challenge\*](#) (2002), or the United States Conference of Catholic Bishops' pastoral statement [\*Renewing the Earth: An Invitation to Reflection and Action on Environment in Light of Catholic Social Teaching\*](#) (1991). All these texts are available on the internet at the provided hyperlinks.

Understanding the background logic to *HE*'s environmental ethic is not, in the first instance, for the purpose of teaching it to your students. Rather, the purpose is to help you feel more comfortable taking a single foundation or norm and exploring it in depth *with* your students. You may, for example, wish to lead a class discussion on what the intrinsic value of nature means and what bearing this might have on the issue of species extinction. In other words, consider approaching the Ethics Section with an emphasis on *depth* rather than *coverage*. Your students may eventually develop a sense of what it means to have a coherent environmental ethic, but a better place to start is often with a specific ethical idea in relation to a specific moral problem.

There are many ways to conduct an informative exploration of environmental ethics as it pertains to energy. You may wish to facilitate small and large group discussion, a class debate, or a case study analysis.

### **Small and Large Group Discussion**

The moral principles of care for creation, the universal destination of goods, and subsidiarity influence many decisions and debates connected with energy use. Care for creation can provide a balancing motivation to preferences for cheap energy sources by calling people to consider costs such as environmental degradation in addition to strictly monetary costs. The universal destination of goods helps to encourage access to clean energy for all people. Among other effects, subsidiarity can help to suggest why different groups of people should support change in energy usage at different levels of society. Have your students read the following regional reports and discuss the questions below in small or large groups to examine the ways that these principles connect to this chapter.

- Are the people in these areas caring for creation? How?
- Does the principle of care for creation support or oppose any other values or actions of these communities?
- How might the universal destination of goods connect with these regional reports?
- How are the actions in these regional reports connected with subsidiarity? Think about who is acting and at what level of society they are acting.
- Should anyone else be taking similar or different actions at another level of society?

*South Asia:* Bangladesh is the first country to get funds from the United Nations for its fast

growing solar home system. The system is lighting up houses in off-grid villages, showing the world the way to a low-carbon future. Read about this [here](#).

*Europe:* The European Commission has assembled the energy action plans of every EU nation for reducing carbon emissions and shifting to renewable energy. You can access each of these national reports at the [European Union: Energy website](#).

### **Class Debate**

The following regional reports discuss sources of energy such as nuclear energy and fossil fuels which both have positive and negative aspects. Have your students prepare a chart with positive and negative points (at least three each) about each source of energy based on one of the articles. In class, compile a list of the benefits and drawbacks of each source. Try to have your students prioritize the most important benefits and drawbacks. Do they support or oppose either or both of the energy sources? Are there reasonable limitations to how each source should be used that makes them morally acceptable or beneficial?

*Asia Pacific:* The government of Japan has lifted a ban on nuclear power that was put in place after the Fukushima nuclear plant disaster in March 2011. The government remains committed to nuclear power, though most Japanese people do not want it. [Read](#) about this government action.

*North America:* The student-led fossil fuel divestment movement has grown to over 300 college campuses. It is also impacting cities, faith-based institutions, foundations, and pension funds. To find out more about this movement and actions being taken, visit the [wearepowershift.org website](http://wearepowershift.org).

### **Case Study Analysis**

The following case studies detail some large projects to develop alternative energy systems. Have your students summarize these cases by drawing a diagram with a brief caption to explain these projects to other people. Consider having groups of 3-4 students work together to combine their diagrams into a larger poster, explaining the most important parts of these projects.

*Africa:* The goal of the non-profit Desertec Foundation is to create a transnational super grid of renewable energy through large-scale production of wind and solar power from deserts. [Go here](#) to discover what Desertec has accomplished in Morocco, Egypt, and Tunisia.

*South America:* The Chilean government has approved of the development of what will be one of the world's largest solar projects for energy storage. When complete in 2019, the [Copiapó Solar Project](#) will deliver 260 megawatts of clean, non-intermittent baseload power a day to consumers.

## **IV. Energy and Spirituality**

*Help students identify core convictions about the meaning and value of energy and the historical basis of these core convictions*

It is very important, here, that you have a clear understanding of the approach taken toward spirituality in *HE*. Spirituality will undoubtedly be the most challenging part of *HE* for teachers and students to accept as related to environmental science. It will be tempting to move through the topic quickly, or not at all. This would, however, degrade the very purpose of *HE*, which is to educate the *whole person* in environmental science. And spirituality is part of what makes up a whole person.

The difficulty is that most people immediately associate spirituality with either religion or some kind of mystical activity. The association of spirituality with religion is a problem for many people due to the history of some religions denying the results of science or intruding into the work of scientists. The association of spirituality with mystical activity is a problem for many people because, again, this activity seems completely unrelated or dismissive of science.

It is important that you help your students understand that spirituality is--in the first instance--a **constitutive feature of every human life**. Students need to understand that **all people have a spirituality--that they have a spirituality**. As stated in the Teacher Guide Introduction, *HE* begins with the view that spirituality is "the energy and content of beliefs that lie at the core of [every] human being's personal identity." This is why every Ethics Section in *HE* invites students to probe their fundamental thoughts and feelings about the natural world. This is an invitation to explore their 'inner spirit', or spirituality.

*HE* also relates spirituality to the particular experiences some people have of sensing a *sacred* quality in nature. Everyone has a spirituality in terms of an 'inner spirit', but not everyone experiences nature as something sacred. Additionally, *Healing Earth* relates spirituality to the beliefs and rituals of the world's religions, with a particular interest on beliefs and rituals concerning the natural world. Again, everyone has a spirituality in terms of an 'inner spirit', but not everyone's spirituality is linked to a religion.

With this in mind, the Spirituality Section of the Energy chapter invites students to explore what energy means to them, how people experience energy as sacred, and how the world's religions treat energy in their beliefs and rituals.

### **Energy and Personal Spirituality**

As detailed in the chapter, Dr. Martin Luther King, Jr. and Albert Camus differed in the ways they saw human energy in connection with the energy of the universe. Have your students take some time to write in their journals about their own views on this subject according to the questions below.

- Do you think that your life or the lives of other people are connected with the processes of the natural world? How?
- Where do you receive energy from the world? In what ways do you use that energy?
- Ultimately, do you think that your life makes a difference in the energy of the universe?

These questions may be quite daunting and, maybe, troubling to students. Consider inviting another teacher, counselor, or campus minister to be available in class this day to talk with

students if they choose. A decompression activity might help transition students back into the school day. Pass out a notecard or a sticky note to each student and have the students anonymously write one word for how they are feeling after the journal exercise, telling them to leave it in a box or near the door as they leave the room. Reviewing these cards can alert you to possible concerns if students seem distressed.

### **Energy and Sacred Experience**

Natural disasters can be powerful signs of the energy of nature. Similarly, some man-made machines can be astonishingly beautiful or terrifying. In Ray Bradbury's short story "Powerhouse," a woman who is on her way to see her dying mother has a spiritual experience while taking shelter from a storm in a power plant. Consider finding a copy of this short story in your school or local library for your students to read for homework or in class. Ask them if they have ever been amazed or frightened by an experience of the energy of the natural world or of a machine. Have they ever had an experience of being spiritually energized? How are your students' experiences similar to and different from each other? How do their experiences connect with the science they learned in this chapter?

### **Energy and World Religions**

How might the following concepts from the science section connect with the spiritual beliefs and practices from the spirituality section for this chapter (or from your students own experiences)? Have your students take about 5 minutes to jot down some initial ideas after reading both sections. Then have them pick two or three connections to explain in more detail by writing three paragraphs to explain the science concept, the spiritual concept, and the connection between the two. Feel free to add or subtract topics from this list based on the science content that your course includes. Some possible connections, which your students might notice, are included in *italics*.

- The transfer of energy as heat (*signs of God's presence in scripture as fire*)
- Energy from the sun (*the sun gods Ra or Helios*)
- The existence of fossil fuels in the earth (*spiritual power drawn from within a person through prayer or meditation*)
- The Laws of Thermodynamics
- Energy Efficiency (*Taoist belief in Qi and the storage/release of energy*)
- Solar spectrum and different wavelengths of light
- Plant's storage of energy in sugars
- Perpetual motion machines (*spiritual people who seem to be energized all the time*)
- Trophic Efficiency
- Current energy use trends (*overload of stimuli in our culture which sometimes feel distracting from our spiritual lives*)
- Renewable and Nonrenewable energy sources (*Rohlheiser's and Ben-Gurion's quotes about the power of spiritual energy*)

### **Energy Examen**

If your students are Catholic Christians you may want to lead them in the following Jesuit

Examen that focuses on energy. Read the statement and questions, leaving a 30 seconds or a minute in between each section for students to reflect.

Take a moment to calm yourself. Become aware of your breathing as we remember that we are in the presence of God. Ask the Holy Spirit to be with you in this Examen.

Call to mind the variety of ways that you use and experience energy in your everyday life. Where in your life do you feel grateful to God for energy, spiritually or literally?

Review the events of this day, starting with when you woke up this morning. When did you use electrical, physical, or spiritual energy today?

Were there any times when you wasted energy today? Did you use electronics out of convenience when you really did not need to? Were you angry or frustrated by something small that happened? Ask for forgiveness from God for your shortcomings.

How could you better use energy better in the future? Are there ways that you can be more efficient or mindful of your energy use? Ask for the knowledge and willpower to use energy in ways that praise, reverence, and glorify God above all else.

Close with the Ignatian Suscipe prayer: “Take, Lord, and receive all my liberty, my memory, my understanding, and my entire will. All that I have and call my own, you have given it all to me. I return it to you, wholly to be governed by your will. Give me only your love and your grace, and I am rich enough to ask for nothing more.”

## V. Energy and Action

*Guide students in identifying personal actions to obtain and use energy in ways that benefit their own community, region, and nation.*

### **Actions in the World**

How do governments or international organizations advocate for efficient energy use and sources? Your students can visit the [International Energy Agency website](#) to see how different countries are setting goals and making policies to govern their energy usage. There are several international groups that hold governments accountable to these standards besides the IEA. Assign your students to research one of the laws or policies listed for your country. Then have them write a brief summary and opinion about the policy, noting whether they think it is effective, scientifically supported, ethically consistent, and spiritually motivated. Consider then having them contact a government representative electronically or by mail, from your community or not, to explain their support or disapproval of the policy. This activity could also be completed by your class as a whole.

### **Actions in the Community**

Large community events or buildings can use significant amounts of energy, much more than most individuals or homes. Reducing the energy use of these communities can make a large difference in terms of energy costs for the community and in terms of their overall carbon

footprint. Among many other projects, the organization [Interfaith Power and Light](#) provides resources and encourages faith communities to take actions to reduce their energy usage, such as through their “Cool Congregations Challenge.” Have your students check out the [challenge winners from 2015](#). Can they think of ways to adapt any of these projects to your school or to other communities of which they are a part?

### **Personal Habits**

In the perspective of your students, individual actions might not seem to make a big difference in terms of planetary energy issues. However, collective actions of multiple people or cumulative actions of one person over a lifetime can make larger differences in the world. Forming energy saving habits can help your students make large impacts over their lifetime and can be a daily solidarity reminder for them that other people in the world struggle to have enough energy to complete daily tasks. Challenge your students to pick an energy-saving habit (possibly after completing the home or school energy audit mentioned in the science section of this guide) and to find ways to integrate this habit into their daily life for at least a month. Remind them that some actions make larger impacts than others, so they should pick an action that is going to have a relatively large effect.

## **VI. Reflection**

*Have students analyze their role in the misuse of energy, their responsibility to use energy sustainably, and the ways in which people around the world are affected by lack of energy source.*

This is a chance to tie everything back together – science, ethics, spirituality, and action. By drawing all four of these aspects of the curriculum together students should begin to understand the role they play in the planet Earth and why it is important for them to know all these aspects of the curriculum. Have them look back over all the work they have done and tie the different aspects together. This is where the concluding reflection questions should be brought in and students should be able to identify personal actions to address energy issues.

Any of the previous activities and explorations can encompass these lessons and values. Consider having your students try to create a public service campaign outlining ways that people in your community can use energy more efficiently. These campaigns could take the form of posters or videos and should include both tangible actions and reasons why people should take these actions (scientifically, ethically, and spiritually).

### **Inspired Person**

Not all inspired people are famous scientists or public figures. Beth Rickard worked as a high school student to drastically change the energy usage of her school. Read about her story [here](#). Are there any ecology heroes from your own school or community that could be recognized? Consider sharing their stories with the *HE* community or local news agencies. Sometimes small acts of encouragement or gratitude can help support people in their work.

## *Conclusion*

---

By the end of this chapter, students should have a deep scientific, ethical, and spiritual understanding of energy by going through case studies, regional reports, identifying personal actions, and studying the sources and uses of energy around the world. Important questions that students should be able to reflect on and answer by the end of this lesson are:

1. What are the laws of thermodynamics and how do they help us understand energy?
2. What is the role of photosynthesis in the interaction between the sun's energy and life on Earth?
3. How is energy lost in moving from a primary energy source, such as coal, to the production of visible light in an incandescent light bulb?
4. What are the forms of renewable energy? What technologies are being developed today to expand these forms of energy for human use?
5. Why is it important to understand the history of the industrial revolution when doing energy ethics?
6. What bearing does the principle of the universal destination of goods have on energy ethics?
7. Describe the way energy has been understood as a spiritual force in two world religions.
8. What does Richard Rohlheiser mean by 'spirituality'? What does his understanding of spirituality have to do with energy?