1. **Incorporating Indiana State Standards**
   *Note, have been temporarily removed from IDOE and were downloaded pre-removal.*

   **Env.1.16** Cite examples of how all fuels have advantages and disadvantages that society must question when considering the trade-offs among them, such as how energy use contributes to the rising standard of living in the industrially developing nations. However, explain that this energy use also leads to more rapid depletion of Earth’s energy resources and to environmental risks associated with the use of fossil and nuclear fuels.

   **Env.1.21** Differentiate between renewable and nonrenewable resources, and compare and contrast the pros and cons of using nonrenewable resources.

   **Env.1.24** Give examples of the various forms and uses of fossil fuels and nuclear energy in our society.

   **Env.1.25** Recognize and describe alternative sources of energy provided by water, the atmosphere, and the sun.

   **Env.1.32** Understand and describe how nuclear reactions release energy without the combustion products of burning fuels, but that the radioactivity of fuels and by-products poses other risks which may last for thousands of years.

2. **Asking questions and defining problems:**
   Evaluating an energy source for benefits and challenges of use
   Creating questions of relevance to topic
   Asking questions about energy source information being presented.

3. **Obtaining and evaluating information:**
   - Reading for information and responding to questions requiring concept application for correct response
   - Internet search by topic, or other resources such as personal interviews, books, etc.
   - Evaluation of sources for reliability and importance/relevance of information they contain

4. **Use of technology and software:**
   - MacBook Airs, or comparable internet-connective devices
   - Various Presentation software such as PowerPoint, imovie, Prezi, etc. – sharable
   - Google Docs

5. **Collaboration:**
   Students work together to determine “two truths and a lie” from presented material while selecting 20 questions for a test bank.

6. **Critical thinking**
   Students interpret published graphs of energy usage at global, national, state, and home and create and explain a graph that represents a comparison of the different levels of use.

7. **Communication:**
   Presentation of research to peers
   Sharing of a Google Doc of “two truths and a lie” questions to evaluate
   Collaboration of “two truths and a lie” activity

8. **Analyzing and interpreting data**
   Students respond to questions requiring application of concepts from reading
   Graph element – create and explain a graph comparing different levels of energy source usage
   Evaluation of benefits and challenges of using various energy sources
9. **Assessment plan:**
   - worksheet correct answers
   - Evaluation score sheet for Presentations (50 points, see below)
   - Checklist of Collaborative Element (15 points, see below)

10. **Implementation plan with resources (supplies and estimated cost) needed**

   **Day 1:** Read through the NEED Secondary Energy infobook (introduction to Energy) and answer questions on the “Student Hand-out: Energy Source Expert Individual Short-Term Research Project” included below.

   **Day 2-4:** Begin student projects with an explanation of the requirements and then allowing students time to work,
   as teacher checks work and prompts students to higher achievement.

   **Day 5-6:** Student presentations with teacher evaluations.

   **Day 7:** Students work individually to create “two truths and a lie” questions and then collaboratively to make 20 questions for test (Google doc)

   **Estimated Cost:** None to school above normal operating cost. Free online book.
   If students do not have access to computer, free downloading and printing of the NEED infobook is possible for educational purposes.
   Note: NEED has a lot of similar resources available.
As you read pp. 6-9 of the Infobook, answer the following questions:

1. Classify different forms of energy examples as Potential (P) or Kinetic (K).
   - a microwave
   - a stretched rubber band
   - sugar
   - loud music
   - a bowling ball travelling down a lane
   - uranium atoms (used in nuclear power plants)
   - a hot stove
   - a skier on top of the mountain
   - a skier travelling down the mountain
   - sunlight
   - electricity

2. Order steps of operation in a Thermal Power Plant. (number 1-6)
   - Inside the generator, the shaft spins coils of copper wire inside a ring of magnets. This creates an electric field, producing electricity.
   - The steam travels at high pressure through a steam line.
   - Water is piped into the boiler and heated, turning it into steam.
   - The high pressure steam turns a turbine, which spins a shaft.
   - Electricity is sent to a switchyard, where a transformer increases the voltage, allowing it to travel through the electric grid.
   - Fuel is fed into a boiler, where it is burned to release thermal energy.

3. Explain the difference between renewable and nonrenewable sources of energy.

4. Classify today’s 10 major energy sources into Renewable (R) and Nonrenewable (N).
   - Petroleum
   - Natural gas
   - Coal
   - Uranium
   - Propane
   - Biomass
   - Hydroelectric
   - Geothermal
   - Solar
   - Wind
5. In what units do we measure the amount of energy in a source? 

6. Define the unit that you answered above.

7. What are two examples that can help a person understand how much energy is represented by one of these units.

8. How many British thermal units would be contained in one gallon of gasoline? (Show calculations)

9. About how many miles can your car (personal or family) travel on one gallon of gasoline? ______

10. How does your car mileage compare to a similar model being manufactured this year? (use MPG)

11. The average American uses about __________________________Btu daily.

12. Large quantities of energy are measured in __________________________, which represents one quadrillion Btu (1,000,000,000,000,000, or \(10^{15}\)).

13. If you are an average American, you will use about the amount of energy stored in _______ gallons of gasoline daily. Per year, you would use the energy equivalent of _______ gallons of gasoline.

14. Into what four categories is energy use classified by the U.S. Department of Energy?

   ______________________________________________________  ______________________________________________________
   ______________________________________________________  ______________________________________________________

15. Which category uses the greatest percentage of energy? __________________________

16. List the categories where you personally participate in energy use.

17. The information describes three factors that help to decrease an individual’s energy use. What are they?
   A. ______________________________________________________
   B. ______________________________________________________
   C. ______________________________________________________

18. Which factor do you think has the most impact on your personal energy use decisions? Why?

19. Which factor, according to the article, has had the most influence on limiting our energy use in the United States?
Student Hand-out: Energy Source Expert
Individual Short-Term Research Project Requirements and Evaluation
Day 2-4

Name: ________________________________

Method: PowerPoint, imovie, or other venue, with teacher approval
10 minute duration

Energy Sources:
- Biomass
- Biofuels: Ethanol + biodiesel
- Coal
- Geothermal
- Hydropower/Hydrokinetic Technologies
- Natural Gas
- Petroleum
- Propane
- Solar
- Nuclear
- Wind

1. Choose one source of energy from the list provided.
2. Your goal is to become the in-class expert on your energy source and teach the other students in the classroom about your form of energy.
3. Educate yourself about your choice by reading the NEED Secondary Energy Infobook and gleaning information from at least three other sources of reliable information. I may ask you to defend your source, if I question its reliability. If you don’t convince me, it may be rejected.
4. Make sure to take notes for each of your 3 selected sources. (computer or handwritten)
5. Proper citation of each source used must appear in the presentation (see easybib.com or comparable help program)
6. See the evaluation chart on the back of this paper for required elements
<table>
<thead>
<tr>
<th>Requirement</th>
<th>Points Possible</th>
<th>Points Earned</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 reliable sources(with infobook)</td>
<td>4</td>
<td></td>
<td>Extra?</td>
</tr>
<tr>
<td>4 Sources properly cited</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 sets of notes with unique information on each</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Create your <em>own</em> Graph showing usage of your energy source in the world, U.S., and State levels (Extra point for home) needs to be clear and you need to explain/interpret it for audience</td>
<td>5</td>
<td></td>
<td>Extra?</td>
</tr>
<tr>
<td>Description of the history of your source (discovery, development, etc.)</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explanation of how the source is converted for use (step-by-step)</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explanation of source availability (density/amount/future/renewability)</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The benefits of using this source</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The challenges to overcome in using this source</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal favorite - share about what you learned</td>
<td>2</td>
<td></td>
<td></td>
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<tr>
<td>Presentation 9-11 minutes in length</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correct response to audience Questions – unplanned</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Quality</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neatness- effort obvious (visual aids and personal grooming)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pace (enhanced presentation)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enthusiasm was demonstrated</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>50</strong></td>
<td></td>
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</tbody>
</table>
Follow-up Activities: Day 7?

Task: Create a shared Google document with 20 questions, and the correct answers, representing the most important concepts to be learned from the different energy source presentations.

Directions:
1. Work together using the Norse Honor Traits: Pride, Respect, Responsibility, Peacemaker.
2. Share the creation of a Google document and submit to teacher for grading (one submission).
3. Each student must decide upon three of the most important concepts from his presentation.
4. Each student must then formulate test questions that cover the 3 most important concepts covered in his presentation. (one question per concept). This preliminary work could/should be done on your own and then copied and pasted into the shared Google doc as a completed work.
5. Each question must be appropriate for age and experience of students in the class. (challenging)
6. Correct grammar, spelling and punctuation must be used.
7. An answer key must be provided. Here is the twist: One of the questions must be answered incorrectly (key will be wrong) and the other two will be answered correctly. In other words, you are providing “two truths and a lie” when making up the answer key.

DO NOT DISCLOSE THIS INFORMATION TO YOUR FELLOW STUDENTS!

Also, any special evaluation criteria must be described in your key. For example, if the question is an essay question, what needs to be included in order for the student to earn full credit?

8. As each student completes his individual work, and posts it on the shared document, all students will enter the collaborative discussion to determine which one of the three questions for each set is the lie and supply a correct answer. During discussion, the creator of the question set will only affirm a correct identification of the “lie” and affirm a correct answer to the “lie”. The discussion will be student driven. For example, if a student created the first three questions on the document, she would only listen to the discussion until the group identifies the “lie”. She would nod or say yes when the group correctly identify the “lie”. When the group then supplies a correct answer for the “lie”, The student would nod again.

9. The above student would then be responsible to edit the Google doc, making the “lie” into a “truth”. The group would then move on to the next set of questions and The student could enter the discussion while the creator of the new set becomes a listener and affirmer only.

10. Teacher will be monitoring (listening) to the discussion, but will have very limited input. The teacher just oversees the discussion to ensure that the “rules” are being followed.

11. When all sets are completed, students will collaborate again to select the 20 questions to appear on the test. Now that the “lies” are corrected, they may be considered as possible test questions.

12. The 20 selected questions will make up 2/3 of the test over these energies, as long as they meet the criteria for challenging and age appropriate.

13. The following checklist will be the evaluation tool for this activity.
**Evaluation Checklist of Collaborative Element:**

<table>
<thead>
<tr>
<th>Name:</th>
</tr>
</thead>
</table>

| Demonstrated Norse Honor Traits During Activity Pride, Respect, Responsibility, Peacemaker | 5 |
| Question posted on Google doc with correct answer | 1 |
| Challenging, age appropriate, correct grammar and punctuation | 1 |
| Question posted on Google doc with correct answer | 1 |
| Challenging, age appropriate, correct grammar and punctuation | 1 |
| Question posted on Google doc with wrong answer | 1 |
| Challenging, age appropriate, correct grammar and punctuation | 1 |
| Participated in collaborative discussion on all sets of questions, excluding own | 1 |
| Provided affirmation of “lie” identification and of correct answer provided by the rest of the group for own set of questions | 1 |
| Participated in the collaboration to decide upon 20 questions for the test | 1 |
| Submitted a complete Google doc to the teacher | 1 |
| 15 points possible | Total Points: |