**Expert Pack: Renewable Energy Sources**

Lexile Range: 1160-1350

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| **Topic/ Subject:** Energy/Science |
| **Text/ Resources**Book1. *Energy Sources: The Pros and Cons* by David D. Dreir

Articles1. “The Wind Farm of the Future Might be Underwater”
2. “How Solar and Wind Got So Cheap So Fast”

Other Media1. “Climate kids – Gallery of Energy” (Photos with Captions)
2. “Alternative Energy” (informational video)
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| **Rationale and Suggested Sequence for Reading**This text set begins with a series of photos with captions that capture many different sources of energy. “Climate kids – Gallery of Energy” reveals images of both renewable and non-renewable energy sources. Having a clear picture of the types of energy resources we have, student will read *Energy Sources: The Pros and Cons*. This book will allow students to get a better idea of the importance of focusing on renewable energy sources; and provides a clear outline of many renewable energy sources including solar, hydro, and nuclear power; and some of the pros and cons of each. Then, in “Alternative Energy” (informational video), students will be exposed first-hand to some of the concerns that real people face with renewable energy, and again are reminded of the great need to make these resources work for the future of the planet. In “The Wind Farm of the Future Might be Underwater,” students will be exposed to a source of renewable energy that is not commonly in sue currently. This text will help students to begin to think about the potential in the future to make renewable energy the majority of the energy resource used; while right now the United States continues to use mostly fossil fuels. Finally, in “How Solar and Wind Got So Cheap So Fast”, student will get deeper into the technology that is making renewable energy a real possibility.  |
| **The Common Core Shifts for ELA/Literacy**1. Regular practice with *complex* text and its academic language
2. Reading, writing and speaking grounded in *evidence* from text, both literary and informational
3. Building *knowledge* through content-rich nonfiction
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| **College and Career Readiness Anchor Standards for Reading Literary and/or Informational Texts** 1. *Read closely to determine what the text says explicitly and to make logical inferences from it*; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
2. *Determine central ideas or themes of a text* and analyze their development; summarize the key supporting details and ideas.
3. *Read and comprehend complex literary and informational texts independently and proficiently.*
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| **Annotated Bibliography****N/A “Climate kids – Gallery of Energy”** Author: Earth Science Communications Team. Genre: Photographs with CaptionsLength: 11 images with captionsSynopsis: There are ways to collect energy that are harmful to the planet, but there are also ways to harness energy in ways that do not harm the plantet.Citation: Earth Science Communications Team. (n.d.). *Climate Kids – Gallery of Energy.* Retrieved on Dec. 22, 2016 from <http://climatekids.nasa.gov/energy-gallery/>. NASA’s Jet Propulsion Laboratory. California Institute of Technology. Suggested Activities: A Picture of Knowledge**1160L *Energy Sources: The Pros and Cons***Author: David D. DreirGenre: Nonfiction Book Length: 24 half pages = 12 pages totalSynopsis: This book outlines the major sources of energy and the need for energy to fuel everything we do. The book outlines fossil fuels, hydroelectric power, solar energy, nuclear power, and the potential and needs for the future of power.Citation: *Energy Sources: The Pros and Cons.* Retrieved on Dec. 22, 2016 from <https://www.readinga-z.com/books/leveled-books/book/?id=978&lang=English>. Reading A-Z. Learning A-Z. United States.Suggested Activities: Quiz MakerN/A “Alternative Energy”Author: National GeographicGenre: Informational VideoSynopsis: People can sell power back to the electric company by harnessing the power of the sun; but individual people cannot be the answer to the problem. There needs to be a large-scale commitment to finding energy alternatives.Citation: National Geographic. (n.d.). *Alternative Energy.* Informational Video. Retrieved on Dec. 23, 2016 from <http://video.nationalgeographic.com/video/alternative-energy>. National Geographic. United States.Suggested Activities: Wonderings**1220L “The Wind Farm of the Future Might be Underwater”**Author: Megan GarberGenre: Informational ArticleLength: 2 PagesSynopsis: Humans have been able to harness the power of the wind and the sun; but the future might be harnessing the power of the tide, using energy created by water.Citation: Garber, Megan. *The Wind Farm of the Future Might be Underwater*. Retrieved from <http://www.theatlantic.com/technology/archive/2014/11/the-wind-farm-of-the-future-might-be-underwater/382225/>. Suggested Activities: Wonderings**1350L “How Solar and Wind Got So Cheap So Fast”**Author: Robinson MeyerGenre: Informational ArticleLength: 5 PagesSynopsis: Technology has been changing quickly, and with it, new technologies to harness clear energy has also changed. These big changes have led to an agreement of the powers of the world to limit global warming to just 2 degrees Celsius; an agreement that would have been impossible in the past.Citation: Meyer, Robinson. *How Solar and Wind Got So Cheap So Fast.* Retrieved from<http://www.theatlantic.com/technology/archive/2015/12/how-solar-and-wind-got-so-cheap-so-fast/418257/> Suggested Activities: A Picture of Knowledge |

### Supports for Struggling Students

By design, the **gradation of complexity** within each Expert Pack is a technique that provides struggling readers the opportunity to read more complex texts. Listed below are other measures of support that can be used when necessary.

* Provide a brief **student-friendly glossary** of some of the academic vocabulary (Tier 2) and domain vocabulary (Tier 3) essential to understanding the text
* Download the Wordsmyth widget to classroom computers/tablets for students to access student-friendly definitions for unknown words: <http://www.wordsmyth.net/?mode=widget>
* Provide brief **student-friendly explanations** of essential background knowledge not easily learned from the text
* Include pictures or videos related to the topic within and in addition to the set of resources in the pack
* Select a small number of texts to **read aloud** with some discussion about vocabulary work and background knowledge
* Provide **audio recordings** of the texts being read by a strong reader (teacher, parent, etc.)
* **Chunk the text** and provide brief questions for each chunk of text to be answered *before* students go on to the next chunk of text
* Pre-reading activities that focus on the **structure and graphic elements** of the text
* Provide **volunteer helpers** from the school community during independent reading time
* Use expert Packs as the **resources for Guided Reading** with a small group of students

Why Text Sets Support English Language Learners

Those acquiring English as a second language have to learn many words in English to catch up with their English-only peers. Vocabulary builds at a much quicker pace when reading a set of connected texts. Text sets are an adaptable resource perfect for building knowledge and vocabulary. Student use of text sets can vary in terms of independence or teacher supports based on the individual needs of the students in the room. Activities found within the text set resources reflect several best practices for English Language Learner instruction including:

* Providing brief, engaging texts that provide a high volume of reading on a topic.
* Providing web-based resources and/or videos that are tied to the content of the texts students are reading.
* Providing opportunities for students to learn new vocabulary through the use of student-friendly definitions in resource-specific glossaries.
* Allowing for options to reinforce newly learned vocabulary and/or content through graphic organizers.
* Providing opportunities for students to reinforce new vocabulary through multi-modal activities including written work, group discussion, viewing visual content, and reading texts that feature the vocabulary.

Teachers of ELLs may use the protocols on the following pages to provide additional support to students who are struggling to access the content within text sets because they are new to English.

ELL Text Set Protocol Grades 3-12

The goal of text sets is to help students build knowledge through a volume of independent reading, and it is important that educators provide scaffolds to allow English Language Learners to be successful in engaging meaningfully with the texts, even as students are still developing English language skills. The protocol below can be used for teaching with text set resources as a full class. Students can also be trained on the protocol so that they can utilize text sets in small groups or partnerships as a resource for independent or reciprocal reading and study.

Please note that this protocol includes options for teachers. Individual decisions should be made considering the needs of the students and the demands of the content, keeping in mind that the goal of each scaffold is to allow students to meaningfully access the text and move toward independent, knowledge-building reading.

**Step one: Build knowledge and vocabulary.**

Introduce students to the overall topic/content of the text set, including knowledge demands needed to engage in the content, and domain-specific vocabulary necessary for comprehension. This should be done prior to engaging with the texts themselves; time allotted to this activity should reflect student needs (anywhere from 5 minutes prior to reading, to a full day’s lesson is appropriate).

*Options for this step include:*

* Engage students in reading and discussing auxiliary texts (of lesser complexity) and resources (illustrations, photographs, video clips) on the topic of the text set.
* Pre-teach a few key content-specific terms prior to students engaging with a text set. (Ideas for text-focused vocabulary instruction can be found [here](https://achievethecore.org/content/upload/Selecting%20and%20Using%20Academic%20Vocabulary%20in%20Instruction.pdf).)
* Provide the student-friendly glossary included in the text set prior to reading each text.
* When possible, allow students to read texts in their home language about the topic under study.

**Step two: Read text orally.**

Focusing on one resource at a time, allow students to listen to a fluent read of the resource, while following along with their own copy of the text.

*Options for this step include:*

* Have a fluent reader model the first read of a text or resource.
* Have students engage in a buddy/partner read.
* Use recordings of the text to provide additional opportunities to hear expert reading.

**Step three: Engage in group discussion about the content.**

Allow students time in partnerships or small groups to discuss the content of the resource.

*Options for this step include:*

* + Allow for discussion/conversation (in the students’ home language if possible) with a small group of students reading the same text set prior to writing or provide heterogeneous language groupings to talk about content and discuss what students are learning.
	+ Have students refer to the student-friendly glossary included with each text set to identify meanings for new vocabulary necessary for comprehension.

**Step four: Write about what was read.**

*Options for this step include:*

* Use the “Rolling Knowledge Journal” and/or “Rolling Vocabulary Journal” as a shared writing routine/ graphic organizer to help to scaffold the writing process and capture student knowledge over time.
* Provide students with several supports to help students engage in writing/drawing about what they read:
	+ Use mentor texts about which students can pattern their writing.
	+ Allow them to write collaboratively.
	+ Show students visual resources as prompts, etc.
	+ Provide language supports such as strategically chosen sentence starters.

**Repeat steps one through four with each resource in the text set as appropriate.**

**Expert Pack: Renewable Energy Sources**

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| **Learning Worth Remembering****Cumulative Activities –** The following activities should be completed and updated after reading each resource in the set. The purpose of these activities is to capture knowledge building from one resource to the next, and to provide a holistic snapshot of central ideas of the content covered in the expert pack. It is recommended that students are required to complete one of the Cumulative Activities (Rolling Knowledge Journal or Rolling Vocabulary) for this Expert Pack. |

**1. Rolling Knowledge Journal**

* Read each selection in the set, one at a time.
* After you read each resource, stop and think what the big learning was. What did you learn that was new and important about the topic from this resource? Write or list what you learned from the text.
* Then write or list how this new resource added to what you learned from the last resource(s).

**Sample Response:**

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| **Title** | **Write or List** |
| **New and important learning about the topic** | **How does this resource add to what I learned already?** |
| 1. “Climate kids – Gallery of Energy”  | There are many ways to harness energy in ways that emit carbon dioxide which include burning peat, and refining oil. There are also ways to do it without emitting carbon dioxide, including collecting wind, solar, and tidal energy. |  |
| 2. *Energy Sources: The Pros and Cons* | The U.S. uses much more energy than any other country, and we still get most of our power from fossil fuels. Even if we reduce how much energy we use one thing is certain, we need energy and the fossil fuels we use to supply it will not last forever. | It looks like in the future we will continue to use more and more oil, coal, and natural gas, and even though we will also use more renewable energy, it will not be nearly as much as the fossil fuels. This raises concerns about the environment and because fossil fuels will run out at some point in time. |
| 3. **“**Alternative Energy” | There are many renewable energy options, but they have not been proven to be a really good option in the United states. Grain can create ethanol, the sun can create solar cells, and wind turbines collect wind energy. | Low gas prices keep Americans using lots of energy, but when gas prices are low, many people are not in a rush to find new source of energy.  |
| 4. “The Wind Farm of the Future Might be Underwater” | Technology has improved greatly for harnessing renewable energy, but we still have a long way to go. Some scientists think that underwater turbines are the future of the industry, while others argue that there could be potential challenges with having turbines in the sea. | Some of the challenges that people have with sustainable energy might be solved if turbines are underwater, where people can’t see them. Though underwater turbines require a particular environment to be successful, those environments exist in places like, for example, San Francisco and New York City. |
| 5. “How Solar and Wind Got So Cheap So Fast” | Technology advances have made clean and sustainable resources for harnessing energy a more realistic opportunity. As some of the challenges of renewable energy are solved with technology, there is hope that we will send less carbon dioxide into the atmosphere. | Technology has made it so that sustainable energy is a more viable option than ever before; perhaps before we run out of traditional, environment-harming fossil fuels, the technology will make it so that everyone in the world can use clean energy. |

**2. Rolling Vocabulary: “Fabulous Five”**

* Read each resource then determine the (up to) 5 words from each text that most exemplify the central idea of the text.
* Next use your 5 words to write about the most important idea of the text. You should have as many sentences as you do words.
* Continue this activity with EACH selection in the Expert Pack.
* After reading all the selections in the Expert Pack, go back and review your words.
* Now select the “Fabulous Five” words from ALL the word lists.
* Use the “Fabulous Five” words to summarize the most important learning from this Expert Pack

**Sample Response**

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| **Title:** | **Five Vocabulary Words & Sentences** |
| “Climate kids – Gallery of Energy” | Words: carbon dioxide, tidal power, greenhouse gasses, solar panels, tidal turbine1. An oil refinery in Salt Lake City burns off waste gases, releasing carbon dioxide into the atmosphere.
2. Tidal power stations produce electricity from tides, though it is not widely used.
3. Releasing greenhouse gasses makes the Earth warmer.
4. Solar panels produce energy from the sun without releasing carbon dioxide.
5. A tidal turbine power plant can harness the natural energy of waves.
 |
| *Energy Sources: The Pros and Cons* | Words: energy, fossil fuels, pollutants, hydroelectric power, solar power.1. The United States uses a lot of energy, more than any other large nation on the planet.
2. Fossil fuels – coal, oil, and natural gas – are a leading energy source around the world, but they can have a devastating impact on the environment.
3. Using fossil fuels creates a lot of pollutants that are dispersed in our atmosphere.
4. Hydroelectric power comes from power that is created from the water.
5. Solar power refers to power that can be harnessed from the sun.
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| **“**Alternative Energy” | Words: efficient, alternative power sources, harness, viable, pioneered1. Scientists work to make solar cells much more efficient than those that have existed until this point.
2. Making alternative power sources that can compete with fossil fuels has been the mission for many years.
3. You can harness and get the energy of the sun with solar panels.
4. Proving that renewable energy technology is viable and can be used remains a struggle.
5. Wind turbines were pioneered, created, in the US.
 |
| **“**The Wind Farm of the Future Might be Underwater” | Words: generate, benefit, unsightly, predictable, reliable1. Water may be able generate up to 1/3 of the energy needed to power the country Scotland.
2. Underwater windmills have the benefit of invisibility and cannot be seen.
3. A common objection to wind turbines being how unsightly they are to human eyes.
4. Undersea turbines also benefit from the fact that tides are predictable in ways that winds are not: You know how much power you're generating on any given day.
5. The world may have another source of reliable and clean energy like underwater windmills.
 |
| **“**How Solar and Wind Got So Cheap So Fast” | Words: optimistic, clean-energy, innovation, competitive, plunging1. People have become optimistic and positive about climate change in the past few years.
2. As the cost of renewable energy plunges, the United States is finally getting serious about a clean-energy policy.
3. Renewable innovation has already surprised us despite the industry receiving only small public funding.
4. On-shore wind is competitive with fossil-fuel-burning plants in many parts of the world.
5. Everywhere I looked, it seemed, people cited the plunging cost of renewables as reason for optimism in the planetary struggle.
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| **Fabulous Five** | Words: fossil fuels, pollutants, alternative power sources, innovation, competitive**Fossil fuels** – coal, oil, and natural gas – are a leading energy source around the world, but they can have a devastating impact on the environment.Using fossil fuels creates a lot of **pollutants** that are dispersed in our atmosphere, so for many years scientists have been working on finding alternative sources of energy.This has been a challenge, partly because it is expensive, but making **alternative power sources** competitive with fossil fuels has been the mission for many years. Renewable **innovation** has already surprised us despite the industry receiving only meager public funding; imagine how much more efficient and powerful those wind turbines and solar panels can eventually be.​Today, many renewable and clean energy sources are becoming **competitive** with fossil-fuel-burning plants in many parts of the world, which is great news for our environment. |

**Student Copy**

**1. Rolling Knowledge Journal**

* Read each selection in the set, one at a time.
* After you read *each* resource, stop and think what the big learning was. What did you learn that was new *and important* about the topic from *this* resource? Write or list what you learned from the text.
* Then write, draw, or list how this new resource added to what you learned from the last resource(s).

**Sample Response**

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| --- | --- |
| **Title** | **Write or List** |
| **New and important learning about the topic** | **How does this resource add to what I learned already?** |
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**2. Rolling Vocabulary: “Fabulous Five”**

* Read each resource then determine the 5 words from each text that most exemplify the central idea of the text.
* Next use your 5 words to write about the most important idea of the text. You should have as many sentences as you do words.
* Continue this activity with EACH selection in the Expert Pack.
* After reading all the selections in the Expert Pack, go back and review your words.
* Now select the “Fabulous Five” words from ALL the word lists.
* Use the “Fabulous Five” words to summarize the most important learning from this Expert Pack.

**Sample Response**

|  |  |
| --- | --- |
| **Title:** | **Five Vocabulary Words & Sentences** |
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| **Fabulous Five** | Words:  |

**Learning Worth Remembering**

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| **Singular Activities** – the following activities can be assigned for each resource in the set. The purpose of these activities is to check for understanding, capture knowledge gained, and provide variety of ways for students to interact with each individual resource. Students may complete some or none of the suggested singular activities for each text. Singular activities should be assigned at the discretion of the teacher. |

**1. Quiz Maker –** Recommended for: *Energy Sources: The Pros and Cons*

* Make a list of questions that would make sure that another student understood the information.
* Your classmates should be able to find the answer to the question from the resource.
* Include answers for each question.
* Include where you can find the answer in the resource.

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| --- | --- |
| **Question**  | **Answer** |
| 1. |  |
| 2.  |  |
| 3. |  |
| 4. |  |

**2. A Picture of Knowledge** – Recommended for the following texts: *Climate Kids – Gallery of Energy* and *How Solar and Wind Got So Cheap So Fast*

(see graphic below)

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**3. Wonderings –** Recommended for the following texts: *Alternative Energy* and *The Wind Farm of the Future Might be Underwater*

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| **I’m a little confused about:** | **This made me wonder:** |
| On the left, track things you don’t understand from the video and the article.  | On the right side, list some things you still wonder (or wonder now) about this topic. |

**Expert Pack: Renewable Energy Sources**

Expert Pack Glossary

**“Climate kids – Gallery of Energy”**

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| --- | --- |
| *Word* | *Student-Friendly Definition* |
| ebb and flow | A pattern of coming and going |
| harness | To control something in a way that you can use it to create usable energy |
| oil refinery  | A factory that converts crude oil into more useful products like gasoline or heating oil |
| peat | A brown soil-like material that is partially made of composed vegetable matter |
| tide/ tidal  | The rising and falling of the sea, usually happens twice each day with the gravitational pull of the moon and the sun |
| wind power | Power or energy that was gathered as a result of the wind |

***Energy Sources: The Pros and Cons***

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| --- | --- |
| *Word* | *Student-Friendly Definition* |
| energy | Different types of power that people and machines need to do work |
| environmentalists | People concerned with keeping Earth’s ecosystems healthy |
| fossil fuels | Energy sources taken from the earth, including coal, oil, and natural gas |
| global warming | The worldwide rise of temperatures through air pollution trapping heat |
| hydroelectric | Produced from water as a source of electricity |
| pollutants | Harmful chemicals that damage the environment |
| sediment | Bits of earth carried by flooding |
| turbines | Wheels that spin when the force of water, air, or steam is applied |

**“Alternative Energy”**

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| --- | --- |
| *Word* | *Student-Friendly Definition* |
| clean energy  | Refers to sources of energy that do not emit carbon dioxide or other greenhouse gasses. In general, clean energy is considered good for the environment. |
| green energy | Energy that comes from natural sources such as sunlight, wind, rain or tides |
| National Renewable Research Laboratory  | Where scientists work to create technologies that are better and more available to collect energy that is “clean” or “green” |
| solar cells | A small device that converts solar (sun) energy directly in to electricity |
| viable | Capable of being successful and or surviving for a long time |

**“The Wind Farm of the Future Might be Underwater”**

|  |  |
| --- | --- |
| *Word* | *Student-Friendly Definition* |
| generate | To cause something or produce something |
| horizon | The line where the earth’s surface and the sky appear to meet. In this text, the windmills would not be on this line in the distance, since they would be underwater.  |
| predictable | Behaving in a way that is expected |
| tide | The alternating rising and falling of the sea caused by the gravitational pull of both the sun and the moon |

**“How Solar and Wind Got So Cheap So Fast”**

|  |  |
| --- | --- |
| *Word* | *Student-Friendly Definition* |
| analogous | Comparing two things that are unrelated because there is a similarity to learn from |
| climate change | The worldwide rise of temperatures through air pollution trapping heat |
| glut | An abundant supply of something, having too much |
| humanity | The human race, being human in character; sharing feelings and emotions |
| meager | Small |
| mount | The way that something is supported |
| optimism  | Hopefulness and confidence about a situation |
| photovoltaic | Relating to the production of electricity when something is exposed to light; a key component in solar energy production |
| regulations | Rules or laws that place restrictions on something. Recent American and European regulations that have de-incentivized coal power plants. |
| tepid | Luke-warm |

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