Intermediate energy infobook activities electricity answers

1 Indirect action nergy Infobook Workbook accompanying the intermediate nergy infobook: actions to strengthen general energy information, facts about energy sources and electricity. Level degree: n Intermediate subject areas: n Science n Social Studies n Language Arts 13 2 ND Mission Statement Teacher Advisory Board Shelly Baumann Rockford, MI Constance Beatty Kankakee, IL Sara Brownell Canyon Country, CA Loree Burroughs Merced, CA Amy Constant Raleigh, NC Joanne Coons Clifton Park, NY Nina Corley Galveston, TX Regina Donour Whitesburg, KY Matthew Inman Spokane, Washington Michelle Buffalo Grove , IL Barbara Lazar Albuquerque, NM Robert Lazar Albuquerque, NM Leslie Lively Reader, WV Mollie Mukhamedov Port St Lucie, FL Don Pruett Sumner, WA Josh Rubin Palo Alto, CA The mission of the ND Project is to promote an energy-conscious and educated society by creating effective networks of students, teachers, business, government and community leaders to design and implement objective, multifacet energy education programs. Statement by the Teachers' Advisory Board In support of the ND, the National Teachers' Advisory Board (TAB) is dedicated to developing and promoting a standards-based curriculum and energy training. Permission to copy ND materials may be reproduced for non-commercial educational purposes. Nergy Data Used in ND Materials ND believes in providing recently reported energy data available to our teachers and students. Most of the statistics and data come from the U.S. Nergy Information Administration's Annual Nergy Review, which is published in June each year. In collaboration with the IA, ND includes easy-to-understand data in our software materials. For further research, visit IA's website at the IA's Nergy Kids website has great lessons and classes for students at Linda Fonner New Martinsville, WV Samantha Forbes Vienna, VA Viola Henry Thaxton, VA Robert Hodash Bakersfield, CA DaNel Hogan Kuna, ID Greg Holman Paradise, CA Linda Hutton Kitty Hawk, NC Joanne Spaziano Cranston, RI Gina Spencer Virginia Beach, VA Tom Spencer Chesapeake , VA Joanne Trombley West Chester, PA Jim Wilkie Long Beach, CA Carolyn Wuest Pensacola, FL Wayne Yonkelowitz Fayetteville, WV Printed on Recycled Paper 2 Intermediate Nergy Infobook Activities 3 Intermediate Nergy Infobook Activities Table of Contents Correlations with National Science ducation Standards 4 Teacher Guide 5 Critical Thinking Questions 6 Nergy Forms 7 Nergy Sources Sheets 8 Sources Nergy Crosswords 13 Renewable and Nonrenewables 23 How We Use Our Nergy Sources 24 Water Cycle 25 Lectricity 26 Lectricity Crossword 27 Famous Names in lectricity 28 lectric Math 28 Transport lectricity 29 Measurement lectricity 30 Answer Keys 31 valuation Form ND Project P.O. Box Manassas, VA 4 Correlations with National Science ducation Standards: Grades 5-8 This book has been to national science ducation content standards. For correlations with individual state standards, visit content standard B Physical Science Transfer nergy nergy is owned by many substances and is associated with heat, light, electricity, mechanical motion, sound, nuclei and the nature of the chemical. nergy is transferred in many ways. Heat moves predictably, flowing from warmer objects to colder ones until the same temperature is reached. Light interacts with matter through transmission (including refraction), absorption or scattering (including reflection). To see an object, the light from this object emitted by or scattered from it must get into the eye. electrical circuits provide a way to transfer electricity during thermal, light, sound and chemical conductors. In most chemical and nuclear reactions, energy is transferred to or from the system. Heat, light mechanical movement or electricity may be involved in such transfers. The Sun is the main source of energy for changes on the Earth's surface. The sun loses energy by emitting light. A small fraction of this light reaches the earth, transferring energy from the sun to the earth. Solar energy appears as light of different wavelengths, consisting of visible light, infrared and ultraviolet radiation. Standard D arth and Space Science nergy content in arth Solid earth is layered with lithosphere; hot convective coat; and a dense metallic core. Water, which covers most of the Earth's surface, circulates through the crust, oceans and atmosphere in the so-called water cycle. Water evaporates from the earth's surface, floats and cools as it moves to higher elevations, condenses like rain or snow, and falls to the surface, where it gathers in lakes, oceans, soil and rocks underground. Water is a solvent. As it passes through the water cycle it dissolves minerals and gases and transfers them to the oceans. In the solar system, the Sun is the main source of energy for phenomena on the Earth's surface, such as plant growth, winds, ocean currents and the water cycle. The seasons are due to changes in the amount of solar energy hitting the surface, due to the slope of rotation of the earth on its axis and the length of the day. 4 Intermediate nergy Infobook Activities 5 Teacher Guide Background Intermediate nergy Infobook Activities is a series of worksheets for students aimed at enhancing vocabulary, concept and information in the intermediate nergy infobook. You can download an intermediate nergy information book or specific energy information sheets from minutes of time about minutes so that students read each selected factsheet and complete the sheets. Nonfiction Skills Reading Critical Thinking Vocabulary Grafing Preparation Decide Which Factsheets and Sheets used with the class. Get a set of intermediate classes Infobooks or make copies of the factsheets you want to use. Make copies of the student sheets you want to use in this booklet. nergy in the Balance contains charts and activity charts to further enhance information in infobooks. Many other ND activities also amplify and synthesize information in infobooks such as Nergy Jeopardy, Great Nergy Debate, Transparent Nergy, Nergy on Stage, Great Nergy Rock Performances, Nergy Xpo and Nergy Carnival. Procedure 1. Distribute one intermediate nergy infobook for each student. 2. Have students read the information sheets you have selected. List the concepts and new vocabulary in the factsheets. 3. Have students fill out the selected worksheets. 4. These sheets shall reinforce and synthesize the information contained in the intermediate nergy information sheet. Questions about critical thinking can be found on page 6. You can use any or all of your questions with your students. Sheets include: Nergy Sheet Forms (page 7) Nergy sheet sources (Pages 8-25) lectricity sheets (pages 26-30) 5. Use the pricing form on page 47 to evaluate the activities and then send or fax back to ND The ND Project P.O. P.O. Box Box 10101, Manassas, VA VA 6 Critical Thinking Questions 1. xplain the five energy transfers that are happening now in the classroom. 2. Write a convincing letter to the city council about the pros and cons of the new landfill. 3. Do you think coal mining people should benefit from reclamation on earth? Why? 4. Rank the waterfront layers in order of importance. Enter the reasons why you put them in this order. 5. Write a debate between an environmentalist who is concerned about the construction of a hydroelectric power plant and the owner of the plant. 6. Compare how sectors use natural gas for the way they use other sources. What does natural gas have in common with other sources? What's special about it? What generalizations can be made about natural gas after viewing the data? 7. Fleet vehicles and indoor machinery often use propane. Why do you think these vehicles (more than others) can use propane instead of oil? 8. Describe one benefit and one challenge to U.S. oil consumption. 9. Many energy sources can be dangerous if not intercepted, used or properly contained. Make a list of problems that may arise through the use of uranium and solutions that can be used to prevent problems from occuring. 10. If a 10 turbine wind farm were to be placed somewhere in your community, where do you think it would be the perfect place? xplain the reason why you chose this site. Also include 5 sites you think you've rejected and why you turned them down. 11. Summarize what the chart on page 23 of renewable and non-renewable shows about our use and non-renewable resources. 12. Add another 5 words that deal with electricity to electricity crossword puzzle. They need to properly connect to the current puzzle. Write tips to help someone find out your words. 13. When we turn the switch on, our lights light up. When we plug something in and turn it on, it works. We don't think about where that energy comes from, the electricity. Pretend you're a spark of electricity. xplain journey from energy resources to video game console. 6 Indirect Action Nergy Infobook 7 Forms of Nergy Fill in the blanks with words at the bottom of the page. Some words will be used more than once. 1. The struggles of energy and position energy are energy. 2. Compressed springs and stretched rubber bands are energetic. 3. Vibration and movement of atoms and molecules in substances is called heat or energy. 4. A scientific principle which states that energy cannot be created or destroyed is called the Law. 5. The flow of energy through substances in longitudinal waves is. 6. The energy of positions such as the rock on the hill is energy. 7. The movement of objects and substances from place to place is. 8. Electromagnetic energy traveling in transverse waves is energy. 9. Nergy stored in bindings of atoms and molecules is energy. 10. The movement of atoms, molecules, waves and electrons is energy. 11. Electron movement is energy. 12. The amount of useful energy you get from the system is his. 13. Energy in oil and coal is stored as energy. 14. X-rays are an example of energy. 15. Fission and fusion are examples of energy. 16. The hydropower reservoir is an example of energy. 17. Wind is an example of energy. Word Bank Chemical Energy Efficiency Movement Radiant Thermal Protection Nergy Gravitational Sound Nuclear Kinetic Potential Stored Mechanical 2012 ND Project P.O. Box 10101, Manassas, VA 8 Biomass Description: Renewable or non-renewable: Description of photosynthesis: Ways to convert biomass into energy that we can use: Who uses biomass and for what purposes: ffect the use of biomass in the environment : Important facts about biomass: Carbon Description of coal : Renewable or non-renewable: Where is coal and how to recover it: How we can use coal into energy: Who uses coal and for what purposes: ffect the use of coal for the environment: Important facts about coal: 8 Intermediate 9 Geothermal Nergy Activity Description of geothermal energy: Renewable or non-renewable : Where geothermal resources are located and how we recover them: Ways to convert geothermal energy into energy what we can use: Who uses geothermal energy and for what purposes: ffect the use of geothermal energy in the environment: Important facts about geothermal energy: Hydropower Description of hydropower: Renewable or non-renewable: Description of the water cycle: Ways to transform power plants energy that we can use: Who uses hydropower and for what ffect of the use of hydropower for the environment: Important facts about hydropower: 2012 ND Project P.O. Box 10101, Manassas, VA 10 Natural gas Description of natural gas: Renewable or non-renewable: Where natural gas is located and how to recover it: Ways to convert natural gas into energy that we can use: Who uses natural gas and for what purposes: ffect use of natural gas in the environment : Important facts about natural gas: Oil Description of oil: Renewable or non-renewable: Where is oil and how we recover it: How we can turn oil into energy: Who uses it Oil and For What

Purposes: Ffect Oil Use in the Environment: Important Facts About Crude Oil: 10 Intermediate Nergy Action Infobook 11 Propane Propane Description: Renewable or Non-Renewable : Where propane is located and how to recover it: Ways we convert propane into energy that we can use: Who uses propane and for what purposes: ffect of using propane in the environment: Important facts about propane: Solar nergy Description of solar energy: Renewable or non-renewable: How solar energy is produced and how we recover it: Ways to convert solar energy into energy that we can use : Who uses solar energy and for what purposes: ffect the use of solar energy on the environment: Important facts about solar energy: 2012 ND Project P.O. Box 10101, Manassas, VA 12 Uranium Description of uranium: Renewable or non-renewable: Where uranium is located and how we recover it: Ways to convert uranium into energy that we can use: Who uses uranium and for what purposes: ffect the use of uranium (nuclear energy) in the environment : Important facts about uranium (nuclear energy): Wind Description of wind energy: Renewable or non-renewable: Where is wind energy and how we recover it: Ways, in which we use wind, we can use: Who uses the wind and for what purposes: ffect the use of wind on the environment: Important facts about the wind: 12 Indirect nergy Infobook Activities 13 Biomass Crossword 2012 Project ND P.O. Box 10101 , Manassas , VA 14 Carbon Crossword 14 Intermediate Nergy Infobook Activities 15 Geothermal Crossword 2012 ND Project P.O. Box 10101, Manassas, VA 16 Hydropower Crossword 16 Intermediate Nergy Infobook Activities 17 Natural Gas Crossword Type of Fuel Made from Ancient Plants and Animals 2012 ND Project P.O. Box 10101, Manassas, VA 18 Petroleum Crossword Number on petroleum producing state kind of fuel made from ancient plants and animals 14. About half of our oil from 15 other countries. Houses drilling equipment 18 Intermediate nergy Infobook Activities 19 Propane Crossword Fuel Type Made from Ancient Plants and Animals 2012 ND Project P.O. Frame 10101, Manassas, VA 20 Solar Crossword 20 Intermediate Infobook Activities 21 Uranium Crossword nergy stored in nuclear nuclei Where nuclear power plant stores its radioactive waste Fission produces this form of energy ND Project P.O. Box 10101, Manassas, VA 22 Wind Crossword 22 Intermediate nergy Infobook Activities 23 Renewables and Nonrenewables Convert the quads into percentages and make a pie chart showing how much U.S. energy in 2010 came from renewable sources and how much came from nonrenewable sources. Round to the nearest set. (Q = four- or quadrillion of British thermal units) Crude oil Q = % natural gas Q = % carbon Q = % uranium 8,44 Q = % biomass 4,30 Q = % hydroe hydroenoulent energy 2,51 Q = % propane 1,60 Q = % geothermal, Solar, and Wind 1.24 Q = % Total Quads Q = % 2012 ND Project P.O. Box 10101, Manassas, VA 24 How we use our nergy sources In boxes, the main application number of each energy source from 1 to 5 of 1 as the most important use. Some sources can only be used in one or two ways. TRANSPORT MAK PRODUCTS HATING/COOLING LIGHTING MAK LCTRICITY 24 Intermediate nergy Infobook Activities 25 Water cycle label and describe the water cycle in the space below the number in the chart. Water Cycle ND Project P.O. Box 10101, Manassas, VA 26 lectricity Write the correct word for each definition in the empty space. Use each word only once. 1. A substance in which all atoms are identical. 2. The center of the atom. 3. Negatively charged atom particle. 4. Positively charged atom particle. 5. A particle in the nuclei of an unlaid atom. 6. The smallest part of the element that retains the characteristics of the element p. 7. Electrical force within an atomic particle. 8. Areas around the nucleus where electrons are located. 9. Force field formed between the poles of the magnet. 10. A device that operates in an electrical circuit. 11. The path through which electricity travels. 12. An object in which electrons at one end rotate in one direction and electrons at the other end rotate in the opposite direction. 13. How loads or magnetic poles react. 14. Device with magnets and wire coils that generates electricity. 15. A device that generates electricity as a result of a chemical reaction. Word Bank atom attract battery charging circuit energy level element magnetic field magnetic field neutron deter turbine 26 Indirect nergy Infobook Action 27 lectricity Crossword In coal-fired power plant, thirty-five percent of the fuel is converted into electricity. This is called the Power Plant ND Project P.O. Box 10101, Manassas, VA 28 Known names in lectricity The following sentences refer to well-known scientists and inventors from the history section of the electrotric sheet. Read the sentence. Then write the name of the scientist or inventor in squares and circles. Decipher the letters in circles to create a response to the final statement. 1. The first scientist to conduct electric current by transmitting the magnet through copper wiring. 2. W opened a power plant that used AC power. 3. Many people think they have discovered electricity with their famous lightning experiment. 4. Using salt water, zinc and copper, he created the first electric cell. 5. He invented a light bulb and opened the first electric power plant. 6. The first power plant capable of transporting electricity more than 200 miles away. Lectric Mathematics Match the following numbers to the following instructions. Each number will only be used once. Save the numbers in the rows to the left of the statement. Then perform the mathematical operations indicated by each statement. Write answers on the lines on the right side of the manual Start with the voltage used to operate most household appliances. 2. Divide this number by cost, in cents, kilowatt-hours of electricity = 3. Multiplie this number by the average capacity of the thermal power plant = 4. Add to this the number of the year in which the bulb was invented = 5. Divide this number by the number of watts in one kilowatt = 6. Multiplie this number by a year dison started its power plant = ANSWR 28 Indirect nergy Action Infobook 29 Transport lectricity xplain what each of the items numbered below does, to get electricity from generator to consumer Power plant: 2. Step-up transformer: 3. Transmission line: 4. Power tower: 5. Step-down transformer: 6. Distribution line: 7. Residential transformer: 2012 Nd Project P.O. Box 10101 , Manassas, VA 30 Measurement lectricity Directions : Fill in the blanks in the tables below. TABL 1 VOLTAG = CURRNT X RSISTANC 1.5 V = A x 3 Ω V = 3 A x 4 Ω 120 V = 4 A x Ω 240 V = A x 12 Ω TABL 2 POWR = VOLTAG X CURRNT 27 W = 9 V x A W = 120 V x 1.5 A 45 W = V x 3 A W = 120 V x 2 A TABL 3 APPLIANC POWR = VOLTAG X CURRNT TV 180 W = 120 V x A COMPUTR 40 W = 120 V x x Printr 120 W = 120 V x A HAIR DRYR 1000 W = 120 V x A TABL 4 POWR X TIM = LCTRICAL NRGY (kwh) X PRIC = COST 5 kw x 100 h = x $ 0 12 = $25 kw x 4 h = x $ 0.12 = $ 1000 W x 1 h = x $0.12 = $ 30 Intermediate nergy Infobook Activities 31 Answers to Critical Thinking Questions 1. xplain the five energy transfers that are happening now in the classroom. Responses may include: electric to sound (radio, bell, tv), chemical to move (digestion of food in the stomach), radiant for heating (students sitting near the window feeling warm) 2. Write a convincing letter to the city council about the pros and cons of the new landfill. Responses may include: Negative odor, smoke from burning garbage; Positive cheaper power, cheaper garbage collection. 3. Do you think coal mining people should benefit from reclamation on earth? Why? Students should choose yes or no and explain why the land should be taken care of after it has been used for mining or why it should not. Rank the waterfront layers in order of Enter the reasons why you put them in this order. Order. they should sort out the layers (core, mantle, shell) and defend why they place them in that order. 5. Write a debate between an environmentalist who is concerned about the construction of a hydroelectric power plant and the owner of the plant. Responses may include an environmentalist worried about flooding the area and the loss of animals and habitats. The owner of the plant can conclude that the reservoir will provide recreational options and that salmon ladders and other things can be built to protect wildlife. They can also mention that the area needs a cheap, clean source of energy, and the dam will provide it. 6. Compare how sectors use natural gas for the way they use other sources. What does natural gas have in common with other sources? What's special about it? What generalizations can be made about natural gas after viewing the data? Responses may include that it is divided between [commercial, residential, industrial, transport and electricity] like some other sources (biomass and petroleum). Unlike others, natural gas does not have a sector that dominates its resources. This may mean that natural gas is more versatile than other sources. 7. Fleet vehicles and indoor machinery often use propane. Why do you think these vehicles (more than others) can use propane instead of oil? The answers may include that internal vehicles do not want any form of exhaust gas that comes from an oil vehicle because they are trapped indoors. Fleet vehicles can use propane because they have designated routes or a designated location where they remain. They are able to access propane filling areas. Other vehicles would have more problems with this, as there are not many propane gas stations. 8. Describe one benefit and one challenge to U.S. oil consumption. The answers will vary, but the benefits may include that our society's petroleum fuels allow us to travel easily, or that oil is an inexpensive transport fuel compared to many alternative fuels. Challenges may include the fact that we consume more oil than we produce or that burning oil releases carbon dioxide. 9. Many energy sources can be dangerous if not intercepted, used or properly contained. Make a list of problems that may arise through the use of uranium and solutions that can be used to prevent problems from occuring. Responses may include that the spent fuel from the nuclear reactor is radioactive, but is safely stored on site. A nuclear power plant failure can cause extensive damage, and radioactive power plants in the U.S. are specifically designed and built to contain radiation and radioactive materials in the unlikely event of an accident. in nearby communities, merge plans are in place to Residents. Nuclear power plant workers are highly trained and follow safety procedures. 10. If a 10 turbine wind farm was going to be placed somewhere in your community where you think ideal place would be? xplain the reason why you chose this site. Also include 5 sites you think you've rejected and why you turned them down. The answers should be that the area must be large enough to support 10 turbines. Turbines should be the highest thing around, so the wind is not blocked. The area underneath could be used on agricultural or pasture land, but should not be used in any other way. The area must have strong, constant winds. In the immediate vicinity there should be no places of migration of birds or nesting of birds. 11. Summarize what the chart on page 23, Renewable Energy and Nonrenewables, shows about our use of renewable and non-renewable resources. The students' summary may include the fact that we use 92% non-renewable sources, that we use more uranium (or coal or oil or natural gas) than we do all the renewable energy sources put together, or that renewable sources are just a small slice of the pie. 12. Add another 5 words that deal with electricity to the electric crossword. They need to properly connect to the current puzzle. Write tips to help someone find out your words. The answers will vary. 13. When we turn the switch on, our lights light up. When we plug something in and turn it on, it works. We don't think about where that energy comes from, the electricity. Pretend you're a spark of electricity. xplain journey from energy resources to video game console. Students can identify the energy resources they start as (uranium, coal). Students can explain how this resource turns into electricity. They should trace the path from the power plant to the transformer, transmission lines, neighborhood transformer, distribution line, small transformer, and at the end of the wires to the walls of the house. There is a diagram on page 29 that can be helpful ND Project P.O. Box 10101, Manassas, VA 32 Forms nergy Answers Fill in the blanks with words at the bottom of the page. Some words will be used more than once. 1. Stored energy and position energy shall be potential energy. 2. Compressed springs and stretched rubber bands are mechanical energy. 3. Vibration and movement of atoms and molecules in substances is called heat or heat energy. 4. A scientific principle which states that energy cannot be created or destroyed is called the Law. Maintenance nergy 5. The flow of energy through substances in longitudinal waves is. sound 6. The energy of a position, such as a rock on a hill, is gravitational energy. 7. The movement of objects and substances from place to place is. traffic 8. Electromagnetic energy moving in transverse waves is radiant energy. 9. Nergy stored in bonds of atoms and molecules is chemical energy. 10. Movement of atoms, waves and electrons is kinetic energy. 11. Electron movement is electricity. 12. The amount of useful energy you receive from the system is his. energy efficiency 13. Energy in petroleum and coal is stored as chemical energy. 14. X-rays are an example of radiation energy. 15. Fission and fusion are examples of nuclear energy. 16. The hydropower tank is an example of gravitational energy. 17. Wind is an example of energy. Word Bank Chemical Movement Energy Efficiency Protection Nergy Thermal Energy Kinetic Motion Nuclear Radiation Potential Sound Stored Mechanical Thermal 32 Indirect Nergy Action 33 Biomass Biomass Description: Any organic material that can be used for its energy content of wood, garbage, shipbuilding waste, plant waste, animal waste, even human waste. Renewable or non-renewable: A renewable description of photosynthesis: The process by which light (radiation energy) is converted into sugars or glucose in a plant. Ways in which we convert biomass into energy that we can use: combustion for heat production, fermentation into alcoholic fuel (ethanol), breakdown of bacteria into methane, conversion into gas or liquid fuels by adding heat or chemicals. Who uses biomass and for what purposes: Industry burns wood waste for the production of products, houses burn wood for heat, waste plants for energy burn organic waste for electricity production, ethanol is used as a transport fuel. biomass use in the environment: Burning biomass can cause air pollution as well as odour production. Biomass combustion is cleaner than burning fossil fuels. Important facts about biomass: Biomass takes its energy from the sun through photosynthesis. The use of biomass reduces the amount of organic material placed in landfills. Fast-growing plants can be grown with their energy content. The use of biomass does not contribute to the greenhouse effect, as the amount of carbon dioxide produced is equal to the amount taken during growth. Carbon Description: Coal is a black solid hydrocarbon (fossil fuel) formed from the remains of ancient plants in the swamps millions of years ago. Renewable or non-renewable: Non-renewable Where coal is located and how to recover it: Coal is underground in many areas of the country. Shallow seams are mined surface. Deep buried coal is achieved through the underground shafts of the mine. Ways to convert coal into energy that we can use: Most of the coal is burned to produce heat. Who uses coal and for what purposes: Power plants burn most of the coal to produce electricity. The industry also burns coal for the production of products, especially steel and iron. ffect use of coal for the environment: Burning coal can pollute the air and cause acid rain. carbon dioxide, a greenhouse gas. Important facts about coal: Coal produces nearly half of the U.S. electricity. Coal is found in appalachians and some Western states. Wyoming, West Virginia, Kentucky, Pennsylvania and Montana are all States. Coal is transported mainly by train and barge. Carbon transport is a huge expense of ND Project P.O. Box 10101, Manassas, VA 34 Geothermal nergy Description of geothermal energy: Geothermal energy is heat produced in the earth's core by the slow decay of naturally occurring radioactive particles. Renewable or non-renewable: Renewable, where geothermal resources are located and how to recover them: Resources at low temperatures are almost everywhere a few meters underground. High temperature resources are mainly located at the edges of tectonic plates, especially around the Ring of Fire in the Pacific. Ways to convert geothermal energy into energy that we can use: we can drill wells to reach resources at high temperatures, or lay pipes filled with liquid underground. Some geothermal resources come out of the ground naturally and we can pipe them where we need them. Who uses geothermal energy and for what purposes: Power plants use geothermal steam to produce electricity. Homes and businesses use hot water and steam for heating. use of geothermal energy on the environment: There is very little impact on the environment. Important facts about geothermal energy: the quay consists of layers of inner iron core, outer core magma (molten rock), magma mantle and rock, and crust. The crust is not a solid piece, but giant slabs of earth that move. Along the edges of the boards, geothermal resources tend to surface. Hydropower Description of hydropower: Hydropower is the force of moving water caused by gravity. Renewable or non-renewable: A renewable description of the water cycle: The sun shines on the waterfront, steaming water in oceans, rivers and lakes. Steam rises into the atmosphere and forms clouds. Steam condenses and falls to the waterfront as rainfall. The ways in which we convert energy into energy that we can use: we can use energy in flowing water, damming rivers and using waterfalls. Who uses hydropower and for what purposes: electrodes use water dams to convert energy in flowing water into electricity. use of hydropower in the environment: Dams can flood land and disturb animal and fish habitats. Hydroeno-energy does not pollute the air, but can release deposits in water. Important facts about hydropower: Dams are the cheapest and cleanest way to generate electricity. There are few places in the USA where you can build new dams. Some existing dams may have turbines installed to produce electricity. 34 Intermediate nergy Infobook Activities 35 Natural Gas Description: Natural gas is a colorless, ovable gas created millions of years ago from small plants and animals. It is fossil fuel. Renewable or Non-renewable, although methane produced from landfill gas is classified as renewable. Where natural gas is located and how we will recover it: There is natural gas underground rock formations in sedimentary basins. We drill wells to reach it and pipe it off the ground. The ways in which we convert natural gas into energy that we can use: we usually burn natural gas to produce heat. Who uses natural gas and for what purposes: The industry burns natural gas to produce products. Homes and businesses burn natural gas for heating buildings, water and cooking. Power plants burn natural gas to produce electricity. use of natural gas in the environment: Natural gas is a cleaner fossil fuel, but produces some air pollution and carbon dioxide, greenhouse gas. Important facts about natural gas: Mercaptan, a smell that smells of rotten eggs, is added to natural gas so leaks can be detected. Natural gas is transported millions of miles of underground pipelines. Natural gas can be used as a transport fuel if it is pressurized and the engines are modified. Petroleum Description petroleum: Oil is a liquid hydrocarbon, a fossil fuel formed millions of years ago from the remains of tiny marine plants and animals. It can be thin and clean as water or thick and black as tar. Renewable or non-renewable: Non-renewable Where is the oil and how we recover it: Oil is underground in rocks in sedimentary basins. Many are underwater. We drill wells to find them, and then we need to pump it out of the ground. The ways in which we convert oil into energy that we can use: Oil is refined into many different fuels that are burned to generate heat. When gasoline is burned in vehicles, it causes small explosions that push pistons to generate traffic. Who uses oil and for what purposes: Most petroleum products are used by the transport sector to transport people and goods. The industry burns oil to produce products and also uses crude oil as a raw material for the production of many products. ffect the use of oil on the environment: Burning oil can cause air pollution and produce carbon dioxide, greenhouse gas. Drilling and transporting crude oil can damage soil and water in the event of spills or spills. Important facts about oil: We use more oil than any other source of energy. The United States does not produce enough oil to meet our needs. We import about half of the oil we use from abroad. The central ast has huge reserves of oil. Crude oil is transferred ashore mainly by pipeline, and over water by tanker ND Project P.O. Box 10101, Manassas, VA 36 Propane Propane Description: Propane is a colorless, edible fossil fuel found from oil and natural gas. It was created millions of years ago tiny plants and animals. Renewable or non-renewable: Non-renewable Where propane is located and how to recover it: Propane is located from oil and natural gas deposits and is separated from both fuels during refining and processing. The ways in which we rotate energy that we can use: We put propane in pressurized tanks to convert it into liquid, make it easier to transfer from place to place, and then burn it to generate heat. Who uses propane and for what purposes: Industry uses propane to produce products; farmers use propane for hot in rural areas; houses use propane for outdoor barbecue; companies use propane to drive internal machinery and as fleet fuel. ffect application of propane to the environment: Propane is a cleaner burning of fossil fuels, but combustion produces some air pollution and carbon dioxide, a greenhouse gas. Important facts about propane: Propane is a liquefied petroleum gas. Propane is easily converted into a pressurized liquid. It takes up 270 times less space as a liquid. Propane is stored in underground caves and moved by pipelines and trucks. Propane is called a portable fuel because it is easily transported as a liquid. Solar nergy Description of Solar Energy: Solar energy is the energy of radiation from the sun that travels to a place in electromagnetic waves or rays. Renewable or non-renewable: Renewable as solar energy is produced and how to recover it: Solar energy is produced in the solar core when hydrogen atoms combine under pressure to produce helium, in a process called fusion. Radiation energy is emitted during fusion. Ways to convert solar energy into energy that we can use: We can capture solar energy using solar collectors that convert radiant energy into heat, or photovoltaic cells that convert radiation energy into electricity. We also use visible sunlight to see. Who uses solar energy and for what purposes: We all use visible light from the sun to see during the day. Many homes and buildings use solar panels to heat indoor spaces and water and photovoltaic cells to produce electricity. ffect use of solar energy on the environment: Solar energy is very clean energy, does not produce air or water pollution. Important facts about solar energy: Solar energy is not available at all times and is distributed so that it is difficult to use. Currently, the use of solar energy to produce electricity is costly, but new technologies will make solar energy a major source of energy in the future. 36 Intermediate nergy Infobook Activities 37 Uranium Description Uranium: Uranus is a common metallic element found in rocks around the world. Renewable or non-renewable: Non-renewable Where uranium is found and how to recover it: Uranus is underground in formations We dig mines to get them back. The U.S. has a lot of uranium, but imports are most commonly used in nuclear power plants because it's cheaper to do so. Ways to convert uranium into energy that we can use: uranium is processed and converted into uranium fuel pellets for nuclear power plants. Uranium atoms are split in the fission process to generate heat. Who uses uranium and for what purposes: Nuclear power plants use uranium to produce use of uranium (nuclear energy) in the environment: splitting uranium produces radioactive waste that has been dangerous for thousands of years and must be stored carefully. Radioactive material leaks pose a risk. Important facts about uranium (nuclear energy): Nuclear power plants produce little pollution, with the exception of radioactive waste, which must be stored in special repositories. There is currently no permanent repository in the United States, and most of the waste is stored on site in nuclear power plants. Congress orders a permanent repository, but the final location has not been chosen. Description of wind energy: Wind is the circulation of air caused by uneven heating of the waterfront surface. Renewable or non-renewable: Renewable energy sources where wind energy is located and how we recover it: Wind is generated when the sun shines on the waterfront, heating the earth more than water. Warmer air rises above the mainland, and colder air moves to take its place, producing convective currents. The ways in which we convert wind into energy can be exploited: we use wind turbines that have shovels that rotate in the wind, which turn the turbine into electricity production. Who uses wind and for what purposes: Typically, independent energy producers (not large utilities) build wind farms to produce electricity. ffect use of wind in the environment: Wind turbines are very clean without producing air or water pollution. They occupy a lot of land, but most of the land can be used for other things, such as cattle breeding and grazing, at the same time. Important facts about wind: Wind turbines don't generate much electricity and don't produce it all the time. Wind turbines cannot be used in many areas. There must be stable, continuous wind resources. There are large wind resources on the ocean. The first offshore wind farm in the United States was approved in 2011 and will be built off the coast of Cape Cod, MA The ND Project P.O. Box 10101, Manassas, VA 38 Biomass Crossword Responses Carbon Crossword Answers 38 Indirect Nergy Infobook Actions 39 Geothermal Crosswords Responses Hydropower Crossword Responses 2012 ND Project P.O. Box 10101, Manassas, VA 40 40 Indirect Nergy Infobook Activities T R A S O L I N A C R U O P M I R T I I L O G N S P I P L L S W L I N S I L T F I N R I L L R D D Y R U O F O R T A T A S I O N R T J N W A A B L O N O I T U L L O Natural Gas Crosswords Petroleum Crosswords Answers 41 Propane Crossword Response Solar Crossword Responses 2012 ND Project P.O. Frame 10101, Manassas, VA 42 42 Indirect nergy Infobook Activities A T O N R A D I O R C A C T T O R A R P O S I T Y O T I V I S S I O N U C L L A R U F I O N F T Y N I A H C W A R U L A R O S F N I U M B L C R R I C I S N O T Y N M S T R I S O L A R N W And B L M O M A R I V S A H G I H T T I N G A H F D B O X G T R T A W N A L B D S S L O W I S H R F U T S H H R R O N R A X X S O T R G D F A R M Uranium Crossword Answers Crossword Wind Response 43 2012 ND Project P.O. Box 10101, Manassas, VA Q 1.24 Q Geothermal, Solar, and wind Total quads 1.60 Q 4.30 Q Biomass Propane 8.44 Q Uranium 2.51 Q Q = % Coal Hydropower Q = 25.17% Natural gas 91.78% Nonrenewables 8.22% Renewable = 100 % = 1.2 1 7 % = 1.63 % = 2.56 % = 4.39 % = 8.62 % Q = % oil Convert quads to percentages and make a pie chart showing how much US energy in 2010 comes from renewable sources and how much came from non-renewable sources (Q = quad or quadrillion Btu). Round to the nearest set. Students should calculate the total number of quads to be Q. To find each percentage, ask them to divide the total quads by each source. Renewable energy sources and non-renewable MAK LCTRICITY LIGHTING HATING/COOLING 2 1 MAK PRODUCTS 4 2 TRANSPORT In boxes will number the main applications of each energy source from 1 to 5 of 1 as the most important application. Some sources can only be used in one or two ways. As we use our sources nergy 44 44 Indirect nergy Infobook Steam Activities in clouds condenses and falls to the waterfront as precipitation. 4. Steam creates clouds in the atmosphere. 3. Steam rises into the atmosphere. 2. Heat heats and evaporates water in oceans and rivers. transformed into heat. 1. The sun shines radiant energy on the waterfront. When it hits objects, part of the radiation energy is 3 1 Water cycle label and describe the water cycle in the following space, below the number in the diagram. Water cycle proton 4. Positively charged atom particle. The charging circuit neutrons load magnetic field energy level atom atom attract battery charging circuit energy level element load generator magnet magnetic field neutron nucleus proton re push back turbine battery 15. A device that generates electricity through a chemical reaction. Word Bank Generator pushes back 14. A device with magnets and wire coils that generates electricity. 13. How loads or magnetic poles react. in the opposite direction. 12. An object in which electrons at one end rotate in one direction and electrons at the other end rotate in athe 11. The path through which electricity travels. 10. A device that operates in an electrical circuit. 9. Force field formed between the poles of the magnet. 8. Areas around the nucleus where electrons are located. 7. Electrical force within the atomic particle. 6. The smallest part of the element that retains the characteristics of the element p. 5. A particle in the nuclei of an unlaid atom. element of the electron nucleus 3. Negatively charged atom particle. 2. The center of the atom. 1. A substance in which all atoms are identical. Type the correct word for each definition in an empty place. Use each word only once. lectricity 45 lectricity Crossword nazwiska w lectricity Answer Key Key Faraday 2. Westinghouse 3. Franklin 4. Volta lectric Math Answer Key Left column: 120, 12,35, 1879, 1000, 1882 Right column: 10, 350, 2229, 2.229, dison 6. Niagara Falls Transporting lectricity xplain every element below has to get electricity from generator to consumer power plant: generates 2 electricity. Step-up transformer: increases voltage to reduce transmission loss 3. Transmission line: transports high-voltage electricity over long distances 4. Power tower: runs transmission lines 5. Step-down transformer: reduces voltage for smaller distribution lines 6. Distribution line: transfers lower voltage electricity to 7 homes and businesses. Neighborhood Transformer: Reduces the voltage used by appliances in homes and businesses (120 & 140 V) 2012 Nd Project P.O. Box 10101, Manassas, VA 46 Measurement lectricity Directions: Fill in the blanks in the following tables. TABL 1 VOLTAG = CURRNT X RSISTANC 1.5 V = 0.5 A x 3 Ω 12 V = 3 A x 4 Ω 120 V = 4 A x 30 Ω 240 V = 20 A x 12 Ω TABL 2 POWR = VOL TAG X CURRNT 27 W = 9 V x 3 A 180 W = 120 V x 1.5 A 45 W = 15 V x 3 A 240 W = 120 V x 2 A TABL 3 APPLIANC POWR = VOLTAG X CURRNT TV 180 W = 120 V x 1.5 A COMPUTR 40 W = 120 V x 0.33 A PRINTR 120 W = 120 V x 1 A HAIR DRYR 1000 W = 120 V x 8.33 A TABL 4 LCTRICAL NRGY POWR TIM = X PRIC = COST (kwh) 5 kw x 1 100 h = 500 kwh x $ 0.12 = $ kw x 4 h = 1000 Wh = 1kWh x $ 0.12 = $ .000 W x 1 h = 100 kwh x $0.12 = $ Intermediate nergy Infobook Activities 47 Intermediate Infobook Valuation Valuation Form Status : Class level: Number of students: 1. Have you been active? Yes No 2. Were the instructions clear and easy to follow? Yes No 3. Has your business met your academic goals? Yes No 4. Was the age of activity appropriate? Yes No 5. Were the allocated times sufficient to carry out the activities? Yes No 6. Was the operation easy to use? Yes No 7. Was preparation acceptable for this activity? Yes No 8. Were students interested and motivated? Yes No 9. Was the age of the energy knowledge content appropriate? Yes No 10. Would you teach this activity again? Yes Please do not explain any statements below. How do you rate your total activity? excellent good fair poor How do your students rate overall activity? excellent good fair poor What would make your business more useful for you? Other comments: Please fax or send a message to: ND Project P.O. Box Manassas, VA FAX: ND Project P.O. Box 10101, Manassas, VA 48 ND National Sponsors and Partners american association of blacks at nergy American Chemistry Council American lectric Power American lectric Power Foundation American Solar nergy Society American Wind nergy Association Hydro Research Foundation Idaho Department of ducation Idaho National Laboratory Illinois Clean nergy Community Foundation Independent Association of America Appalachian Regional Regional Independent Petroleum Association of New Mexico Areva Indiana Michigan Power Arkansas nergy Office Interstate Renewable nergy Council Armstrong nergy Corporation istem Idaho STM ducation Association of Desk & Derrick Clubs Kansas City Power and Light Robert L. Bayless, Producent, LLC KBR BP Kentucky Clean Fuels Koalicja BP Alaska Kentucky Departament ducation C & Operators Kentucky Departament nergy Cape and Islands Self Reliance Development and Independence Cape Cod Cooperative xtension Cape Light Compact Massachusetts L.J. i Wilma Carr Central Virginia Community College Chevron Chevron nergy Solutions Comd Condison Solutions ConocoPhillips Rady stosunków zagranicznych CPS nergy Dart Foundation David Petroleum Corporation Desk i Derrick z Roswell, NM Dominion Dominion Foundation DT nergy Foundation Duke nergy Kentucky Oil and Gas Association Kentucky Propane ducation and Research Council Kentucky River Properties LLC Kentucky Utilities Company Lenfest Foundation Littler Mendelson Llano Land and xploration Los Alamos National Laboratory Louisville Gas and lectric Company Maine nergy ducation Project Maine Public Service Company Marianas Islands nergy Office Massachusetts Division of nergy Resources Lee Matherne Family Foundation Michigan Oil and Gas Producers ducation Foundation Midwest nergy Cooperative ast Kentucky Power Mississippi Development Authority nergy Division l Paso Foundation Montana nergy ducation Council.M.G. Właściwości oleju Mosaic Company ncana NADA Scientific ncana Cares Foundation NASA nergy ducation for Michigan National Association of State nergy Officials nergy Training Solutions National Fuel nergy Solutions Foundation National Grid ntergy National Hydropower Association quitable Resources National Oil Propertie Ocean Industries Association First Roswell Company National Renewable nergy Laboratory Foundation for nvironmental ducation Nebraska Public Power District FPL New Mexico Oil Corporation The Franklin Institute New Mexico Landman s Association GenOn nergy California New Orleans Solar Schools Initiative Georgia nvironmental Facilities Authority New York Power Authority Government of Thailand nergy Ministry NSTAR Guam nergy Office OCI nterprises Gulf Power Offshore nergy Center Halliburton Foundation Offshore Technology Conference Hawaii nergy Ohio nergy Project Gerald Harrington, Geolog Pacific Gas and lectric Company Houston Museum of Natural Science 2012 The ND Project P.O. Box 10101, Manassas, VA PCO Petroleum quipment Suppliers Association Phillips 66 PNM Puerto Rico nergy Affairs Administration Puget Sound nergy Rhode Island Office of nergy Resources RiverWorks Discovery Roswell Climate Zmiana Komitetu Roswell Geological Society Sacramento Municipal Utility District Saudi Aramco Schneider lectric Science Museum of Virginia C.T. Seaver Trust Shell Snohomish County Public Utility District WA Society of SolarWorld USA David Sorenson Southern Company Southern LNG Southwest Gas Space Sciences Laboratory University of California Berkeley Tennessee Department of conomic and Community Development nergy Division Tennessee Valley Authority Toyota TXU nergy United States nergy Association University of Nevada Las Vegas, NV Departament Nergy Departament U.S. Departament nergy Hydrogen Program U.S. Departament Nergy Office nergy fficiency i odnawialne nergy U.S. Department of nergy Office of Fossil nergy U.S. Department of nergy Wind for Schools U.S. Department nergy Wind Powering America Departament Spraw Wewnętrznych Land Management Departamentu Spraw Wewnętrznych Ocean nergy Management, Rozporządzenia i nforcement U.S. nergy Information Administration U.S. nvironmental Protection Agency Van Ness Feldman Virgin Islands nergy Office Virginia Department of ducation Virginia Department of Mines, Minerals and nergy Walmart Foundation Washington and Lee University Western Kentucky Science W Alliance.