



Plan It Green: The Big Switch Educator Guide

Using Game Play to Explore
Energy Topics with Middle
School Students



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Game-Based Learning

Using interactive games to facilitate learning in educational settings has a number of recognized benefits. For most students, games are highly engaging and motivating. Games provide real-time feedback and built-in goals, such as increasing game levels, that can motivate students to improve. In addition, more complex games, such as city-building and simulation games, can provide opportunities for higher-level learning.

The serious games movement is a drive to combine the best of the entertainment video game industry with solid content in order to produce complex, meaningful games that are tools for learning and training in a variety of contexts. The results include games that embed educational content and require users to engage in a range of 21st century skills in order to be successful. These games compel users to do more than memorize facts or take in information; they require them to apply knowledge, skills, and strategies to solve problems. Such games provide a rich environment that promotes collaboration, problem-solving, critical thinking, and communication. City-building and simulation games are examples of serious games that provide a simulated real-world context in which users can explore and analyze information within a given storyline in order to make decisions and see results. In educational settings, these games can provide an avenue for students to experiment, explore, and take risks by trying multiple solutions within the context of a low-stakes environment where failure is acceptable—and even expected—as part of the process.

Game Overview

Plan It Green: The Big Switch is an online, city-building simulation game that gives students the opportunity to make complex decisions about the role of green energy, energy conservation, and energy efficiency in a fictional city. Students take on the role of mayor of their fictional city and attempt to build an urban environment that is energy efficient while still meeting the needs of its citizens. They earn money and decide how to spend it, using various energy-efficient technologies to expand and grow their city into the most eco-friendly city in the world. *Plan It Green: The Big Switch* provides a unique opportunity for students to make decisions related to energy efficiency and energy sources and to see how those choices affect life in their city.

There are two main currencies in the game: coins (financial currency) and hearts (social currency). Players earn coins by accumulating points through energy efficiency, energy production, supplies, population count, and more. Players spend coins to make improvements to their city. These improvements can in turn increase the number of points players earn.

Players can spend their coins on urban improvements such as green businesses, mass transit systems, and parks and green spaces. They can also spend coins on district improvements such as electricity grid modernization, bio-fuel conversion, biomass power plants, and more. Players can build a diverse energy system by choosing among eight different types of power plants, each with pros and cons.



QUICK START

- Plan It Green: The Big Switch:
www.planitgreenlive.com
- Registration:
www.planitgreenlive.com/en/register
- Tutorial:
www.planitgreenlive.com/en/tutorial
- Play/Log-In:
www.planitgreenlive.com/en/login



Learning Objectives

Students will:

- acquire, analyze, and apply information about energy-efficient technologies and a variety of energy production options
- evaluate choices based on energy efficiency, cost, effect on quality of life, and other factors
- make complex decisions about the use of green energy and energy efficiency strategies and technology

Players are guided through specific challenges at each level, such as updating their city's infrastructure, increasing production, modernizing neighborhoods, or dealing with a natural disaster. Players decide how best to meet these challenges using a variety of available buildings and technologies. Each option includes a description and information about costs, requirements, and results, allowing students to make informed decisions.



Using the Game in Different Settings

Plan It Green: The Big Switch can be used in a variety of settings:

Afterschool Programs

Because learning opportunities are embedded in the game, students can play the game independently, either individually or in small groups. Facilitators can check in with students and use questions to encourage thoughtful play. For a richer experience, facilitators can use the discussion questions and related activities described in this guide to engage small or large groups of students. The game's built-in scoring and leaderboards can be used to encourage friendly competition among groups of players and can add another element of fun and challenge to the game in this setting.

Classrooms

Teachers can introduce *Plan It Green: The Big Switch* to students as part of a related energy lesson or unit and allow students to play independently over time as they finish other activities early or as a reward. Teachers can also use the game as a focal point for learning about a variety of energy-related topics introduced in the context of the game. Teachers can take advantage of the level of engagement students generally experience with gaming to introduce students to other activities, research opportunities, and hands-on experiments related to the game's topics.



Science Centers

Science centers can make *Plan It Green: The Big Switch* available to visitors through computer stations on the science center floor. Play can be supported in this setting through display text and related exhibits. Science centers can also host competitions in which local teams compete against players at other educational organizations.

At Home

Students can play *Plan It Green: The Big Switch* independently at home. Once players reach level 5, they can enhance their game experience and learning opportunities by forming “circles” to play cooperatively with other remote users. Parents or caregivers can play the role of facilitator, using questions to encourage more thoughtful decision-making. Leaderboards and awards can challenge and encourage independent players.

The Role of the Facilitator

Plan It Green: The Big Switch allows students to play at their own pace. As a result, students who begin the game at the same time may complete challenges and levels at different times. Facilitators can influence completion times by monitoring game play and using questioning strategies. Facilitators should walk around the room and monitor student engagement as students play and ask questions to target or expand student thinking based on their progress in the game. Facilitators should also be prepared with additional activities and resources students can explore if they complete the game early—see the Activities and For Further Exploration sections of this educator guide.

Plan It Green: The Big Switch offers a variety of learning opportunities in the context of game play. Facilitators can encourage the deepest level of engagement with the content by challenging students to read all the available information in the game before making decisions. Having students take notes during game play can help ensure that they are reading and analyzing the information they are given. Facilitators can also encourage more thoughtful decision-making by posing questions for students to discuss and explore as they play.

Game Play Setup

Technology Requirements

Plan It Green: The Big Switch requires an Internet-connected computer for each player or group of players. Adobe Flash Player is also required and is available as a free download at <http://get.adobe.com/flashplayer>.

Player Registration

Player registration is simple. Players select an avatar, enter a name for their city, and select their birthday from a calendar. They are then prompted for a parent e-mail and password. For safety and privacy, player names are not required for play. Instead, city names are used as an identifier for forums, leaderboards, and other needs. Up to 15 users can log in concurrently from the same location.

Setting Up for Independent Play

If students will be playing on their own during free time, each player should register his or her own city. Have each player write down his or her city name and password in a notebook that can be used as a journal over the entire course of the game. Allow students to play in 30- to 45-minute sessions or during whatever downtime is available. Have players track their progress in the game in their journal by writing down their level and experience points within that level at the end of each session. They should also note the number of coins, hearts, supplies, energy, and population they have at the end of each session. They can compare these statistics from session to session to see how their city is improving.



Setting Up for Small Group Play

Working in small groups encourages collaborative problem-solving. Organize students into teams of two to four players. If students are playing in teams, each team should register only one city. Have groups note their city name and password and report it to you. Create a log of city names and passwords for the class in case students lose or forget their information. After teams have reached level 5, guide them to set up a friend circle within the game. This will allow them to communicate just within their circle and to see each other's scores, awards, and accomplishments.

Organize sessions so that students have 30- to 45-minutes for game play, with a brief review/focus period at the beginning and a 15- to 20-minute discussion period at the end of each session. Have teams report their progress at the end of each session. Track team progress across sessions by creating a table of teams and their level and number of experience points within that level. To encourage friendly competition among teams, create a leaderboard on chart paper or on the board to display teams with the highest number of coins, hearts, supplies, energy, and population. Update the leaderboard after each session. You can also use the leaderboard in the mayor's office.

Setting Up for Whole Class Play

If students will be playing individually within a large group or classroom setting, each player should register his or her own city. Have students note their city name and password and report it to you. Create a log of city names and passwords for the class in case students lose or forget their information. After players have reached level 5, guide them to set up a friend circle within the game. This will allow them to communicate just within their circle and to see each other's scores, awards, and accomplishments.

Organize sessions so that players have 30- to 45-minutes for game play, with a brief review/focus period at the beginning and a 15- to 20-minute discussion period at the end of each session. Have players report their progress at the end of each session. Track players' progress across sessions by creating a table of students and their level and number of experience points within that level. To encourage friendly competition among students, create a leaderboard on chart paper or on the board to display players with the highest number of coins, hearts, supplies, energy, and population. Update the leaderboard after each session. You can also use the leaderboard in the mayor's office.

Background Information

As human population and industrialization increase, so does our use of energy resources. We face a number of challenges regarding energy use today, including pollution and global climate changes resulting from carbon emissions from the burning of fossil fuels, and the need to plan ahead for limited fossil fuel availability. Creating a sustainable energy future is a complex challenge, and solutions are equally complex and varied. No single perfect solution exists; instead, a variety of solutions can be applied, grounded in the characteristics of specific places and communities. Cities can be leaders in sustainable growth and energy use. A movement toward “green” cities in the United States and other countries includes a range of innovative technologies and processes from careful urban planning to the use of bike lanes and mass transit to reduce the need for driving. Increasing the energy efficiency of government and other buildings, modernizing the electric grid, and varying the sources of electrical energy can also play roles in greening a city. *Plan It Green: The Big Switch* addresses a number of topics important to the idea of a sustainable energy future. Among these topics are energy efficiency, energy sources, and urban planning and infrastructure.



Energy efficiency refers to the ability to use less energy to produce the same result. There are many ways to increase energy efficiency, from weatherizing a home to introducing grid modernization technology to building co-generation power plants that maximize efficiency by using one energy source to create both electrical energy and usable heat. Energy efficiency can be considered from the ground up when building new homes or commercial buildings, including the use of daylighting, passive solar energy, and adequate insulation to reduce heating and cooling costs. Grid modernization can reduce energy use through changes to the grid infrastructure and a variety of technologies and equipment upgrades that allow for better, more automated, near real-time system communication between the places where electricity is generated and the places where it is used.

There are numerous sources from which electrical energy can be produced, and each has its benefits and drawbacks. In the United States, fossil fuels are most commonly used to produce electricity. Fossil fuels, including coal, oil, and natural gas, are non-renewable resources. This means they cannot be renewed within our lifetimes. These resources, particularly coal and natural gas, are relatively inexpensive to mine and process, yet they can be a major source of harmful carbon emissions. Unlike fossil fuels, renewable energy resources, such as wind and solar energy, cannot be depleted. These resources are generally free of net carbon emissions as well. However, many renewable resources are site-dependent and may not work well everywhere. In addition, there are other environmental concerns related to renewable resources. Animal conservationists are concerned about the impact of large wind farms on birds, hydroelectric dams on fish, and solar farms on land animals. Critics also describe loud sounds from large wind farms near residential areas and point out that large-scale solar and wind farms can have a negative impact on views and property values.

Urban planning and infrastructure can contribute greatly to sustainable urban growth, the reduction of carbon emissions, and quality of life in a city. For example, green spaces in a city not only provide places for recreation, but also help reduce heat build-up from large quantities of pavement, prevent soil erosion and water run-off, provide habitat for animals, and absorb air pollution. Well-designed bike lanes and mass transit systems provide alternatives to driving, leading to reduced carbon emissions and pollution. Thoughtfully designed communities that increase density and locate essential goods and services within easy walking distance of most of the population also reduce the need for driving.

Vocabulary

- biofuel
- biomass
- energy efficiency
- fossil fuel
- green business
- green technology
- grid modernization
- hydroelectric power
- mass transit
- non-renewable energy
- renewable energy
- solar power
- wind power

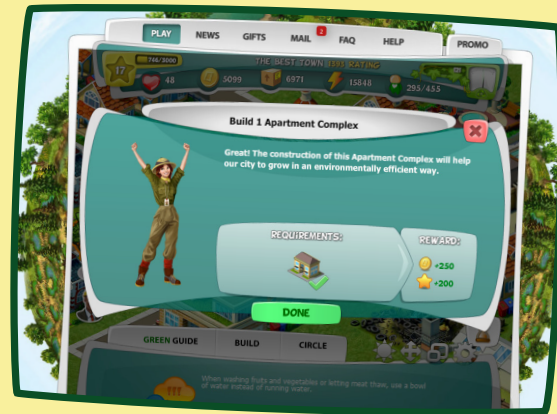
Discussion Questions

Questioning strategies applied during game play, as well as discussion/reflection questions following game play, can greatly enhance student learning.

Sample Questions

During game play (adapt for your specific learners and game play setup):

- What is your challenge?
- What is your goal with this decision?
- What are your available options?
- What are some pros and cons of this choice?
- How will this choice affect your city financially?
- How will this choice affect the quality of life in your city?
- What are some environmental consequences of this choice?
- What are some alternatives to this choice?
- Which factors (economic, quality of life, environmental) are most important to your city right now? Why?



After each session of game play (adapt for your specific learners and game play setup):

- What do you feel you accomplished for your city during this session?
- What were your most important decisions? How did they affect life in your city?
- Do you feel you successfully met the challenges presented during this session? Why or why not?
- How would you evaluate the quality of life in your city at the end of this session? Why?
- What would you most like to improve in your city? Why?
- Have you seen any of these technologies used in your own community? How?
- Which of the improvements that you used in the game today would you most want to see applied in your own community? Why?
- If you were mayor of your own city in real life, what strategy would you use to get green improvements made in your community? Who would your allies be?
- What role do you play as a citizen in helping to make your own community greener?

Activities

Before Initial Game Play

1. Activate students' prior knowledge by asking them to share what they know about "green" cities. Discuss the concept of a green city and have students brainstorm examples of what one might find in such a city.
2. Prepare students to watch the TED Talk, "The Shareable Future of Cities," by giving them the following focus questions: What roles can cities play in reducing carbon emissions? What are some specific ways that cities are currently improving their energy efficiency and carbon footprint? View the TED video (http://www.ted.com/talks/lang/en/alex_steffen.html) and have students take notes as they watch. Use the focus questions to frame a discussion after the video.

3. Have students work in small groups to come up with a list of things they would do to green their city if they were mayor.
4. Use the information in the overview section to introduce the game to students. Then have students complete the tutorial. Monitor progress during the tutorial and answer any questions students might have before beginning game play.

During Game Play

Have students or teams keep a journal during game play.

During each session, have students identify and describe the following in their journal:

- ▶ key decisions they made during that session
- ▶ interesting technology, processes, buildings, or ideas they encountered during that session
- ▶ things they did during that session that they would do differently next time

As students get involved in the game, hold mini-sessions on decision-making strategies. Some strategies include:

▶ **Defining the problem or goal**

Any decision must start with a clear understanding of the problem to be solved and/or the goal to be achieved. Model how to rephrase and summarize each challenge given in the game to make sure it is clearly understood.

▶ **Narrowing choices through the process of elimination**

Some choices can be eliminated early in the decision-making process. Model how to list possible choices and eliminate ones that have obvious flaws before considering the other choices more carefully.

▶ **Benefits and drawback table**

A benefits and drawbacks table includes possible options as row headers and “benefits” and “drawbacks” as column headers. Model how to create this type of table and how to use it to list several choices along with their benefits and drawbacks.

▶ **Grid analysis table**

A grid analysis table aids in considering, comparing, and contrasting specific aspects of complex choices. In a grid analysis, possible options are row headings. Column headings are different aspects of these options that should be considered when making a decision. Model using a grid analysis table by listing a few options for meeting a specific need as rows in a table (for example, whether to build a wind farm, a solar farm, or a coal power plant to increase the amount of energy available to a city). Brainstorm some things to consider about these options (for example, energy efficiency, cost, and environmental impact), and list each aspect as a column heading. Evaluate each aspect of each option and assign it a number between 0 and 5. For example, the fuel for a coal power plant is relatively inexpensive, so it might get a rating of 4 or 5 for cost. But a coal power plant would produce significant carbon emissions, so it would get a lower rating for environmental impact. Be sure to consider the relative importance of each aspect and weigh them appropriately. Make sure students understand that, in the game, a city’s eco-level is also impacted by these decisions. A grid analysis can be used qualitatively to lay out the options or quantitatively to add up scores for each option. If you are using the table quantitatively, assign each aspect a number between 1 and 5 based on its relative importance. Multiply each rating by its relative importance number before adding them together to get a score for each option.

▶ **Stakeholder consequences decision-making process**

Students first identify the constraints and considerations surrounding their decision. They then make a cascading consequences web, showing the initial consequences of a decision and then branching out in a cause-and-effect chain to show the continuing effects of the decision. Students then identify stakeholders who will be impacted by the decision and assess the impact on each stakeholder. Finally, they weigh the importance of the impacts on various stakeholders to inform their decision.



If students complete a session early, direct them to the following activities to further explore concepts introduced in the game:

- ▶ Have students explore the News section of the game for additional information on green topics.
- ▶ Have students research an idea, improvement, or technology that they encountered in the game and want to know more about. Have students develop and present two-minute talks focusing on real-world examples of their topic. These talks can be delivered live or recorded and made available online.
- ▶ Have students read the National Geographic Article “What is Efficiency Measured In” (<http://greenliving.nationalgeographic.com/efficiency-measured-in-20343.html>). Have them make a list of different ways energy efficiency could be considered. Then have students explore the Energy Saver section of energy.gov (<http://energy.gov/energysaver/energy-saver>) and create a top ten list of ways they could make their own home or school building more energy efficient.
- ▶ Have students play a game to review the benefits and drawbacks of different sources of electricity. Write each type of electrical power plant (e.g., hydroelectric, coal, biomass) introduced in the game on an index card, and combine the cards into one stack (Stack 1). Create a second stack of cards (Stack 2) by writing “benefit” on three index cards, “drawback” on three index cards, and “how it works” on one index card. Have the first player turn over a card from each stack. Based on the card in Stack 2, the player must either describe how the electrical power plant from Stack 1 works or give a benefit or drawback of that type of electrical power. Players then take turns turning over a new card from Stack 2 and responding appropriately until a player is unable to come up with a response. The last player to give a response wins the card from Stack 1. The next player then turns over a new card from both stacks and play continues for possession of the new electrical power plant card in Stack 1.
- ▶ Have students create a large-scale drawing or painting of what a green city looks like. Different students or groups can add to the drawing when they finish a session early. Have students label different aspects of their drawings with a brief explanation of how the aspect contributes to a green city. For example, students might include bike paths, renewable energy power plants, factories that use waste heat capture technology, or mass transit systems.
- ▶ Introduce students to green initiatives in other parts of the world by having them read about National Geographic explorers who work on energy sustainability projects (<http://www.nationalgeographic.com/explorers/>). Some explorers in this field include Thomas Taha Rassam Culhane and Ibrahim Togola.
- ▶ Provide small groups of students with milk-crate-sized cardboard boxes and craft materials such as paint, cardboard or foam board, aluminum foil, markers, felt, and a variety of throw-away items. Have them create a model of an eco-friendly house. Encourage students to read the “Eco-Friendly Ways to Build a House” article from National Geographic (<http://greenliving.nationalgeographic.com/ecofriendly-ways-build-house-3159.html>) and “Your Energy Efficient Home” from energy.gov (<http://energy.gov/articles/new-energysavergov-save-money-saving-energy>) for ideas. The Eco Friendly Houses website also has links to unique home-building ideas (<http://www.ecofriendlyhouses.net/>). Encourage students to think about and represent how their home will be heated and cooled, where they will get their electricity, what kinds of appliances they will use, what building materials they will use, how their water will be heated, and more.
- ▶ Have students work in small groups to create a business plan for a green business. Have students first identify a specific need in their home, school, or community that could be met by a new green product or service. Have them write a business plan including the following information: the need for the product or service, existing products or services that address the need (if applicable), and detailed descriptions of the proposed new product or service, what makes the product or service green, who the target audience would be for the product or service, and how much students would charge for the product or service. Students can reference the Small Business Administration’s page on the Green Business website (<http://www.sba.gov/content/starting-green-business>) for basic definitions and to learn about green businesses. For inspiration, they can read interviews with green business owners at the Green America website (<http://www.greenamerica.org/greenbusiness/interviews/index.cfm>). Encourage students to think about different facets of what makes a company green, such as how the company gets the energy it uses, how energy efficient the workplace is, what kinds of recycling programs the company has, and even how easy it is for employees to use bikes or public transportation to get to work.

- ▶ Have students explore some of the video and website resources listed in the For Further Exploration section. For each resource they explore, have students fill out an index card with the name of the resource, the URL, whether or not they would recommend the resource to other students, and an explanation of their reasoning. Display these cards, and encourage students to use them to select additional resources to explore.

After Each Session of Game Play

1. Discuss the session as a whole group. Use the provided sample discussion questions as a starting point, and adapt them based on the challenges encountered during that session of game play.
2. Have students share some of the items they recorded in their journals with the class. Discuss the similarities and differences in their experiences during the session and encourage them to look at similarities and differences in how they addressed the challenges.
3. Have each student write a brief reflection of their session in their journal. Choose from the following prompts:
 - ▶ Based on the status of your city at the end of this session, would you want to live there in real life? Why or why not?
 - ▶ What is the most successful aspect of your city at this point? Why?
 - ▶ What is the least successful aspect of your city at this point? Why? What could you do to change and improve this aspect?
 - ▶ If you were creating an ad campaign for your city right now, what would you focus on? Why?
 - ▶ How might the energy efficiency of your city affect life there?
 - ▶ Which improvements that you made to your city in this session make you feel the most proud? Why?



Wrap-Up

To summarize the game play and assess student learning, challenge students to give advice to other mayors hoping to green their cities. Have students imagine that they have been invited to speak on the topic at a conference of mayors. Depending on your setting and goals, students could work individually or in small groups to outline, write, and deliver a speech on the topic. Alternatively, students could work individually or in small groups to brainstorm ideas about what information should go into such a speech; students could then share their ideas with the whole group and combine them to create a single outline for a speech. In either case, encourage students to be specific and to use examples from their city-building experience to illustrate their ideas.

Extending the Learning

- ▶ Create a Green Watch location, such as a bulletin board, for students to share information and stories about new innovations or interesting case studies in green cities, energy efficiency, electrical power, or other topics of interest related to the game. Alternatively, allow time for students to present new information with the group after game play has ended. Students can monitor websites such as National Geographic News (<http://news.nationalgeographic.com/news/archives/energy/>) for news items to share.
- ▶ Hold a Green Innovation Fair. Have students research green innovations on the U.S. Department of Energy website (<http://energy.gov/science-innovation>). Have them create models and/or displays to share an innovation of their choice. Encourage them to include information such as: What problem does this innovation address? How does it work? Where and/or how is it used? Where can I get more information about it?
- ▶ Have students read case studies of several green cities from Popular Science (<http://www.popsci.com/environment/gallery/2008-02/how-americas-greenest-cities-got-green>). Then ask students to investigate green initiatives in their own community. Students can begin by examining their community's official website, or a guest speaker can be invited to address the topic. Have students work in small groups to create their own brief case study of a green initiative in their community.

APPENDIX

Connections to National Standards and Principles

Energy Literacy Essential Principles and Fundamental Concepts

- Fundamental Concept 4.1: Humans transfer and transform energy from the environment into forms useful for human endeavors.
- Fundamental Concept 4.2: Human use of energy is subject to limits and constraints.
- Fundamental Concept 4.5: Humans generate electricity in multiple ways.
- Fundamental Concept 4.7: Different sources of energy and the different ways energy can be transformed, transported, and stored each have different benefits and drawbacks.
- Fundamental Concept 5.1: Decisions concerning the use of energy resources are made at many levels.
- Fundamental Concept 5.3: Energy decisions can be made using a systems-based approach.
- Fundamental Concept 5.4: Energy decisions are influenced by economic factors.
- Fundamental Concept 5.6: Energy decisions are influenced by environmental factors.
- Fundamental Concept 6.2: One way to manage energy resources is through conservation.
- Fundamental Concept 6.5: Social and technological innovation affects the amount of energy used by human society.
- Fundamental Concept 6.6: Behavior and design affect the amount of energy used by human society.
- Fundamental Concept 7.1: Economic security is impacted by energy choices.
- Fundamental Concept 7.3: Environmental quality is impacted by energy choices.

National Science Education Standards

- (5-8) Standard F-5: Science and technology in society

National Educational Technology Standards for Students (NETS*S)

- Standard 1: Creativity and Innovation
- Standard 2: Communication and Collaboration
- Standard 4: Critical Thinking, Problem Solving, and Decision Making
- Standard 6: Technology Operations and Concepts

Connections to Skills

21st Century Skills

Learning and Innovation Skills

- Creativity and Innovation
- Critical Thinking and Problem Solving
- Communication and Collaboration

Life and Career Skills

- Flexibility and Adaptability

For Further Exploration

Articles

- National Geographic News: Salt Power—Norway Power Gives Osmotic Energy a Shake:
<http://news.nationalgeographic.com/news/energy/2013/01/130107-osmotic-energy-norway/>
- National Geographic News: Second Life for Old Electric Car Batteries—Guardians of the Electric Grid:
<http://news.nationalgeographic.com/news/energy/2012/11/121116-second-life-for-used-electric-car-batteries/>
- National Geographic News: Tiles May Help Shrink Carbon Footprint by Harnessing Pedestrian Power:
<http://news.nationalgeographic.com/news/energy/2012/05/120518-floor-tiles-turn-footfalls-to-electricity>

- National Geographic News: Waste Wattage—Cities Aim to Flush Heat Energy Out of Sewers: <http://news.nationalgeographic.com/news/energy/2012/12/121211-sewage-heat-recovery/>
- Rocky Mountain Institute: Advanced, Non-Food Biofuels Come of Age: http://blog.rmi.org/blog_2013_01_22_Advanced_NonFood_Biofuels
- Scientific American: What are Cities Doing to Go “Green?” <http://www.scientificamerican.com/article.cfm?id=how-do-cities-go-green>
- Rocky Mountain Institute: Why Transformation of the U.S. Electricity System is Critical, and How to Approach That Change: http://blog.rmi.org/blog_2013_01_24_Why_Transformation_of_the_US_Electricity_System_is_Critical

Books

- *Learning Science Through Computer Games and Simulations*: http://www.nap.edu/catalog.php?record_id=13078

Photo Galleries

- National Geographic News: 10 Green-Tech City Solutions for Beating the Heat: <http://news.nationalgeographic.com/news/2012/07/pictures/120726-green-tech-city-building-solutions-urban-heat-island/>
- National Geographic News: Most Hopeful Energy Developments of 2011: <http://news.nationalgeographic.com/news/energy/2011/12/pictures/111228-hopeful-energy-stories-2011/>

Videos

- GE: The Juice Train: <http://www.ge.com/stories/juicetrain>
- PBS: Earth—The Operator’s Manual: <http://video.pbs.org/program/earth-operators-manual/>
- Ted Ed: Retrofitting Suburbia—Ellen Dunham-Jones: <http://ed.ted.com/lessons/ellen-dunham-jones-retrofitting-suburbia>

Websites

- Games for Change: <http://www.gamesforchange.org>
- National Geographic Environment: The Great Energy Challenge: <http://environment.nationalgeographic.com/environment/energy/great-energy-challenge/>
- National Geographic Environment: The Green Guide: <http://environment.nationalgeographic.com/environment/green-guide/>

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