NTX Future City Junior, 2024

PART 1
RESEARCH ESSAY: ELECTRIFY YOUR FUTURE

Students write a 1,000-word essay that introduces their city and provides a solution to this year's challenge—Electrify Your Future. Design a 100% electrically powered city with energy generated from sources that keep your citizens and the environment healthy and safe.

Suggestions and Resources for Completing the Essay Assignments
See the Research Essay Outline (attached). Go over the outline with the students and have them list what they want to say in each section. Then suggest that they divide the sections so that everyone writes at least one part of the draft. When it's time to write the final version, they'll have plenty of material to work with. Also remind students that they can include up to four (4) graphics in their essay.

Research Essay Resources:

- Electrify Your Future Research Questions: This resource provides background information and questions for guiding student research (attached).
- Future City Design: Questions to Consider: Students in the Junior Competition are not required to design a complete city – just focus on the solution to the electrification problem. The questions in this handout cover a wide range of city issues but will help guide students to consider all the related aspects of their city solution (attached).
- Electrify Your Future: Real World Case Studies: Students will find these real-life examples of technological advances both inspiring and instructive (attached).
- City Essay Suggested Outline: This outline explains what students should include in each section of their essay and how to organize their essay (attached).
- Research Resources: pre-selected set of references and resources and more ideas and information on citing sources in the bibliography (attached).
- Review the Research Essay Rubric (attached) to make sure you understand what the judges will be looking for in your paper. Note: the Junior Essay Rubric is different from the one in the handbook.
- Analyze Essays from past NTX Junior winners to give the students a strong sense of what they are aiming for in their own essays. Go to Junior Team Center (http://www.dfwfuturecity.org/team_junior.html).

Research Essay Assignment
Students research and write a 1,000-word essay that describes the unique attributes of their city and provides a solution to this year's challenge: Electrify Your Future.

Electrification Overview
Every day we plug in and power up, thanks to electricity. Electricity is essential for heating, cooling, and ventilation. With each day comes new demands on our electrical grid: more electric cars on the road, more buildings switching to electric heat pumps, and more industries electrifying manufacturing processes.

Today most electricity is generated by large power plants, with over 60% in 2022 from fossil fuels such as coal and natural gas. Burning fossil fuels for electricity, heat, and transportation is the largest source of greenhouse gas emissions in the United States and China. These emissions cause global warming, which in turn causes climate change. As the world works to adapt to and mitigate the impacts of climate change, we need to change how we generate electric power.

Today's engineers, scientists, architects, and city leaders are working together to ensure our future cities can be powered completely by electricity. What clean, green, and renewable energy sources could power the electrical grid? How would these sources generate enough electricity for industry, transportation, agriculture, residential, and commercial uses? How can we minimize the impact on the environment?

Research Essay Requirements

- In their essay, students will present their future city – at least 100 years in the future, describe its location, and share its innovative features.
- The students will explain what their city was like in the past (before it went 100% electric) and the impacts of using fossil fuels and producing power from non-sustainable sources.
- They will describe their future city's main source of power for generating electricity (after it goes 100% electric) and any significant secondary sources.
- The essay cannot exceed 1,000 words and should be free of grammatical and spelling errors.
- The essay can include a maximum of four graphics.
- The essay must cite at least three sources of information used during the idea development process. MLA style is preferred (see Research Strategies for more detail).
- Students should use a variety of sources of information, such as interviews with experts, reference books, periodicals, and websites. (Note: Wikipedia is not accepted as a source of research.)

Research Essay Deliverable

- The essay must be submitted as a Word document via the NTX Junior Team Center (http://www.dfwfuturecity.org/team_junior.html).

Competition Scoring

Teams can earn up to 60 points for their Research Essay. Make sure they have thoroughly covered these categories in the rubric to maximize points:

- Introduce City 15 points
- Problem and Solution 18 points
- Judge Assessment of Solution 15 points
- Writing Skills 12 points

Total 60 points

Scoring Deductions
5 points – Late submissions are accepted with a small point deduction (see online schedule)
10 points – For essays that exceed the 1,000-word limit.

SUGGESTED ESSAY OUTLINE

In the Research Essay, you will share your vision of your future city and your futuristic and innovative electricity solution.

You can use the following outline as a guide to help you organize and draft your essay.

Introduction
Briefly describe your future city. Include the location, geographic features, climate, population, etc. Include any unique, futuristic features of your city.

Electrification
Define the Problem:

- Describe what your city was like in the past (before it went 100% electric) and the impacts of using fossil fuels and producing power from non-sustainable sources.

Describe the Solution:

- Describe the future city's main source of power for generating electricity (after it goes 100% electric) and any significant secondary sources.
- Describe the technology involved in generating electricity.
    - Describe how it works to reduce health and environmental impacts and how it addresses the major issues from the past.
    - Highlight the futuristic and innovative aspects of this technology and solution.
    - Describe some of the benefits, risks and tradeoffs associated with the technology.
    - Explain what types of engineering were involved and what types of engineers or technicians were most helpful.

Conclusion
Share why people want to live in your city. Summarize how your solution for electricity generation will make it a healthy, safe and satisfying place to live.

Electrify Your Future: Research Questions

Imagine your city at least 100 years in the future. Think about different forms of green, clean, and renewable forms of energy. What if your city were powered entirely by electricity generated from sources like these? How would it look, smell, sound, and feel different?

For the competition, your team will design a 100% electrically powered city with energy generated from sources that keep your citizens and the environment healthy and safe.

Use the question below and in the **Future City Design Questions to Consider** handout as you start your research and brainstorming. And be sure to read and discuss the **City Essay Suggested Outline** and the **City Essay Rubric** with your teammates, as it provides a clear and detailed picture of what you'll need to include.

Green, Clean, Renewable: What's the Difference?

These are terms for sources of energy to produce electricity that can replace the use of fossil fuels. The terms are often used interchangeably, and there is a lot of overlap, but they are not the same. In fact, each source of energy comes with pros, cons, and trade-offs that need to be researched and considered.

Green: Sources that come from nature: solar, wind, heat, hydro (fresh water from rivers and lakes), ocean water, and biomass. Most create no carbon emissions or other greenhouse gases.

Renewable: Sources that quickly replenish themselves or never run out at all. Examples include solar, wind, hydro, ocean, and geothermal (heat extracted from underground). Whether biomass should be included here is up for debate.

Clean: Creates no greenhouse gases but may have other environmental impacts. Solar, wind, some forms of hydro, ocean, and nuclear are clean sources of energy.

Powering Today's Cities

Below are some questions to get you started with your research. As you learn how today's cities generate and use electricity, look for innovations that engineers and others are developing that may inspire your future city.

Energy Sources and Usage

- What is currently powered by electricity in your city?
- What energy sources are currently being used to generate electricity in your city today?
- In what ways is your city not powered by electricity? What is the power source for these uses (for example, trains running on diesel fuel or manufacturing plants)?
- Today, there are three main types of electricity consumers: industrial, commercial, and residential. How do the electrical needs of the three main types of consumers differ?

Generating and Storing Electricity

Electricity can be created from many power sources and in various ways. Today, there are two types of generation: Centralized generation refers to large-scale generation far away from where it's used (e.g., power plants fueled by coal or nuclear). Decentralized generation occurs close to usage (e.g., rooftop solar).

- What are the different ways electricity is generated?
- Where are electrical power plants typically located, and why?
- How do different types of generation impact the environment? What are the advantages of generating electricity as sustainability as possible?
- What advances or innovations are occurring in electricity generation today?
- What is a microgrid, and how is it different than a traditional electrical grid? What are the advantages and disadvantages of microgrids?
- How much energy can your city's system generate today? If everything ran on electricity, could your city generate enough for all the demands?
- How efficient are today's power plants? How much energy is lost as they convert the primary energy source into electrical energy?

Getting Electricity Where It's Needed: Transmission and Distribution

Sending electricity from power plants to cities is called transmission, while getting electricity to consumers is called distribution.

- How is electricity moved to individual businesses and homes?
- Is today's electrical distribution system capable of providing 100% of a city's power needs? Why or why not?
- What are the geographic challenges to transmission and distribution?
- What innovations are happening in today's transmission and distribution systems to increase capacity?
- How is the electricity supply controlled?
- How are transmission and distribution controlled?

Storing Electricity

Since electricity was first discovered, people have been looking for ways to store it. The challenges of storing electricity on a large scale can make it difficult to balance the level of generation with the level of usage throughout the day.

- Do today's cities store electricity? Why or why not?
- How can electricity be stored with existing technology? What are cutting-edge ideas in energy storage?
- What are some innovative methods of energy storage that engineers are developing?
- What are the benefits and drawbacks of each source of renewable energy storage?
- What happens when we don't store enough energy?
- How do different energy storage systems connect to the power grid? What infrastructure is needed?

Electrifying Your Future City

The more city planners, engineers, and scientists research the feasibility of cities running completely on electricity, the more consensus builds that it is possible. There are many issues to address for this to become a reality, however, and many innovations are in the works. What are all the clean, green, and renewable sources of energy that could be used to make electricity?

- What are the benefits of each source of energy? What are the drawbacks? (Things to consider: how much does it cost, is it readily available, are there any safety concerns?)
- Which energy sources would work best for your city's climate and location?
- Will you have a primary source of energy, with several others for backup? Will you have a range of sources that work together to keep your city powered up?
- What are innovative ways engineers are coming up with to electrify city sectors that are traditionally run on fossil fuels?
- How will electricity be distributed throughout your city?
- If electricity will be generated outside the city, how will it be delivered?
- How will electricity be stored so that supply always meets demand?
- How will life in your future, fully electrified city be different from life in this city today?
- What trade-offs are you willing to make to electrify your city?
- Is it a good idea to power a city 100% on electricity—why and why not?

Future City Design: Questions to Consider

Your challenge is to design a city that runs entirely on electricity that is supplied by alternative sources of energy. These sources will inform how your city will generate, distribute, and store energy.

As you and your teammates begin to design your future city, use the topics and questions below to guide your research, brainstorming, and design sessions. Remember, no city can provide everything. What are the most important features of your city? What trade-offs do you have to make? How might a switch to electricity address more than one problem your city is facing?

City Features

- Where is your city located?
- What is its climate?
- Who lives in your city?
- What are your city's distinctive natural features (e.g., mountains, oceans, rivers)? Where are suitable locations for generating alternative forms of energy in your city?
- What makes your city futuristic and innovative?

Zoning, Government, and Budget

- How is your city zoned? Are the zones separate, or are there mixed-use zones (e.g., commercial and residential or commercial and industrial) in your city?
- How has your city used zoning to achieve its goals around full electrification?
- How is your city governed? Who makes the laws and regulations?
- How does your city fund its operations (i.e., utilities, infrastructure, and public services)?

Food and Agriculture

- Where does your city's food supply come from?
- How will electrifying your city affect the city's food supply system?
- What changes have local and regional farmers made to accommodate alternative energy production?
- How can farmers benefit from the switch to alternative forms of energy?
- How can electricity be generated from agricultural waste?

Industry, Manufacturing, and Jobs

- What drives the economy in your city (e.g., tourism, manufacturing, education, agriculture, sports, medicine, the arts)?
- How has electrifying your city affected its economy? What new jobs or industries have come about since electrification or what jobs have been lost?
- What trade-offs have there been as your city has weaned off fossil fuels?
- How has going 100% electric affected these sectors?
- What types of jobs are available to your reside

Structures and Housing

- Where do your residents live, work, and go to school?
- Do individual homes generate their own electricity, or do they participate in a neighborhood grid?
- How does your city manage energy storage and distribution to homes and other buildings?
- What materials are used in your city's buildings? What makes them innovative? How are materials produced, used, and potentially reused?

Transportation

- What transportation options are available to your residents? Is there more than one way to get around?
- How are goods and materials moved around your city?
- How has your city been redesigned to fully electrify its transportation systems?
- How is your city designed to be accessible for people with mobility issues related to aging or a physical disability?

Utilities and Services

- What services does your future city provide its residents (e.g., medical, education)?
- How does your city address the needs of vulnerable populations, including the poor, the sick, the unhoused, and the elderly?
- What impact has your city's electrification had on its utilities, such as water, sewer, waste management and recycling, electricity, Internet, and so on?

Health and Recreation

- How does your city support a healthy lifestyle for its residents throughout every stage of life?
- What does your city offer for entertainment, recreation, and cultural enrichment?
- How have hospitals and healthcare adapted to full electrification?
- What types of public spaces does your city have? What do people do there?

Electrify Your City Case Studies

Compressed Air: A Breakthrough in Energy Storage

We've known how to make clean, renewable energy from wind, sun, and water for decades. The problem has been figuring out how to store this energy and have it ready when we need it, not just when the wind blows, the sun shines, or the water flows in torrents.

A company called Hydrostor has developed the technology to store large amounts of energy from renewables in the form of compressed air from 5 hours to many days. It is building a facility in Ontario, Canada, and another one in southern California, near Los Angeles. Repurposed components from mining and gas operations are part of this system, which compresses air and stores it underground or in a container. When the air is released, it drives a turbine. It is as powerful as hydro (water) power but uses 10 times less land and up to 20 times less water.

A School Bus That Powers the Grid

School buses are going electric all over the country. This trend reflects the general electrification of transportation in a growing effort to eliminate a major source of carbon dioxide, which is a key contributor to global warming. But electric school buses can do something else—they can serve as batteries, storing energy and pouring it back into the electrical grid.

A process called, V2G which stands for vehicle-to-grid, refers to bidirectional charging programs that turn electric vehicles into sources of energy for the electrical grid. When a school bus has completed the morning route and then again after the afternoon route, it has stored energy that can be sent back to the electrical grid.

The impact of V2G school buses could be substantial. One bus can store enough energy to power five hospital operating rooms for eight hours. Just 10 school buses can make 10 megawatts of power--more than enough energy to power a home for an entire year. Plus, the buses can generate funding for the school district, which gets paid $2/kWh when they send energy to the grid.

Increasing Access to Renewable Energy

As is true for many cities around the world, summers are getting hotter in Melbourne, Australia. Homes and businesses rely on air conditioning to get through the days of extreme heat. Air conditioning requires a lot of energy. But right now, Melbourne's energy infrastructure is fragmented, and many parts of the city do not have good, reliable access to renewable energy.

To solve this problem the City of Melbourne has partnered with universities to develop Power Melbourne, a project to construct a network of coordinated mid-scale batteries across the city. Each battery will range in capacity, but they will be modular; small batteries can stack together to create bigger batteries. The batteries will be charged via rooftop solar or through the grid itself when it has energy to spare. Then the batteries can store and release energy when it is needed, and thousands of air conditioners can run at once to keep everyone safe and cool.

Alice the Electric Airplane

Engineers around the world are working hard to develop airplanes with electric propulsion motors that will make flying carbon-free. Alice, created by a startup in Seattle called Eviation, is at the forefront of this new technology. Carrying as many as nine passengers 500 miles on one charge, Alice has a sleek and futuristic design with a pointed nose, tapered body, and T-shaped fin at the back. Its twin propellers have piston-free motors that make it very quiet. Its lithium-ion battery packs are located on either side of the fuselage (the main body of the plane) so that they contribute to the integrity of the aircraft, which saves weight—even though these battery packs weigh 8,000 pounds!

Charging six times faster than the fastest Tesla; it needs only half an hour of charge time to fly an hour. It requires little maintenance beyond replacing the battery at regular intervals, reducing the costs of maintaining a conventional plane. Alice is expected to be ready to fly passengers by 2024.

DISCOVER PRESENTS

FUTURE CITY COMPETITION

Research Strategies

Many students are not aware of the time and effort that effective research requires. Similar to the engineering design process, researching is an iterative process with many steps involved. Teaching your students effective research strategies is a worthwhile endeavor that will benefit your students throughout their academic and professional lives.

Research Tips and Strategies

- **Be sure that students are aware of the purpose of their research**. It helps if they form a focused question related to their research. For example, "What is infrastructure?" or "What types of crops can grow in dry, arid climates?"

- **Stress the importance of drawing information from multiple resources** and formats (books, brochures, journals, interviews, surveys, magazines, newspapers, and electronic sources). Although the Internet may be the most convenient place for students to begin their research, they should not overlook their school or local library.

- **Encourage students to use a process for finding and recording data** so they aren't overwhelmed by information**.** For example, they could use a Read-Think-Select process when finding information. Students should read the information presented, think about the important points presented, sort the data, and then select key facts. Have students repeat this process until they find the answer to their questions.

- **Have students make a plan for how they will collect and organize their notes**. Will they keep all of their notes on index cards, in their Learning Log, or will they use an online tool or app? How will they divide up the task of researching? Who will be responsible for finding what information?

- **Encourage students to share their findings** with others.

- **Make sure that every quote and fact is connected to its source**. Students must always write the full bibliographic reference for information that they draw from.

Internet-Specific Research Strategies

Although the Internet is wonderful tool, students may need help using it effectively. Share the following steps with students as they begin their Internet research process.

1. Make sure that students understand exactly what information they are searching for.

2. Work with your students to create a list of key words and search terms. If they are not finding what they want, alter the key words to make a more (or less) specific search. Point out that sometimes it is a matter of trial and error to discover what keyword combination yields the best results.

3. Preview websites that may be helpful and prepare a list of sites students can start their research with. Have students use search engines like Google, Bing, and/or Sweet Search (a search engine that searches sites that have been found appropriate for students) to test out their key words.

4. Teach students how to evaluate sources. (Choose a site to evaluate and model what you mean by answering the following questions.)

    - Look at the actual URL address? Is it a well-known site? Is it an educational, government, commercial, or opinion-based site?

    - Who published the source?

    - Is the information current?

    - What is the purpose of the source and who wrote it? (Why was it written and whom was it written for?)

    - Is the information supported by evidence?

    - In what ways is the information relevant to your topic?

    - Whose perspective is represented in the source?

DISCOVER PRESENTS

FUTURE CITY COMPETITION

Works Cited

A works cited page, or bibliography, is a list of works that you used for researching your essay. It is useful for two reasons: (1) to give proper credit to your sources and (2) to help your reader to find your sources.

General Tips

- The Works Cited is always the last page of your essay.
- Type the title "Works Cited" and center it on the page.
- List sources alphabetically by the first word or name of the source.
- If an entry goes beyond one line always indent the next line(s) five spaces or one-half inch.
- Dates are written as: Day Month Year. For example: 14 May 2004 and 22 Feb. 2010
- Abbreviate all months except for May, June, and July.

The information below shows how to format commonly used sources in MLA style.

Book by One Author
Author (Last name, First name MI). *Title*. City of Publication: Publisher, Year of Publication. Print.

Book by Two or More Authors
Author (Last name, First name and First Name Last Name). *Title*. City of Publication: Publisher, Year of Publication. Print.

Encyclopedia Article
Author of Specific Article (Last name, First name MI). "Title of Article." *Title of Encyclopedia.* Edition. Year of Publication. Print.
Note: If there is no author listed, begin the entry with the article title.

Magazine Article
Author (Last name, First name MI). "Title of the Article." *Title of the Magazine* Date of Issue (Day Month Year): Page Numbers (XX – XX). Print.
Note: If there is no author listed, begin the entry with the article title.

Newspaper Article
Author (Last, First MI). "Title of Article." *Title of Newspaper* Date of Publication (Day Month Year): Page Numbers (XX – XX): Section Number. Print.

Interview Conducted by Researcher
Name of person (Last name, First name MI). Personal interview. Date of interview (Day Month Year).

Article on a Website
Author (Last name, First name MI). "Title of Internet Article." *Title of Website*, Year posted or last updated. Web. Date viewed (Day Month Year). <Web address (optional)>

Online Encyclopedia Article
Author (Last name, First name MI). "Article Title." *Title of Encyclopedia*. Publisher, Date of publication. Web. Date viewed (Day Month Year).

Personal E-mail
Author (Last name, First name MI) of e-mail. "Subject line from posting." Message to recipient. Date of message (Day Month Year). E-mail.

References:

Modern Language Association of America. *MLA Handbook for Writers of Research Papers.* 7th ed. New York: Modern Language Association of America, 2009. Print.

The Purdue Online Writing Lab Website. The Writing Lab and OWL at Purdue and Purdue University, 2015. Web. 7 July 2015. < https://owl.english.purdue.edu>

Electrify Your City: Research Resources

General

Energy Kids - U.S. Energy Information Administration: https://www.eia.gov/kids/energy-sources/renewable/

National Renewable Energy Laboratory (NREL): Energy Basics
https://www.nrel.gov/research/learning.html

Electricity statistics and analysis from the U.S. Energy Information Administration (EIA)
https://www.eia.gov/electricity/

Mythbusting renewable electricity
https://www.there100.org/our-work/publications/mythbusting-renewable-electricity

What's the Difference Between Green, Renewable, and Clean Energy?
https://terrapass.com/blog/whats-the-difference-between-green-renewable-and-clean-energy

US Dept of Energy: How We're Moving to Net-Zero by 2050
https://www.energy.gov/articles/how-were-moving-net-zero-2050

Can 100% of a city's electricity come from renewables?
https://www.weforum.org/agenda/2018/03/clean-energy-can-provide-100-of-a-city-s-electricity-here-s-how

The biggest hurdles on the path to clean energy
https://www.weforum.org/agenda/2021/02/heres-why-geopolitics-could-hamper-the-energy-transition/

How Cities Can Take Action to Drive the Energy Transition
https://www.irena.org/News/articles/2021/May/How-Cities-Can-Take-Action-to-Drive-the-Energy-Transition

Why cities are shifting to all-electric buildings
https://www.climatesolutions.org/article/2021-01/living-cleaner-why-cities-are-shifting-all-electric-buildings

WSSC Water and Montgomery County Partner to Turn Human Waste to Power
https://www.wsscwater.com/news/2023/june/wssc-water-and-montgomery-county-partner-turn-poop-power

Videos

Can A City Run On 100% Renewable Energy?
https://www.youtube.com/watch?v=zKhzVcHrWH4

National Geographic: Renewable Energy 101
https://www.youtube.com/watch?v=1kUE0BZtTRc

What is renewable energy?
https://www.youtube.com/watch?v=VfowJHJz6-s

Green energy: Which sources are the most sustainable?
https://www.youtube.com/watch?v=Ms--0d7Oh0s

Can 100% renewable energy power the world?
https://www.youtube.com/watch?v=RnvCbquYeIM

Net Zero Homes: Why it's easy to build one
https://www.youtube.com/watch?v=st-Gd1ZcFyM

The world's most electric city: Oslo, Norway
https://www.youtube.com/watch?v=IdawuX8PGl0

Smart Cities - Infrastructure and Transport of the Future
https://www.youtube.com/watch?v=d1DndVz9dAs

Real-World Electrification Examples

The cities that are leading in electrifying transportation
https://www.greenbiz.com/article/here-are-cities-are-leading-electrifying-transportation

Consumers Energy to test burying power lines to bolster grid reliability
https://www.mlive.com/public-interest/2023/07/consumers-energy-to-test-burying-power-lines-to-bolster-grid-reliability.html

Cities Confront Climate Challenge: How to Move from Gas to Electricity?
https://e360.yale.edu/features/cities-confront-climate-challenge-how-to-move-from-gas-to-electricity

Portugal produced over 100% of its electricity from renewables in March
https://www.weforum.org/agenda/2018/04/last-month-portugal-produced-almost-104-of-its-electricity-from-renewables

Electric cities: Shifting into the future of electrified transportation
https://www.cummins.com/news/2019/09/25/electric-cities-shifting-future-electrified-transportation

DISCOVER PRESENTS
FUTURE CITY COMPETITION

Works Cited Format Suggestions

A "Works Cited" page, or bibliography, is a list of works that you used for researching your essay. It is useful for two reasons: (1) to give proper credit to your sources and (2) to help your reader to find your sources.

The list below shows how to format commonly used sources in MLA (Modern Language Association) style. You can also use free programs, such as **NoodleBib Express** (http://www.noodletools.com) and **EasyBib** (http://www.easybib.com/), to create an entry in MLA format and paste it into your document.

General Tips

- The Works Cited is always the last page of your essay.
- Type the title "Works Cited" and center it on the page.
- List sources alphabetically by the first word or name of the source.
- If an entry goes beyond one line line, always indent the next line(s) five spaces or one-half inch.
- Dates are written as: Day Month Year. For example: 14 May 2004 and 22 Feb. 2010
- Abbreviate all months except for May, June, and July. (e.g., Dec. and Feb.

Sample Works Cited Page

Works Cited

Devitt, Terry. "Flying High." *The Why Files*, 1999. Web. 16 Mar. 2010.

Enz, Tammy. *Build Your Own Fort, Igloo and Other Hangouts*. Mankato: Capstone Press, 2011. Print.

Thompson, Lucas R. "Electricity." Message to the author. 12 Dec. 2009. E-mail.

Sample Citations*

Book by One Author

Format:

Author (Last name, First name MI). *Title*. City of Publication: Publisher, Year of Publication. Print.

Example:
Enz, Tammy. *Build Your Own Fort, Igloo and Other Hangouts*. Mankato: Capstone Press, 2011. Print.

Book by Two or More Authors
Format:
Author (Last name, First name and First Name Last Name). *Title*. City of Publication: Publisher, Year of Publication. Print.
Example:
Woods, Mark and Ruth Owen. *Ace!: Tennis Facts and Stats.* New York: Gareth Stevens, 2011. Print.

Encyclopedia Article
Format:
Author of Specific Article (Last name, First name MI). "Title of Article." *Title of Encyclopedia.* Year published or edition. Print.

Note: If there is no author listed, begin the entry with the article title.

Example:
Pettingill, Olin S., Jr. "Falcon and Falconry." *World Book Encyclopedia*. 1980 ed. Print.

Magazine Article
Format:
Author (Last name, First name MI). "Title of the Article." *Title of the Magazine* Date of Issue (Day Month Year): page #s. Print.

Note: If there is no author listed, begin the entry with the article title.

Example:
DeAngelis, Gina. "Countdown to Yorktown: A Timeline." *Cobblestone* Oct. 2006: 4-7. Print.

Newspaper Article
Format:
Author (Last, First MI). "Title of Article." *Title of Newspaper* Date of Publication (Day Month Year): Page Numbers. Print.

Example:
Ratti, Carlo. "Phone-Call Cartography." *New York Times* 3 July 2011: SR4. Print.

Interview Conducted by Researcher
Format:
Name of person (Last name, First name MI) interviewed. Type of interview. Date of interview (Day Month Year).

Notes: Type of interview can include Personal interview (if it was face-to-face), Telephone interview, or E-mail interview.

Example:
Lee, Emily. Personal Interview.15 Oct. 2011.

Article on a Website

Format:
Author (Last name, First name MI). "Title of Internet Article." Title of Website, Year posted or last updated. Web. Date viewed (Day Month Year).

Example:
Devitt, Terry. "Flying High." *The Why Files*, 1999. Web. 16 Mar. 2010.

Online Encyclopedia Article

Format:
Author (Last name, First name MI). "Article Title." *Title of Encyclopedia*. Publisher, Date of publication. Web. Date viewed (Day Month Year).

Example:
Maier, Pauline. "Boston Tea Party." *World Book Student.* World Book, 2010. Web. 16 March 2010.

Personal E-mail

Format:
Author (Last name, First name MI) of e-mail. "Subject line from posting." Message to recipient. Date of message (Day Month Year). E-mail.

Example:
Thompson, Lucas R. "Electricity." Message to the author. 12 Dec. 2010. E-mail.

*Source: Modern Language Association of America. *MLA Handbook for Writers of Research Papers.* 7th ed. New York: Modern Language Association of America, 2009. Print.

Essay Rubric (FC Jr.)

	0 **No Points** Requirements missing	1 **POOR** Poor-Fair quality. Fulfills less than 50% of requirements.	2 **GOOD** Average-Above average quality. Fulfills at least 90% of requirements.	3 **EXCELLENT** Excellent quality. Fulfills 100% of requirements with additional distinctive features.
I. INTRODUCE CITY (15 points)				
1. City overview ● Introduce city and basic features ● Location, geography, climate, development, etc.	No description of city	Underdeveloped description of city.	Clear and developed description of the city and unique features.	Clear and thoroughly developed description of city and unique features.
2. Features and innovations • Attributes that make this city unique.	No description of unique features.	Underdeveloped description of unique features.	Clear and developed description of unique features.	Clear and thoroughly developed description of unique features.
3. City innovation and futuristic elements	No description of innovative or futuristic elements.	Underdeveloped description of futuristic elements.	Clear and developed description of innovative and futuristic elements.	Clear and thoroughly developed description of futuristic elements.
4. Describe power sources used in past (before 100% electric)	No description of power sources.	Underdeveloped description of one power source	Clear and developed description of more than one power sources.	Clear and thoroughly developed description of power sources..
5. Describe the impact of using less than 100% electric power • Impact on the city (environment, economy, etc.) • Impact on health of citizens	No description of impact on city, citizens or environment	Underdeveloped description of effects on city, citizens, or environment	Clear and developed description of effects on city, citizens, and environment.	Clear and thoroughly developed description of effects on city, citizens, and environment.
II. PROBLEM AND SOLUTION (21 points)				
6. Describe overall solution to going 100% electric ● Description of how solution works ● Technology involved ● Innovative and futuristic	No description of solution or technology.	Underdeveloped description of solution and technology.	Clearly outlines the solution and somewhat futuristic technology involved. Could be more detailed.	Clear and thorough description of solution. Innovative and futuristic technology.
7. Describe main source for electric power generation. ● Environmental impacts ● Clean, green, renewable and/or sustainable ● Health and safety impacts	No description of source.	Underdeveloped description of source and attributes.	Clearly describes source and attributes. Could be more detailed.	Clear and thorough description of source and its attributes and impacts.
8. Describe how solution resolves problems from past • Major issue associated with past non-electric power • Successfully resolves problems	No description of issue and solution.	Underdeveloped description of issue and solution.	Clearly outlines the resolution of issue. Could be more detailed.	Clear and thorough description of resolution of issue. Effective solution.
9. Discuss risks, tradeoffs, and compromises of solution ● Benefits, drawbacks, risks ● Tradeoffs & compromises	No discussion of benefits, risks or tradeoffs	Description of one risk and/or tradeoff.	Description of more than one benefit, risk, or tradeoffs.	Description of more than two benefits, risks, or tradeoffs.
10. Describe benefits to citizens ● How does 100% electrification benefit the residents	No description	Underdeveloped description	Clear and developed description of benefits	Clear and thoroughly developed description of benefits

Essay Rubric (FC Jr.)

	0 **No Points** Requirements missing	1 **POOR** Poor-Fair quality. Fulfills less than 50% of requirements.	2 **GOOD** Average-Above average quality. Fulfills at least 90% of requirements.	3 **EXCELLENT** Excellent quality. Fulfills 100% of requirements with additional distinctive features.
II. PROBLEM AND SOLUTION (Cont'd)				
11. Engineering disciplines involved	Engineering disciplines are not identified or not relevant to solution	Discusses one relevant Engineering discipline.	Clear description of more than one relevant engineering discipline	Clear and detailed description of more than one relevant engineering discipline.
12. Role of 1-2 engineers	Role of engineers are not identified	Underdeveloped discussion of role of one engineer	Clear description of role of 1-2 engineers involved in system and solution	Clear and detailed description of role of 1-2 engineers involved in system and solution
III. JUDGE ASSESSMENT OF SOLUTION (12 points)				
13. Effectiveness and Quality of solution to 100% electrification ● Effective strategy electrifying city power ● Addresses stated problems of past power generation	Not effective	Solution is somewhat effective. Solves a few of past problems.	Solution is effective, and solves most of past problems of power generation.	Solution is a highly effective, with addresses all of the problems of past.
14. Effectiveness of choice of power generation source(s) ● Effective choice of source(s) for power generation. ● Appropriate design and application of technology	Not effective	Power source choice is somewhat effective. Technology and design need improvement.	Power source choice is effective, but technology and design could be improved.	Power source choice is a highly effective, with excellent technology application.
15. Innovative & futuristic technologies ● Futuristic, but reasonable extrapolation and application of technology	Not innovative or original	Overall concept is somewhat original or innovative. Not futuristic.	Overall concept is moderately innovative, original or futuristic.	Overall concept is highly innovative, original and futuristic.
16. Plausibility of solution ● Plausible. Based on sound scientific principles.	Implausible or not scientifically sound	Solution is not very plausible (science fiction)	Solution is plausible	Solution is highly plausible and scientifically sound
IV. WRITING SKILLS (12 points)				
17. Organization	Poorly organized	Fair organization	Good organization	
18. Writing skills	Poor writing	Fair writing	Good writing	
19. Grammar & spelling	Many errors	Some errors	Few, if any, errors	
20. Maximum number of Graphics ● If used, max of 4 (does not include tables)	Exceeds maximum of 4 graphics, illustrations		Does not exceed maximum of 4 graphics and/or illustrations	
21. List of references ● At least three acceptable references ● Wikipedia not recognized as an acceptable reference	No references	Less than three acceptable references	At least three acceptable references	
22. Word count ● Does not include title, references ● Includes all captions and words in graphics, illustrations and tables.	No word count at end of document or inaccurate count		Accurate word count at end of document	