1. **Brainstorm**: What are your initial thoughts about how to approach this prompt? What possible arguments come to mind?
2. Can you begin to assess the strengths and weaknesses of the possible arguments? Think about how logical reasoning could be used to structure a possible argument and what evidence might apply.

3. Based on your assessment of the possibilities, can you choose the strongest arguments?

Thesis (What's your argument?):

Thesis support (What is the evidence or reasoning that supports your argument?):

Counterargument (What is their argument?):

Counterargument support (What is the evidence or reasoning that supports their argument?):

NOTE: Multiple counterarguments are certainly possible.

Rebuttal (How will you refute their argument?):

Rebuttal support (What is the evidence or reasoning that refutes their argument?):

NOTE: Multiple counterarguments may require multiple rebuttals.

4. **Intro and Conclusion**: Let's flesh out what you may want to say in the introduction and the conclusion of your essay.

Introduction	
Context/Background?	
State the Problem	
Answer the "so what?" question	
Thesis statement	
Do you need a brief roadmap?	
Conclusion Many moves may be possible here, but below are a few considerations.	
Reassert Significance: Why, again, does your analysis matter?	
Establish Consequence: How does your thesis statement change or improve understanding of the topic?	
Impart Substance: Highlight the strongest evidence in support of your argument.	

5. **Outline**: Can you create an outline based on what you've done above?

“Reconsidering the Risks of Nuclear Power”
by Jordan Wilkerson

1. Can you identify the author's main argument and supporting claims? What evidence and reasoning does he provides?

Thesis (What is the author’s argument?):

Thesis support (What is the evidence or reasoning that supports the author’s argument?):

2. Can you identify the counterargument(s) that the author entertains?

Counterargument (What competing argument[s] does the author entertain?):

Counterargument support (What evidence or reasoning supports the counterargument[s]?):

3. How does the author refute the counterarguments in the rebuttal?

Rebuttal (How does the author refute the counterargument[s]?):

Rebuttal support (What is the evidence or reasoning that refutes counterargument[s]?):

4. Do you feel that the author’s exploration and refutation of the counterargument(s) affect the persuasiveness of the text? Why or Why not?

Excerpt from "Reconsidering the Risks of Nuclear Power"

by Jordan Wilkerson, October 2016

Note: Jordan Wilkerson was a PhD candidate in the Department of Chemistry at Harvard University when this article was published.

paragraph

1 The United States emits an immense amount of carbon dioxide into the atmosphere. According to the Intergovernmental Panel on Climate Change, it is extremely likely that the rising global temperature trends since the mid-20th century is dominantly due to human activity. No scientific organization of national or international standing disputes this. Furthermore, the US Department of Defense has officially stated that climate change poses a serious national security threat. In light of all of this, the United States recently ratified the Paris Climate Agreement, which means we are committed to significantly reducing our carbon emissions. How do we do that?

2 Given that, in 2015, we released 2 billion metric tons of carbon dioxide (CO2) from electricity generation alone, and fossil fuels accounted for over 99% of these emissions, a great place to start would be to begin replacing fossil fuel power plants with alternative energy sources. The main alternatives are solar, wind, and nuclear. The first two are certainly alluring, attracting the investment of a lot of government money worldwide. However, they are also variable. The wind isn't always blowing; days aren't always clear and sunny. This isn't to say relying solely on renewables is impossible or even unrealistic with some clever storage and transportation strategies. However, it is a challenge to replace the constantly running fossil fuel power plants with sources that are intermittent.

3 Ideally, we'd have a source that doesn't emit CO2 and is consistently reliable; this is known as a baseload energy source. In this context, nuclear energy is the main alternative energy source that works. Yet, unlike its fickle counterparts, nuclear energy is subjected to hostile attitudes adopted by a number of governments in the world which restrict the building or continual operation of power plants. Fear for Chernobyl and Fukushima-type catastrophes exacerbate the unpopularity of going nuclear. The US, currently the world's largest producer, relies on nuclear energy for 20% of its overall electricity generation. Yet there has historically been a strong anti-nuclear movement in the US, and the sentiment is still somewhat present today, as demonstrated by closures of nuclear power plants and stances held by prominent political figures such as Vermont Senator Bernie Sanders. In order to assess whether such notoriety is deserved, we need to learn about the physics of nuclear power and compare the statistics of its supposed dangers with that of existing energy sources. …

4 What is Nuclear Energy? … [A nuclear chain reaction] provides a lot of energy, and the best part is that it does so without emitting any CO2. In fact, the only CO2 emitted due to nuclear power plants is what's released indirectly from developing the construction materials!

5 How does this compare to other energy sources? Coal power emits the equivalent of 820 g CO2 worth of greenhouse gases for every kilowatt-hour (g CO2eq/kWh) of electricity produced. (A kWh is a standard unit of energy used in billing by electrical utilities). Natural gas has a lower output at 490 g CO2eq/kWh. Nuclear power, though? A mere 16 g CO2/kWh. This is the lowest of all commercial baseload energy sources.

6 Nuclear energy isn’t all good news, though. The Fukushima Nuclear Disaster is the latest testament to that. This disaster was a consequence of the combination of a tsunami and a powerful earthquake in March 2011. Although the chain fissile reactions were shut down automatically in response to the earthquake, the tsunami damaged generators responsible for cooling the reactors of the plant. Without cooling, the components of the core of the reactors can literally melt from all the energy released from these reactions. In this case, they did. Radioactive material was subsequently released along with several chemical explosions, which were initiated by the immense heat released by the nuclear reactions.

7 Why is radioactive material dangerous? To start with, to be radioactive refers to the fact that this material is actively emitting radiation. This is not the same kind of radiation we’re familiar with such as visible electromagnetic radiation from a light bulb. Electromagnetic radiation emitted as a result of nuclear fission, known as gamma rays, has 100,000 times more energy than visible light. Radioactive material can also emit highly energetic electrons (beta particles) and small clusters of protons and neutrons (alpha particles). This concentrated energy causes the molecules in our body to react in ways that can be extremely damaging, sometimes giving rise to cancer.

8 Radioactivity isn’t just a characteristic of the material being used in the nuclear reactor. Even in the absence of a nuclear accident, nuclear power inevitably produces dangerous materials: radioactive waste. This waste, composed of mostly unconverted uranium along with intermediate products plutonium and curium, stays radioactive for extremely long periods, too, presenting a major problem in regards to storage.

<u>Putting Nuclear Power in Perspective</u>

9 There is no doubt that nuclear power has problems that can cost human lives, but such risks are borne by all major modes of energy production. Therefore, the question shouldn’t be, ‘is nuclear energy deadly?’ Instead, we should ask ‘is nuclear energy more dangerous than other energy sources?’

10 Fossil fuels have a host of problems themselves. The byproducts from burning fossil fuels are toxic pollutants that produce ozone, toxic organic aerosols, particulate matter, and heavy metals. The World Health Organization has stated the urban air pollution, which is a mixture of all of the chemicals just described, causes 7 million deaths annually or about 1 in 8 of total deaths. Furthermore, coal power plants

release more radioactive material per kWh into the environment in the form of coal ash than does waste from a nuclear power plant under standard shielding protocols. This means that, under normal operations, the radioactive waste problem associated with one of the most mainstream energy sources in use actually exceeds that from nuclear energy.

11 In fact, on a per kWh of energy produced basis, both the European Union and the Paul Scherrer Institute, the largest Swiss national research institute, found an interesting trend regarding the fatalities attributable to each energy source. Remarkably, nuclear power is the benchmark to beat, outranking coal, oil, gas, and even wind by a slight margin as the least deadly major energy resource in application.

12 The nuclear industry is constantly developing innovative technologies and protocols towards making the energy production process failsafe. Newer generations of nuclear reactors, particularly what is called a pebble-bed reactor, are designed so that the nuclear chain reaction cannot run away and cause a meltdown – even in the event of complete failure of the reactor's machinery. Geological stability considerations will also likely play a bigger role in approving new sites of construction. And although long-lived nuclear waste may remain dangerous for considerable periods of time, that timescale is not prohibitive. In fact, even without recycling the fuel, which would further shorten the lifetime of radioactive waste, the radioactivity of the waste is reduced to around 0.1% of the initial value after about 40-50 years. …

13 Dangers associated with nuclear power are, in many ways, different from the dangers we face from other methods of getting energy. This might explain why fear of nuclear power persists and why the above fatality rates may surprise you. However, we know that nuclear energy does not produce the greenhouse gases that fossil fuels have been producing for over a century. Research also concludes that the more familiar dangers from using fossil fuels claim far more lives. Furthermore, with the advent of modern reactors such as the pebble-bed reactor and careful selection of plant sites, nuclear accidents like the one in Fukushima are actually not possible. When balanced with these notable benefits, the problems associated with nuclear power do not justify its immediate dismissal as a potential energy source for the world.

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