**Exercise 3: A Clean Energy Revolution**

Please write up your vision of a clean energy revolution in the United States. Envision a future in which the environmental impacts from energy production and use in the U.S. are dramatically lower than they are today. Make your vision compelling by discussing the technological, operational, and sociological feasibility of your ideas and proposals. You can talk about economic feasibility as well if you want, but it is not required. Maximum word count is 1,000.

[INTRODUCTION]

Energy production and use in the United States imposes massive environmental impacts with the likely greatest perpetrator being fossil fuel combustion. Achieving an energy future with minimal environmental impacts hinges on phasing out fossil fuels and increasing investment in other technologies, both for generation and use.

Fossil fuel use must be phased out completely due to their massive contribution to greenhouse gas emissions and resulting driving of climate change. [EXPAND]  
The major barriers to displacing fossil fuels are their ability to provide consistent baseload generation for the grid; their low cost and prevalence; and their specialized use in certain industries, such as steel production.

Nuclear power does not represent a viable alternative to replace the baseload generation lost from the phase out of fossil fuels. While the actual impacts of electricity generation using nuclear technology are quite low, the inputs and outputs of the technology do have an extensive environmental and humanitarian impact. On the input side, uranium mining leaves landscapes devastated and exposes local communities to radiation, resulting in major health impacts. After fuel rods are depleted, they remain radioactive for millennia and thus pose a threat to human life. The question of how they can be safely stored until they are safe has not yet be solved even as depleted material piles up.

Similarly, hydropower provides low-emission electricity generation in most scenarios, but has a massive impact on the landscape and the processes associated with it as well as humanitarian effects on those displaced by reservoirs. The environmental impact of existing hydropower installations is low compared to fossil fuels and the technology itself offers consistent generation to support baseload demand. While hydropower would ideally be phased out to reduce the overall environmental impact of energy production, such actions are not as critical in the short term as ending the use of fossil fuels.

Biofuels are inefficient and provide little benefit. As such they will not be discussed here.

The key to an energy transition is to ensure that energy demand is being met. This will require investment in renewable technology research and in the implementation of existing technologies, with a plan for expansion increasing efficiency to meet the ever-growing demand for energy. The greatest shortcoming of current renewable technologies such as wind and solar is that they are not “always on” in the way that fossil fuel generation, nuclear power, or even hydropower can be. This leaves a potential shortfall in energy supply relative to demand, especially during peak use hours after the sun has gone down. The key to address this shortfall is the implementation of storage technology, particularly batteries. Batteries suffer from being less efficient that the simple combustion of fossil fuels, certain technologies posing fire risk, and from the sourcing and reclamation of the materials that go into them. While it is necessary to use the technology available now to displace fossil fuel use, it is also necessary to continue research on battery technology and reclamation opportunities to address these issues.

While a combination of wind and solar generation with storage technology provides significantly lessened environmental impacts than fossil fuel use, they are not free of them. The technology still requires mineral extraction and space to operate in addition to potential impacts from operation, including on wildlife. While climate change poses such an outsize threat to the environment and humanity that swift, decisive action needed to address the greatest driver of that, efforts to reduce impacts cannot stop there. Even with massive changes to energy production, it is likely that there will be no future with zero environmental impact due to energy demand.