For your final project in this class, you are required to write a research paper about a subject of your choice that has been approved by me (and by this date above all topics submitted or discussed have been approved).

The paper must promote or support a theme, thesis, argumentative proposition, or clear perspective (hereafter proposition) and the paper must be generally organized around promoting this proposition. The proposition can be modest, narrowly defined, and very specific (in fact that is encouraged). It must only be relevant and insightful or instructive within the domain of the general topic concerning this class: the economics of energy use and production.

As an option a paper might offer an entrepreneurial promotion of a new technology or practice that would contribute to an improved energy future.

I. Research Categories

Generally such papers fall into one of the following five categories:

1. A comparison between the past, current, and or projected costs (or prices, or efficiencies) of competing energy producing technologies or facilities, including some very specific and targeted comparisons.

2. A discussion of the feasibility, including competitive economic feasibility, of certain emerging technologies, including very specific components of larger and more inclusive technologies.

3. A comparison of environmental emissions or other standards between competing energy producing technologies or facilities, possibly including cost tradeoff considerations, including some very specific and targeted comparisons.

4. An evaluation, typically by the criteria of cost or efficiency or emissions, of a policy or practice that would change energy applications from the status quo.

5. An empirical inquiry, typically into categories of energy costs, prices, or similar data, where a new contribution to cost or price estimation is attempted, typically for a narrow category of comparison. Any theme that emerges might be the consequence of discovery rather than a-priori.

6. The entrepreneurial promotion of a new technology or practice that has the potential to alter the energy environment if developed. For this application, the student must be a part of the innovation process (an inventor or developer, or part of a group or team doing the innovation or development, subject to the condition that the team approves of this application).

II. Rules and Guidelines

1. The text portion of the main body of the paper (excluding graphics) must exceed 2,250 words in length, given the format discussed below. [Note: Word keeps track of word counts at the bottom of the page - this page for example has 442 words].
2. The formatting convention that must be followed has been explained in a document entitled *formatting conventions*. Generally that document advised standard *Word* margins (1"), single spacing except double spacing between paragraphs, no paragraph indentation, and *Times New Roman 12* font for the main text, headers, and specifications for citations. *This* document also generally fits those guidelines.

3. Because this is a research paper, the paper must have cited references from at least *five* different sources excluding magazine, newspaper, or generic online articles. Online sources may be cited if any of these criteria are satisfied (a) the site is providing raw and original data, (b) is a scholarly source, (c) is a valid academic source, (d) is a government agency or formal private research or educational institution known to be a reliable source, (e) is a referred academic journal, or (f) is a reliable trade journal. An online blog or similar source may be cited only if authored by an obvious authority at a deep level (ask your teacher if in doubt). Citations from traditional books are allowed if they are a truly scholarly source. Again, if in doubt about any source ask your teacher.

4. This research paper is due on *Friday May 4, 2021 at 4:00 PM*.

### III. Suggested Outline and Tips for Organization

The student writer is required to prepare a tentative outline and fit the research paper to the outline, subject to modification as the project matures. An outline can keep a paper compressed and organized and raises the likelihood that the final presentation will be more acceptable to readers.

The outline below is recommended as a starting point. The resourceful student might want to add some components or, more likely, sub-topics, and might even care to change the order some, although the latter should be done only with care. There is a reason why one introduces a paper with an introduction (rather than, say, put it second). Because proper organization is an essential practice when writing or working on long sustained projects, for this paper the writer is required to use Roman number section heads (I, II, etc.) as was done for this paper and the *formatting conventions* paper.

Also, as was done for this paper, the first section head number follows the introduction rather than begins the paper, although it is acceptable to begin even the introduction with a section head number.

Here is the minimum suggested outline:

**Introduction:** This will be very short and merely let the reader know what you intend to attempt in this paper. Your *proposition* (thesis, theme, argument) should be clearly explained.

If possible, an opening sentence or paragraph of general interest that will motivate the paper and capture the reader should be attempted, but for the novice writer this can be difficult. The student writer is encouraged to follow blog format (*good blog*) where one gets to the point quickly with a very brief opening.

I strongly suggest that you write your opening *last*. The opening is sometimes the most difficult part of the paper to write and, more important, for students at least, it is often the most deficient part of the paper.

**Roman Section Head I. Background Material:** Don’t call it “Background material.” This section is used to provide some context, history, support information, or any other information that will place your narrower proposition in context. The material presented here should establish a platform for your own material. The importance and context of your proposition can be established here. If your proposition is
part of a much larger picture (for example residential photovoltaic technology is part of renewable energy technology which in turn is part of the national energy picture) then this is where you want to offer background and relevance.

Some judgment is required about what to include and what to omit. Remember that the background material should be informative but brief and included only if truly relevant to the proposition. Students sometimes get carried away and make this section too long and inclusive.

**Optional Next Roman Section Head Discussion of Related Research:** Papers with a more formal proposition such as academic papers and other papers intended for research journals should include (or must include) some discussion of prior related research and that normally goes in the front of the paper before the proposition is presented. This can be blended into the background section in less formal papers and can be presented in a dedicated section.

All papers presenting formal propositions must cite and in some cases discuss background support material or related research. Papers in research-blog format can include the discussion and citation where relevant and need not have a dedicated section for this.

**Next Roman Section Head or two or three The Core Presentation:** Now that you have built a foundation for presenting your proposition, make the proposition and build the case. This is often done in two or three steps, especially for a longer paper or a complicated subject, which implies that you will have as many Roman Section Heads as steps or components.

If you begin intending to use only one section head and discover that this section runs four or five pages in length, then you should consider breaking the section down into subsections. For example, if you are making the claim that shale gas technology will reduce the relative price of natural gas relative to coal, if you have a section that presents the argument that the answer in part is dependent upon whether emissions controls are required for coal, then possibly that argument and its support should have a dedicated section.

All primary data and visual references such as graphs that provide support specifically germane to your proposition should be found here in your main body. (Data and graphs that are pertinent to background information should be placed in that section).

This section should include a very clear articulation of the proposition of the beginning of this section, even if it has already been expressed (normally the case) in the opening.

This part of the paper must be convincing and should be written with great care.

**Final Roman Section Head The Summary:** If there is a summary statement it should be brief and succinct. If there is a statement about future research possibilities or further work to be done is included, there should obviously be a concluding section.

**Note:** I do not require conclusions summary statements. I regard them as inefficient and have read many that are poorly written. High-level blogs generally do not have summary statements. They make the point and are done.

I summary or ending section is much more acceptable if it is forward-looking –if it describes “what’s next.” This should not be contrived though. It is better to cut clear and be done than to contrive and ending.
IV. Writing Tips

Here are some enumerated tips that might help:

1. Write your introduction last (explained earlier).

2. After completing a draft of a section, let it sit overnight and then proofread it the next day. Proofread all of your material very carefully.

3. Plan to revise your document. Revision is a significant part of writing. For revision you should budget an amount of time equal to nearly half the amount of time spent writing the first draft, or considerably more! When writing a book, it is not unusual to spend more hours on revision than on the first draft.

4. Successful writing is very, very rewarding. Writing is a very personal and initially private experience (it ceases being private once your audience starts reading). Writing is also a tremendous challenge. It requires substantial self-discipline. For that reason the writing project should be planned in the same spirit as planning your outline. The successful writer will budget time with a planning calendar and impose deadlines for project milestones. Treat this no differently than you would physical exercise, piano lessons, or planning for a long vacation. You accomplish next to nothing if you do everything at the last minute. You become an incandescent light – more heat than light – if you approach the task of writing as a crisis-driven afterthought.

You have no boss to tell you to start writing at 8:30 AM until 4:00 PM, with a break for lunch. That is why writing is a pleasant occupation for smart people – you have true freedom. But true freedom can be a huge liability if you don’t have the self-discipline to be your own boss.

5. Writing taxes your intellectual resources but also can drain you physically, especially if you write for long hours. Writing is ergonomically unhealthy, or at least it can be. Many writers pay no attention to posture, the design of your chair and keyboard, lighting, impact upon your eyes. You must create a healthy writer’s environment, a specific place to write, a writer’s cockpit, if you want to mitigate the physical and emotional drain of writing.