GEOG 470 Energy, Environment, and Society Final Exam 2015 Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

PART ONE Closed Note Questions (60 pts.)

1. Based on various chapters in Smil, answer the following question. Describe the various historical changes in how human societies have sourced and transformed their energy supply, beginning with hunter-gatherers and continuing to the present. Document changes in per capita supply and how some societies were able to make the grand transitions. Define and integrate the concepts of solar flows (also known as solar income) and solar capital and how their relative importance has changed through time (very important!). (15 points)

2. Discuss the forces likely to shape a) the degree, and b) the speed, in which, global civilization will make a transition in this century from being based mostly on ***solar capital*** to being based mostly on ***solar flows/income***. Utilize concepts from Smil and Friedman. (15 points)

3. Global oil prices: (10 pts.)

1. Summarize all forces that are likely to influence the global price of oil over the next 50 years.
2. Then state whether you believe oil will be more expensive, or less expensive (in inflation-adjusted terms), than it is now, and drawing from what you wrote in part a), why you believe this.

4. Summarize each of the various types of arguments for and against making a transition from fossil fuels to solar-based types of energy. (10 pts)

5. Consider that: a) The developed countries (Europe, North America, Japan, Australia) have emitted most of the anthropogenic carbon dioxide that is in the atmosphere today, in part due to higher per capita emissions over the past century. These emissions were an unintended consequence of the high standard of living that fossil fuel combustion made possible. b) However, the developing countries are now emitting more total carbon dioxide per year than the developed countries, even though per capita emissions remain substantially higher in the developed countries. Due to b), many policy specialists have stated that even if the developed nations take steps to reduce carbon dioxide emissions, such efforts will have little effect because of the continued growth and magnitude of emissions from the developing countries. Describe why a) can be considered to be a form of environmental injustice, and propose policies for how to slow and eventually reverse global greenhouse gas growth in the atmosphere. (10 pts.)

GEOG 470 FINAL EXAM PART TWO OPEN NOTES QUESTIONS (40 pts.) Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What two factors have caused the affordability of lighting to improve rapidly over the past century, aside from the dramatic decline in electricity prices? (5 pts)

2. Choose either a) or b) below: (5 pts)

a) Give five advantages of kerosene over gasoline for jet fuel.

b) Explain why humans can’t outsprint deer, but can run them down over a long distances

3. Make a list of what you would need to know to compute the **embodied energy** in a pound of chicken. Explain each item briefly. (5 pts)

4. Choose either a) or b): a)make a list of things that the Japanese and Germans did in World War 2 to adapt to their lack of petroleum. b) explain why electric cars were defeated by gasoline-powered vehicles in the marketplace of 100 years ago, but are now growing in market share (5 pts)

5. Identify the various ways that are already technologically possible to accommodate on the electric grid the intermittency challenges presented by solar-based renewable sources of electricity. Be as complete as possible. (10 pts.)

6. While on one hand the rich countries of the world have produced most of the anthropogenic greenhouse gasses that are now changing the climate, they have also played a major role in developing and make cost competitive a particular form of electricity generation that is now having a huge impact in poor countries that formerly couldn’t afford it. What is this form of electricity generation, and how exactly did the rich countries develop it and dramatically drive down its cost? (5 pts.)

7. Given that a large part of the industrial production of rapidly growing China is purchased by the West, it can be argued that the huge growth in greenhouse gas emissions from China (now emitting far more than any other country) is ultimately caused by the West. **As such, suggest policies wherein China’s greenhouse gas emissions could be limited: a) without forcing the majority of China’s households to continue to live below household incomes of approx. $2300, and b) while simultaneously improve current air urban quality.** (5 pts.)