Eric Pender 10/21/09

Senior Seminar

Research Outline

Professors Sims & Miller

**More Nukes Please!**

* **Abstract/ Rough Intro:** Ever since the disaster of Chernobyl hit the world’s scene in 1986, the rising popularity of nuclear energy came to an abrupt halt. The fear of more nuclear meltdowns and leakages of harmful radiation resulted in a flurry of rumors about the dangers of nuclear energy. The purpose of this paper is to explore the success and failures of the implementation of nuclear power in national energy plans, at home and abroad, and to weigh the environmental and ecological arguments for and against the increased utilization of nuclear power in America.
* **Question:** The question that I will be wrestling with in my paper is:

Although current green energies provide environmentally sustainable and emission free energy, is it likely that renewables will be able to meet both America’s conservation efforts and rising energy demands without increasing the utilization of nuclear power?

**My Argument:**  Nuclear energy is arguably the emission free energy of the future because of its capacity to alleviate the world’s current environmental and energy crises.

1. **Introduction**
   1. What is Nuclear power, how does it work, and why was it created?
      1. Different types of generators (Gen II, III, etc)
      2. Go into why should America needs to implement more nuclear power into its energy plan
      3. What is preventing America from building new nuclear power plants today?
   2. Historical Background:
      1. The emergence of Nuclear power in the America
         1. 1970’s: Rising gas prices & America’s dependence on foreign oil
      2. Cause of the decline in public opinion
         1. Three Mile Island Accident (1979):
            1. Partial core meltdown

Caused by an operational (human) error

* + - * 1. Deaths or injuries to plant workers?

Zero

* + - * 1. Result

20% decrease in public opinion

The legacy of the incident caused a complete succession of nuclear power in America for the next 20 years

* + - * 1. Why did nuclear power become so taboo in American society?

Media and anti-nuclear activists

Idea behind 🡪 Not In My Back Yard (N.I.M.B.Y) policies

* + - 1. Chernobyl (1986)
         1. Nuclear reactor exploded and sent plume of radio active fallout into the atmosphere

Killing many instantly

International spread of radioactivity (killing many more)

* + - * 1. What caused the meltdown?

Workers were extremely under qualified

No emergency protection systems set up to prevent the combination of events that led to the disaster

* + - 1. Storage of nuclear waste
      2. Upfront capital cost
      3. Anti nuclear lobbyists and rumors
    1. Possible solutions to these issues
       1. Touch on Yucca mountain, increasing public acceptance, and the dispelling of rumors about the dangers of nuclear power
  1. America’s Nuclear Power Plants
     1. Short summary about the positive effects of nuclear power in the American spheres of:
        1. The economy
        2. The environment
        3. The increasing energy demand
  2. Examples of other countries that depend a large portion of their energy demand on nuclear power
     1. France
        1. According to a nuclear regulatory study, if the United States were to utilize the same amount of nuclear power as France, it could immediately reduce its carbon emissions by 10 percent.
     2. Japan
     3. United Kingdom
        1. How their successes could provide further incentives for more nuclear power in America

1. **Energy Consumption Analysis:** 
   1. A breakdown of the current energy sources used in America (for electricity in 2006) and their related environmental and economic costs
      1. Fossil fuels (supply is depleting)
         1. Coal (49%)
            1. Emissions include SO2, NOx, carbon dioxide, particulates, mercury, and other toxic metals
         2. Oil (2%)
         3. Natural Gas (20%)
            1. Emissions include nitrogen oxide and carbon dioxide
      2. Renewables (3% not including hydroelectric)
         1. Hydroelectric (7%)
         2. Wind
         3. Geothermal
         4. Solar
      3. Nuclear (19%)
   2. A brief look at the projected estimates of what America’s current rising energy demands will be in the future
      1. The feasibility of phasing out fossil fuels in America without the aid of nuclear power
         1. Renewable only
      2. The feasibility of phasing out fossil fuels with the aid of nuclear power
         1. Renewable + nuclear
      3. A brief evaluation as to why the a combination of the both would be best
2. **Environmental/Health Analysis:**

How have nuclear plants, and their respective toxic wastes, effected the surrounding ecosystems and people? How do other countries store or dispose of their nuclear waste? How nuclear power compare to other sources of energy used in America?

* 1. A brief description of what nuclear waste is
     1. Half life of waste
  2. The current practices of how America stores nuclear waste
     1. No permanent storage sites
     2. Only temporary storage sites
        1. The main the disposal of radioactive waste is still an economic, political, and environmental issue that remains to be solved.
  3. Suggested storage methods to overcome this issue
     1. Geologic repository sites
        1. Can saflety store waste for over a thousand years
           1. Even during an earthquake
        2. Yucca mountain
           1. The US has proposed that all nuclear waste should be sent and stored at Yucca mountain
  4. What is worse? The dispersal of waste into the atmosphere, or the storage of waste into the earth?
     1. Continuing to burn fossil fuels vs. storing nuclear waste
        1. Fossil fuels contribute to global warming
        2. Nuclear power plants have no emissions
        3. Nuclear power contains its waste while combustibles disperse their emissions into the air. While combustion power plants are known to have negative effects on the people and the environment, nuclear power can be argued to be more of a green energy in that it has the capacity to pay for its waste while benefiting the environment
  5. The dangers of living near a coal fired plant vs. a nuclear power plant
     1. Every new coal fire plant condemns at least 100000 people to an early death
        1. The pollution from these plants cause numerous Respiratory illnesses
        2. It can be argued that building new nuclear power plants will save lives by reducing the pollution caused by coal fired plants
           1. Since 1973 nuclear power plants have reduced:

1.6 metric tons of co2

65 million tons of sulfur dioxide,

27 million tons of nitrogen oxides

* 1. New nuclear plants are also passively safe making it impossible for a melt down

1. **Economic analysis:**

Nuclear power has continued to become a more economically competitive with the other forms of energy production.

* 1. Nuclear fuel costs have drastically fallen in the United States from 1.28 cents per kWh in the 1980’s to 0.44 cents per kWh today.
  2. It is also important to note that the fuel cost of waste disposal is already factored into the overall fuel cost, thus dispelling the myth that costs of waste management will be to expensive.
  3. Although Uranium prices have risen in the past couple years, it only accounts for 5 percent of the overall kWh cost. Because fuel cost has such an insignificant effect on overall cost, it makes the price of nuclear electricity far less susceptible to change if the cost of Uranium increases.
  4. It is important to note that another large fanatical cost of nuclear power is storage.
     1. Explain why it is important to see
        1. It costs more than other fossil fuel bringing plants largely becuase those plants pollute for free
           1. Thus not paying or storing its contaminates.

1. **Points of emphasis for the conclusion:**

* Although nuclear energy is not considered a green technology:
  1. It has significant positive impacts on the environment
  2. It will provide America with enormous amounts of energy that we will need during our gradual transition from fossil fuels
  3. Compared to renewable energies, nuclear has the highest potential to mitigate greenhouse gases and acid rain.
  4. Nuclear also has the capacity to satisfy America’s increasing energy demands emission free.
  5. The price of nuclear power is also competitive with our current forms of energy, which arguably makes the public more inclined to use this emission free energy resource.
  6. The advancements in nuclear power plants will be compatible with electric cars of the future, which will greatly reduce the amount of carbon dioxide generated from automobiles.
  7. Nuclear should be more intensely utilized in America’s energy plan because it benefits the environment and is more economical than current green energies.

**Other ideas for paper I am still thinking about:**

* 1. Even if nuclear power is not the long-term solution, if we were to beef up our supply of nuclear energy it would make it a lot easier to wean off of fossil fuels in the short term
     1. Fossil fuels are estimated to deplete within the next century so we should be thinking about this anyway
     2. We could also use nuclear power as a crutch for our energy supply until we can transition to new and more efficient renewable technologies
        1. Regardless we will not be burning fossil fuels while we use nuclear so it still is a large player in our fight against global warming
  2. The US probably is not likely to ratify the Kyoto protocol anytime soon.
     1. Our recession is hurting our country enough
        1. The cost we would have to pay for emitting such high levels of CO2 under the protocol might kill out economy even more
     2. More nuclear power would reduce our levels of co2 dramatically, which would help the international fight against global warming because we are second largest emitters of co2 only behind china.
  3. Americans are so accustomed to our comforts of living that it is unlikely that we will greatly reduce our consumption of energy by choice.
     1. If we build more nuclear power plants to make up a majority of out energy demands, it is plausible that we could enjoy the environmental benefits of reducing co2 levels WITHOUT sacrificing our comfort of living

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