

Assessment #6

1. Climate Change:

- a) What is it about the human or society or whatever preventing society to adequately respond to the threat of climate change (which all but one of you last week claimed is a crisis)?

It seems many folks are in the state of anger here over climate crisis. It often takes the form of blaming: "Greedy corporation", "corrupt politicians", "older people who don't care". It's not that I don't recognize this as true, but I think we need to:

- i) *Recognize that it is still **us** the people who are the decision makers when we vote and when we buy. This is a necessary step in changing society. We can't start with the premise that it's someone else's fault.*
 - ii) *We need to take a scientific look at the factors and subtract out our emotions:*
 - a. *How does the human mind prioritize threats (see video)*
 - b. *How does change take place in a human mind and in society?*
 - c. *What factors inhibit change in society:*
 - i. *Who is powerful now, and who would lose power in a change?*
 - ii. *How does money and power steer a "democracy".*
- b) You are tapped by the Sanders Campaign to run the EPA and you are asked what we should do to reduce global emissions. With your knowledge of how people act (and vote!) outline what you think will work and also be accepted by the global population. Feel free to make reference to historical examples.

- i) *I'm again disappointed in myself for not formulating a question that focuses students on the correct answer. Of course, we need to reduce emissions as a society. However, "reduce emissions" or "make corporations pay" is not an answer to this question. What **policies** would you introduce?:*
 - a. *Command and Control (regulations).*
 - b. *Market mechanisms, such as environmental tax restructuring... it's not **more** taxes because charging people for environmental impact would reduce other taxes such as income tax.*
- ii) *Precious few students identified education as crucially important. Thank you... how would this education look? How has this class shaped your thoughts? How would you like to change it for college students? HS students? Middle school? Grammar School? Nursery School? Note the study that showed students who learned about CC reduced emissions by 3 Tons of CO₂ per year.*

Many people endorsed a regulation to require cogeneration. How would this work for large central station plants such as Diablo (extra difficult because a nuclear facility requires for security lots of unused land around it) would we somehow subsidize distributed generation to allow for cogeneration?

I also recognize that this question might be hard because maybe we don't have any obvious answers that would fly politically. However, I do think that there are some policies that would work. There are some that seem to be working in Europe.

2. Nuclear Power!

a) With a drawing, explain all the important parts of a nuclear reactor and how it works to generate electricity? *Please make a better drawing of a nuclear reactor... This would have likely taken longer than 20 minutes:*

- i) *Include a moderator, control rods, fuel rods (what are they made of?)... what are each for?*
- ii) *Containment shell... what's that for?*
- iii) *heat exchangers. The pressurized water (that can be what hotter than 100 C because it is under high pressure) circulating in the reaction chamber becomes radioactive – other coolants such as liquid metal are sometimes used for this cycle. We can't release it into the environment. The water boiling to turn the turbine is specially treated water and is also kept in a closed loop. Ocean water or evaporated water is in a separate 3rd loop.*
- iv) *Do we use a Rankin Cycle? There are some that could use a Brayton Cycle and thereby fuel a combined cycle, but they are not deployed.*

b) How has your position on nuclear power changed in the past 6 weeks. Please use material from the class to explain what caused this change, and how you might want to promote this change in society's choices.

Please make use of information from the class. Some areas to touch on might be mortality, long-lived radioactive waste and options for "disposal" or "maintenance", financial cost (capital costs, operations cost, life-cycle costs), commitment to grid technology and "stranded assets". I think it is important to compare anything you evaluate with other options including renewable energy NGCC, conservation, and demand response. Many people noted that nuclear is "efficient". What does "efficient" mean? The Rankin cycle is probably only 40% efficient at best. However, efficiency is not always the bottom line. Uranium is inexpensive (making nuclear operation inexpensive), just like people don't complain about solar's 20% efficiency because sunlight is free... efficiency = (electrical energy output)/(fuel input energy). However we may be more interested in financial efficiency or environmental efficiency:

financial efficiency = (electrical energy output)/(\$).

environmental efficiency = (electrical energy output)/(ton of CO₂ or ton of radioactive waste).

space efficiency = (electrical energy output)/(area of roof top).