

Citizens Jury[®]

Global Climate Change

March 18 – 22, 2002
Baltimore, Maryland
with support from a
cooperative agreement with the
United States Environmental Protection Agency

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I know of no safe depository of the ultimate powers of society but the people themselves; and if we think them not enlightened enough to exercise their control with a wholesome direction, the remedy is not to take it from them, but to inform their discretion."

Thomas Jefferson, 1820

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Project Overview

Many parties within the public and private sectors of the United States are grappling with how the U.S. should address global climate change. It is important that they have a better understanding of what American citizens think about climate change and of what they think should be done about it, if anything. There is also a need to more fully engage American citizens in a meaningful dialogue about climate change issues.

Eighteen citizens from within a 35-mile radius of Baltimore, Maryland were carefully chosen from a randomly identified jury pool to serve as a representative microcosm of the public. During five consecutive days beginning March 18, 2002, the jury heard expert witness presentations on a range of issues and perspectives related to global climate change. The Citizens Jury focused on what potential impacts of climate change are of most concern, and what, if anything, should be done to address climate change. Jurors deliberated together as they developed recommendations for policy makers and the public to consider.

The Citizens Jury is a unique process that generates input from citizens who are both informed and representative. Sufficient time is allowed for discussion and deliberation by the jurors to develop thoughtful and useful recommendations.

The Jefferson Center

The Jefferson Center is a non-profit, non-partisan organization located in Minneapolis, Minnesota. Established in 1974, the Center is committed to generating thoughtful citizen input on issues of public significance. The central focus of the Center is the Citizens Jury process, through which randomly selected and demographically representative panels of citizens meet for several days to examine public policy issues and present their findings to decision-makers and the public. To date, the Jefferson Center has conducted 30 Citizens Jury projects on a wide range of issues. *Information on the Jefferson Center can be found at www.jefferson-center.org.*

United States Environmental Protection Agency

This project was conducted with support from a cooperative agreement with the U.S. EPA, the federal agency that works to protect human health and safeguard the natural environment. The Global Programs Division of USEPA provides information to the public on the environmental issues of global climate change and stratospheric ozone depletion. By observing how informed citizens absorbed information and developed the recommendations in this report, EPA hopes that this project will allow governmental agencies, business interests, and environmental groups interested in the topic of climate change to improve their science communication materials. *For general information on the US EPA, visit their website at www.epa.gov. For specific information*

on climate change and energy efficiency, visit www.epa.gov/globalwarming or www.energystar.gov.

The Citizens Jury[®] Process

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Advisory Committee

The Advisory Committee consisted of 13 individuals knowledgeable about the issues surrounding global climate change and representing a variety of perspectives and areas of expertise. They helped the Jefferson Center identify the key topics relating to global climate change. They advised the project in such areas as the charge (key questions posed for the jury), agenda development, and witness selection. The Advisory Committee was interested in the integrity and fairness of the process, not in specific outcomes. They were also on alert for any bias in the project. *A list of Advisory Committee members can be found on page 25.*

Juror Selection

The process for selecting the jury began with a telephone survey of adults living within a 35-mile radius of Baltimore, Maryland. The survey was conducted of 963 individuals using randomly generated telephone numbers, during the period of November 1 – 13, 2002. All respondents were asked, among other things, if they might be interested in participating as a juror. Interested individuals (496) were sent information about the Jefferson Center, the Citizens Jury process, and this project. They were asked to return a Juror Information Form if they were willing to participate in this project. All individuals who were sent information were entered into the pool of potential jurors. Eighteen jurors were then selected out of this pool to participate in the Citizens Jury project. The jurors collectively represented the mid-Atlantic region (Delaware, Maryland, Pennsylvania, Virginia, Washington DC and West Virginia) in terms of age, education level, gender, race, geographic location, and political party affiliation. *A list of jurors, the demographic targets, and the final composition of the jury can be found on pages 22-23.*

Witness Selection

Individuals knowledgeable about the issues relevant to climate change were selected to serve as witness presenters for the Citizens Jury hearings. Some witnesses provided valuable background information while others advocated specific positions. The expert witnesses represented a variety of perspectives and opinions concerning climate change issues. Together, they presented a balanced picture of the issues. *A complete list of the witnesses can be found on page 30, and brief biographic information for all witnesses can be found in Appendix A.*

Charge

The charge to the jury outlined the jury's focus and provided direction for the deliberations. It informed the jury of their overall goals and objectives. In this project, the jurors were asked to respond to three questions. Background and advocate testimony provided key information that enabled the jury to answer the questions in a knowledgeable manner. The charge to the jury was as follows:

1. What potential impacts of global climate change (positive or negative) are most notable or of most concern?
2. Is it likely or unlikely that global climate change will have significant impacts for humans and/or natural systems?
3. In your opinion, what steps, if any, should be taken to address climate change?

Hearings

The agenda was carefully developed to provide the jurors with the necessary information to address the charge questions. The hearings included the following elements:

- Overview & Background Information
- Scientific, Technology & Economic Considerations
- Potential Impacts
- Uncertainty
- Mitigation & Adaptation Strategies
- Advocate Visions
- Deliberations, although discussions and deliberations occurred throughout the hearings.

On Day One, jurors heard a general overview of global climate change issues and learned about scientific and technology considerations, as they affect climate change scenarios. On Day Two, witnesses presented information on economic considerations as well as potential impacts of climate change. Also on Day Two, witnesses presented specific information on a wide range of mitigation strategies. On Day Three, the jurors heard specific information about adaptation strategies before hearing from six advocate witnesses presenting six 'visions' about global climate change. Each vision witness presented a climate change scenario that he/she supports, as well as a set of strategies and action/policy steps (if any) to address their specific scenario. The six vision witnesses also participated in a panel discussion with the jury. On Days Four and Five, the jurors continued their deliberations and formalized their recommendations. All five days of the hearings were professionally moderated by two Jefferson Center-trained moderators. *The complete agenda can be found starting on page 26.*

Recommendations

The jury's recommendations included their answers to the charge questions. The recommendations were issued in an initial report on the final day of the hearings, Friday March 22 at 2:30 PM. The jurors presented their recommendations to USEPA staff and other interested individuals in a public session. The jurors were given an opportunity to interact with those present about the process, the hearings, and their recommendations. The recommendations in both the initial report and this final report appear using language that the jurors themselves developed and approved. *The jury's recommendations can be found starting on page 5.*

Evaluation by Jurors

At the conclusion of this process, the jurors completed an evaluation of the project. A key question on the evaluation form asked the jurors to consider the overall integrity of the project. All jury members felt that the project was conducted in an unbiased manner, with 16 indicating that they were "very satisfied" in this regard and 2 indicating that they were "satisfied" in this regard. *The results of the final evaluation by the jurors can be found on page 24 of this report.* The jurors were also given an opportunity to write a personal statement about the project for inclusion in this report. *These comments can be found on pages 19-21.*

Jury Recommendations

In responding to the three Charge questions posed to them, the jury generated a set of findings and recommendations. These findings and recommendations appear in this final report as outlined below.

Charge Question #1: What potential impacts of global climate change (positive or negative) are most notable or of most concern?

1. Categorized list of potential impacts, with votes to indicate impacts that are most notable or of most concern.

Charge Question #2: Is it likely or unlikely that global climate change will have significant impacts for human and/or natural systems?

1. Responses to questions:
 - Do you think that the global climate is changing or will change in the next 100 years?
 - How much of the global climate change do you believe is due to human activities?
 - What level of impacts will Global Climate Change have on human and/or natural systems over the next 100 years?
 - How confident are you in your answer to the above question (about level of impacts)?
2. Reasons for each stated 'level of impacts'
3. Reasons for each stated 'level of confidence'

Charge Question #3: In your opinion, what steps, if any, should be taken to address climate change?

1. Action Steps related to:
 - Energy use
 - Types of energy
 - International actions
 - US government actions
 - Research & development
 - Education

Additional ideas, concerns, comments and perspectives

PLEASE NOTE:

Explanations and narratives of the process, written by the Jefferson Center to assist the reader's understanding of the recommendations and the Citizens Jury process, appear in *italics* in the jury recommendations sections. All of the jury's recommendations are in non-italicized text and appear in language developed and approved by the jury.

Question #1: What potential impacts of global climate change (positive and negative) are most notable or of most concern?

The jury developed a list of impacts, both positive and negative, that are notable or of concern to them. Following the generation of the list of impacts and discussion, the jurors were given 10 votes to allocate among the impacts that are most notable or of most concern to them as individuals. Jurors were allowed to allocate more than one 'vote' to any specific impact item. The numbers in parentheses represent the number of votes received by each particular impact. A 'zero' in parentheses indicates an item that was listed as notable, but received no 'priority' votes.

ECONOMIC

Positive

- new jobs & new technology (13)
- more information sharing (2)
- encourage more results in R&D in many sectors (1)

Negative

- increased costs for food and clean water (10)
- costs to build sea walls and deal with other extreme weather events (6)
- increased cost of electricity (4)
- increase in insurance costs (3)
- costs of R&D passed to consumer (2)
- costs of job training and relocations (2)
- dislocation of people (2)
- increased government costs (e.g, supporting research) (0)

ENVIRONMENT

Positive

- temperature increases at higher latitudes (3)
- sea rise creates more recreational activities (0)

Negative

- negative changes in air quality, increase of air, water & land pollutants (20)
- loss of habitat for animals & plants (12)
- more episodes of extreme weather (9)
- loss of species (3)
- increase in algae blooms (1)
- less predictable weather (1)
- possible change in ocean currents (0)

SOCIAL/POLITICAL

Positive

- requires population control (4)
- change in native cultures (3)
- force people to change and adapt (2)
- new regions available for settlement (2)
- increased international cooperation (1)

Negative

- requires population control (8)
- shift in balance of power (7)
- increasing problem for each generations (7)
- increased war, civil & international conflict (3)
- loss of native cultures (3)
- force people to change and adapt (1)

Question #1: What potential impacts of global climate change (positive and negative) are most notable or of most concern?

AGRICULTURE

Positive

- longer growing season (3)
- could expand areas for farming (2)

Negative

- food supply decrease (4)

HEALTH

Positive

- increased mortality (population control) (3)

Negative

- health effects of decrease in air quality and increased air, water, land pollutants (21)
- increased insect borne diseases (3)
- increased mortality (1)

Question #2: Is it likely or unlikely that global climate change will have significant impacts for human and/or natural systems?

The jury was asked the following questions verbally, and responded as individuals by first writing their response down, and then raising their hands to indicate their choice.

Assuming a "business as usual" scenario, do you think that the global climate is changing or will change in the next 100 years?

Very likely or very probable	12
Likely or probable	2
Possible	4
Unlikely or some chance	0
Little chance or very unlikely	0

How much of the global climate change do you believe is due to human activities?

Most of the change	10
Part of the change	7
Very little of the change	1

Following presentations, discussions, and voting on the above questions, the jurors responded to the following questions on a written form.

1. Assuming a "business as usual" scenario, what **level of impacts** will Global Climate Change have on human and/or natural systems over the next 100 years?
2. In your opinion, based on what you've heard so far, how **confident** are you in your answer to question #1?

The jurors responded to the questions as individuals. The chart below summarizes the jury's responses as a whole.

confidence \ level of impacts	Very confident	Confident	Not very confident	TOTAL
Very serious	9	2	-	11
Somewhat serious	3	2	-	5
Not very serious	1	1	-	2
Not at all serious	-	-	-	0
None	-	-	-	0
TOTAL	13	5	0	

Question #2: Is it likely or unlikely that global climate change will have significant impacts for human and/or natural systems?

The jurors broke into small groups based on their response to question #1 and each group developed a list of reasons for their respective view.

Very serious

- Cost and trauma of having to relocate and retrain entire populations.
- Need to act now; there is evidence that the process has already started.
- Humans don't breathe CO₂. Air quality is low.
- Humans don't tolerate mercury. Health effects will be dramatic.
- Stands to affect present and future generations all around the world.
- More serious for future generations.
- Will lead to panic and unrest in the US and other countries.
- Temperature rise causing polar melting, sea changes and habitat changes.
- Requires international cooperation on a topic that is difficult to solve, and is uncertain, and requires consensus.
- Water supply uncertainties are a reason for concern and a reason to act.
- Increase in costs in everything - health, insurance, fuel, food, water, taxes, etc...
- Poor & older people, and people in poor health throughout the world will suffer.
- Action is needed by individuals, industry, government, nation, world levels - difficult to get everyone to act.
- Best scientific data shows that this is a real, actual change. The threat is real.
- Lots of inaction due to political barriers.
- Change our balance of trade and relationship with other countries.
- Threatens biodiversity - which is the source of many new raw materials.
- Threatens urban areas and could increase desertification of parts of the earth.

Fairly serious

- The temperature range is so wide that the change may not be as bad as we are told, nor as quick or severe.
- If it takes place over a 100-year period, it will give us time to adapt. We have shown that we adapted 1 degree over the last 100 years.
- If the change is on the higher end, we will attack the problem and bring down the impact.
- God designed the earth and won't allow man to completely destroy it.
- Many companies and areas have started working on the process of dealing with the climate change and once everyone gets on the bandwagon we should be able to handle it.

Not very serious

- Data of global warming advocates are suspect. Inconsistent data presented - recorded temps for past 150 years; ice core & tree ring data for earlier trends.
- Recognition of a *possible* problem. We don't know the magnitude of human cause.
- Technology - if humans caused the problem, humans can fix the problem.
- Loss of species...my concern is for humans first.

Question #2: Is it likely or unlikely that global climate change will have significant impacts for human and/or natural systems?

On the same written form, each juror was asked about their response to question 2. Since the bullets reflect the thoughts of individual jurors, there may be some overlap or repetition. Additionally, individual bullets do not necessarily reflect the thoughts of the whole jury.

If you answered very confident, **why** do you have confidence in your answer to #1? What **information** 'convinced' you that your response to question 1 is likely correct?

- Very serious (9)
- Scientific data presented - IPCC data convincing.
 - Past impacts of life on earth, both before and since *Homo sapiens*
 - Archeological, geological, biota data
 - Common sense approach to problems - finding solutions should be more feasible and inexpensive if undertaken now than if we wait for more serious issues to develop.
 - I have confidence because what I heard made sense.
 - There are things happening today that let me know that there is global warming, and serious CO₂ problems relating to health especially.
 - I am really concerned about the melting of the polar region, glaciers, etc... which could cause flood, disease, etc...
 - Research data, documentation of temperature change in last 100 years, testimony of scientists and climatologists, evidence of CO₂ levels in atmosphere
 - There is much compelling data that represents a consensus of top scientists and researchers in the field.
 - Even though all the data presented may be off a little, enough was presented and backed up that makes me feel strongly about this issue.
 - I believe that today the problem is very serious, but not insurmountable. I believe with education most people will act towards solving the problem. I also believe that the problem is growing and inaction is the worst that than can be done.
 - The scientific data coming from people with no agenda was very convincing and I like hearing from people that found ways to reduce global emissions while improving their quality of life.
 - Prior knowledge of scientific data; ice core data, tree-ring data, coral ring data - although with some uncertainty support global warming.
 - We know burning fossil fuels releases greenhouse gases, resulting in adverse health effects.
 - R&D needs to be done to provide greater efficiency and alternatives. Education and personal commitment are required.

Question #2: Is it likely or unlikely that global climate change will have significant impacts for human and/or natural systems?

- Fairly serious (3)
- Scientific data is convincing. Present observable impacts are undeniable. We would have liked to have heard from academic sociologists.
 - Because we are humans dealing with human emotions.
 - Data received was given by people/agencies/ companies who basically used the data that strengthened their agenda. I took it all with 'a grain of salt.'
 - The effects of global warming present a challenge, and its impacts will produce significant changes.
- Not very serious (1)
- I am suspicious of the data being put forth by the environmentalists. I think they are overestimating the threat. I believe the potential threat has been recognized and measures are being taken to cope or resolve it. Problems created by humans can be resolved by humans, if attacked in time.

If you answered confident, **what information** was 'convincing' and what information would you need to make you more confident in your response to question #1?

- Very serious (2)
- I'm confident the ways things are progressing that things will change.
 - Better evidence on the variance in the temperature over the past 100 years. I believe the temperature should be measured using the same method. Also, if the change in temperature over the past 100 years was in excess of 1 degree, then maybe I would be more convinced to change my vote to very confident.
- Fairly serious (2)
- The fact that the variables are so vast. The time involved, the range of temperatures. There is so much that we don't know.
- Not very serious (1)
- That the calculated temperature changes estimate range is reduced and moves to the lower range. That is instead of 1.5° to 10 or 11°C, it is 1.5° to 4° or 5°

If you answered not very confident, **what information**, if any, would make you **more confident** in your response to question #1? **(There were no jurors in this group.)**

Question #3: In your opinion, what steps, if any, should be taken to address climate change?

The jurors generated the following list of actions that should be taken to address global climate change. Each juror then indicated which actions he/she felt would be most effective, or most important to undertake. Jurors were allowed to indicate up to ten 'most important' actions, but were not permitted to cast more than one vote for any one action. Each juror was also given the opportunity to cast a 'veto' vote for any actions he/she would actively oppose. Jurors could cast as many vetoes as desired. However, jurors were not required to cast a veto.

Jurors could put their 'vote' or veto on a 'category' (e.g, maximize use of non-emitting sources), or put their vote/veto on a specific action within a category (e.g., atomic, tree planting). It depends on whether they support/reject the idea in general (category), or feel strongly about something specific. Therefore, the votes/vetoes for 'sub-actions' do not add up to the votes/vetoes for the category as a whole. The votes/vetoes for the category indicate the number of jurors who cast their vote/veto for the category as a whole, not a sum of the sub-actions within that category. Each 'line' is a unique item on which they could cast a vote or veto.

	# of 'top ten' votes	# of vetoes
ENERGY USE		
• Consumers		
▪ Follow through on information received on energy conservation.	1	
▪ Use of energy efficient products, including	3	
• cars - mileage, tires, emissions	1	
• appliances	2	
• lighting		
• heating/cooling	2	
• mass transportation		
• building products	1	
▪ Follow through with wise consumption, including	1	
• turning down thermostat		
• use of energy-conserving products at windows		
• Industry		
▪ Provide adequate information on products for highest energy conservation to consumer.	2	
▪ Use more safe energy resources to produce "greener" products.	2	
▪ Use chilled water cooling in buildings where feasible (like Austin, TX).	2	
▪ Make it mandatory that all appliance companies make only energy efficient products and mandate use in new construction and/or replacement of existing appliances when they expire.	5	1
▪ Develop transportation that addresses family size requirements and 4-wheel drive handling, with mileage improvements		

Question #3: In your opinion, what steps, if any, should be taken to address climate change?

	# of 'top ten' votes	# of vetoes
• Rebates and tax incentives for energy conservation in public and private sectors	3	
▪ tax credits for industry		3
▪ cash rebates for buying energy efficient products - for both individual consumers & non-profit organizations		2
▪ sales tax amnesty on major purchases such as energy efficient appliances or cars (perhaps for a limited amount of time per year)		2

	# of 'top ten' votes	# of vetoes
<u>TYPES OF ENERGY</u>		
• Maximize use of non-emitting sources. Where local sources are available, use them.	9	
▪ wind		1
▪ hydro		1
▪ geothermal		
▪ atomic	2	
▪ tree planting	1	
• More efficient uses of sources	1	
▪ power plants		
▪ turbine		
▪ fuel cells	6	
• Encourage incentives.	2	
▪ autos	7	
▪ power	1	
▪ industries	2	

	# of 'top ten' votes	# of vetoes
<u>INTERNATIONAL</u>		
Help underdeveloped countries with technology	2	
• Goals & Standards	2	
▪ be realistic	2	
▪ be flexible	1	
▪ continue to meet together		
▪ get back into Kyoto, but with realistic goals	1	5
▪ important to have whole world working together	2	
• Assisting developing countries		
▪ financial support		1
▪ improve standard of living		1

Question #3: In your opinion, what steps, if any, should be taken to address climate change?

	# of 'top ten' votes	# of vetoes
▪ help them avoid our mistakes (e.g., have economic development, but utilize less emitting sources)	2	
• Sharing technology	1	
▪ worldwide sharing of technology		
▪ US help underdeveloped countries with technologies		
▪ consider climate change issues along with other pollution issues (not in isolation)	1	
▪ US should be a good role model and leader	3	

	# of 'top ten' votes	# of vetoes
US GOVERNMENT ACTIONS		
Focus on supporting development for first 5 years, then carrots/sticks for 20 years, then reassess at that point.		
• Regulations on fossil fuel power plants (5-20 years)	4	
▪ standards on CO2 emissions	1	
▪ reduce emissions than 1990 levels, or better		
▪ limit/cap on number of new fossil fuel-based power plants built	2	
▪ set term for life of a power generator facilities (mandate retirement of facilities)		
• Incentives	2	
▪ funding for practical applications (5 years)	1	
▪ tax credits (businesses & individuals)		
▪ rebates (industry & individuals)	1	
▪ renewable power - fuel cells, etc...	1	
• Controls		
▪ increase taxes on 'excess' energy consumption	3	
▪ fines for non-compliance	2	
▪ increase regulations on extractive industry to control waste stream from power generation	2	
• Consumers	1	
▪ mandate vehicle weight and mileage	1	
▪ mandate tire size and gear ratios		
▪ reduce gas guzzlers		
▪ low energy transport use (encourage public transportation)		
• Land use and Coastal Use	2	
▪ set standards for where building occurs (zoning)		1
▪ zoning to promote live-work-play communities		4
▪ zoning on agriculture land use		
▪ all of these strategies have to be supported and backed by the courts	2	

Question #3: In your opinion, what steps, if any, should be taken to address climate change?

	# of 'top ten' votes	# of vetoes
<u>RESEARCH & DEVELOPMENT</u>		
Increase and improve research and development commitment and performance.		
• Private sector		
▪ put larger share of profit margin into R&D		5
▪ build more efficient appliances		
▪ transportation		
▪ extractive methods		
▪ reduction of environmental pollutants	1	
▪ utilize alternative sources of energy	1	
• Government Subsidies & Incentives		
▪ prioritize for best results for dollars spent	2	
▪ decentralize power grid		1
▪ r&d new technologies and expand existing technologies	8	
• continue research in nanotechnology	1	
• alternative sources (e.g., wind, photovoltaic, solar, geothermal, hydro)	4	
• hybrid cars & mass transit	1	
• cleaner coal extraction and use	4	
• research CO ₂ sequestration	2	4*
• reduction NO _x , SO ₂ , CH ₄	3	
• methods to upgrade for cleaner power in existing power plants	1	
• better methods of waste stream disposal from nuclear plants	2	
▪ fund scientific data set on global warming		
▪ sequester genes (in gene banks) from endangered populations of plants, animals, microbes	1	
• Public Health Issues	2	
▪ r&d respiratory and related air pollution diseases	1	
▪ novel geographic distribution of infectious diseases and vectors		
▪ research methods to minimize health risks	1	
• Social Issues		
▪ research problems and difficulties of "adaptation" - especially for vulnerable populations		
▪ r&d to address population changes		

***the 4 vetoes object to the deployment of carbon sequestration now, not to continuing research on the technology.**

Question #3: In your opinion, what steps, if any, should be taken to address climate change?

	# of 'top ten' votes	# of vetoes
<u>EDUCATION</u>		
"To provide for the common good"; Progress can only be made through education; For a concept to be internalized and therefore acted upon, it must be comprehensible; fair and balanced approach, not <u>indoctrination</u> .	1	
• Public	5	
▪ Media (TV, radio, newspaper, billboards)	6	
• spotlight industries, cities, regions that have prioritized and initiated these ideas	1	
▪ Town meetings	3	
• inform		
• get feedback		
• maintain ongoing dialogue		
▪ Government Officials	3	
• educate government officials		
• use of referenda		
• inform industry of public demand		
• publish emission and conservation data		
▪ Schools	8	
• start early		
• integrate with everything		
• action programs (e.g., recycle, cleanup, public service campaigns)	1	
• Industry	6	
▪ Identify environmentally friendly companies.		
▪ Publish list of environmentally friendly companies.		
▪ Inform industry of public interest and compliance	1	
• Global		
▪ Identify problem	1	
▪ Identify need		
▪ Identify action		

	# of 'top ten' votes	# of vetoes
<u>MISCELLANEOUS</u>		
• Challenge politicians to address the issue	4	
• "True" perspective - develop a way to weigh scientific certainty		
• Don't ignore the problem. Take some action.		
• Start a public fundraiser.		
• Put world politics and party lines aside and work together		
• Encourage global population control	2	12
• Narrow down long/short term importance		
• Prioritize our goals	2	
• All of the above		

In addition to the answers to the charge questions, the jury developed a list of additional ideas, questions, concerns, comments, or perspectives. The following items may or may not reflect the opinions of the entire jury.

International

- Keep the dialogue going in some way - at some level.
- Redefine the goals and standards so that they are realistic and can met internationally (alternative to Kyoto).
- The process needs to start at the basic or bottom level and build from that point.
- We have a 'leadership gap' in our government departments (large responsibilities, lower pay than industry) which limits what we are able to do.
- The penalties for not meeting Kyoto goals would have been very high.

Education

- Where do you get information currently? TV, newspaper, radio (talk, public radio), magazines, internet.
- Need universal education - people need to understand the issues.
- Emphasize school-based education efforts.
- Each individual has a personal 'sphere of influence' - could start as one-on-one activities (family, church, work, community, etc...).
- Join established groups that can help address the issue.
- Promote and support Earth Day celebrations and activities.
- Media can provide information on a regular basis, to remind people on what they can do to be more environmentally responsible.
- Standards for temperatures in public buildings should be established and enforced.
- Review some of the standards that may not work - revise them, update them.
- EPA may be viewed as an organization that creates limits on people. Need to understand the opinion of the "common person."
- Address the issue so that it meets the needs of the "common person."
- EPA needs to do a better job of telling their story.
- EPA is often seen as the 'bad guy' - they need to find ways to change their image
- Industry and businesses are nervous about the EPA - so that image gets in the way.

What worked?

- Scientific data was compelling.
- Visions were helpful - practical application was easier to understand.
- The process helped participants look at the entire issue in a systematic way.
- The presentation from Austin, TX was a great, specific example of what really works.
- The people presenting the information need to be good at talking with the "common person." Say it in a way people can understand.
- Science itself is not enough - what was helpful were the real examples.
- Examples that showed the economic returns were very powerful. (things that actually work, and that save money)

- Find a way to use this process with political leaders who have a larger sphere of influence.
- Illustrate how environmental improvements enhance the quality of life (e.g., Austin, TX).
- Show the positive impacts for this generation and for future generations.
- Conduct Citizen Jury projects in other regions and compare similarities and differences.
- Get citizen input by time zones, latitudes, etc... to compare the wide range of views and attitudes.

Juror Comments

The jurors were given an opportunity to make a statement about the project, the process, or the issue. The comments of all the jurors who chose to express their opinions are included below, in their own words.

"I want to thank the Jefferson Center for the privilege of being part of this Citizens Jury. I was pleased with the whole process. I thought they did a wonderful job of giving us the most information in the minimum amount of time. They carefully selected a very diverse group of people for the jury as well as the many presenters. I thoroughly enjoyed the way the jury interacted with one another, the facilitators, and the presenters. I've learned a great deal this week and have seen how I can make changes in my own life and the way I do things that can make a difference regarding this issue."

-Pam Alton

"The potential impact of climate change that is of most concern to me are the consequences of the change in temperature due to global warming. If the temperature continues to rise, it could cause hotter heat waves, which could affect the health of humans and some species that are not capable of adapting to the severe shift in temperatures. It concerns me that the quality of life for future generations will not be as good as we have it today. Because the temperature change over the past 100 years has not affected us yet, society will not be concerned with the change in the climate. My concern is that we will wait until it is too late and try to reverse something that we've been warned against for years. It's always better to be safe than sorry."

-Tracey Bowers

"I am very happy to have been able to participate in the jury. I feel we all learned quite a bit. It would be nice to be able to continue working on the problem in some way. I hope that this jury will provide enough information to get the government (all) and industry on the move."

-Tina Butler

"Having had no prior experience with or even knowledge of the Citizens Jury process, I can honestly say that I was pleasantly surprised with the whole project and its outcome. I would strongly recommend a Citizens Jury project on any topic that would greatly impact our society when you would want to get a true cross-representation of what the 'common man' thinks once he is educated on a subject."

-Sandy Carter

"I feel truly fortunate to have been selected for the Citizens Jury on Global Climate Change. The quality of the witnesses and staff were outstanding. This type of informational process needs to be implemented on many other levels and in many other

areas. I won't soon, if ever, forget what I've learned. This knowledge I've gained has encouraged me to become more active in attempt to implement change."

-Lynn Dement

"My time spent here was very welcome. I've learned things about this issue that really opened my eyes and changes my views and hopeful, I can and will do more for my world and my children so that they will have a world. I will teach my children when they start to understand things, that climate change is a very important issue and that they can help and show them how they can help. Thank you for helping me to understand this issue."

-Anthony King

"The process used is a valid method to extract the deep-seated belief and bias of individuals on any question. The process depends upon the building of a knowledge base that becomes the 'common thread' to which each individual of the group places their life experiences and their vision of the common good. The mutual respect displayed by the jurors is the kind of behavior we would wish all of mankind could exhibit."

-Claudia Lewis

"I think the largest problem being the EPA on global warming is educating the consumer. The consumer in me will do more the move the economy towards 'greener' products and energy utilization than the government or industry will do alone."

-Rick Neukam

"The process was stable. Witnesses could have set out more information proving sources and facts that were presented by them. I enjoyed the scientific process of the climate change program and the speaker from Austin, Texas. He set out and showed his experiences and how people and things could adapt. Staff were particularly helpful, useful and satisfying."

-Willie Norman

"I give the Jefferson Center staff a 5A+. I speakers I give a 3A+. I thank each juror. I enjoyed your company. If I offended anyone, I apologize. No harm intended. I thank everyone for the help you provided. I thank you. I wish you the best in the future. God bless you."

-George Sanford

"This project was interesting and I was pleased to serve and learn on this project as a part of the Citizens Jury."

-Stan Simon

"Thank you for having me as a juror. This past week has to be one to the best and most enlightening of my life. I have learned so much and again I thank you for my

crash course. The Jefferson Center did a great job in selecting a diverse group of jurors and needs to be commended for their selections. I met a great bunch of human beings and I know I will remember them fondly. Last, but not least, our facilitators deserve super 'kudos.' They were good. Thank you Jefferson Center for this experience."

-Josie Swagger

"My recommendation would be to devote a little more time to that contrarian data to give us a better feel for why there are doubters and the justifications for their positions. Then we can be in a better position to accept or reject that data."

-Ray Williams

Juror List

Name	Age	Occupation	Residence
Pam Alton	48	Human resources / Recruiter	Crownsville, MD
Janine Bacquie	33	Supervisor, early childhood education	Greenbelt, MD
Tracey Bowers	38	Chemist	Owings Mills, MD
Tina Butler	54	Proof operator	Baltimore, MD
Sandy Carter	50	Retail store - dept manager	Railroad, PA
Lynn Dement	54	Child support case worker	Millersville, MD
John Hughes	74	Retired dept mgr of Mech Eng.	Columbia, MD
Anthony King	34	Assembler	Baltimore, MD
Joe Lacy	68	Retired educator/administrator	Silver Spring, MD
Art Leonard	62	Retired internist	Owings Mills, MD
Claudia Lewis	57	High school teacher	New Windsor, MD
Rick Neukam	34	Electrician	Baltimore, MD
Willie Norman	54	Home improvement	Baltimore, MD
George Sanford	71	Retired deputy sheriff	Baltimore, MD
Stan Simon	41	Security officer	Delta, PA
Josie Swagger	63	Retired – working part-time	Baltimore, MD
Donnette White	45	Assembly line worker	Baltimore, MD
Ray Williams	71	Retired US Air Force	Bowie, MD

Jury Composition

One of the key goals of any Citizens Jury is to be demographically reflective of the community. Potential jurors were first identified through a random telephone survey designed by the Jefferson Center. The final eighteen jurors were carefully selected to be representative of the Mid-Atlantic region consisting of Delaware, Maryland, Pennsylvania, Virginia, Washington DC, and West Virginia. Data from a variety of sources¹ were used to establish the demographic targets for the jury. The targets included age, education level, gender, geographic location, race, and political party affiliation. Below is a chart of the demographic targets for this jury. In some cases, assigned targets were not entirely achieved due to last minute cancellations and substitutions.

Demographic Category	Actual % in region	Jury target	Final Jury Make-up
Gender – Male	47.6%	9	10
Gender – Female	52.4%	9	8
Age – 18-34	30.0%	5	3
Age – 35-54	40.1%	7	8
Age – 55+	29.9%	6	7
Education – H.S. or less	50.5%	9	6
Education – Associate degree or Some college	23.2%	4	5
Education – College graduate	26.3%	5	7
Race – White only (Hispanic or non-Hispanic)	77.2%	14	13
Race – Non-white or multi-racial (Hispanic or non-Hispanic)	22.8%	4	5
Geographic Location – “Urban”	24.8%	5	4
Geographic Location – “Suburban”	57.0%	10	11
Geographic Location – “Rural”	18.2%	3	3
Attitude – Democrat	47.7%	8	9
Attitude – Republican	36.0%	7	7
Attitude – Other/Independent	16.3%	3	2

¹ The sources for the data used to determine the jury targets can be found in Appendix B.

Juror Evaluation

1. In general, how do you feel about the Citizens Jury on Global Climate Change now that you have completed the project?

13	Very satisfied
4	Satisfied
1	Neutral
-	Dissatisfied
-	Very dissatisfied

2. How do you feel about different parts of the project?

	Very Satisfied	Satisfied	Neutral	Dissatisfied	Very Dissatisfied
Introductory Session	11	7			
Day 1 – Background/overview	8	9	1		
Days 1 & 2 – Considerations <i>(scientific, technology, economic)</i>	6	9	3		
Day 2 – Impacts & Uncertainty	6	11	1		
Days 2 & 3– Strategies <i>(adaptation & mitigation)</i>	4	12	2		
Day 3 – Advocate Visions	10	8			
Deliberations	7	8	1		

NOTE: These may not all add up to exactly 18, due to abstentions.

3. One of our aims is to have the Jefferson Center staff conduct the project in an unbiased way. How satisfied are you with their performance in this regard?
(Note: Jefferson Center staff includes Kim, Verlene, Doug, & Keiko only)

16	Very satisfied
2	Satisfied
-	Neutral
-	Dissatisfied
-	Very dissatisfied

Project Staff & Committees

Moderators

Kim Boyce
Verlene Gardner

Jefferson Center

Doug Nethercut.....Executive Director
Keiko Veasey.....Project Director

US EPA Working Group

Kathryn Parker
Kevin Rosseel
Sharon Saile

Advisory Committee

Robert Balling.....Arizona State University, Climatology Dept.
Ken Colburn.....New Hampshire Dept. of Environmental Services
Jae Edmonds.....Pacific Northwest National Laboratory
Sally Ericsson.....Pew Center on Global Climate Change
Bill Fang.....Edison Electric Institute
David Gardiner.....David Gardiner & Associates
Edward Garvey.....Minnesota Public Utilities Commission
Robert Greco.....American Petroleum Institute
Tony Jonetos.....World Resources Institute
Alden Meyer.....Union of Concerned Scientists
Jonathan Patz..... Johns Hopkins University, Bloomberg School of Public Health
Michelle Swanson.....Xcel Energy
Jeremy Symons.....National Wildlife Federation

Agenda

DAY ONE – Monday, March 18

8:30	Welcome <ul style="list-style-type: none">• Welcome to jurors• Project overview• Brief history of Jefferson Center and Citizens Jury process• Introduction to staff• Role of jury• Rules of procedure & discussion ground rules• Introduce charge & agenda	Jefferson Center & Moderators
9:30	Introductions <ul style="list-style-type: none">• Get to know each other exercise	Moderators
10:00	BREAK	
10:15	Background Information – BIG PICTURE <ul style="list-style-type: none">• General Introduction to Global Climate Change• Overview of where global climate change issues are now in the U.S., abroad• Overview of economics – role, assumptions, considerations• Overview of policies and politics• Overview of adaptation and mitigation strategies	Nancy Kete WRI
11:45	LUNCH	
12:45	Scientific Considerations <ul style="list-style-type: none">• Key scientific questions• Climate basics, linkage to atmospheric composition, historical variations, reasons for change, range of potential responses• Overview of the range of perspectives• How scientific considerations affect scenarios• Q&A	Mike MacCracken U.S. Global Change Research Program Fred Palmer Peabody Energy
2:45	Break	
3:00	Scientific Considerations <ul style="list-style-type: none">• Q and A with both witnesses	
3:20	Technology Considerations <ul style="list-style-type: none">• How technology affects potential scenarios• Overview of the range of perspectives• Q&A	John Novak EPRI
4:15	Juror Check-in, Review, etc...	
4:30	Adjourn	

DAY TWO – Tuesday, March 19

8:30	Review agenda for the day and recap the previous day	
8:45	Economic Considerations <ul style="list-style-type: none">• How economic considerations affect scenarios• The role of economic considerations in global climate change scenarios• Overview of the range of perspectives• Q&A	Skip Laitner EPA
9:45	BREAK	
10:00	Potential Impacts (positive and negative) generated by global climate change and their related economic & social costs <ul style="list-style-type: none">• More detailed presentation: Mid-Atlantic Regional Climate Change Assessment Project• Potential impacts on ecosystems and people in Mid-Atlantic regions• Q&A	Ann Fisher Pennsylvania State University
11:00	Jury Discussion <ul style="list-style-type: none">• Brief discussion of considerations and impacts	Moderators
11:30	LUNCH	
12:30	How uncertainty impacts choices & policy decisions Overview of general policy directions	Mike MacCracken U.S. Global Change Research Program
1:15	Mitigation Strategies <ul style="list-style-type: none">• Describe specific strategies• Review costs and benefits of each strategy• Both domestic and international• Q and A	Skip Laitner EPA James Ekmann National Energy Technology Lab
3:45	Jury discussion	
4:15	Juror Check-in, Review day, Preview tomorrow, etc...	
4:30	Adjourn	

DAY THREE – Wednesday, March 20

8:30 Review agenda for the day and recap the previous day

8:45 Adaptation Strategies

- Overview
- Describe specific strategies
- Review costs and benefits of each strategy
- Q and A

Joel Smith
Stratus Consulting

9:35 Vision Advocates

The jury will hear from advocate witnesses each presenting a scenario (i.e., what the witness believes likely will happen), and a set of strategies and action/policy steps (if any) to address their particular scenario, to form a holistic **vision and plan**. As a whole, the set of advocate witnesses from this day will present a wide range of scenarios as well as a range of specific strategies and actions or policy steps.

Each 'vision' presentation section will consist of a 30 minute presentation, then 10 min Q&A

There will be a discussion section following each vision presentation. In every discussion section, the jury will discuss:

- What's compelling about the scenario portion of this vision?
- What's not compelling?
- What impacts (positive & negative) of this scenario are most notable or of most concern?
- What is appealing or not appealing about the proposed action/policy steps and strategies?
- Other discussion

Ken Colburn
New Hampshire
Dept of
Environmental
Services

Roger Duncan
Austin Energy

Myron Ebell
Cooler Heads
Coalition

J. Drake Hamilton
Minnesotans for an
Energy Efficient
Economy

Eric Holdsworth
Edison Electric
Institute

Patrick Atkins
Alcoa

11:50 LUNCH

12:45 Vision Advocates (continued)

4:00 Panel of advocate witnesses

Witness Panel

4:30 Juror Check-in, Review day, Preview tomorrow, etc...

4:45 Adjourn

DAY FOUR – Thursday, March 21

8:30 Review agenda for the day and recap the previous day

8:45 Continue Initial Deliberations

Moderators

12:00 LUNCH

1:00 Begin Final Deliberations

Moderators

4:30 Adjourn

DAY FIVE – Friday, March 22

8:30 Review agenda for the day and recap the previous day

8:45 Continue final deliberations and finish initial report

Moderators

10:30 Review and edit initial report

**Jefferson Center
staff**

11:30 Evaluations by jurors

12:00 LUNCH

1:30 Juror debrief with moderators

Moderators

2:00 Prepare for Wrap Up Session

2:30 Wrap Up Session – jurors present initial report
Q&A with audience

4:00 Juror thank you reception

4:30 Adjourn

Witness List

INFORMATIONAL

Background Information: Big Picture	Nancy Kete Climate, Energy & Pollution Program World Resources Institute
Scientific Considerations	Mike MacCracken US Global Climate Change Research Program Fred Palmer Peabody Energy
Technology Considerations	John Novak Electric Power Research Institute (EPRI)
Economic Considerations	Skip Laitner US Environmental Protection Agency (USEPA)
Impacts	Ann Fisher Pennsylvania State University
Uncertainty in policy	Mike MacCracken US Global Climate Change Research Program
Mitigation Strategies	Skip Laitner (efficiency, sinks, nuclear, renewables) US EPA James Ekmann (efficient fossil fuels, sequestration) US Department of Energy National Energy Technology Lab
Adaptation Strategies	Joel Smith Stratus Consulting, Inc.

ADVOCATES: 6 holistic visions (scenario + actions, if any)

Pat Aktins, Alcoa

Ken Colburn, New Hampshire Department of Environmental Services

Roger Duncan, Austin Energy

Myron Ebell, Cooler Heads Coalition

J. Drake Hamilton, Minnesotans for an Energy Efficient Economy

Eric Holdsworth, Edison Electric Institute

Appendix A

Witness Biographical Sketches

Patrick Atkins is Director of Environmental Affairs for Alcoa. Dr. Atkins is responsible for Alcoa's environmental policy and global environmental programs. Before joining Alcoa in 1972, he served as a professor in Environmental Health Engineering at the University of Texas at Austin where he taught courses in engineering, industrial hygiene and ecology. Dr. Atkins is a member of the National Academy of Sciences Commission on Geosciences, Environment and Resources.

Kenneth Colburn is Director of the Air Resources Division of the New Hampshire Department of Environmental Services. In addition to his work in New Hampshire, Mr. Colburn chairs the State and Territorial Air Pollution Program Administrators' (STAPPA) Stratospheric Ozone and Global Warming Committee. In that capacity, he has represented the interests of state air regulators at U.N. climate change meetings in Kyoto, Buenos Aires, The Hague, and Bonn.

Roger Duncan is Vice President, Conservation, Renewables & Environmental Policy, Austin Energy in Austin, Texas. Mr. Duncan represents Austin Energy in national forums on a variety of environmental policy issues and advises cities and counties nation-wide on energy and conservation matters. He has managed several key programs and departments for the City of Austin, and served two terms as a member of the Austin City Council.

Myron Ebell is Chairman of the Cooler Heads Coalition, a group of two dozen nonprofit organizations that question global warming theory and oppose the Kyoto Protocol. Mr. Ebell is also the director of global warming and international policy at the Competitive Enterprise Institute, a free market and environmental public policy institute. Before joining the Institute he was the policy director at Frontiers of Freedom and previously senior legislative assistant to Representative John Shadef of Arizona.

James Ekmann is the Associate Director in the Office of Systems and Policy Support for the National Energy Technology Laboratory of the US Department of Energy (NETL). NETL focuses on energy and environmental issues, particularly those associated with fossil fuels. Mr. Ekmann represented NETL in the development of two DOE studies dealing with climate change mitigation strategies. He continues to be involved on DOE task forces exploring climate change mitigation technology R & D needs.

Ann Fisher is Senior Scientist and Professor of Agricultural and Environmental Economics at Pennsylvania State University. Dr. Fisher examines nonmarket benefits of environmental improvements and assesses perceptions and consumer decisions about various environmental risks. She led a large interdisciplinary team in an integrated assessment of potential impacts from climate change in the Mid-Atlantic region.

J. Drake Hamilton is Science Policy Director for Minnesotans for an Energy-Efficient Economy (ME3), a nonprofit organization advocating a transition to a clean, efficient, and fair energy system. Her work includes scientific analysis, policy development and outreach on global climate change. Dr. Hamilton serves on the Steering Committee of the U.S. Climate Action Network. She has taught graduate and undergraduate courses in environmental science and energy policy at George Washington University in Washington, D.C.

Nancy Kete is the Director of the Climate, Energy and Pollution Program at the World Resources Institute. Dr. Kete joined the WRI staff after serving the USEPA as Deputy Director of the Office of Atmospheric Programs. She is an expert on energy and environmental problems and the use of economic instruments for environmental protection. She has held various positions at the USEPA, and before that at the U.S. Mission to the Organization for Economic Cooperation and Development in Paris.

John A. "Skip" Laitner is the Senior Economist for Technology Policy at the USEPA Office of Atmospheric Programs. He is a resource economist with 30 years experience in public policy analysis, economic impact studies, and economic development planning. Mr. Laitner was awarded EPA's 1988 Gold Medal for his work with a team of EPA economists concerning climate change and greenhouse gas emissions.

Michael MacCracken is on assignment as a senior global change scientist from the University of California's Lawrence Livermore National Laboratory to the interagency Office of the US Global Change Research Program in Washington, D.C. This office is charged with helping to coordinate research efforts of ten federal agencies to understand and improve predictions of climate variability and change, depletion of stratospheric ozone, and the long-term impacts of humans on the environment and society. Dr. MacCracken has worked for more than 25 years on the development, testing and application of global climate system models. He coordinated work on the National Assessment on the Potential Consequences of Climate Variability and change for the U.S.

Fredrick Palmer is Executive Vice President, Legal and External Affairs and Secretary, Peabody Energy in St. Louis, Missouri. Mr. Palmer is responsible for the legal, state and federal government affairs, public relations and investor relations functions of Peabody Energy. He formerly served as the Chairman of the Environmental Information Council and President of the Board of Directors of the Greening Earth Society.

John Novak is the Product Line Leader, Environment Sector for the Electric Power Research Institute (EPRI). He has managed numerous environmental issues for the electric utility industry. Before joining EPRI, Mr. Novak was the manager of global climate change issues for the Edison Electric Institute and was the lead power industry representative in U.S. and international discussions regarding climate change.

Joel Smith is Vice President of Stratus Consulting, Inc. an environment and energy research consulting firm based in Boulder, Colorado. Mr. Smith has examined climate change impacts and adaptation issues for many national and international agencies. He provides technical advice, guidance and training on assessing climate change impacts and adaptation strategies to people around the world. Before joining Stratus Consulting, Mr. Smith was the deputy director of U.S. EPA's Climate Change Division.

Appendix B

Source information for data used to determine jury demographic targets.

Jury targets were based on the Mid-Atlantic region consisting of Delaware, Maryland, Pennsylvania, Virginia, Washington DC, and West Virginia. Targets were calculated based on the populations of these states only.

Gender: 2000 Census data. Based on those age 18 and older only.

Age: 2000 Census data.

Education: based on estimates from 2000 Census Supplemental Survey. Based on those age 25 and older only.

Race: 2000 US Census Data. In the 2000 census, as in earlier censuses, Hispanic or Latino identity is considered an ethnic rather than racial category. People who identify themselves as Hispanic or Latino may be any race or combination of races. Non-white includes black/African-American, Asian/Pacific Islander, American Indian, or "some other race." This grouping also includes those who consider themselves to be of more than one race. Individuals who consider themselves white/Caucasian and Hispanic identity are included in the white only category.

Geographic Location: 1990 US Census data. Urban includes populations categorized as residing in areas designated as 'central cities' by the US Census Bureau. Suburban includes those populations defined as residing in a 'metropolitan area' but not in a 'central city.' Rural includes populations designated as 'nonmetropolitan.'

Attitude: based on 2000 voter registration data, as listed in *The Almanac of American Politics 2002*, except Virginia. (No party registration in VA.) Virginia's estimates calculated by averaging the results of 2 different VCU Commonwealth Polls, one from April 2001 and one from Feb 2001, and applying the resulting percentages to the total number of registered voters.

Appendix C

Summary of Witness Presentations

These summaries were prepared by an EPA staff person to capture a consistent and brief description of each speaker's presentation. Each speaker had the opportunity to review and correct these brief outlines. The materials prepared by the speakers themselves, including copies of slide presentations, are available upon request. For copies of speaker-prepared materials or more information about this project, please contact EPA by e-mail at global.warming@epa.gov or by regular mail at Global Programs Division, Citizen's Jury Project (6205J), 1200 Pennsylvania Avenue, NW, Washington D.C. 20460.

Nancy Kete, WRI: Introduction to Climate Change

Science:

- Global warming is real and happening now
- US & Canada responsible for 25% of current emissions (with very high per capita emissions)
- Uncertainty is in the timing and regional impacts and potential surprises

Economics:

- Historically, energy has been cheap – prices don't reflect environmental costs
- While economic models predict a wide range of potential costs, the range depends on the assumptions (the greater the flexibility, the lower the costs)

Policies and Politics:

- Barriers to solving the problem include
 - Scientific complexity
 - Long time horizon
 - Need for international cooperation
 - Conflicting and entrenched interests

Conclusion:

- We need to start now to adapt and to avoid making the problem worse for future generations

Mike MacCracken, USGCRP: Climate Change Science

- The Intergovernmental Panel on Climate Change (IPCC), which brings together scientific representatives from about 150 countries, prepares periodic assessments that present the central view of the climate scientists around the world
- Scientists try to provide the facts and best possible projections of what would happen if particular scenarios of the future come about, not the "shoulds" (i.e., they provide data, not policy prescriptions)
- Quick summary of the scientific facts about climate change:
 1. Humans are changing atmospheric composition, with the carbon dioxide (CO₂) concentration up over 30% and the methane concentration up over 150% since preindustrial times
 2. Increasing concentrations of greenhouse gases are creating a warming influence
 3. Human influence on climate is becoming more and more evident. The global average temperature increased about 1 F during the 20th century and is now higher than in at least the last few thousand years. Mountain glaciers are melting, oceans are warming, and sea level is rising.
 4. Scenarios of projected emissions indicate that there will be ongoing change through the 21st century and beyond. The IPCC projects global average temperature will increase about 2.5 to 10 F and sea level will rise about 4-35 inches by 2100.

5. Significantly slowing climate change by the end of 21st century will require significant reductions in carbon dioxide (CO₂) emissions. If it were to be fully implemented, the Kyoto Protocol would only be a very modest first step in slowing climate change.

Fred Palmer, Peabody Energy: Climate Change & Energy Policy

- There is little issue with findings that humans have a discernible impact on the climate.
- The issue of human induced climate change deserves thoughtful attention.
- Climate change policy cannot be separated from energy policy.
- All positive and negative externalities from use of fossil fuels must be considered; much attention has been given only to negative costs.
- Research shows enormous benefits from abundant, low-cost coal-fueled electricity. Use of coal improves lives, extends lives and contributes hundreds of billions of dollars each year to the U.S. economy.
- We need to be very careful in putting the quantifiable and known benefits of fossil fuel use at risk as the result of speculative modeling unsupported by empirical data.
- We have also not significantly researched the benefits of additional CO₂ through the increased greening in America.
- Concerns over climate change should be solved through technology, requiring a robust federal program and movements toward improved carbon emissions as a percent of GDP.
- Observations suggest modest, benign global warming, even if human induced.
- In response, U.S. policies should:
 - reject a carbon constrained approach (Kyoto Protocol)
 - increase electricity supplies for a growing economy
 - invest in clean coal technology
 - continue to study the science and benefits of increased CO₂
 - develop, as an insurance policy, carbon sequestration and near-zero emissions technologies
 - encourage voluntary approaches to increase energy efficiency
 - pursue sustainable development

John Novak – EPRI: Technology Considerations

- Modest global warming is occurring
- Technology is the key to eventually stabilize concentrations and keep reasonable costs
- Need more investment in research and development (R&D) to develop a technology portfolio
- Need to improve R&D process and performance
- Emissions limitations and controlling costs complement a technology portfolio

Skip Laitner – EPA: Economic Considerations

- In a growing economy, the U.S. can increase both the economy's gross domestic product (GDP) and environmental quality
- The real "marketplace" has barriers to accounting for environmental quality
- Incentives can be useful to overcome barriers (incentives include: recognition, performance standards, regulatory flexibility, information access, cooperative support, financial support)
- Economic models can be used to assess benefits and costs, but results depend on assumptions
- With smart assumptions about technology and policies, models show that emission caps on sulfur dioxide (SO₂), nitrogen oxides (NO_x), mercury (Hg), and CO₂ can be achieved in the electric sector with modest costs or even modest benefits to the economy

Ann Fisher – Penn State University: Potential Impacts of Climate Change

- Penn State conducted the Mid-Atlantic Regional assessment to understand the impacts of climate change, using a broad stakeholder process including environmental groups, citizen groups, industry, state and local government representatives, and federal government representatives, and other academics
- For the Mid-Atlantic Region, used two models to develop a range of projections for changes in environmental parameters by the year 2030, using 1990 as the baseline:
 - an increase in CO₂ emissions (20-30%) very high confidence
 - an increase in sea level (4-12 inches) high confidence
 - an increase in temperature (about 2-3°F) high confidence
 - a change in precipitation (-1 to +8%) medium confidence
 - a change in runoff (-2 to +6%) low confidence
- These environmental changes will also have an impact on various sectors – changes in fish and bird populations; changes in the dominant trees in the forest, increase in human mortality due to heat waves, and a smaller decrease in human mortality due to cold exposure
- Results: the Mid-Atlantic region economy is expected to be resilient, but there are potentially large risks to the regions ecosystems – more study is needed to understand extreme weather events, costs and benefits of adaptation, and how policies affect future vulnerabilities
- Impacts will make some people better off and others worse off, so there is concern about inequitable impacts on vulnerable groups and locations
- While some actions to protect ecosystems and the economy from these impacts, the complexity, uncertainty and the future timing for climate change impacts makes communication of these results challenging

Mike MacCracken – USGCRP: How Uncertainty Affects Perspectives on Policy Decisions

- Fossil fuels provide tremendous benefits to society and have major effects on the environment
- Depends on your point of view – environmentalist, coal company executive, scientist, economist, religious leader, technology developer, or citizen may place different value on environmental risk or economic risk
- Assessing the risk depends on questions much bigger than the science, including considerations of: technological progress, fairness (among “have” and “have not” countries), national security, economy and jobs, international cooperation, and international and intergenerational equity
- The media has a tendency to emphasize the controversy and focus on describing the difference between two points of view
- Policy makers are expected to resolve our many conflicting desires: scientific agreement, cheap and abundant energy, clean environment, better technologies at reduced costs, low costs to society, improving conditions for others, and peaceful resolution internationally
- Should society focus on risk or certainty? Should the standard be the same for impact on the economy and impact on the environment?
- Diversity of perspectives have led to a range of **mitigation** approaches – no action now and address later; expand research and development; take “no regrets” cost-effective actions now, take modest cost actions now as insurance policy; or pursue aggressive, costly actions now to avoid risk
- Whatever we decide on mitigation, we need to **adapt** to changes to minimize costs and take advantage of opportunities

Skip Laitner – EPA: Mitigation Strategies

We've invented a lot of new technologies in the last 30 years (calculators, PCs, cell phones, etc)

Only Possible Options to Control CO₂ Emissions:

1. Reduce energy use and economic activity,

2. Energy efficiency
 3. Carbon sequestration
 4. New sources of energy
 - US waste is bigger than Japan economy
 - We need not just energy efficiency, but also clean fuel sources to reduce emissions
 - Good energy efficient technologies exist; examples include Energy Star consumer electronics, street lighting, heat exchanger technology, combined heat and power, etc.
- Conclusion: We can invest in new technologies, reduce our emissions, and grow the economy

Jim Ekmann – National Energy Technology Lab, DOE: Mitigation Strategies

1. Scope of problem: fossil fuels provide a huge share of US energy (transportation, electricity)
2. Mitigation – only four options:
 - Reduce demand
 - Reduce carbon intensity (need alternative fuels)
 - Improve energy efficiency
 - Sequester carbon
3. Some specific strategies (assumes continued use of fossil fuel is necessary)
 - Increase use of natural gas, cleaner liquid fuels, and maximize efficiency by using higher efficiency generating technologies, combined heat and power to use “wasted” heat from electricity generation or by co-production approaches that make both power and fuels or chemicals
 - Study ways to sequester carbon back into unmineable coal seams, deep saline formations, depleted oil/gas wells, or in the deep ocean, and enhance natural capture of carbon in trees or ocean organisms (research needed to ensure safe, verifiable, environmentally acceptable, and economically viable)
4. Review costs and benefits
 - Need to compare electricity generation costs – coal still very competitive, renewables are very expensive (though costs coming down), natural gas is relatively cheap and clean
5. Domestic and international considerations
 - World energy demand is rising rapidly, and still primarily powered through fossil fuels
 - USAID and DOE are investing in power plant efficiency improvement projects in India and China

Panel Session: Mitigation Strategies Discussion (Skip Laitner and Jim Ekmann)

Emissions trading is a mechanism where government sets the amount of emission reductions (target or emissions “cap”), and industry can use any technology to get the reductions – particular companies that find the cheapest reductions can invest in “extra” reductions and trade them to companies facing higher costs. This emissions trading mechanism has been used successfully in the U.S. under the Clean Air Act to require electric utilities to reduce emissions of sulfur dioxide SO₂ which cause acid rain. Emissions trading is included as one mechanism for countries to use to meet greenhouse gas emission reduction targets established in the proposed Kyoto Protocol.

Combined Strategies Which Could Potentially Achieve Significant Reductions

(note: as a benchmark to very roughly calculate potential contributions of various strategies, Kyoto Protocol would require U.S. to make reductions of about 600 million tons of carbon (MtC) as an annual average during the years 2008-2012)

- Energy efficiency – incentives, tax credits, smarter business – 200 MtC by 2010
- Clean power fuels – 200 MtC
- Sinks (locking in carbon in forests, ag) 50 MtC (around \$40/ton)
- Renewables – 40 MtC (Renewable Portfolio Standard could require electric utility companies to meet some percentage of their demand through some renewables)
- Nuclear – 20 MtC
- Remaining GAP of about 90 MtC
 - International emissions trading (emission reductions in other industrial countries)

- Clean Development Mechanism (emission reduction projects with developing countries)
- Reduce other gases included in the emissions accounting (carbon is only 80% of U.S. greenhouse gas emissions) methane, nitrous oxide, these gases can be reduced more than their share of the average target for greenhouse gases

Why Don't We Use More Renewables Now?

Electricity generated through fossil fuels costs an average of about 4 cents per kWh (kiloWatt-hour) for the generation (other cost is transport, admin) when you include capital costs for the equipment, renewables are not as cheap as fossil fuel – a rough estimate of electricity generation cost for various renewable technologies:

- Hydropower 4 cents
- Solar Thermal 8-12 cents (passive heat, or even concentrating)
- Solar Photovoltaic (light into electricity) 18-30 cents
- Wind Power 4-6 cents
- Geothermal 8-12 cents
- Biomass 8-12 cents

Joel Smith – Stratus Consulting: Adaptation Strategies

Adaptation is inevitable because climate will continue to change

1. How **vulnerable** are systems and sectors to impacts of climate change?
 - Depends on three factors:
 - Exposure to climate change (e.g. rising temperatures, sea levels, etc)
 - Sensitivity to change (e.g. change in crop yield, energy demand (for heating/cooling))
 - Capacity to adapt (ability to change location or behavior to reduce negatives/enhance pluses)
 - Generally, natural ecosystems and developing countries are more vulnerable
 - Generally, US and other industrialized countries are less vulnerable
 - Vulnerability can change as nations develop
2. What kinds of actions can be taken to **adapt** to climate change?
 - Difficulty in anticipating climate change is uncertainty of the impacts at local/regional levels; therefore adaptation actions should be flexible and efficient (low cost)
 - Some changes may be irreversible without adaptation to help avoid (such as creating migration corridors to help prevent species extinction)
 - Look for “no regrets” or “low regrets” strategies to adjust planned actions to account for anticipated changes
 - Rolling easements to allow wetlands to migrate inward with rising sea levels,
 - Where to designate flood plains
 - Creating heat watch warning systems and disease surveillance
 - Research into heat and drought resistant crops, more efficient irrigation systems
 - Adaptation is beginning to be factored into some long term decisions on natural resources

Ken Colburn – New Hampshire Dept of Environmental Services: Vision A

The science of the Intergovernmental Panel on Climate Change (IPCC) shows that

- “There is newer and stronger evidence that suggests most of observed warming over last 50 years is attributable to human activities”
- Greenhouse gas emissions will persist for many centuries
- climate models have improved, and temperatures are projected to both rise and vary more widely

New England states and Eastern Canadian provinces are taking mitigation action

Short term: reduce greenhouse gases to 1990 levels by 2010 (not as stringent as Kyoto, can't do as much as the country to do – transportation policy is needed at national level)

Mid-term: reduce greenhouse gas emissions by 10% below 1990 levels by 2020

Long term: eliminate dangerous threat to the climate (emission targets are expected to be 75-85% below current emission levels)

specific action items:

1. Establish inventory of greenhouse gases
2. Plan to mitigate
3. Public awareness
4. Governments lead by example in cutting emissions
5. Reduce greenhouse gases from electricity sector

Vision A: Take Mitigation Action Now, promoting energy efficiency and renewable technologies to the benefit of environment and economy

- This is a win/no lose strategy - we need both good environment and good economy
- Control costs are exaggerated by industry (acid rain program is good example)
- Technology only develops once the need is clear (necessity is the mother of invention)
- Longer we wait, the higher costs will be
- Adaptation costs are already starting, and could be high
- Energy efficiency – reduce costs, air pollution, climate
- US could gain competitive advantage in “green” technologies if we start now, or could lose that advantage to Germany, Japan, etc.
- Should value our kids and grandkids environment!

Roger Duncan – Austin Energy: Vision B

- Austin Energy is a large public power utility, generating electricity from gas, coal, nuclear, and renewables – company has invested in 2 options to reduce pollution:
- Significant investment in Demand Side Management (DSM) – programs which fund investments in energy efficient technologies – huge success with energy efficient air conditioners (all programs add up to equivalent of a 400MW coal-fired power plant)
- Austin Energy is also increasing its commitment to renewable energy with a substantial investment in wind power, and also in landfill gas and solar energy – its customers can pay a fixed charge of just under 3 cents per kWh to pay a little bit extra to fund renewable energy

Vision B: nanotechnology will transform the world and the debate on climate change

- Will produce revolutionary materials with virtually no waste
- Can make virtually everything recyclable
- Zero emission manufacturing, scrubbing CO₂ out of the air
- Need billions to develop this technology, like investment in nukes, then it will be cheap
- Specific Technologies will emerge, improving production and lowering emissions:
 - 120% energy efficient buildings
 - Convergence of energy production/consumption for stationary and mobile needs
 - Renewables-based hydrogen economy (fuel cells)
 - New energy sources
 - Atmospheric carbon (scrubbing carbon from air) as a source of materials production

Myron Ebell – Cooler Heads Coalition: Vision C

The principles of everyone involved in the global warming debate should be suspected, examined, and taken into account when evaluating statements and claims

Scenario: No Cause for Alarmism

- Climate is always changing due to natural causes
- Graph showing extreme warming in last century is fabricated from questionable data sources
- Satellite data shows no significant warming
- Conclusion: amount of global warming will be small, and net effect mildly beneficial

Vision C: Build Resiliency and Deal with Current Environmental Problems

- Don't use precautionary principal to put the world on an expensive and unnecessary energy diet (don't take mitigation action now)
- Do build resilience through long-term technological innovation and adaptation
- It is likely that in the next 50-100 years, new energy sources will economically emerge to supplant fossil fuels
- Invest any environmental protection resources in preventing current cases of malaria, rather than to attempt to stop the spread of malaria 50 years from now
- Reducing fossil fuel use will make us poorer and do nothing to slow the increase in greenhouse gases; if global warming occurs, we will be in a more robust position to deal with it later

J. Drake Hamilton – Minnesotans for an Energy-Efficient Economy: Vision D

Assumptions

- Global warming is real and already happening. The world's leading climate specialists predict an additional 2-10 degree F warming by 2100.
- Burning fossil fuels is the primary cause
- Magnitude and pace of climate change will cause considerable harm to human settlements and natural resources
- People will need both to adapt and to try to slow the amount of change

Considerations

- Global warming will have adverse impacts on agriculture and human health, particularly in developing countries, will increase severe weather, will lead to species extinctions
- The costs of inaction are high and will fall mostly on the world's poorest people
- We have the clean energy technologies to slow climate change and protect vulnerable humans and sensitive areas, and we are obligated to use them

Vision D: We must begin immediately to modernize our energy system by increasing energy efficiency and investing in cleaner fuels to protect the climate.

- We need to commit to reducing emissions by 60-80% immediately
- Phase in more clean energy by requiring 20% renewable electricity by 2020, and use market mechanisms to achieve that goal
- Require higher fuel efficiency for cars, and fuel them with renewable fuels
- Increased research and development in low-carbon technologies
- Require increased efficiency in appliances, new buildings, and industry
- Following this strategy will produce no regrets: relatively small investments now will produce cleaner air and water as well as increase U.S. energy security, while reducing the impacts of global warming for future generations.

Eric Holdsworth – Edison Electric Institute: Vision E

- Climate science – we've learned a lot, but scientists admit there is a lot we don't know
- Developing countries are the biggest source of greenhouse gas emissions, based projected emissions growth in global emissions
- Need to invest in research and development for fossil free energy sources and other technologies
- Kyoto Protocol is not appropriate – regulatory approach, short term targets and timetables, and only limited number of countries

Vision E: Address climate change over the mid to long term through investments in energy efficiency and development of new energy sources

- To address climate, address development through electricity
- All energy sources have to be included in research and development
- The kinds of technologies to make 60—70% reductions haven't been invented yet
- Changing energy consumption is a very long term and global task
- Should climate change be addressed? Yes – in the mid to long term

Patrick Atkins – Alcoa: Vision F

- Alcoa believes that climate change is real, and man has contributed
- Alcoa has developed a climate change statement, action plan, sustainable development
- Changing climate is expected to impact agriculture, coastal areas, extreme weather events, human health, sensitive species and ecosystems; and abrupt changes such as an interruption of ocean currents, could be very problematic

Scenario: 1) society will flunk the climate change test – it is very difficult in the U.S. to spend money to protect people now from hundred-year impacts; 2) global climate change will result in significant changes (rainfall, local, ecosystems, major systems, sea level rise); 3) most industrialized nations will adapt – we can build levees, import food, affordable solutions to protect from health and biodiversity 4) most developing countries will suffer significant losses in our lifetime; 5) world will recognize the consequences by about year 2020, 6) then technologies will be implemented to reduce greenhouse gas emission by 70% within 10 years; 7) increases in the rate will slow down by 2040 – by 2040 CO₂ atmospheric concentrations will peak at 550 ppm, and start to decline by 2090; 8) the world will recover – by 2150, climate change will be solved, although some sensitive species (like the monarch butterfly) and ecosystems may be lost

Vision F: Take economically beneficial mitigation action now (companies can get the savings from energy efficient technologies by setting voluntary goals)

Alcoa's Action plan:

- Reduce by 25% lower than 90 levels by 2010 (resulting in lower total emissions, even as the company itself had grown)
- Measure greenhouse gas emissions and have data validated (by Price-Waterhouse-Coopers)
- Monitor and report on emissions with purchased electricity
- Rapidly deploy best practices and technologies
- Evaluate effectiveness of sequestration (Pat not personally convinced that sequestration will work in the long term – in 40 years, CO₂ could be released again, “permanence” is the issue)
- Support emissions trading regimes as a cost-effective mechanism to reduce emissions
- Participate in national and international discussions (and talk to “dreaded” EPA) to promote comprehensive global approach to all sources and sinks from all countries, recognizing any “early action” to reduce emissions
- Identify and promote beneficial uses and recycling for Alcoa products (for example: lifecycle greenhouse gas emissions for an aluminum intensive car – 40% weight savings – 27 mpg to 35 mpg – a pound of aluminum used to replace heavier material will save 20 pounds of CO₂ from being emitted over the lifetime of the car)