SOME CHILLING CONSIDERATIONS ABOUT GLOBAL WARMING

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Jefferson’s Ferry Public Affairs Committee Forum

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http://www.ecd.bnl.gov/steve
SCIENTIFIC EVIDENCE FOR GLOBAL WARMING

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The Greenhouse Effect

Some solar radiation is reflected by the Earth and the atmosphere.

Solar radiation passes through the clear atmosphere.

Most radiation is absorbed by the Earth's surface and warms it.

Some of the infrared radiation passes through the atmosphere, and some is absorbed and re-emitted in all directions by greenhouse gas molecules. The effect of this is to warm the Earth's surface and the lower atmosphere.

Infrared radiation is emitted from the Earth's surface.
ATMOSPHERIC CARBON DIOXIDE IS INCREASING

Global carbon dioxide concentration over the last thousand years

- Law Dome
- Adelie Land
- Siple
- South Pole

Mauna Loa Hawaii

Polar ice cores
WHERE IS ALL THIS $CO_2$ COMING FROM?

WHO IS RESPONSIBLE?
HOW MUCH CARBON IS IN A GALLON OF GASOLINE?

1 lb?

3 lbs!?

2 lbs?

5 lbs!??!

All of this carbon goes into the atmosphere as carbon dioxide when you burn the gasoline in your car.
THE MOST EFFECTIVE WAY TO DOUBLE THE FUEL ECONOMY OF A CAR . . .

IS TO PUT TWO PEOPLE IN IT!
CHANGE IN GLOBAL MEAN SURFACE TEMPERATURE 1855-2004

Climate Research Unit, University of East Anglia, UK
GREENHOUSE GASES AND TEMPERATURE OVER 450,000 YEARS

Vostok core, Antarctica

Modified from Petit et al., Nature, 1999
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CLIMATE SENSITIVITY ESTIMATES THROUGH THE AGES

Estimates of central value and uncertainty range from major national and international assessments.

T², Sensitivity to 2 °C

Despite extensive research, climate sensitivity remains **highly uncertain**.
THE ‘BIBLE’ OF CLIMATE CHANGE

It's big and thick.
Every household should have one.
No one reads it from cover to cover.
You can open it up on any page and find something interesting.
It was written by a committee.
It is full of internal contradictions.
It deals with cataclysmic events such as floods and droughts.
It has its true believers and its rabid skeptics.

http://ipcc-wg1.ucar.edu/wg1/wg1-report.html
• The lifetime of incremental atmospheric CO₂ is about 100 years.

• The expected life of a new coal-fired power plant is 50 to 75 years.

*Actions taken today will have long-lasting effects.*

*Early knowledge of climate sensitivity can result in huge averted costs.*
Looking to the Future . . .
Prediction is difficult, especially about the future.

– Niels Bohr
PROJECTIONS OF FUTURE CO2 EMISSIONS

Scenarios

- A1B
- A1T
- A1FI
- A2
- B1
- B2
- IS92a

CO2 emissions (Gt C/yr)

Year

2000 2020 2040 2060 2080 2100

5 10 15 20 25
PROJECTIONS OF FUTURE CO2 CONCENTRATIONS

The diagram shows the projections of future CO2 concentrations over the years 2000 to 2100. The scenario lines represent different emission pathways:

- A1B
- A1T
- A1FI
- A2
- B1
- B2
- IS92a

The CO2 concentration is measured in parts per million (ppm).
PROJECTIONS OF FUTURE TEMPERATURE CHANGE
PROJECTIONS OF FUTURE SEA LEVEL RISE
Thermosteric (density change) only

- Scenarios
  - A1B
  - A1T
  - A1FI
  - A2
  - B1
  - B2

- All SRES envelope including land-ice uncertainty
- Several models all SRES envelope
- Model average all SRES envelope

Bars show the range in 2100 produced by several models
present
1 meter
Complete melt of the Greenland ice sheet would raise the level of the global ocean 7 meters.
3 meters
4 meters
5 meters
“Gentlemen, it’s time we gave some serious thought to the effects of global warming.”
CONCLUDING REMARKS

Atmospheric carbon dioxide will continue to increase absent major changes in the world’s energy economy.

The consequences of this increase are not well known but they range from serious to severe to catastrophic.

Present scientific understanding is sufficient to permit “no regrets” decision making.

Research is urgently needed to refine “what if” projections. Actions taken (or not taken) today will inevitably affect future generations.
WHERE IS THIS CARBON DIOXIDE COMING FROM?

WE ARE ALL RESPONSIBLE.

Burning a gallon of gasoline in your car puts 5 pounds of carbon in the atmosphere as carbon dioxide (CO$_2$), and it will stay there for decades — maybe a century!

Other sources are home heating and electric power production.
Global Atmosphere, Global Warming

Questions about Global Warming

- Is it real?
- Is it important?
- What is it due to?
- How much more can we expect?
- Are we seeing just the tip of the iceberg?

Research at Brookhaven National Laboratory is helping to answer these questions.