

**Global Warming\***  
**The Perfect Storm**

**Jim Hansen**

**29 January 2008**

**Health Implications of Climate Change**  
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**\*Any statements relating to policy are personal opinion**

# Perfect Storm, Perfect Disaster

## 1. Great Inertia of Systems

- Ocean: Half of Warming still “In Pipeline”
- Energy Systems: Decades to Replace

## 2. Non-Linear Problems

- Ice Sheet Disintegration
- Interdependencies of Species

## 3. Special Interests have Undue Sway

- Exert Media and Political Control
- Delay Actions a la Smoking and Health

**Danger: Tipping Points → Different Planet**

# New Science in Pipeline

- 1. CO<sub>2</sub> = 450 ppm is dangerous!**
  - Already 280 → 385 ppm
- 2. Criteria for Defining Target CO<sub>2</sub>**
  - Earth's History
  - Ongoing Effects at 385 ppm

# Example: Arctic Sea Ice Criterion\*

## 1. Restore Planetary Energy Balance

CO<sub>2</sub>: 385 ppm → 325-355 ppm

## 2. Restore Sea Ice: Aim for -0.5 W/m<sup>2</sup>

CO<sub>2</sub>: 385 ppm → 300-325 ppm

Range based on uncertainty in present planetary energy imbalance (between 0.5 and 1 W/m<sup>2</sup>)

\* Assuming near-balance among non-CO<sub>2</sub> forcings

# Assessment of Target CO<sub>2</sub>

## Phenomenon

## Target CO<sub>2</sub> (ppm)

- |                              |         |
|------------------------------|---------|
| 1. Arctic Sea Ice            | 300-325 |
| 2. Ice Sheets/Sea Level      | 300-350 |
| 3. Shifting Climatic Zones   | 300-350 |
| 4. Alpine Water Supplies     | 300-350 |
| 5. Avoid Ocean Acidification | 300-350 |

→ Initial Target CO<sub>2</sub> = 350\* ppm

\*assumes CH<sub>4</sub>, O<sub>3</sub>, Black Soot decrease

# **Initial Target CO<sub>2</sub>: 350 ppm**

## **Technically Feasible**

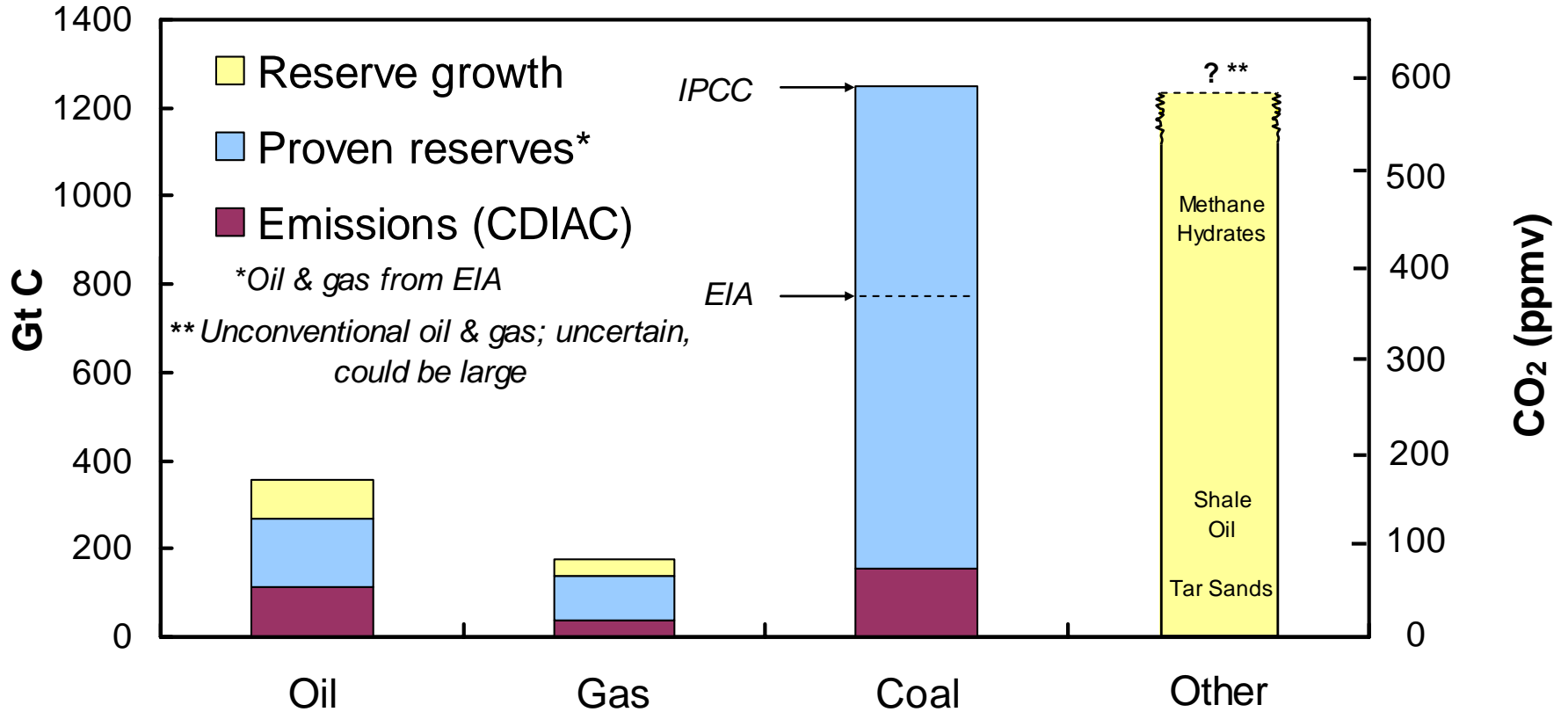
**(but not if business-as-usual continues)**

## **Quick Coal Phase-Out Critical**

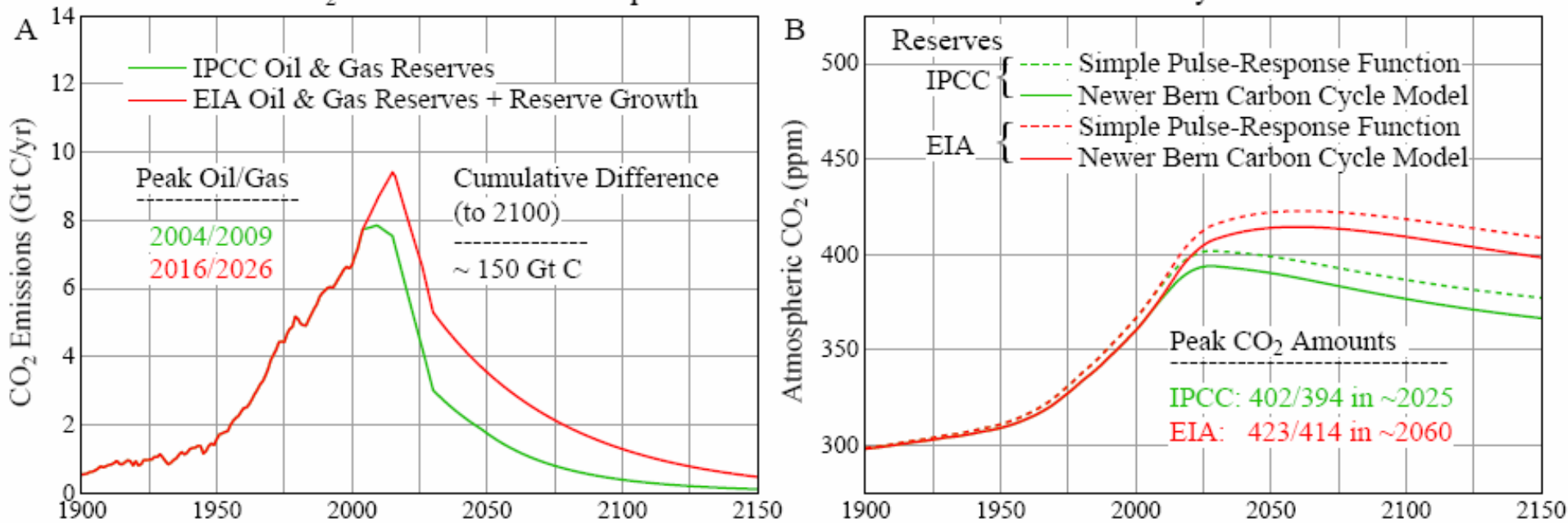
**(long lifetime of atmospheric CO<sub>2</sub>)**

**(must halt construction of any new coal plants that do not capture & store CO<sub>2</sub>)**

# Fossil Fuel Reservoirs and 1750–2004 Emissions



CO<sub>2</sub> Emissions and Atmospheric Concentration with Coal Phaseout by 2030



Caption if needed



# “Free Will” Alternative

## 1. Phase Out Coal CO<sub>2</sub> Emissions

- by 2025/2030 developed/developing countries

## 2. Rising Carbon Price

- discourages unconventional fossil fuels & extraction of every last drop of oil (Arctic, etc.)

## 3. Soil & Biosphere CO<sub>2</sub> Sequestration

- improved farming & forestry practices

## 4. Reduce non-CO<sub>2</sub> Forcings

- reduce CH<sub>4</sub>, O<sub>3</sub>, trace gases, black soot

# Basic Conflict

**Fossil Fuel Special Interests**

**VS**

**Young People & Nature (Animals)**

**Fossil Interests:** God-given fact that all fossil fuels will be burned **(no free will)**

**Young People:** Hey! Not so fast!  
Nice planet you are leaving us!

# What are the Chances?

**Fossil Interests:** have influence in capitols world-wide

**Young People:** need to organize, enlist others (parents, e.g.), impact elections

**Animals:** not much help (don't vote, don't talk)

# The Big Tipping Point

**If the (human/energy) system reaches a point such that positive feedbacks cause a rapid change**

**It is possible. We have to figure out how to live w/o fossil fuels someday anyhow – why not sooner?**



but animals can't do it