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## Engineering Earth's thermostat with CO<sub>2</sub>?

Earth's temperature is a chemical process system. Review of control system engineering of Earth's thermostat with anthropogenic CO<sub>2</sub> in 1997 proved it will never work because it is an unmeasurable, unobservable and uncontrollable system. CO<sub>2</sub> does not affect temperature; temperature affects CO<sub>2</sub>. There are no greenhouse gases in physics. CO<sub>2</sub> is not a pollutant; it is green plant food. Global warming stabilized since 1998.

**Purpose.** Physics, chemistry, mathematics, engineering, economics, history and ethics are deployed to identify the barriers to designing the thermostat to control Earth's atmospheric temperature by adjusting its CO<sub>2</sub> input.

**Method.** People have beliefs and knowledge. Knowledge of nature is discovered by the scientific method: theory in the language of nature (mathematics), prediction and verification. Such discoveries are held to be true until falsified. I offer claims supported by credible evidence, settled science and warrant how one can know that they are true. Sound engineering requires no less. No opinion, no speculation, no controversy, no politics, no alarmist adjectives. When an unlicensed engineer resorts to name calling and threats, I declare victory and move on.

**Credentials.** I built a thermostat to verify my "Time Optimum Control of Chemical Processes" PhD Thesis theory at Purdue in 1966; the first computer control loop in Shell Oil Co., a FCC regenerator thermostat at Deer Park, Texas in 1967; and digital autopilots and spacecraft trajectory controls for NASA's Apollo Program in 1968. I invented and commercialized hundreds of true boiling cut-point thermostats for petroleum product quality in the hydrocarbon processing industry (HPI) since 1970. I am a registered PE chemical engineer in Texas and control system engineer in California. I was Control Engineer of the Year 1999 and Purdue's Outstanding Chemical Engineer 2007. I am a contributor to the *US Senate Minority Report*, "700 Scientists Dissent and Debunk Man-Made Global Warming," March 16, 2009. I personally financed this presentation; I have no financial incentive in the outcome. I seek no government or business funding. I am an anthropogenic global warming (AGW) skeptic denier.

### Science.

- CO<sub>2</sub> is not a pollutant; it is harmless green plant food. CO<sub>2</sub> is the inert result of complete oxidation. There are only two CO<sub>2</sub> gas phase reactions, both are endothermic: arc welding and photosynthesis (CO<sub>2</sub> + H<sub>2</sub>O + sunlight = sugars + O<sub>2</sub>, catalyzed by chlorophyll). US Navy submarines limit CO<sub>2</sub> to < 8,000 ppmv because it displaces O<sub>2</sub>.

- Halting all combustion of hydrocarbons (oil, gas, coal and wood) by man will not measurably affect atmospheric CO<sub>2</sub> content, now 380 ppm. A simple material balance shows man gener-

ates 30 billion tons/year (this is neither a big nor a small number, it is just a number) while plants consume 7 trillion tons/year (this is neither a big nor a small number, it is just a number). Forest fires, rotting flora and volcanoes input most of the CO<sub>2</sub> to the atmosphere. Total input or output is >7. The ratio is 0.03/7 = 0.0043 (this is a small ratio). Cutting the 30 in half to 15 will drop CO<sub>2</sub> by 100 ppm after 70 years.

- CO<sub>2</sub> does not affect temperature; rather temperature affects CO<sub>2</sub>. Data for the past 400,000 years, reported by Al Gore, *An Inconvenient Truth* in 2005, shows they cycle together but CO<sub>2</sub> lags temperature by about 800 years. Solubility of CO<sub>2</sub> in water, oceans, beer and champagne decreases with temperature so solar warming of the ocean releases dissolved CO<sub>2</sub> and cooling reabsorbs it. Solar radiation drives Earth's temperature; CO<sub>2</sub> has nothing to do with it.

- Atmospheric radiation absorption and emission are dominated by the presence of all three phases of H<sub>2</sub>O. Like all molecules, CO<sub>2</sub> only absorbs and emits specific spectral wavelengths (14.77 microns) that constitute a tiny fraction of solar radiation energy in Earth's atmosphere. The first 50 ppm of CO<sub>2</sub> absorbs about half of this tiny energy, each additional 50 ppm absorbs half of the remaining tiny fraction, so at the current 380 ppm there are almost no absorbable photons left. CO<sub>2</sub> could triple to 1,000 ppm with no additional discernable absorption-emission. This is the Beer-Lambert Law: The intensity of radiation decreases exponentially as it passes through an absorbing medium.

- There is no such thing as a greenhouse gas because the atmosphere has no glass house. German physicists Gerhard Gerlich and Ralf D Tscheuschner proved this in their classic paper, "Falsification of The Atmospheric CO<sub>2</sub> Greenhouse Effects Within The Frame of Physics," *International Journal of Modern Physics B*, v23, n03, January 6, 2009, pp. 275-364. Free download at [http://arxiv.org/PS\\_cache/arxiv/pdf/0707/0707.1161v4.pdf](http://arxiv.org/PS_cache/arxiv/pdf/0707/0707.1161v4.pdf).

- Earth's temperature increased naturally 0.6°C from 1976 to 1998 and has stabilized since, decreasing nearly 0.1°C from 2005 to 2009. Forecasts of long-term cooling are credible but irrelevant to the claim anthropogenic CO<sub>2</sub> does not affect temperature. CO<sub>2</sub> content did not accelerate at the onset of the increase in hydrocarbon combustion by man after 1900.

- Warming or cooling, the surface temperature rate of change at a moment in time, does not affect the melting or freezing rate of H<sub>2</sub>O, only the average temperature of its surroundings > 0°C or < 0°C does. If average temperature is < 0°C, water will freeze even if the temperature is increasing; if average temperature is > 0°C, ice will melt even if the temperature is decreasing. In other words

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**The author**, president of CLIFFTENT Inc., is an independent consulting chemical engineer specializing in identifying, capturing and sustaining measurable financial value from HPI dynamic process control, IT and CIM solutions (CLIFFTENT) using performance-based shared risk-shared reward (SR2) technology licensing.

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ice melts because its surroundings are too warm, not because they are warming. This is calculus, Isaac Newton, *Principia*, 1687.

- Earth's atmospheric temperature is not measurable. Temperature is a point property of the energy content of vibrating and radiating molecules. Physics has no rigorous definition of average temperature of bulk matter, accounting for changes in temperature, state, composition, pressure, heat capacity, velocity and reactions. Air temperature and pressure change with altitude, latitude, clouds, time of day, season, weather fronts and deforestation. Wien's Law gives an average surface temperature from radiation emitted by black bodies like stars; it does not apply to bodies dominated by nonuniform, variable reflection, like Earth.

- UN IPCC climate models incorrectly assume Earth's radiation to space decreases as its temperature increases. The Stefan-Boltzmann Law states all bodies radiate proportional to  $T^{**4}$ . In July 2009, Prof. Richard Lindzen, MIT meteorologist, verified Earth obeys this law. Control engineers know all matter reaches an equilibrium temperature due to this change-mitigating effect. Otherwise Earth would have exploded or frozen long ago. UN climate models are empirical and hence, wrong.

- The Waxman-Markey HR2454 CO<sub>2</sub> cap-and-trade bill requires the USA to reduce its CO<sub>2</sub> production by 83% from 2010 to 2050. Using discredited empirical UN IPCC models, they predict this will reduce CO<sub>2</sub> by 20 ppm and temperature by 0.05°C after 40 years. Physics predicts the temperature change approaches zero.

- Sea level is changing slowly and naturally in direct proportion to land ice changes, not floating sea ice. Archimedes proved his buoyancy law about 250 BC. Most Northern Hemisphere glaciers have been receding since the ice age ended 18,000 years ago. They have not accelerated since 1900. All AGW scares, like hurricanes, droughts and dying polar bears, have been competently debunked.

- Arctic ice shrinks annually when Earth is too warm, but Siberian and Canadian snowfall increases, increasing Northern Hemisphere solar reflectivity, causing Earth to cool and ice to grow again. A plausible mechanism for these regular 40,000-year ice age cycles has been related to the shallowness of the Barents Sea south of Spitsbergen where the Gulf Stream can break through to the Arctic Ocean. Data indicate another regular ice age began since 2000. CO<sub>2</sub> is not involved.

## Engineering.

- Earth's temperature system cannot be adequately modeled for control. Modeling and control of multivariable, nonlinear, dynamic systems like fluid catalytic cracking, crude distillation, coking, hydrocracking and gasoline blending were commercialized in the 1980s and deployed throughout the HPI and the chemical industry ever since. Control systems engineering has been implemented for mechanical and electrical systems like aircraft and spacecraft since 1960.

- Earth's temperature system cannot be adequately measured or controlled. Mathematical criteria devised in the 1960's that ensure a system is measurable, observable and controllable are not satisfied.

- Mankind has no decision process for properly setting global temperature or CO<sub>2</sub> targets, or home thermostats either. The rigorous procedure for optimizing risky tradeoffs for HPI control system setpoints like thermostats was published in *HP*, December 1996.

## Ethics.

- Gradual warming is good. Earth's flora, fauna and humans have flourished since Earth warmed again 18,000 years ago. Humans have experienced 5,000,000 years/50,000 years per cycle = about 100 such cycles. New Yorkers retire to Florida, Canadians to Phoenix, Chicagoans to Hawaii and Germans to Provence.

- Taxing energy production is bad. Energy management is basic to human prosperity and well being. Profitable conversion of heat to work since 1780 has created great comfort and wealth for all who know how. Waxman-Markey HR2454 will never work.

- India, China, Africa and Russia will continue to produce CO<sub>2</sub> from coal, oil and gas, to their credit. Their people will prosper.

- Al Gore, at Oxford on July 8, 2009, promoted research to violate the second law of thermodynamics. He condemned power plant and vehicle combustion for wasting 70% of the fuels energy. In 1824 Sadi Carnot proved the maximum theoretical frictionless reversible efficiency is  $W/Q_i = 1 - T_2/T_1$ , where  $Q_i$  is total heat in,  $W$  is net work out,  $T_1$  is temperature of the heat source (flame, steam) and  $T_2$  is temperature of the surroundings (air, cooling water). Great engineers have labored to approach maximum economic efficiency ever since.

- Corrupting science is bad. Al Gore promotes spending by governments around the globe to finance his multibillion-dollar venture-capital fund, KPCB, which owns 16 Greentech firms and Google. Providing government grants for fraudulent science research promoting caps on CO<sub>2</sub> production is a conflict of interest. I personally found flawed science in peer-reviewed papers in *Science* and *Proceedings of The Royal Society* and published my findings in a letter to *HP* in January 2009.

- On April 17, 2009 the US EPA issued instructions for comments on, "Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases under the Clean Air Act," as it prepared to declare CO<sub>2</sub> a pollutant. It claims current law and court precedent authorize them to do so.

## Conclusions.

- Knowledgeable environmental engineers support reforestation and efforts to curtail anthropogenic pollutants like SO<sub>2</sub>, NO<sub>x</sub>, Bz, CFCs, particulates and surface ozone. They oppose depriving Earth's flora of their green plant food, choking and starving them for personal gain. I like harmless CO<sub>2</sub>. I exhale some at 40,000 ppm every 4 seconds.

- CO<sub>2</sub> and O<sub>2</sub> are the basic molecules of the life cycle between Earth's flora and fauna. The miracle of life photosynthesis reaction should not be tampered with lightly. Starving and choking plants of their food supply would be a monumental crime against humanity, all fauna and flora, the environment and Earth itself.

- Since there are no graduate or licensed chemical process control engineers in the UN IPCC, US Congress, Cabinet or Supreme Court, these incompetent engineering groups continue to waste time and money since 1997 attempting the impossible, designing Earth's thermostat using anthropogenic CO<sub>2</sub>. No one has controlled the climate of an entire planet.

- Climate experts like Richard Lindzen, William Happer, S Fred Singer and ClimateDepot.com are reliable.

- Forecast: This article will remain valid beyond 3000 AD. If engineers consider this report good news, ok. I welcome any proof of errors and apologize if I have offended anyone. *If we knew what we were doing, it wouldn't be called research.* Albert Einstein. **HP**