



Chapter 1.

Supersize Part 1: Connecting the CO₂ dots, Discovering supersized coal burning power plants.

Supersized coal burning power plants are the low hanging fruit.

[Part 1](#) Supersized. A supersized problem. Super easy to fix. 16 times larger than average coal power plants.

[Part 2](#) The first time we tried going nuclear. Where the author thinks supersized coal plants got their start.

Oops, the antinuclear environmentalists supersized Global Warming.



Exploring nuclear options for making fossil fuels obsolete.

Part 1: Connecting the CO₂ dots. A supersized problem. 16 times larger than average coal power plants, making 30% of all Global Warming.

Connecting the CO₂ dots, finding Supersized power plants.

Supersizers are now making 30% of all Global Warming.

At a supersize power plant. **Coal: The big challenge for US CO₂ emissions**

November 3, 2009 1:08pm by Sheila McNulty - - From Financial Times Article.

"At NRG Energy's coal-fired electricity plant in Thompsons, Texas, a train from the Powder River Basin coal mines of Wyoming pulls in after a five-day trip from Wyoming, loaded with more than 16,000 tons of coal. It takes eight hours to unload the 130-car train, and then the next train pulls in.

This plant burns 35,000 tons of coal on a hot day to provide electricity to cool area homes. And bulldozers must constantly shift the coal stockpiled in a giant mound under the hot, noontday sun to prevent spontaneous combustion as it awaits its turn in the 2,200°F furnace. Yet burning the coal to make electricity, transporting it 1,500 miles to the power plant and keeping it cool emits enormous amounts of carbon dioxide.

The US government estimates CO₂ emissions from coal-fired electricity generation comprise nearly 80 per cent of total CO₂ emissions produced by the generation of electricity in the US. Sixty to 80 per cent of coal is, in fact, carbon, making it an extremely carbon-intense fossil fuel. The Environmental Protection Agency has estimated the average US coal plant emits **5 million tons of CO₂** each year. And there are 600 coal-fired electricity plants across the country."

Where you can find out about the world's power plants and the Global Warming they make.

The world's power plant population count is 150,000 generating units at [65,000](#) power plant sites in 225+ countries. (Platts, below.)

About 30,000 are fossil fuel.

Platts [65,000](#) gives many technical and administrative details about the world's power plants but does not provide Global Warming emissions information.



<http://www.platts.com/Products.aspx?xmlFile=worldelectricpowerplantsdatabase.xml>



Data from CARMA (www.CARMA.org)

CARMA asked their logo and link be inserted, something I'm delighted to do.

The web site, **CARMA**, offers an on-line a database providing Global Warming emissions information about the world's power plants. Offered as a means of enabling people to check on the CO2 emissions of their local power plants, the author used Microsoft's "Excel" to sort and plot all the world's power plants by their CO2 emissions. [CARMA Groups Minimum Master .xls](#) (54,000 power plants, 8.3 meg.)

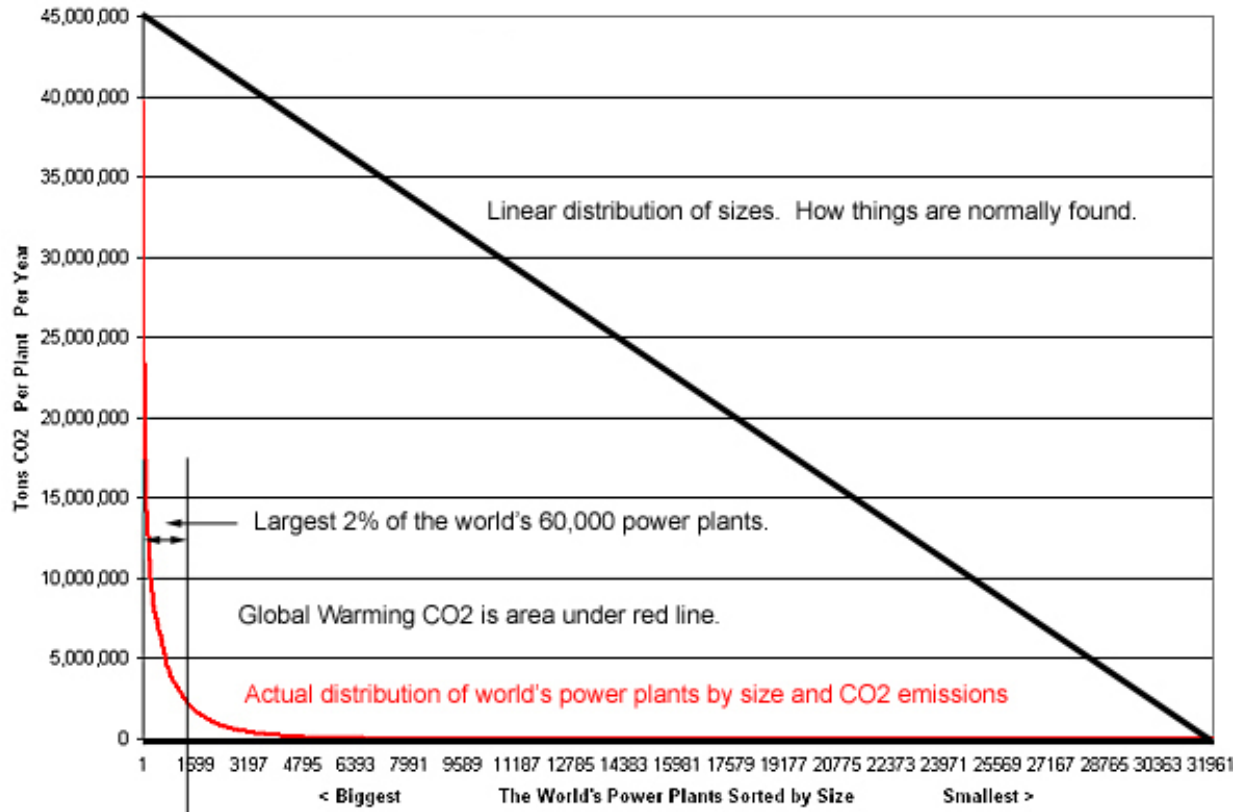
The Excel plot of the world's largest 32,000 power plants [[Excel can only plot 32,000 data entries at a time](#)] is at right with the red line being power plants sorted by annual CO2 emissions. The author expected a normal CO2 emission distribution - values clustered toward the black line instead of the red line being crammed against the x and y axes.

Instead, the the world's power plant population (plot right) is an extreme example of the Pareto statistical principle

(Teaching example: 20% of the population own 80% of the land.) (More:) http://en.wikipedia.org/wiki/Pareto_principle

This is extreme beyond even normal distributions that include a few giants. In oil, for example, out of the world's 500 major oil fields, the top 20 fields (4%) produce only 25% of the world's total.

Of these power plants, The CARMA database indicated that 1,200 power plant sites are emitting about 3/4 of coal's Global Warming CO2. A power plant typically has 4 generating units with the largest having perhaps 8 units. This means less than 10,000 generating units are causing about 3/4 of coal's CO2.



Looking at CARMA's data in more detail we find that only about half of the 150,000 generating units are emitting carbon dioxide. The other half are small hydro and wind generators which tend to be small, 1 megaWatt or so, and produce no Global Warming CO2, while a few of the CO2 emitters tend to be extremely large coal burners, some as large as 750 megaWatts. In fact, just the world's 50 largest power plants make almost 10% of coal's Global Warming CO2.

Knowing that the IPCC AR4 report attributed 11.7 billion short tons of CO2 to coal, and that CARMA attributed 11.4 billion short tons of CO2 to the world's 60,000 power plants, (most fossil fuel power plants burn coal), a check was made on how many power plants contributed 75% (8.6 billion short tons) of coal's 11.4 billion short tons of CO2.

That surprisingly small number was close to 1,200 or just 2% of the world's entire 65,000 power plant population. About half of the power plant population are tiny diesels or zero CO2 emitting hydro or wind farms - insignificant or zero CO2 sources.

Since IPCC AR4 states that 2007 Global Warming CO2 was 13.2 billion short tons, the top 1,200 emitters, according to CARMA, produced 8.6 billion short tons of CO2, or **slightly over 3/4 of coal's Global Warming CO2.**

Sizing up supersized coal burning power plants

The world began to move toward a Global Warming-free future when the world began to build supersized [nuclear electricity power plants](#). Tragically, anti-nuclear environmentalist organizations such as Sierra Club persuaded the world to build *supersized coal-burning power plants instead*. Supersized coal-burning power plants, now producing 3/4 of coal's CO2 in our air, led to much greater production of Global Warming CO2 than was necessary, exacerbating the Climate Change emergency now overwhelming us.

Just as these power plants supersized Global Warming, repowering them with next-generation nuclear boilers will supersize our

impact on Global Warming. Replacing a coal burning boiler with a nuclear boiler stops coal burning immediately - at 10% to 20% the cost and time of building new.

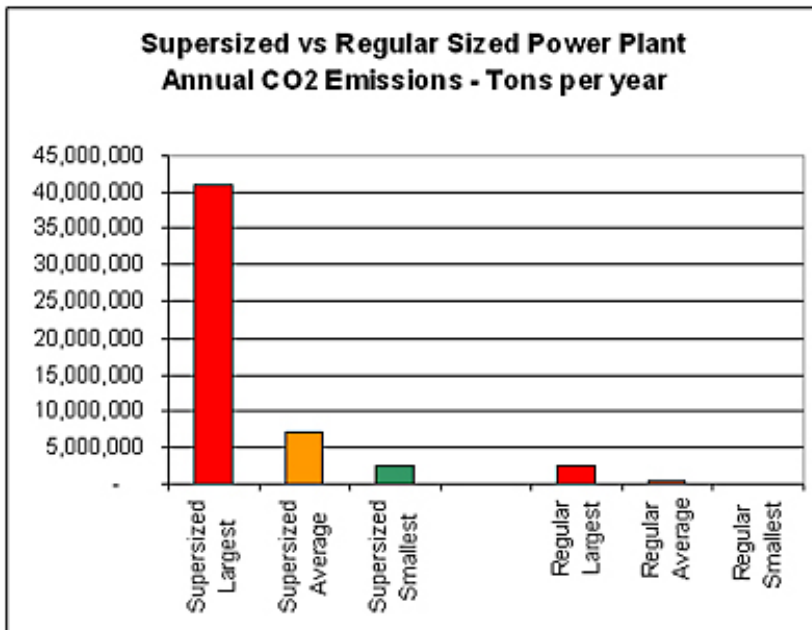
16 Times Larger: Describing the 1,200 Supersize Power Plants by their CO2 Emissions.

(Right) **The 1,200 supersized power plants compared with regular sized power plants.** 2% of the world's [65,000](#) power plants are making over 3/4 of coal's Global Warming.

	Largest	
Average		Smallest
Supersize power plant CO2:	41,000,000 tons,	7,200,000 tons,
	2,600,000 tons,	25,000 tons.
Regular Size power plant CO2:	2,600,000 tons,	440,000 tons,
	25,000 tons.	

The average supersized coal burning power plant produces 7.2 million tons of CO2 per year.

The average regular sized coal burning power plant produces 440 thousand tons of CO2 per year.

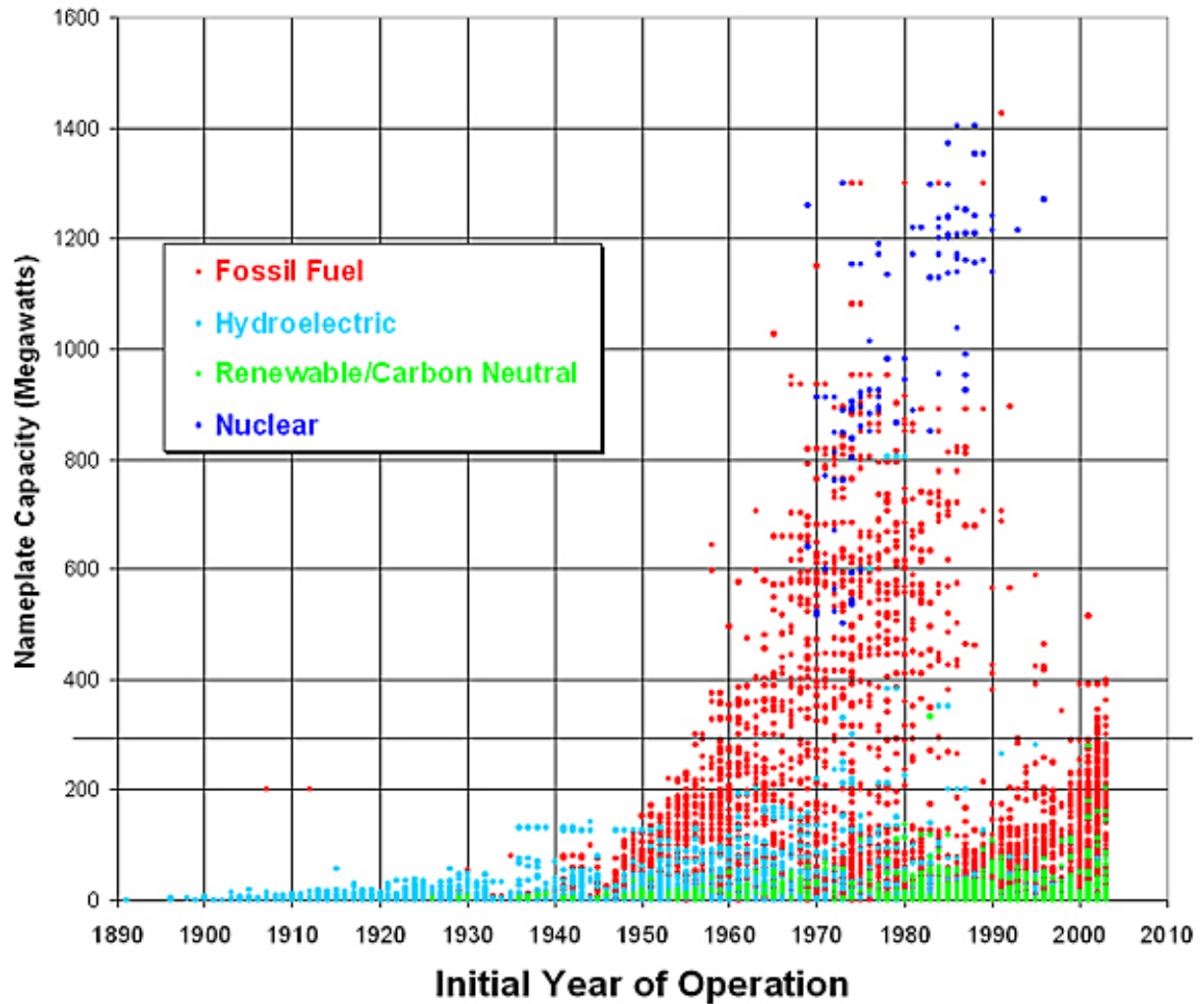


The average supersized is 16 times larger than the average regular sized power plant.

Cost to nuke isn't much larger for a supersized power plant than a regular sized plant.

A Supersized Power Plant Unit's Relative Electrical (megaWatt) Size.

Electricity Generators by Primary Fuel Type



The Energy Information Agency of the United States Department of Energy maintains a wealth of on-line databases. (Below Right) United States electricity generators powered by all forms of energy - color-coded to break them out by general fuel types.

EIA historical data on about 18,000 U.S. generators to 1/10 megaWatt resolution. 1 megaWatt is about 1,340 horsepower. <http://www.eia.doe.gov/cneaf/electricity/page/capacity/existingunits2003.xls>

The red dots were drawn first, then light green, then light blue, and then finally dark blue. There are thousands of red dots hidden under the green and light blue dots at the diagram's bottom.

A power plant typically has four generating units. This scattergram shows the sizes of all United States individual generating units installed since 1890. Later units installed outside the United States will cluster toward larger.

They thin out noticeably above 300 megawatts so the author arbitrarily decided that individual units larger than this size would be considered "supersized" units. All nuclears fall into this category. Note line at 300 MegaWatts electric.



Taichung, Taiwan, supersized coal power plant. The world's top Global Warming CO2 producer.

Checking out the largest supersized CO2 emitter in CARMA's database, [Taichung](#), turned up an 8-unit plant with four 500 MegaWatt

electrical and four 550 MWe boilers. Taichung is a supersized power plant with eight supersized boilers.

Conclusion: Based on the scatter plot above, if we are to mass-produce only one size nuclear boiler to keep the cost low, the 880 MWe BN-800 nuclear boiler is none too big. Oversize can be limited to the basic tub. Different sized right-sized steam generators, pumps, etc., shouldn't run the cost up.

Part 2:

Where the supersized coal power plants got their start

The first time we tried going nuclear

Oops, the antinuclear environmentalists supersized Global Warming

How the antinuclear environmentalists just made things worse when they opposed nuclear in the '70's and '80's.

Global Warming became much worse because we lost the courage to stick to President Eisenhower's 1953 "[Atoms for Peace](#)" advice that "we should convert from coal electricity to nuclear electricity" after the [Three Mile Island accident](#) happened 26 years later in 1979.

After World War II, the economic rivalry of the "Cold War" between Capitalism and Communism meant nearly every country in the world was industrializing rapidly to grow their economies. Industrializing meant they needed *abundant cheap electrical energy* to power their industries and commerce, so the motive then was to build nuclear powered electricity plants to produce "**Electricity Too Cheap to Meter.**" Naive sounding today, but a far wiser goal than we realized at the time.

Then came Three Mile Island in 1979 and Chernobyl in 1986. Neither were major disasters like earthquakes, tsunamis, or even airplane crashes, but nuclear energy was still largely a mystery to the average person back then and the public recoiled in fear of the unknown - spooked by outrageous scary lies told them by the antinuclear environmentalists.

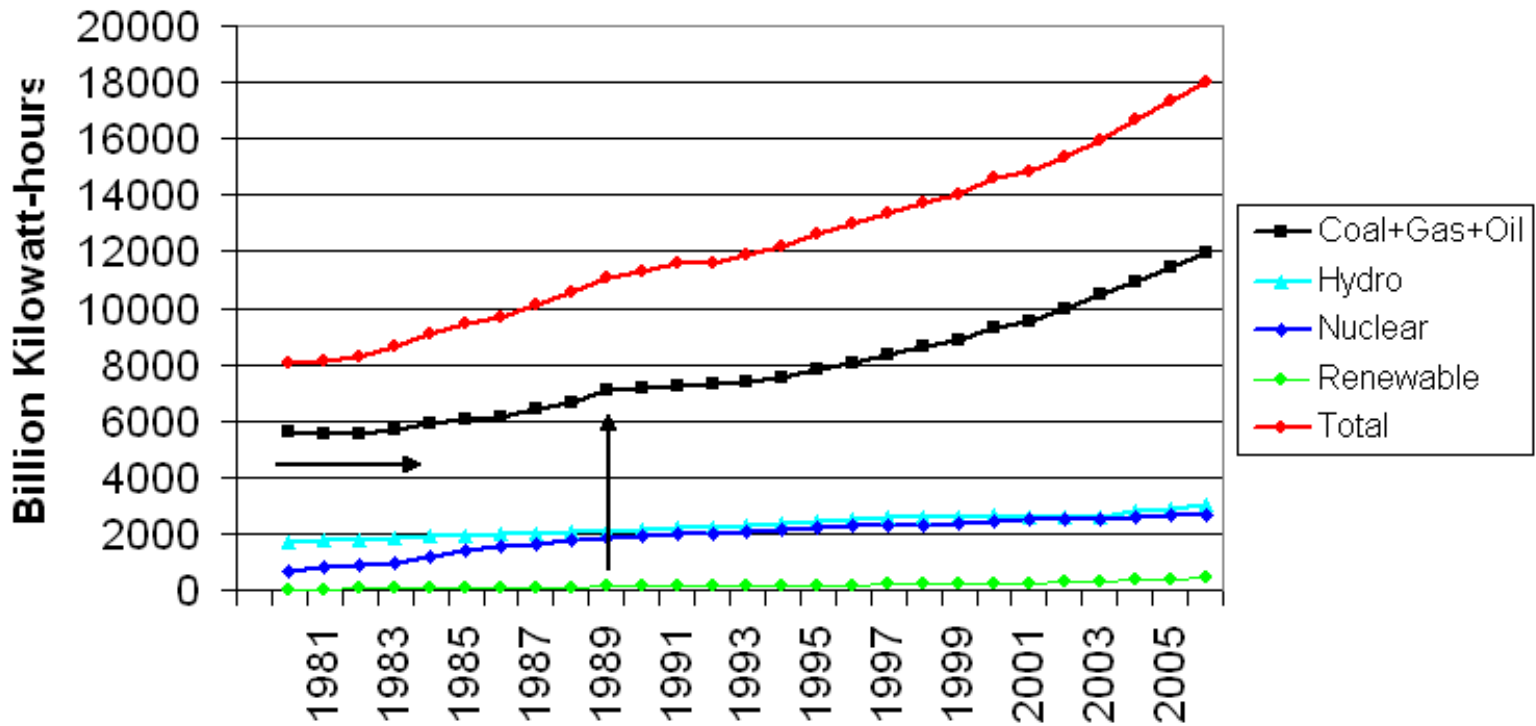
1953: [Atoms for Peace](#). In 1953, President Eisenhower addressed the United Nations proposing his "[Atoms for Peace.pdf](#)" idea for, among other things, worldwide production of nuclear electricity.



We didn't know it then, but "Atoms for Peace" was the world's only chance to avoid Global Warming.

When Global Warming's growth was stopped for a few years.

World Net Electricity Generation



(Data: U.S. EIA <http://www.eia.doe.gov/iea/elec.html>)

1980: Black line traces Global Warming's growth path. In the early 1980s, many new nuclear power plants were coming on line. Coal burning power plants were not being built and the Global Warming they were making was not increasing. Note horizontal arrow showing when Global Warming's growth was stopped..

Three Mile Island in 1979, followed by a more serious accident at Chernobyl in 1986, made it very easy for the antinuclear environmentalists - such as GreenPeace and Sierra Club - to persuade everyone to stop building nuclear power plants and resume building coal burning power plants. [About Supersized Boilers](#)

1989: New nuclear power plant construction ended. (Notice dark blue line going flat.) The fossil fuels - mostly coal - were back in the driver's seat again, many of the new coal, natural gas and oil burning power plants, mimicking nuclear's rapid growth in power output, were much larger than before - becoming true *boilers from hell* - supersized units, along with more boiler units per power plant, producing far more Global Warming. **This is what put Global Warming permanently into high gear.** Note the vertical arrow in the above graph pointing out the additional coal electricity - and, by implication, the surge of Global Warming's CO₂ that fossil fuel's return brought.

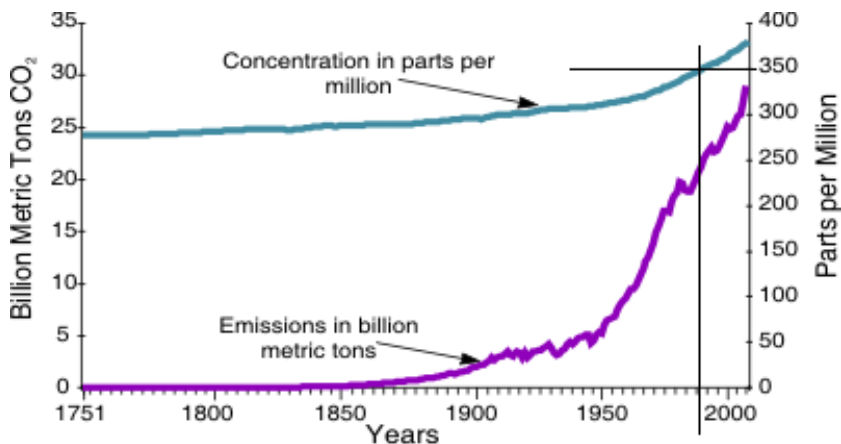
2009: Global Warming is now becoming much worse much faster. Few seem to understand that what the world is doing now - building windmills and hoping something good will happen - amounts to environmental cargo-culting. This is not fixing the power plant mess the antinuclear environmentalists led us to build.

We now know nuclear is can be safe, coal is always dangerous, and we have to end Global Warming pronto. ***To end Global Warming mankind has to go back and convert all those big power plant boilers from fossil to nuclear.*** Building some windmills and hoping for the best isn't ever going to end Global Warming. Everyone understands that also.

A hundred books and movies could be written about how the antinuclear environmentalists sucked the world into making Global Warming much worse.

The author would like to think this data could be interpreted in some different way.

Notice that the time of victory for the antinuclear environmentalists - the 1980's - coincides with the "350" parts per million CO₂ levels today's environmentalists say we must return to. Ironic, isn't it? Notice also emissions had actually begun to fall as nuclear was beginning to come on line just before the antinuclear environmentalists prevailed? A global recession?



Source: Oak Ridge National Laboratory, Carbon Dioxide Information Analysis Center.

As far as the author knows, no one else in the world is writing about how to *replace* the fossil fuel burning boilers that cause over 70% of all Global Warming. No government, no environmental organization, no nuclear organization, no school of engineering. **Only this web site.**

Three Mile Island's unfounded, but paralyzing, nuclear fears remain to this day, causing us to ignore the fact that whatever the problems of nuclear, they are nothing compared to Climate Change.

Unlike the constant institutional advertising (happy talk) by the coal, natural gas, and oil industries, there has been virtually no effort over the years on the part of the nuclear industry to set the record straight. This has given the public the clear, deep, and lasting impression that nuclear is, in fact, sinister.

Nuclear industry's "Cowardly Lion" behavior has left the entire world unimpressed and more than a little disappointed.

Are Environmentalists To Blame For Global Warming?



"Had the United States gone on with its nuclear power plant building program after Three Mile Island, it's likely there would be no climate change crisis today." - Dr. James Lovelock, (World's top environmental advocate, author of the GAIA theory.) [His papers](#)

Exceptionally eminent figures in the environmental movement such as James Lovelock have long since recognized that, whatever the challenges of nuclear power, they are as nothing compared to those of global warming.

Reasoning anything nuclear must be bad, combined with strong antinuclear funding support from the public and their very understandable fear and loathing of nuclear war, environmentalist organizations such as the Sierra Club made a mistake by throwing their support behind the antinuclear advocates in the 1960s.

By helping to prevent the general evolution from coal electricity to nuclear electricity under Eisenhower's "Atoms for Peace" program, environmentalists inadvertently helped to bring about Global Warming.

Between 1960 and 2005, world coal burning quadrupled as electricity use quadrupled.

By about 1995, climatologists identified dirty electricity from coal-burning power plants as being the cause of 2/3 of the *accumulating* CO₂ problem.

Real antinuclear advocates will continue doing all they can to oppose nuclear technology in any form except when they personally need nuclear medicine.

Environmental opposition to nuclear electricity has become the biggest single barrier to ending the Global Warming CO2 crisis.

Environmentalists must now decide whether the environment or their continued opposition to clean nuclear electricity is most important to them.
