



Association of Energy Engineers New York Chapter

May 2004 Newsletter

[Contact information at the end of this document]

May Meeting Announcement

Topic: Renewable Energy Portfolios, Green Tags & Trading

Speakers: John Siciliani, New Wind Energy, a project of Community Energy, Inc.
Peter Fusaro, Managing Director of Green Trading and Chairman, Global Change Associates.

Where: Cornell Cooperative Extension
16 East 34th Street, 8th floor

When: Tuesday, May 18th, 5:30 p.m. - 8:00 p.m.
Sandwiches, soda, networking 5:30-6:00

Reminder: \$15 for chapter members, \$20 for non-members

Join us for a presentation and involved discussion of new developments in renewable energy portfolios, green tags and trading.

2003-4 AEE-NY Advance Planning Calendar

June 24 Annual June Gala & Awards Dinner Keynote Speaker:
(Thursday) **Look for more details & RSVP Form coming soon!** Richard Costello
AEE-NY is pleased to present this year's program in cooperation with the
Environmental Business Association of New York and the EBA Energy Task Force

April Meeting Report

Configuring Photovoltaic Systems on the edge of a Con Ed World

By Peter Mellman

With recent increase in green and sustainable design around the City, April's chapter meeting looked at experiences in implementing non-residential PV systems in New York. We held our meeting in one of them, the Stuyvesant Cove Learning Center on 23rd Street at the East River. The center itself, is a small solar powered classroom, developed by the Community Environmental Center (CEC). John Cramer and Richard Leigh of CEC graciously hosted us and spoke about the project's background, engineering and interconnection issues. Colin Cathcart, of Kiss & Cathcart Architects, the project's designer, provided his perspective on being "off-grid" in the midst of our dense urban environment, as did Anthony Pereira of AltPower on an array of current solar and wind projects around the City.

The Center was built in partnership between CEC and the City of New York as part of a contract to maintain the new Stuyvesant Cove Park. The present building is considered temporary – a recycled structure preceding the permanent building that is now in design, with a net-zero energy goal. Even though temporary, the present building set out to make its point, originally standing alone from the grid powered by a nominal 3kW photovoltaic array on its roof, with summer-shaded south-glazing and super-insulated steel panel north wall.

Originally, the building’s planners had intended to close the building for the winter months and thought that ventilation with minimal air-conditioning at the riverside location would suffice for cooling. Subsequent modeling suggested this might not be the case, requiring installation of cooling that the PV array could not support, even with its battery storage.

Richard Leigh, PE discussed the three options faced for supporting the building’s heating and 3 ton cooling loads: (1) limit the building’s use or risk discomfort under peak conditions (2) preserve “stand-alone” status by bringing in fossil fuel supply for either a generator or direct-fired heating and cooling or (3) connect to the grid to support a small conventional split system. The designers decided that grid connection was the most realistic solution, but created another dilemma: If the full building was interconnected, it would send excess PV power back to the grid, unacceptable to Con Ed without an extensive application and review process. The solution was to provide isolated circuits for just the split-unit heating and cooling, supplied by a new Con Ed feeder.

Based on discussion at this and our previous chapter meeting, it seems that given adequate time for engineering review under the full application process, Con Ed probably would accept the small amount of PV power back into the grid at this location. Their consideration is purely case-by-case. But a significant economic element in the PV design is at stake – if the grid is available to accept excess power, especially if a net metering arrangement is allowed, then the expensive battery array can be eliminated from the design.

Discussion ensued about Con Ed’s system, procedures and intentions and then we viewed Anthony Pereira’s slides of solar and wind projects being planned or already underway around the city. A constant issue in such projects is how to place them appropriately in an urban environment. The Holocaust Museum in Battery Park City may be, as Anthony put it, the most perfect solar site the City will ever have and its new PV system is almost operational. But with space generally so limited and shading so prevalent, generating enough power to overcome the inevitable economies of scale issue is always an issue.

Whether it makes sense to build these projects on site or, instead, to buy green power or green power certificates from sources outside the city, leads us to the topic of our May meeting. We hope to see you there.

Announcement:

Association of Energy Engineers, New York Chapter
American Planning Association, Sustainable Energy Initiative, New York City Metro Chapter,
Environmental Business Association of New York State, Inc., Energy Task Force

Join us for our ongoing series in New York City:

ENERGY IN THE 21ST CENTURY

Energy 101

Visualizing Macro-scale Energy Flows and What They Can Tell Us

Tuesday June 8, 2004 5:30pm – 7:30pm

3 West Club, 3 W. 51st St., New York, NY 10019

Guest Speaker: Michael Bobker, MSc., CEM, Association for Energy Affordability

Summary of Presentation

Mr. Bobker will provide an overview perspective on large-scale energy systems – how energy flows through regional and national systems can be characterized diagrammatically. Visualized in this way underlying

thermodynamic principles are revealed. Mr. Bobker will discuss some of the implications for planning and practice that emerge from these observations.

Affiliates: University Transportation Research Center, Metropolitan Waterfront Alliance

From:

John Nettleton, Vice President, Association of Energy Engineers New York Chapter

Gerry Bogacz, American Planning Association, Sustainable Energy Initiative Coordinator

Scott Smith, Chair, Energy Task Force, Environmental Business Association of New York State, Inc.

Corporate Sponsor Program

The New York Chapter of the Association of Energy Engineers (NY-AEE) invites companies to participate in our Corporate Sponsor Program, which offers opportunities for its corporate sponsors to become active players in promoting the Association's goals of energy and environmental conservation and cost savings.

We invite corporate involvement in the future of our Chapter, one of the largest among thirty-six state chapters of the Association of Energy Engineers, the world's leading society of energy and environmental professionals.

Chapter membership numbers approximately 500 throughout New York State and represents some of the nation's top energy and environmental experts and leaders.

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Energy 2004

(as announced on the Web site of Rebuild America)

8/8/ to 8/11/2004, Rochester, NY

If you work in the energy, environmental or transportation fields, this workshop is for you! You'll learn about the latest strategies and products for saving energy in buildings, and you'll network with your peers at the country's top gathering of building energy professionals. Come to Energy 2004 to establish or improve your energy management program and learn how to save energy in your facilities, procure renewable and energy-efficient products and services, utilize water-saving technologies, incorporate sustainable design concepts, take an environmentally conscientious approach to energy management and improve your organization's transportation systems.

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Web site: www.energy2004.ee.doe.gov.

As Energy Thieves Turn Crafty, Utility Turns Up Battle of Wits

By Ian Urbina, *The New York Times*, May 5, 2004

JILTED LOVERS, disgruntled former employees, prying neighbors — Charles A. Mormilo takes the anonymous tips where he can. But in his tireless pursuit of those stealing from the giant New York utility Consolidated Edison, Mr. Mormilo, its top inspector, is up against a city that prides itself on its scrappy ingenuity.

There was the cost-cutting landlord from the Bronx who dug a trench — 130 feet long and 3 feet deep — from his building to the street. Drilling a hole in the side of a gas main, he tried to connect his own pipe, but failed to make a proper seal and caused a near disastrous gas leak that went undiscovered for days.

There was the Brooklyn pizzeria with a 10-foot fake wall in its dining room to conceal its pirated wires. By tapping into the electricity before it reached the meter, the restaurateur powered air conditioning, appliances and several ovens without paying.

Then there are your everyday superintendents (*sic!*) who wire communal laundry machines and hallway lights to the meters of tenants they dislike. Or the contractors who run entire remodeling projects, including power tools and scaffolding lighting, with electricity drawn from nearby lamp poles.

"This is a creative city," said Mr. Mormilo, seated in his office, a square room decorated with only a wooden desk, a file cabinet and a laptop computer at Con Edison's Revenue Protection Department in Astoria, Queens. "The work keeps you on your feet."

After 32 years on the job, Mr. Mormilo is unaccustomed to giving outsiders a peek into this relatively unknown realm of larceny. And while many New Yorkers might privately applaud stealing from Con Ed, which ranks alongside the I.R.S. among the easily demonized entities burdening the average citizen, the cost of such theft is huge, and it is other customers who pay. Energy theft has increased sharply over the last five years, with estimated annual losses across the country rising to about \$30 billion from \$20 billion, said Kurt Roussell, the chairman of the International Utilities Revenue Protection Association, an industry research group.

For those caught, Con Ed can extract back bills, large fines and, in extreme cases, press felony charges. And there is no shortage of extreme cases.

After an electrician altered the wires for a large clothing store in Manhattan so that its meter would register only 40 percent of the total electricity use, the store saved more than \$600,000 over several years. Then it was caught.

More often, though, it is nickel-and-dime savings that people are after. And in this case, doctoring the meter is the tactic of choice. Removing the glass casing, customers rotate the disc backward hoping to falsify the amount of electricity used. Others drill through the glass front of the meter and insert a toothpick to slow the swirling disc. Then they cover up the hole with the label that warns against tampering with the meter.

"These days a lot of people seem to be opening accounts in their dogs' names," Mr. Mormilo said, referring to the popularity of identity fraud. People get a standard lease at an office supply store and submit it to the utility as proof of residence. They enter a false name for the tenant — perhaps their dog's — and for the purposes of verifying the information, they provide their own phone number on the application.

"After running up the tab, they say the tenant left and try to open an account in their cat's name," Mr. Mormilo said.

The fraction of electricity stolen in the United States once hovered around 1 percent, said Mr. Rousell of the industry research group, but in recent years it has been closer to 2 percent. While the percentage change may seem small, it adds up billions of dollars.

But Con Ed, at least according to Mr. Mormilo, has been able to contain its losses to a great degree.

"New Yorkers are stealthy," Mr. Mormilo said. "But my inspectors are New Yorkers, too."

For nearly a decade the utility's annual losses from pilfering have remained around \$7 million to \$8 million. Mr. Mormilo credits his team of 35 inspectors, who last year caught more than 4,000 culprits in the five boroughs and Westchester County.

Technology also helps. The utility uses a computer program that flags sudden drops in use of electricity or gas. To monitor new methods of stealing, inspectors post queries on the Internet asking how to get around the meter. Mostly, the utility's tip hot line receives calls from people annoyed by filching neighbors or bragging bosses.

"Customers know that the theft comes directly out of their pockets," Mr. Mormilo said, "so they take the matter personally."

Theft between customers, though, can be an especially thorny problem.

When Ametria Hutchinson, 42, moved into an apartment in New Rochelle in December 1999, the landlord warned that her electrical meter covered the adjacent dwelling as well as her own. She signed the lease anyway, she said, because the landlord agreed to let her brother move in next door.

"My brother and I were simply going to split the electrical costs between the two apartments," she said. But when the landlord reneged and allowed a family of five to move in next door, Ms. Hutchinson said, her bills skyrocketed.

"I was paying almost \$300 a month while the people next door were running several space heaters on my account," she said. Under state law, Ms. Hutchinson had the right to ask the utility to intervene. When the utility inspectors arrived, they found that the next-door neighbors were not the only other drains on the bill. Indeed, the costs for the hallway lights and other sections of the two-story building were being registered on the same meter, she said.

Customers also try to siphon off electricity from the city by tapping into lamp poles — a method that is difficult to catch because it is hit and run. "Vendors are usually done powering their carts long before we get wind of it," Mr. Mormilo said.

For Blair Sorrel, a community safety advocate who lives on the Upper West Side, stopping this form of piracy has been a personal calling for several years. She spends weekends posting fliers around Manhattan warning against the hazards of tampering with city wires. An avid pet lover, Ms. Sorrel said she grew concerned about how many dogs in her neighborhood were sticking their noses among the live wires at the open bases of city lamp poles.

"It's no wonder that so many of these poles were recently found with stray voltage," she said, referring to citywide inspections conducted by Con Ed in February that revealed more than a hundred light poles with errant electricity running through them.

Given the potential penalties involved for energy theft, Mr. Mormilo said, "It just doesn't make sense for people to do this."

The Bronx landlord who drilled into the nearby gas main paid \$18,000 in repair fees, Mr. Mormilo said, and the Brooklyn pizzeria with the concealed wires paid \$80,000 in back bills.

But the legality of taking electricity without permission is not always clear. Matthew Lee, a lawyer with the Homesteaders Inner City Press, a Bronx community group, cited a fight that occurred in 1992 between Con Ed and a group of squatters in the Bronx.

After taking over an abandoned building at 1724 Crotona Park East, and fixing it up, squatters applied to the utility to have electricity turned on again. The utility refused, requiring that the squatters prove legal residency. So the group sent its own electrician into the adjacent manhole to do the work.

A fierce game of one-upmanship ensued. The electrician turned on the electricity. Con Ed turned it back off. The utility sealed the manhole. The group pried it open with a crow bar. The utility filled the manhole with sand. The squatters shoveled it out. Finally, Con Ed poured wet concrete into the hole, and the group began looking for another option.

They learned that under the state's Home Energy Fair Practices Act, Con Ed had to provide electrical service to the building as long as the original work on the wires was done by a licensed electrician and the applicant did not owe any back bills to the utility, Mr. Lee said. The lights were back on within the week. "It's not often that you can beat the utility," he added. "But in this instance, we did — and with the law on our side."

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A Question Still Unanswered: How Did the Blackout Happen?

By Matthew L. Wald, *The New York Times*, May 10, 2004

AS THE ELECTRIC GRID approaches its season of peak strain, engineers say they still cannot answer the central question of how a power failure in Ohio on Aug. 14, 2003, became the biggest blackout in North American history.

Investigators, including officials from the United States and Canada, say that the eastern power grid - the vast complex of generators, substations and transmission lines through which the power failure spread last August - has become so large, complicated and heavily loaded in the last two decades that it is difficult to determine how a single problem can expand into an immense failure.

A report issued by the Energy Department on April 5 put forward extensive recommendations for reducing the likelihood of isolated problems, like the failure of transmission lines in Ohio last August. But the report stopped short of speculating how a local problem cascaded into a catastrophe that spread from northeastern Ohio through Michigan, Ontario and New York and into parts of Connecticut and New Jersey.

Investigators did identify how local failures could become larger difficulties in a way that had not been previously known: protective devices called relays could be tricked into shutting down power lines if they sensed short-circuits that did not actually exist. But the report only hinted at solutions.

The report has drawn mixed reactions from electricity experts. While some said it was thorough and balanced, others said that it reflected a bias by its overseer, the Federal Energy Regulatory Commission, to de-emphasize ways that deregulation of the electric market might have affected the system's reliability and vulnerability.

Robert Blohm, an electricity consultant who first questioned some of the report's calculations, said in an e-mail message: "We've charged ahead with long distance markets in electricity without realizing/understanding the reliability effects which this blackout brought home."

People involved in preparing the report acknowledged that it focused on the origins of the blackout and did not fully explain how it spread. One specialist, Gerry Cauley, the director of standards at the North American Electric Reliability Council, an industry group founded after a widespread blackout in the Northeast in 1965, said it made sense to promptly address the events that started the blackout because they were easily preventable. The events in Ohio were "so egregious that they just should have never happened," he said.

Alison Silverstein, senior energy policy adviser to the regulatory commission, who drafted much of the report, said in an interview: "Reliability is about taking care of the basics every single day. That's what all of those prior blackouts told us. That's what this blackout told us."

Investigators concluded that power lines initially failed in the blackout because they came into contact with tree branches. The inquiry also found that an Ohio utility and a regional power control agency did not have the computer tools to spot failures as they occurred and make compensating adjustments. Focusing on the origins of last year's blackout was easier than looking in detail at how it spread, experts said. Mr. Cauley said that lines, substations and generating stations fell in such profusion that plotting just two or three seconds of events takes weeks of work. He says he hopes to finish a detailed analysis by the first anniversary of the blackout.

The report discusses several hypotheses about the spread of the disturbance, including relays confusing huge power flows with short-circuits and reacting by shutting down lines. Installation of relays that can tell the difference is probably years away, experts said.

A broader question is whether the power failure would have been less extensive if the system had been set up to tolerate more disruptions. "Maybe the Midwest would not have gone down," said Jack Casazza, a transmission expert and consultant. Conversely, he said, had the relays not tripped, it is also possible that the blackout might have spread further. "Maybe the whole darn East Coast would have gone down. I think it's important to know the difference."

The report cautions that "simulation of these events is so complex that it may be impossible to ever completely prove" theories about the events. Such a thorough analysis was "not a job we could do in the time we had available," said David Meyer, senior adviser to the Office of Electric Transmission and Distribution in the Department of Energy.

The report notes that some companies on the grid failed to submit complete data and that some utilities, asked to say when and why various components of the electric system shut down, did not fully respond. The report's focus on initial failures in the blackout contrasts with similar studies of earlier power failures. In 1978, discussing blackouts in 1965 and 1977, the regulatory commission said that it was "not possible to prevent an occasional localized power failure." The trick, the investigators said then, was to prevent them from spreading. Ms. Silverstein said that the 1977 blackout was less than a tenth the size of the 2003 blackout, and easier to diagnose.

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Chernobyl in 2004

April 26, 2004 was the 18th anniversary of the Chernobyl catastrophe.

A short review of Chernobyl's fallout pattern shows how irresponsible the reporting has become.

AP, May 15, 1986: "Airborne radioactivity from the Chernobyl nuclear accident is now so widespread that it is likely to fall to the ground wherever it rains in the United States, the EPA said."

AP, May 14, 1986: "An invisible cloud of radioactivity spewed over the Soviet Union and Europe, and has worked its way gradually around the world."

AP, May 15, 1986: "State authorities in Oregon have warned residents dependent solely on rainwater for drinking that they should arrange other supplies for the time being."

Star Tribune, May 17, 1986: "Since radiation from the Chernobyl nuclear accident began floating over Minnesota last week, low levels of radiation have been discovered in . . . the raw milk from a Minnesota dairy."

AP, April 4, 1996: "Plutonium and other dangerous particles released in the accident . . . have now found their way to Ukraine's major waterways . . . 'We have billions of tons of radiated earth that can't be dumped anywhere, and which will pour plutonium, cesium and strontium into Europe for decades,' the chief consultant to the Ukrainian Parliament's Chernobyl commission said."

The Bulletin of the Atomic Scientists, May 1996: "radiation contamination was detectable over the entire Northern Hemisphere."

The pro-nuclear Time magazine reported in 1989 that perhaps "one billion or more" curies were released, rather than the 50 to 80 million estimated by Russian authorities.⁵ One curie is the amount of radiation equal to the disintegration of 37 billion atoms $\frac{3}{4}$ 37 billion becquerels per second. It is a very large amount of radiation.

The U.S. government's Argonne Nat. Lab has said that 30 percent of the reactor's total radioactivity 3 billion of an estimated 9 billion curies was released.⁶ And scientists at the U.S. Lawrence Livermore Nat. Lab suggested that one-half of the core's radioactivity was spewed $\frac{3}{4}$ 4.5 billion curies, according the World Information Service on Energy, quoting *Science*, 6-13-86.

Vladimir Chernousenko, the chief scientific supervisor of the "clean up" team responsible for a 10-kilometer zone around the exploded reactor, says that 80 percent of the reactor's radioactivity escaped, something like seven billion curies. At the Union of Concerned Scientists, senior energy analyst Kennedy Maize, concluded that "the core vaporized" all 190 tons of fuel, and all 9 billion curies.

Former Chair of the U.S. Nuclear Regulatory Commission, Joseph Hendrie, concluded likewise, saying "They have dumped the full inventory of volatile fission products from a large power reactor into the environment. You can't do any worse than that."

"After all, the IAEA is in the business of promoting nuclear energy, not discouraging it. For 10 years the agency has attempted to downplay the consequences of the accident," wrote Alexander R. Sich in a cover story for the *Bulletin of Atomic Scientists* [see <http://www.thebulletin.org>].

The IAEA, still downplaying in 1995, said any increase in cancer caused by Chernobyl would be "undetectable."

Nineteen months after the disaster, in Nov. 1987, the U.S. government officially doubled its estimate of the "background" radiation to which we are exposed every year.

Chernobyl at Ten: Half-lives and Half Truths

By John M. LaForgeã

[John M. LaForge is codirector of Nukewatch, a peace group based in Wisconsin, and editor of its quarterly newsletter, the *Pathfinder*.]

WITH A HEAVY DOSE OF HALF-TRUTH, the commercial press worked over-time to reduce the results of the Chernobyl catastrophe to a "nervous disorder" confined to the C.I.S. and Europe. Understated reports on the 10th anniversary of the world-wide radiation disaster help the nuclear reactor industry hold on against overwhelming opposition, in spite of what should have been the final insult from nuclear power.

The latest psychological "clean up" often went like this. Peter Crane, a lawyer at the U. S. Nuclear Regulatory Commission (NRC), said that "...the explosion... sent a radioactive cloud into the atmosphere of Eastern Europe." (1) This is a true statement. It merely neglects to mention the rest of planet Earth.

Reporter Michael Specter wrote that, "The fire which burned out of control for five days, spewed more than 50 tons of radioactive fallout across Belarus, Ukraine and Western Russia." (2) This loaded sentence is also literally true. The fact that the fire burned uncontrolled for two weeks, after a series of three explosions; that perhaps 190 tons of reactor fuel was catapulted into the atmosphere; or that the radioactive fallout spread world-wide $\frac{3}{4}$ reaching Minnesota's milk for example $\frac{3}{4}$ doesn't make of Mr. Specter a liar, only a miser with the truth.

Associated Press (AP) correspondent Dave Carpenter 's description $\frac{3}{4}$ that "deadly reactor fuel shot into the atmosphere, contaminating some 10,000 square miles and reaching as far as Western Europe" (3) is likewise "correct," but Reuters News Service reported on 28 Nov. 1995 that the contaminated areas include about 61,780 square miles.

Carpenter practiced perfect obfuscation in his dispatch, saying of the reckless nuclearists over

there: "In a big lie, Soviet officials. . . first hushed up the disaster then played down its severity." What is it to understate the sum of irradiated territory by a factor of six? It isn't the pot calling the kettle black; it's the cesium calling the strontium a cancer agent.

Carpenter's AP lullaby was published widely and included the comment that, ". . . those living in the shadow of Chernobyl will be living with its deadly health and environmental legacy for years."

(4)

For years? The word centuries would have been more accurate, if conservative, since radiation's health affects are multi-generational and not limited in time. Indeed, some genetic effects appear to be increasing with each successive generation.

The AP's Angela Charlson went so far as to say the reactor sent "a radioactive cloud across parts of Europe ..." (5) Understatement of the overwhelming facts was practiced as well by the editors of The New York Times, who said on April 21 that the disaster "spewed radiation across much of Europe" (6) and on the anniversary, that "...a plume of toxic gases & dust...spread across the western Soviet Union, Eastern Europe and Scandinavia." (7) Although the contamination of the rest of the world was hinted at as lately as 6 Oct. 1995, when the Times reported that the radiation spread across western Russia "and beyond," this uncomfortable fact is nowadays passé.

The Disaster's in Your Head

While the explosions' long-lived carcinogens $\frac{3}{4}$ primarily cesium, plutonium, strontium and iodine $\frac{3}{4}$ are well known to be deadly for decades and even centuries, Soviet officials, the U. N's International Atomic Energy Agency (IAEA), and U.S. editors have all ridiculed the common sense fear of Chernobyl's radioactive fallout.

The official Soviet paper *Izvestia* said in 1988 that doctors in the Ukraine were, ". . . spending more time on trying to dispel irrational fears than on treating the effects of radiation." (8)

The IAEA which at first refused to conduct a post-Chernobyl health study, claiming that all the accident's effects were confined within Soviet borders (9), dared to say in a 1991 study that Chernobyl's health effects were mainly "psychological." This heavily criticized report didn't even consider the health of the "liquidators," or the evacuees from the 18-mile exclusion zone, 8,000 of whom are now known to have died from radiation related diseases. (10)

The IAEA study failed to mention the lengthy latency period for observed cancer incidence. This cavalier white-wash of the disaster's inevitable results came from a nominal nuclear watchdog, which in fact is only the most prestigious booster of nuclear power. "After all the IAEA is in the business of promoting nuclear energy not discouraging it. For ten years the agency has attempted to downplay the consequences of the accident," wrote Dr. Alexander R. Sich in a cover story for the May/June Bulletin of Atomic Scientists. (11) The IAEA, still sticking in its vacuum, said in 1995 that any increase in cancer caused by Chernobyl would be "undetectable." (11.1)

Editors across the country have embraced the IAEA's dismissive attitude, distracting readers with headlines like, "Area Frozen In Fear," "Citizens Still Suffering Radiation Phobia," and "The Legacy of Chernobyl: Fear is the Deeper Wound." A dread of radiation doesn't appear irrational in view of last year's report that "A second catastrophic explosion at the Chernobyl nuclear plant in Ukraine could happen "at any time," Western scientists have warned." (12)

Reality Officially Forgotten

A short review of Chernobyl's fallout pattern shows how irresponsible the late reporting has become. AP, 15 May 1986: "Airborne radioactivity from the Chernobyl nuclear accident is now so widespread that it is likely to fall to the ground wherever it rains in the United States, the EPA said." AP, 14 May 1986: "An invisible cloud of radioactivity spewed over the Soviet Union and Europe, and has worked its way gradually around the world." AP, 15 May 1986: "State authorities in Oregon have warned residents dependent solely on rainwater for drinking that they should arrange other supplies for the time being." Minneapolis Star Tribune, 17 May 1986: "Since radiation from the Chernobyl nuclear accident began floating over Minnesota last week, low levels of radiation have been discovered in... the raw milk from a Minnesota

dairy." AP, 4 April 1996: "Plutonium and other dangerous particles released in the accident...have now found their way to Ukraine's major waterways. ... 'We have billions of tons of radiated earth that can't be dumped anywhere, and which will pour plutonium, cesium and strontium into Europe for decades,' [the chief consultant to the Ukrainian parliament's Chernobyl commission] said." Bulletin of Atomic Scientists, May 1996, p. 38: "...radiation contamination was detectable over the entire northern hemisphere."

With so much disparity among so many figures, we may never know the true dimensions of Chernobyl's radiation bomb.

Notes:

- (1) NYT, Op-Ed, 5 April 1996.
 - (2) International Herald Tribune, 2 April 1996.
 - (3) Milwaukee Journal-Sentinel, 14 April 1996.
 - (4) Minneapolis Star Tribune, 21 April 1996.
 - (5) St. Paul Pioneer, 27 April 1996.
 - (6) NYT, 21 April 1996, The Week In Review.
 - (7) NYT, 26 April 1996, signed editorial by Philip Taubman
 - (8) Los Angeles Times, 11 Feb. 1988.
 - (9) In These Times, 22 April 1987.
 - (10) AP, 23 April 1992; WISE News Communiqué, (Amsterdam) No. 449, 10 April 1996.
 - (11) Bulletin of Atomic Scientists, May 1996, p.38.
 - (11.1) Bulletin of the Atomic Scientists, May/June 1996, p. 8.
 - (12) The London Observer, 26 March 1995; Milwaukee Journal, 27 March 1995.
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Half Lives and Half Truths: Chernobyl Ten Years On-Part 2:

The 10th anniversary was no party.

"I have seen the beginning of the end of the world," is how Michael Mariotte, editor of *The Nuclear Monitor*, put it after visiting Chernobyl's doomed landscape, everything dead or dying for miles around. "The end of the world begins in Pripyat, Ukraine, a once-thriving city of 45,000. Now it sits crumbling, abandoned, a mute but overwhelming testament to technological arrogance gone amok."¹

Pripyat was the city nearest Chernobyl's Unit 4, the reactor that exploded on April 26, 1986 and burned dangerously until October, spewing tons of cancer-causing isotopes around the world.⁽²⁾

Mr. Mariotte is not known for emotional writing in *The Monitor*, but anyone who can stand to investigate the unfolding human consequences of the world's worst industrial catastrophe can understand his choice of words. *Izvestia* called it "the greatest technological catastrophe in world history."⁽³⁾

Cancers and other disease caused by Chernobyl's radioactive poisons are being recorded thousands of kilometers from the reactor site. The ninety million people who lived in the path of the very worst fallout are learning the hard way that damage done by ionizing radiation is unrelenting, cumulative and irreversible.

In the first part of this article (Spring 1996 Pathfinder) I compared the recent trivialization of Chernobyl's consequences to news accounts that appeared soon after the explosions and fire. For example, while the commercial press now tell us that the disaster "spread radiation across parts of Europe," the fact is that the federal EPA announced in mid-May 1986 that, "Airborne radioactivity from the Chernobyl nuclear accident is now so widespread that it is likely to fall to the ground wherever it rains in the United States."⁽⁴⁾

In this part I look at how much radiation Chernobyl evidently dumped added to the "background," at official skewing of the its inevitable long-term effects, and at recent reports of its human health consequences.

Answers are Blowin' in the Wind

How much radiation was released? What percentage of which isotopes were thrown into the atmosphere. Was it mostly iodine-131? How much of the total was made up of the far more dangerous cesium-137, strontium-90 and plutonium?

Piecing together the truth is a dizzying job of ferreting out bias and vested interest. The pro-nuclear *Time* magazine reported in 1989 that perhaps "one billion or more" curies were released, rather than the 50 to 80 million estimated by Russian authorities. (5) One curie is the amount of radiation equal to the disintegration of 37 billion atoms 37 billion becquerels per second. It is a very large amount of radiation.

The U.S. government's Argonne Nat. Lab has said that 30 percent of the reactor's total radioactivity (3 billion of an estimated 9 billion curies) was released.⁶ And scientists at the U.S. Lawrence Livermore Nat. Lab suggested that one-half of the core's radioactivity was spewed (4.5 billion curies, according the World Information Service on Energy, quoting *Science*, 6-13-86.)

Vladimir Chernousenko, the chief scientific supervisor of the "clean up" team responsible for a 10-kilometer zone around the exploded reactor, says that 80 percent of the reactor's radioactivity escaped, something like seven billion curies. (7) At the Union of Concerned Scientists, senior energy analyst Kennedy Maize, concluded that "the core vaporized" - all 190 tons of fuel, and all 9 billion curies. (8)

Former Chair of the U.S. Nuclear Regulatory Commission, Joseph Hendrie, concluded likewise, saying "They have dumped the full inventory of volatile fission products from a large power reactor into the environment. You can't do any worse than that." (9)

The Russians and the International Atomic Energy Agency (IAEA) claimed in a 1986 report, that 50 million curies of radioactive debris, plus another 50 million curies of rare and inert gasses were discharged. However, the rocketing incidence of cancers, leukemia and other radiation-induced illnesses, leads scientists to suspect that the higher radioactive fallout estimates are likely. Pandemic numbers of thyroid cancers led even the cautious Dr. Alexander Sich, in his Chernobyl cover story for the May 1996 *Bulletin of Atomic Scientists* to conclude that the "higher [radiation] release estimates support the conclusions drawn by medical experts."

Geneticist Valery N. Soyfer, founder of the former Soviet Union's first molecular biology laboratory, analyzed the 1986 report to the IAEA, which has since been condemned as a cover-up. Dr. Soyfer says that if only 100 million curies were vented, then world "background radiation doubled at once." (10) This claim was unsupported by accompanying evidence, but if "background" was doubled by 100 million curies, then it was multiplied 180 times by the release of Chernobyl's "full inventory." Nineteen months after the disaster, in Nov. 1987, the U.S. government officially doubled its estimate of the "background" radiation to which we are exposed every year.(11)

Thyroid Cancers: More, Sooner, Untreatable

Dr. Soyfer further discovered that the Soviets focused on and publicized the fallout's radioactive iodine content, but understated the amounts of other far more dangerous isotopes. While 10 to 15 percent of the fallout was iodine-131, the long-lived radionuclides strontium-90 and cesium-137 made up more than two thirds of the total contamination. (12)

Furthermore, the Soviet's 1986 estimate of future cancer deaths was based only on the impact of iodine-131, and then only on external doses. As a result, the IAEA misled the world about Chernobyl's cancer threat. People contaminated with iodine-131 ingested it, first by breathing, then by drinking contaminated milk for six weeks. Thyroid cancer is caused by the iodine-131. Its rates are today ten times higher than the increase any scientist had anticipated. The U. N. has said that the number of thyroid cancers among children in Belarus - where 70 percent of the fallout landed - are 285 times pre-Chernobyl levels.(13)

The British Medical Journal reported in 1995 that the rate of thyroid cancer in the region north of Chernobyl - Ukraine and Belarus - is 200 times higher than normal, and the (British) Imperial Cancer Research Fund found a 500 percent increase in thyroid cancers among Ukrainian children between 1986 and 1993. (14)

Fear is growing among physicians treating the young radiation victims, because the thyroid cancers are appearing sooner than expected and growing quicker than usual. Dr. Andrei Butenko, at Kiev Hospital No. 1 in Ukraine, says of his patients, "Routine chemotherapy seems to have lost its effectiveness; something has changed in the immune system."(15)

Cesium's Genetic Assault: the 300 Years War

Cesium-137 contamination is probably Chernobyl's most devastating and ominous consequence. The body can't distinguish cesium from potassium, so it's taken up by our cells and becomes an internal source of

radiation. Cesium-137 is a gamma emitter and its half-life of 30 years means that it stays in the soil, to concentrate in the food chain, for over 300 years. While iodine-131 remains radioactive for six weeks, cesium-137 stays in the body for decades, concentrating in muscle where it irradiates muscle cells and nearby organs.¹⁶

Strontium-90 is also long-lived and, because it resembles calcium, is permanently incorporated into bone tissue where it may lead to leukemia.

The Soviet's acknowledged in 1986 that the influence of cesium-137 on cancer death rates would be nine times that of iodine-131. They said that the effects of strontium-90 would "perhaps have, along with cesium-137, the most important meaning."⁽¹⁷⁾

Early Findings Go from Bad to Worse

Exposure to radiation more often results in genetic and reproductive damage than cancer. These hereditary disorders are unlimited in time, since they pass from generation to generation in the sperm and ovum. So, as geneticist Soyfer points out, Chernobyl's enduring biological legacy will be that of inherited diseases, deformities, developmental abnormalities, spontaneous abortions and premature births.

Some recent epidemiological studies confirm the worst of these inevitable effects. The June 25, 1995 *Washington Post* reported that birth defects in the areas most heavily poisoned have doubled since 1986.

In a long page one story, the Aug. 2, 1995 *New York Times* reported that life expectancy has plummeted in Russia, making it the first nation in history to ever experience such a public health status reversal. Male life expectancy is now the lowest in the world (below even India or Bolivia) and, at the same time, infant mortality rose 15 percent in both 1993 and 1994, and there are now epidemic rates of heart disease and cancer. Dr. David Hoel, an epidemiologist at the Medical University of S. Carolina, is studying whether Chernobyl's radiation is a major factor in the spread in cancers and birth defects. "Everyone assumes the connection," he said.

The journal *Nature* has published a study of children born in 1994 to mothers exposed to Chernobyl's fallout in 1986. Researchers studied 79 families 186 miles from Chernobyl and found never-before-observed "germ-line" mutations: changes in DNA of the sperm and ovum. Such mutations are passed on from generation to generation. (18)

Nature has also reported that in Greece, 2,800 kilometers from Chernobyl, where radiation exposures were far lower than in areas close to the reactor, leukemia has been diagnosed at rates 2.6 times the norm in young people who were in the womb when the reactor exploded. The British epidemiologist Dr. Alice Stewart found long ago that only one diagnostic X-ray to the pregnant abdomen increases the risk of leukemia in the offspring by 40 percent.⁽¹⁹⁾ However, the report from Greece is the first to link Chernobyl's wreckage to increased leukemia incidence in children exposed in utero. (20) The report has moved some experts to again warn that the low levels of radiation to which people are exposed every day "could contribute to cancer."

Even the stodgy *New York Times* has reported that "cancers are now believed to be the result of smaller [radiation] doses, and the amount of damage inflicted by a given dose is now believed to be larger."⁽²¹⁾

In a related study, two U.S. geneticists analyzing animals inside Chernobyl's 6-mile radius found that small rodents known as voles "sustain an extraordinary amount of genetic damage." The study found that "the mutation rate in these animals is...probably thousands of times greater than normal." Two findings called "ominous" were, first, that one-third of the mutations that the scientists expected to see were not even detected - probably because they were lethal. "It could be that the animals were never born," said Dr. Robert Becker of Texas Technical Univ. Second, "the vole mutations were cumulative, increasing with each succeeding generation." Both researchers doubted that any species could sustain such a mutation rate indefinitely. (22)

Acceptable Whole-Earth Poisoning

The extent of Chernobyl's radioactive, biological and ecological damage, and the depth its psychological and economic devastation are incalculable.

What everyone does know about nuclear reactors is that they have a record of whole-earth poisoning, and that their potential for more of the same is considered acceptable ³/₄ authorized in advance.

This potential, for unlimited and uncontrollable radiation "accidents," has been deliberately developed, promoted, protected, ignored and then denied, or forgotten.

Sadly, denial and forgetfulness only make another Chernobyl inevitable.

Notes:

- 1 The Nuclear Monitor, newsletter of Nuclear Information Resource Service (NIRS), April 1996.
- 2 St. Louis Post Dispatch (SLPD), 7-23-90.
- 3 SLPD, 4-26-90.
- 4 Associated Press, 5-15-86.
- 5 Time, 11-13-89.
- 6 The Chicago Tribune, 6-22-86.
- 7 "The Truth About Chernobyl," Critical Mass: Voices for a Nuclear-Free Future, Ruggiero and Sahulka, Eds., 1996 by Open Media, p. 127.
- 8 Not Man Apart, the journal of Friends of the Earth, March 1987.
- 9 The Minneapolis Star Tribune, 5-19-86.
- 10 SLPD, 4-24-87.
- 11 The New York Times, 11-20-87.
- 12 SLPD, 4-24-87.
- 13 The New York Times, 11-29-96.
- 14 The Washington Post, 3-25-95.
- 15 Milwaukee Journal-Sentinel, 12-12-94.
- 16 Caldicott, H., Nuclear Madness, 1994, Norton, p. 137.
- 17 SLPD, 4-24-87.
- 18 The New York Times, 4-25-96.
- 19 Caldicott, Ibid., p. 43.
- 20 St. Paul Pioneer, 7-25-96.
- 21 The New York Times, 6-23-96.
- 22 The New York Times, 5-7-96, B6.

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The Pentagon and Climate Change

by The Editors of *Monthly Review*, May 2004

Climate Collapse: The Pentagon's Weather Nightmare

—*Fortune*, February 9, 2004

Now the Pentagon Tells Bush: Climate Change Will Destroy Us

—*Observer* (London), February 22, 2004

Pentagon-Sponsored Climate Report Sparks Hullabaloo in Europe

—*San Francisco Chronicle*, February 25, 2004

The Sky is Falling! Say Hollywood and, Yes, the Pentagon

—*New York Times*, February 29, 2004

ABRUPT CLIMATE CHANGE has been a growing topic of concern for about a decade for climate scientists, who fear that global warming could shut down the ocean conveyor that warms the North Atlantic, plunging Europe and parts of North America into Siberian-like conditions within a few decades or even years. But it was only with the recent appearance of a Pentagon report on the possible social effects—in terms of instability and war—of abrupt climate change that it riveted public attention. As the *Observer* (February 22) put it, “Climate change over the next 20 years could result in global catastrophe costing millions of lives in wars and natural disasters.”

Indeed, widespread public alarm, particularly in Europe, was the predictable response to the Pentagon’s October 2003 report, *An Abrupt Climate Change Scenario and its Implications for United States National Security*, once it became available early this year.¹ In an attempt to quiet these fears Defense Department officials and the authors of the report quickly came forward to say that the entire exercise was speculative and “intentionally extreme”; that the whole thing had been misconstrued and overblown in certain press accounts.

Was this then simply a “hullabaloo” about nothing, as the *San Francisco Chronicle* suggested, or are there dangers associated with global warming that have not been sufficiently appreciated thus far? To answer this question it is necessary to approach the issue in stages, by first addressing global warming, then abrupt climate change and its inherent social dangers, and finally how the present system of production constitutes a barrier to any ready solution.

Global Warming: How Bad Is It?

A natural greenhouse effect is crucial to the earth’s atmosphere. As carbon dioxide, methane, and other greenhouse gases accumulate in the atmosphere they trap heat that would otherwise radiate off into space. This natural greenhouse effect along with proximity to the sun serves to warm the earth making it habitable to diverse species. But now, as a result of enhanced greenhouse gas emissions from human production, most notably the burning of fossil fuels, this same life-supporting greenhouse effect is pushing average global temperatures higher and higher. Carbon dioxide concentration in the atmosphere is now at its highest point in the last 420,000 years and likely in the last 20 million years. Rising sea levels, heat waves, crop failures, worsening floods and droughts, and more extreme weather conditions in general are all to be expected as a result of such increases in average global temperature.

Some of the warming to be experienced in coming decades is already locked-in. Greenhouse gases have atmospheric lifetimes of decades to centuries. Even if societies were to cease fossil fuel use and end all other forms of greenhouse gas emissions today the accumulation of such gases in the atmosphere would likely generate further warming on the order of 0.5EC (0.9EF) during this century. While if we do nothing to limit such emissions global average surface temperature could conceivably rise as much as 5.8EC (10.4EF) between 1990 and 2100, exceeding the change in average temperature separating us from the last ice age. Few informed analysts now expect the increase in average global temperature from 1990–2100 to be kept below a 2EC (3.6EF) increase, even with the most concerted social action over the next couple of decades. The main fear at present is that the rise in global temperature will be two or three times as large if human society is unable to act decisively.²

Global warming is expected to be a growing factor in coming decades in species extinction, the rate of which at present is higher than at any time since the disappearance of the dinosaurs 65 million years ago. In mountainous regions all around the earth plant and animal species are ascending higher and higher as warming occurs. But mountains only reach so far. Consequently, the species occupying the topmost ecological niches are now in the process of ascending “to heaven.”³ We do not know how many other species will share this fate during this century. But we do know that the earth’s species in general will be massively affected, that biological diversity will continue to decrease, and that if we do nothing and average global temperatures rise to the upper levels that leading climate scientists think possible by the year 2100 it could prove catastrophic, seriously threatening ecosystems and destabilizing human society.

Still, the ruling economic and political interests and their attendant elites tell us not to be worried. Never mind the threats to other species. Human society, we are frequently told, is different. It can evolve rapidly by economic and technological means and thus adapt to global warming, which from its standpoint can be viewed as slow, “gradual” change. What is often projected for global society then is increased discomfort rather than

massive social upheaval and dislocation. Orthodox economists generally caution that we should do nothing that might limit economic growth. Instead they see the only answer as lying in a bigger economy, which will give us more means of addressing future contingencies.

Abrupt Climate Change

Nevertheless, there is every reason to believe that placing so much faith in economic growth and technological change as answers to global warming is short-sighted and naive. Considerable uncertainty exists as to how far human society can actually support such “gradual” climate change—since human beings are themselves part of nature and dependent on the world around them in manifold ways. But the problem does not stop there. Scientists are now raising the even more alarming question of abrupt climate change, i.e., climate change of a scale and suddenness—shifting dramatically in years rather than decades or centuries—that would definitely have catastrophic effects for human society.

Abrupt climate change is usually seen as change arising from gradual causes that lead to the crossing of a threshold, triggering a sudden shift to a new state—with the shift determined by the climate system itself and occurring at a rate much faster than the initial cause.⁴ Such shifts have occurred numerous times in history, one of the clearest being the abrupt cooling of the Younger Dryas (named after an arctic wildflower that thrived in the climate of the time), which began 12,700 years ago and lasted 1,300 years, interrupting the warming associated with the end of the last ice age. A lesser instance of abrupt climate change occurred 8,200 years ago and lasted around a century. In the worst of all current, plausible scenarios, such “abrupt climate change” could occur sometime over the next couple of decades—though this is still seen by scientists as highly unlikely.

Abrupt climate change is believed to result from disruption of the thermohaline circulation, a global ocean conveyor that moves warm, saline tropical waters northward in the Atlantic with the Gulf Stream as its northern arm, and then loops south. (“Thermohaline” comes from the Greek words for heat “thermos” and for salt “halos.”) The heat from this warmer water, when it reaches the North Atlantic, is released into the atmosphere, creating milder winters than would otherwise exist at those latitudes, and allowing the dense surface waters to cool and sink. This draws additional warmer, saline water from the south, helping to keep the conveyor going. Differences in the density of ocean waters associated with the saline content thus drive this ocean conveyor. Abrupt climate change arises from a lessening or collapse of the thermohaline circulation due to increased river runoff, melting ice, and changes in precipitation—all of which serve to increase the amount of freshwater supplied to the North Atlantic. As the salinity of the ocean waters decreases a dramatic lessening or complete collapse of the North Atlantic conveyor circulation can occur. The current global warming is seen as potentially triggering this effect. According to the UN Intergovernmental Panel on Climate Change (IPCC), in *Climate Change 2001*, “beyond 2100, the thermohaline circulation could completely, and possibly irreversibly, shut-down in either hemisphere” if global warming is “large enough and applied long enough” (p. 16).

Two basic scenarios are worth considering. (1) If the ocean conveyor slows down or collapses during the next two decades it could cool the North Atlantic region by as much as 5°C (9°F), creating winters of much greater severity. (2) If, however, the conveyor slows down in a century the drop in temperature in the North Atlantic could temporarily compensate for the rise in surface temperature associated with the enhanced greenhouse effect—though once the thermohaline circulation recovered the “deferred” warming could be delivered within a decade. The second of these two scenarios is viewed as much more likely. Yet, recent scientific studies, including a major report in 2002 by the National Academy of Sciences, have stressed that the thermohaline circulation could possibly “decrease...very fast,”—resulting in a sudden switch of climate early this century that although still thought unlikely cannot be ruled out altogether. Seeming to confirm these fears, a report in *Nature* in 2002 concluded that the North Atlantic has been freshening dramatically for 40 years; while a report a year earlier suggested that the ocean conveyor may already be slowing down.⁵

Faced with the uncertain hazards of such a “low probability, high impact” event, scientists associated with the National Academy of Sciences study recommended that society take what steps it could, if not too costly, to protect itself against such an extreme outcome. “If a shutdown were to happen soon,” Richard Alley, who chaired the scientific team releasing the National Academy of Sciences study, observed in *The Two-Mile Time Machine*, “it could produce a large event, perhaps almost as large as the Younger Dryas, dropping northern temperatures and spreading droughts far larger than the changes that have affected humans through

recorded history, and perhaps speeding warming in the far south. The end of humanity? No. An uncomfortable time for humanity? Yes.”⁶

These assessments and recommendations on abrupt climate change were offered with so much caution by climate scientists that they might easily have been ignored altogether by a society that in its upper echelons is devoted to the accumulation of capital and little else. That this did not happen is due to the fact that the issue was taken up and dramatized in the Pentagon report.

The Pentagon Elevates the Threat

The story behind the Pentagon report on abrupt climate change is almost as remarkable as the contents of the report itself. The National Academy study of this issue crossed the desk of Andrew Marshall, director of the Pentagon’s Office of Net Assessment. Marshall, who has worked for every secretary of defense since James Schlesinger in the 1970s, is a legendary “wise man,” known as “Yoda,” at the Pentagon. When they need someone to think about big things, the Department of Defense turns to Marshall. His most famous achievement was the promotion of missile defense. It was Marshall who authorized the \$100,000 grant for Peter Schwartz and Doug Randall of the Global Business Network to analyze abrupt climate change for the Pentagon. The intent was obviously to have economic futurologists visualize the possible effects of such abrupt climate change, since they would be in the best position to speculate on the economic and social fallout of such a catastrophic development, and thus upgrade it to a major Pentagon concern.

Schwartz was a surprising choice for such a task since he was best known previously for his book *The Long Boom* (1999). In the 1990s he was a contributing writer to *Wired* magazine. Together with Peter Leyden, a senior editor of the magazine, and Joe Hyatt of the Stanford University Business School he got caught up in the idea that the New Economy, rooted in today’s digital high technology, pointed to a long economic boom stretching from 1980 to at least 2020. During this time the economy would, they argued in the book, simply “grow more” based on the New Economy model pioneered by the United States, with global growth of “possibly even 6 percent” (p. 266). Their first version of this thesis in their *Wired* article on the long boom came out in July 1997 and created a stir. The article together with the book that followed two years later, constituted the most extreme version of the great millennial celebration. According to Schwartz and his coauthors, who grossly misunderstood the main economic tendencies of the time, the U.S. economy was rocketing throughout the 1990s and was likely to accelerate further in the 2000s. All such New Economy mythology was put to an end, however, by the bursting of the speculative bubble and the dramatic stock market decline of 2000, followed by recession in 2001 and slow growth and employment stagnation ever since. Nevertheless, it was to Schwartz, the failed prophet of a long New Economy boom, to whom Marshall turned to dramatize the consequences of abrupt climate change.⁷

An Abrupt Climate Change Scenario and its Implications for United States National Security by Peter Schwartz and Doug Randall begins by challenging the way in which climate change is usually approached:

When most people think about climate change, they imagine gradual increases in temperature and only marginal changes in other climatic conditions, continuing indefinitely or even leveling off at some time in the future. The conventional wisdom is that modern civilization will either adapt to whatever weather conditions we face and that the pace of climate change will not overwhelm the adaptive capacity of society, or that our efforts such as those embodied in the Kyoto protocol will be sufficient to mitigate the impacts. The IPCC documents the threat of gradual climate change and its impact to food supplies and other resources of importance to humans will not be so severe as to create security threats. Optimists assert that the benefits from technological innovation will be able to outpace the negative effects of climate change.

Climatically, the gradual view of the future assumes that agriculture will continue to thrive and growing seasons will lengthen. Northern Europe, Russia, and North America will prosper agriculturally while southern Europe, Africa, and Central and South America will suffer from increased dryness, heat, water shortages, and reduced production. Overall, global food production under many typical climate scenarios increases (p. 4).

Schwartz and Randall argue against such complacent views of global warming, insisting that they do not take sufficient account of the discontinuities that may arise as warming causes various thresholds to be crossed. More frequent droughts, for example, could have disastrous and cumulative effects. Still, the worst effects from such gradual warming are seen as applying mainly to the poorer countries of the global South rather than the richer countries of the global North—the main source of carbon dioxide emissions. All of this encourages a do-nothing or do-little attitude in the northern centers of world power.

Abrupt climate change alters this picture dramatically. Such change would create catastrophic conditions for human society; and rather than falling first and foremost on the global South the direct effects of a shutdown of the thermohaline conveyor would bear down on the global North—specifically those countries bordering the North Atlantic. Schwartz and Randall are clear that they are not actually predicting such abrupt climate change in the near future (though it is certain to occur in the long-term future). Rather, they offer a “plausible” if unlikely scenario “for which there is reasonable evidence” so as to “explore potential implications for United States national security” (p. 5). They model their scenario on the event of 8,200 years ago rather than on the much worse Younger Dryas. In their scenario a “thermohaline circulation collapse” causes a drop in average surface temperature in northern Europe of up to 3.3EC (6EF) along with severe temperature drops throughout the North Atlantic, lasting about a century. Colder temperatures, wind and dryness in the global North are accompanied by increased warmth and drought in much of the rest of the world.

The picture they paint is one of agricultural decline and extreme weather conditions, stretching energy resources, throughout the globe. Relatively well-off populations with ample natural resources and food producing capabilities, such as the United States and Australia, are seen as building “defensive fortresses” around themselves to keep massive waves of would-be immigrants out, while much of the world gyrates toward war. “Violence and disruption stemming from the stresses created by abrupt changes in the climate pose a different type of threat to national security than we are accustomed to today. Military confrontation may be triggered by a desperate need for natural resources such as energy, food and water rather than by conflicts over ideology, religion, or national honor. The shifting motivation for confrontation would alter which countries are most vulnerable and the existing warning signs for security threats” (p. 14). As the world’s carrying capacity declines under harsh climatic conditions, warfare becomes widespread—producing increased dangers of thermonuclear war.

For Schwartz and Randall the lesson is clear. Human society must “prepare for the inevitable effects of abrupt climate change—which will likely come [the only question is when] regardless of human activity” (p. 21). If the scenario that they depict is actually in the cards, it is already too late to do anything to stop it. What can be done under these circumstances is to make sure that the necessary security measures are in place to stave off the most disastrous consequences resulting from social instability. Since this is a report commissioned by the Pentagon, the emphasis is on how to “create vulnerability metrics” to determine which countries are likely to be hit the hardest ecologically, economically, and socially and thus will be propelled in the direction of war. Such information will make it possible for the United States to act in its own security interest. The narrow objective is thus to safeguard fortress America at all cost.

Although the ecological repercussions are supposed to hit the global North the hardest, the scenario provided by the Pentagon report with respect to instability and war follows conventional ideological paths, focusing mostly on the global South. The possibility that the United States itself might in such circumstances attempt to seize world oil supplies and other natural resources is not raised by the report. The U.S. response is depicted as entirely defensive, mainly concerned with holding off unwelcome waves of would-be immigrants, and trying to create an atmosphere of peace and stability in the world under much harsher global conditions.

Given the contents of this report it is not surprising that it initially generated dismay and widespread fears when it was made public in February. At that point the Pentagon quickly stepped in to quiet the alarm that the report had set off. Marshall himself released a statement that the Pentagon study “reflects the limits of scientific models and information when it comes to predicting the effects of abrupt global warming.” Although backed up by “significant scientific evidence...much of what this study predicts,” Marshall indicated, “is still speculation.” Pentagon officials meanwhile declared that the abrupt climate change report, although commissioned by their legendary “Yoda,” had not been passed on to Marshall’s superiors in the Defense

Department and the Bush administration (*San Francisco Chronicle*, February 25, 2004; *New York Times*, February 29, 2004).

Yet the real importance of *An Abrupt Climate Change Scenario* does not lie in its impact on the top brass in the Pentagon much less their environmentally-challenged superiors in the White House. Instead, its historical significance derives from the more general contention made at the beginning of the report that “because of the potentially dire consequences, the risk of abrupt climate change, although uncertain and quite possibly small, should be elevated beyond a scientific debate to a U.S. national security concern” (p. 3). It is a small step from this view to one that insists that the nature of the threat demands that we begin to consider other, radical social alternatives to business as usual, which must be elevated to the forefront of public discussions.

Accelerated Climate Change

Here it is crucial to recognize that abrupt climate change as currently modeled by scientists, though the most dramatic, is not the only nongradual outcome possible as a result of global warming. Scientists are even more concerned at present about the potential for positive feedbacks that will greatly amplify global warming, increasing the rate of its advance and the speed with which it crosses various ecological thresholds. According to the IPCC in *Climate Change 2001*, “As the CO₂ concentration of the atmosphere increases, ocean and land will take up a decreasing fraction of anthropogenic CO₂ emissions. The net effect of land and ocean climate feedbacks as indicated by models is to further increase projected atmospheric CO₂ concentrations, by reducing both the ocean and land uptake of CO₂” (p. 12). The hydrological cycle (evaporation, precipitation, and runoff) could accelerate as a result of global warming, driving temperatures higher faster. Water vapor, the most potent natural greenhouse gas, could trap additional heat increasing the rate at which average surface temperatures rise. The melting of highly reflective ice and snow could result in further absorption of sunlight, leading to additional global warming. The capacity of both forests and oceans to absorb carbon dioxide could decrease, creating a positive feedback loop that accelerates climate change. All of this is taken into account to some extent in the IPCC reports. But given the level of uncertainty the possibility of surprising developments under these circumstances is very great.

The grim reality is that the more threatening scenarios with respect to global warming are becoming increasingly plausible as the data keeps coming in. Carbon dioxide levels in the atmosphere increased at an accelerated level over the past year. The increase of 3 parts per million was well above the 1.8 parts per million annual increase on average over the past decade, and three times the year-to-year increase experienced half a century ago. Although it is too soon to be sure if this means anything or not (it may reflect mere annual variance), this kind of evidence is leading scientists to worry that positive feedbacks may already be at work, serving to accelerate the whole problem (*New York Times*, March 21, 2004).

Capitalism and Carbon Dioxide

Both the capitalist economy and the world climate represent complex, dynamic systems. The uncertainty with respect to climate change and its economic effects has to do with the interaction of these two complex systems. To make matters worse, both the climate system and the human economy are subsets of the biosphere and are inseparably interconnected in extremely complex ways with innumerable other biogeochemical processes. Many of these other biospheric processes are also being transformed by human action.

It is not uncommon for analyses of climate change to assume that the world economy is essentially healthy except for disturbances that could result from the climate. This, however, is in error and underestimates the economic vulnerability of populations and whole societies. As indicated only a few months ago in this space, at present “half the world’s population lives on less than two dollars per day, with most of those either chronically malnourished or continually concerned with where their next meal will come from. Many have no access to clean water (1 billion), electricity (2 billion), or sanitation (2.5 billion)” (Fred Magdoff, “[A Precarious Existence](#),” *Monthly Review*, February 2004). Economic growth is slowing in ways that have deepened the economic crisis for human populations. At the same time, “nature’s economy” is also in trouble, viewed in terms of the diversity of life on the planet. Economic and ecological vulnerabilities are everywhere.

For the Pentagon, the answer to all of these dangers would seem to be straightforward: arm to the teeth, prepare for greater threats than ever from thermonuclear war, and build an impregnable wall around the United States, closing the global masses out. All of this is depicted by Schwartz and Randall. Yet a more rational response to potential high-impact climate events would be to seek to reorganize society, and to move away from imperatives of accumulation, exploitation, and degradation of the natural environment—the “after me the deluge” philosophy—that lies at the base of most of our global problems.

The truth is that addressing the global warming threat to any appreciable degree would require at the very least a chipping away at the base of the system. The scientific consensus on global warming suggests that what is needed is a 60–80 percent reduction in greenhouse gas emissions below 1990 levels in the next few decades in order to avoid catastrophic environmental effects by the end of this century—if not sooner. The threatening nature of such reductions for capitalist economies is apparent in the rather hopeless state at present of the Kyoto Protocol, which required the rich industrial countries to reduce their greenhouse gas emissions by an average of 5.2 percent below 1990 levels by 2008–2012. The United States, which had steadily increased its carbon dioxide emissions since 1990 despite its repeated promises to limit its emissions, pulled out of the Kyoto Protocol in 2001 on the grounds that it was too costly. Yet, the Kyoto Protocol was never meant to be anything but the first, small, in itself totally inadequate step to curtail emissions. The really big cuts were to follow.

Even if the Kyoto Protocol were to be enacted (its future right now is uncertain and depends largely on whether Russia decides to go along with the climate treaty) this would only open the door to bigger questions: Will the rich countries of the global North agree to cut their carbon emissions to the extent required? How can the poorer countries of the global South be brought into the climate accord? There would be little opportunity for most of these poor countries—still the victims of imperialism—to develop economically if they were forced to cut back sharply in their average level of per capita greenhouse gas emissions at this point. Since the atmosphere cannot support increasing levels of carbon dioxide and most of its capacity to do so without high levels of global warming has already been taken up by the rich countries of the center, countries in the periphery are likely to be severely constrained in their use of fossil fuels unless the countries in the center drastically reduce their levels of emissions—on the order of 80–90 percent.

Third world countries insist that the North has an ecological debt to the South, arising from a history of ecological imperialism, and that the only way to redress this and to create a just and sustainable climate regime is to base any solution on per capita emissions. Such a position is rooted in the recognition that the United States, to take the most notorious example, emits 5.6 metric tons of carbon dioxide per person per year,⁸ while the whole rest of the world outside of the G-7 countries (the United States, Canada, Germany, Britain, Japan, Italy and France) releases only 0.7 tons of carbon dioxide per person annually on average.⁹ Inequality of this kind is a major barrier to a smooth climate transition and means that the necessary change must be revolutionary in nature. The only just and sustainable climate regime will be one in which there is a *contraction* of per capita carbon dioxide emissions to levels that are globally sustainable, together with a *convergence* of rich and poor countries around these low, globally sustainable emissions levels. Such safe per capita emissions levels would be less than a tenth of what the North currently emits per capita. One estimate claims that “based on the 1990 target for climate stabilization, everyone in the world would have a per capita allowance of carbon of around 0.4 tonnes, per year.”¹⁰

Obviously, equalization of per capita emissions at low levels for all countries is not something that the United States and the other nations at the center of the system will readily accept. Yet third world countries that desperately need development cannot be expected to give up the right to equality in per capita emissions. Any attempt to impose the main burdens for global warming on underdeveloped countries in accordance with past imperialistic practices will thus inevitably fail. To the extent that the United States and other advanced capitalist nations promote such a strategy they will only push the world into a state of barbarism, while catastrophically undermining the human relation to the biosphere.

Easter Island and the Earth

For environmentalists the destruction of the ecology and civilization of Easter Island around 1400–1600 A.D. has long been both a mystery and metaphor for our times. We now know that the giant stone statues, the erection of which resulted in the destruction of the island’s forests and with them a whole ecology and

civilization, were the main symbols of the power and prestige of competing chiefs and their clans. As Jared Diamond explains: “A chief’s status depended on his statues: any chief who failed to cut trees to transport and erect statues would have found himself out of a job.”¹¹ Due to such a narrow acquisitive logic—an early treadmill of production analogous to our own—the Easter Islanders drove their ecology and society to the point of extinction.

Are we headed for a similar disaster today—only on a planetary scale? To quote Diamond again:

Thanks to globalization, international trade, jet planes, and the Internet, all countries on Earth today share resources and affect each other, just as did Easter’s eleven clans. Polynesian Easter Island was as isolated in the Pacific Ocean as the Earth is today in space. When the Easter Islanders got into difficulties, there was nowhere to which they could flee, or to which they could turn for help; nor shall we modern Earthlings have recourse elsewhere if our troubles increase. Those are the reasons why people see the collapse of Easter Island society as a metaphor, a worst-case scenario, for what may lie ahead in our own future.

Easter Island society got into trouble because of a class system. With its island world increasingly under ecological strain, the chiefs and priests were overthrown by military leaders and the society descended into the barbarism of civil war and then declined completely. Here too is a lesson for our time: we need to confront the class system and reorganize society in line with the needs of all of its inhabitants before barbarism descends upon us.

The Pentagon report itself takes on a different meaning here. It depicted abrupt climate change and a descent into internecine war. It was “intentionally extreme.” But as the fate of Easter Island suggests, it may not have been extreme enough.

1. Available at www.ems.org.
2. Thomas R. Karl & Kevin E. Trenberth, “Modern Global Climate Change,” *Science* 302, p. 1721; Intergovernmental Panel on Climate Change, *Climate Change 2001* (Cambridge: Cambridge University Press, 2001), pp. 7, 13; Tom Athanasiou & Paul Baer, *Dead Heat* (New York: Seven Stories, 2002), pp. 43–47.
3. “All Downhill from Here?,” *Science* 303 (March 12, 2004).
4. National Research Council, *Abrupt Climate Change: Inevitable Surprises* (Washington, D.C.: National Academy Press, 2002) p. 14.
5. Robert B. Gagosian, “Abrupt Climate Change: Should We Be Worried?,” World Economic Forum, Davos, Switzerland, January 27, 2003, <http://www.who.edu>; National Research Council, *Abrupt Climate Change*, pp. 115–16B. Dickson, et. al., “Rapid Freshening in the Deep Atlantic Ocean Over the Past Four Decades,” *Nature*, 416 (April 25, 2002); B. Hansen, et. al., “Decreasing Overflow from the Nordic Seas into the Atlantic Ocean Through the Faroe Bank Channel Since 1950,” *Nature*, 411 (June 21, 2001).
6. Richard B. Alley, *The Two-Mile Time Machine* (Princeton: Princeton University Press, 2000), p. 184.
7. There were no doubt rational motives to assigning the task of writing such a report to Schwartz, who had shown that he had all the necessary dramatic skills of the professional futurologist. Given his past history, and his absolute faith in the system, he could not be viewed as a prophet of doom and gloom or as an enemy of business. Further, a paragraph of *The Long Boom* (p. 153) had actually pointed to the possibility of a shutdown of the thermohaline circulation and the coming of a “another Ice Age”—though this was introduced in a generally pollyannaish view of the ecological crisis in which the “long boom” itself provided all the answers.
8. Measured in carbon units.
9. John Bellamy Foster, *Ecology Against Capitalism* (New York: Monthly Review Press, 2002), p. 18; John Bellamy Foster and Brett Clark, “Ecological Imperialism: The Curse of Capitalism,” in Leo Panitch and Colin Leys, ed., *The Socialist Register 2004* (New York: Monthly Review Press, 2004), pp. 186–201.
10. Andrew Sims, Aubrey Meyer, and Nick Robbins, *Who Owes Who?: Climate Change, Debt, Equity and Survival* <http://www.jubilee2000uk.>; Athanasiou and Baer, *Dead Heat*, pp. 63–97.
11. Jared Diamond, “Twilight at Easter,” *New York Review of Books*, March 25, 2004, pp. 6–10.

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