

Official Japanese New Hydrogen Energy (Cold Fusion) Program to End— Missed Opportunities and Botched Management

Commercial Development and Research Continues and Accelerates in the US, Japan, and Elsewhere

by Jed Rothwell and Eugene Mallove

Infinite Energy Magazine has learned that the official Japanese cold fusion program (the New Hydrogen Energy Program), sponsored by Japan's MITI since 1993, will not receive continued funding beyond the spring of 1998. The *New York Times*, the *Nikkei* and Reuters have also reported that MITI intends to close down the New Hydrogen Energy cold fusion research program.

Infinite Energy reported on the astonishing weaknesses of the NHE program in Vol. 2, No. 10, published after the Sixth International Conference on Cold fusion (ICCF6), which was held in October 1996 in Hokkaido, Japan. Contributing Editor Jed Rothwell pointed out several major technical problems with the research in his ICCF6 review and in An **Open Letter** to Japan's NHE Lab Directorate, written in Japanese and English, on page 28 of Issue #10. The letter includes 17 references to the literature, and it lists concrete problems with the protocols and materials used at the NHE lab, including low cell temperatures, improper cell and cathode materials, inadequate preparation and pre-testing of cathodes, and so on. These technical criticisms did not originate with *Infinite Energy*. They were suggested by Drs. Stanley Pons, Martin Fleischmann, John Bockris, Edmund Storms, T. Mizuno, Hideo Ikegami and the others cited in the footnotes. We pointed out that the French Atomic Energy Commission has successfully replicated the Pons-Fleischmann IMRA boil-off experiments (originally reported in *Physics Letters A*, 176 (1993) 118-129), because they were more careful about replicating every detail of the experiment, without making any changes.

The NHE is staffed mostly by scientists and engineers new to the cold fusion field. They are on 6 to 12 month assignments to the NHE lab. We urged the NHE researchers to pay more attention to the literature; to hire some electrochemists for

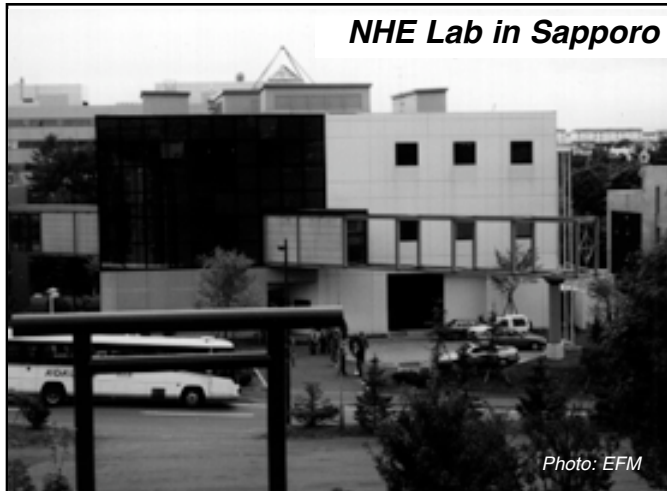


Photo: EFM

the research; and to try the techniques suggested by these leading workers, but as far as we know, they have not done so. We did not receive any official response to the **Open Letter**, nor did we expect any. Unofficially, NHE researchers denied that there is anything wrong with their techniques, and they refused to address any of the technical points in the **Open Letter**. They accused us of plotting to bring down the lab in league with arch-enemies of cold fusion such as John Huizenga and Frank Close.

Let there be no misunderstanding: The prospective NHE closing has nothing to do with determining whether excess energy and low energy reactions are real or not. The evidence for excess heat and nuclear reactions at low energy is overwhelmingly established by numerous published peer-reviewed and non-peer reviewed papers and reports.

A MITI spokesman, quoted in news reports, pointed out that the \$20 million spent on cold fusion was "was a pittance" compared with what is spent on other energy programs, like nuclear fast breeder reactors. Unfortunately, Japan's official NHE program could have had a major impact on the world's future in sustainable energy—eliminating not only the need for

fossil fuels but dangerous and problem-plagued programs such as breeder reactors. Instead, the news about the NHE program, certain to be abused by critics of cold fusion—it already *has been* abused, will simply muddy the waters.

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Excellent experimental continuing work that totally confirms the original cold fusion claims, and more, has been done in Japan. We cite, in particular the work of Drs. Yoshiaki Arata and Yue-Chang Zhang, which was recently the topic of a 56-page special issue of the journal of the *High Temperature Society of Japan*, "Solid State Plasma Fusion ('Cold Fusion')" Vol. 23, January 1997. This work has also been published in several papers in the *Proceedings of the Japanese Academy of Sciences*. Dr. Arata is an esteemed physicist who had been instrumental in Japan's hot fusion program.

Among other continuing activity in Japan, *Infinite Energy* has profiled the work of Dr. Mizuno on excess energy from solid state (solid proton conductor) cold fusion devices and established transmutation in metals of more conventional cold fusion devices. Drs. Ohmori and Enyo have obtained excellent excess heat results in light water systems. They have also observed and published evidence of metal transmutation phenomena. These scientists have been ignored in the official NHE program. In general, the NHE program has not given serious, appropriate attention to the excess energy phenomenon in light-water cold fusion cells, which is the preferred embodiment in many US-based efforts.

In the United States, commercial activity in cold fusion energy has accelerated

beyond the Japanese work. Clean Energy Technologies, Inc. of Sarasota Florida (CETI), BlackLight Power, Inc. of Malvern, Pennsylvania, and ENECO of Salt Lake City—to name the more well-known efforts—are developing commercial heating and electricity generating devices. Several major utility companies have established investment positions within some cold fusion/new energy companies. The Cincinnati Group in Ohio has recently announced for sale a commercial demonstration device that transmutes radioactive thorium into benign nuclides in less than an hour. CETI, whose cold fusion heating devices have been profiled several times on ABC TV “Good Morning America” and “Nightline,” also has a radioactivity reducing processes for which a United States Patent has been granted. A cold fusion and New Energy investment fund, *New Energy Partners*, has just been launched (see *Infinite Energy*, Vol.3, Issues #13/14 as well as this double issue.)

The New York Times, which influences all other science reporting in the United States, has regrettably *not* been covering progress in cold fusion research. Its last comprehensive report on cold fusion was on November 17, 1992, by Andrew Pollack, who is based in Japan. Mr. Pollack has not attended cold fusion conferences in Japan or anywhere else, but he was quick to report MITI’s decision on the NHE program. *The Times* report was published on August 26, 1997, in an article titled “Japan, Long a Holdout, Ending Cold Fusion Quest.” He states that the research “has failed to confirm that the phenomenon exists.” This is a gross misunderstanding of the situation. We also point out that *New York Times* science reporter, William Broad, shown the work of Drs. Arata and Zhang by a representative of Dr. Arata, refused to report on it. Broad has previously (1991) written on accusations by cold fusion critics of alleged (and disproved) ethical violations by Drs. Pons and Fleischmann. While giving major attention to announcements of US hot fusion program achievements, Mr. Broad and his US-based colleagues have not covered cold fusion in the United States or Japan since his article in 1991.

The recent *Times* article by Pollack quotes Hideo Ikegami: “We couldn’t achieve what was first claimed in terms of cold fusion. We can’t find any reason to propose more money for the coming year or for the future.” Jed Rothwell of *Infinite Energy* points out that hot fusion scientist Ikegami himself obtained positive results in his lab, which he transmitted to Rothwell. But Ikegami never published them, for reasons that remain unclear. Unless he is being misquoted by the New

York Times, we do not understand why he is ignoring the many positive experimental results in Japan.

The *Nikkei* reported the NHE story on August 24, 1997. It quotes a MITI spokesman, “regrettably, we have not seen the effect in our experiments,” but “we do not deny that the cold fusion effect exists.”

To cite but a single example of the ineptitude of the official Japanese NHE program, let us discuss the absurd debacle at NHE in analyzing the Fleischmann-Pons boil-off experiment:

The Boil-Off Entrainment Problem

The *Yomiuri* quoted the NHE program manager:

“In the Pons replication experiment, we saw excess heat and by the same token we saw examples of a heat deficit, where the energy appeared to vanish,” explained program manager Naoto Asami, looking back over the work. “We found problems with their calorimeter, and we feel that their entire data set is weak and questionable.”

No further details about the problems were described in the newspaper article, but in an Internet discussion group, Elliot Kennel, an American researcher now with the NHE who will be returning to the US, said there are huge flaws in Pons and Fleischmann’s technique and data. He described these as “holes in the data big enough to drive a truck through.” He cited this example:

“In the case of boiling cells, we were able to verify that the electrolyte is entrained in the vapor column by measuring the pH of the condensate. Whenever excess heat was calculated, it was always due to overestimating the vapor mass transport. This is not to say that P&F did not have valid results. It may be that their equipment generates nuclear excess heat in France and false positives in Japan. All we can say is that our results, using their equipment, was susceptible to false positives, and for that reason we are not convinced by the data set which now exists. . . .

“Anyway, for these reasons I believe that excess heat is at best elusive, and I’m no longer convinced that it exists at all. Mr. Rothwell claims to have some easy solutions, and I hope that he will soon convince some reliable laboratories to put them to the test. They might even work. But my view is that these laboratories also will become scapegoats when unambiguous results are not quickly

obtained.”

Kennel refers to the mass transport or entrained water problem. During a boil-off, if water leaves the cell as a liquid in unboiled droplettes, this invalidates Pons and Fleischmann’s calorimetry, which is based upon the heat of vaporization of water. It takes a great deal of energy to vaporize water. It takes much less energy when foam or something else removes the water as droplettes. If you assume it was vaporized instead, you would greatly overestimate the energy during what looks like a boil-off. NHE researchers condensed the steam from the boil-off, and measured the acidity (pH) of the condensate. They found it contained lithium. This means that some electrolyte lithium left the cell in droplettes; the water was not perfectly distilled.

As long ago as ICCF4, Rothwell recalls that NHE researchers and others in Japan told him they suspected entrained water is a problem with the Pons and Fleischmann experiments. NHE researchers have circulated rumors about this, alluded to it during press conferences, and discussed it informally on Internet. *But they have never published a formal paper about it or discussed it at a conference.* They never told Pons or Fleischmann about their suspicions. When Rothwell brought up this subject with Martin Fleischmann, he expressed surprise. It was obvious from his reaction that he knew nothing about the NHE’s statements. It is equally clear that the NHE researchers did not know that Pons and Fleischmann addressed this issue years ago. Miles, McKubre, Bockris, Fleischmann and others have repeatedly warned it can happen. Some heavy water supplies produce a lot of foam which can reach the top of the cell and expel unboiled electrolyte out of the cell. Miles and Fleischmann say they have identified the cause: heavy water can be contaminated with surfactants (surface-adhering chemicals, often used in detergents). Fleischmann explained to Steve Jones in September 1993:

“One could say some of the D₂O is expelled as droplets (actually, we recover ~95% of the alkali by dissolving the residues and titrating; some is undoubtedly lost by irreversible reactions with the glass walls of the Dewars.)”

Biberian told Jed Rothwell that the French AEC researchers check for entrained water by weighing a Kleenex tissue with a precision scale and placing it under the steam venting from the test tube. Entrained droplettes will fall onto the tissue. Melvin Miles comments on the problems of foam:

“... four experiments were all hindered by unusually large fluctuations in the cell voltages (± 0.5 V) that were traced to a foaming problem in the D_2O -LiOD solutions. This foam would collect in the coils of the anode and then release. These four experiments all used D_2O supplied by NRL (Cambridge Isotope Laboratories, Lot No. PSO EH-283) and lithium foil supplied also by NRL (Alfa/Aesar Stock No. 10769). This shows that the D_2O can be an important uncontrolled variable in these experiments.”

Foaming and entrainment are well-known problems. They must be checked for and prevented. They cannot explain IMRA Europe's results because Pons and Fleischmann did check for them and found no significant problem. Everyone knows that some entrainment will occur. A test tube does not make a perfect distiller. When this problem was first discussed years ago, Jed Rothwell remarked that he would never drink the distillate. (Lithium is highly toxic.) On the other hand, as far as is known, entrainment has never been observed to cause more than a minor error, no more than a few percent. We cannot imagine how it could carry off most of the water and cause 50% to 300% apparent excess, like that measured using boil-off calorimetry at IMRA and the French AEC. Rothwell asked Kennel how much apparent excess heat this artifact produced, but he did not respond. We suspect the NHE saw marginal artifactual heat, a few percent at most. They determined it was caused by entrainment and they decided to circulate the rumor than the same mechanism can explain Pons and Fleischmann's results too, as if foam could remove two-thirds of the water from the bottom of a tall test tube. Rothwell thinks the NHE researchers are casting about for a reason to discredit Pons and Fleischmann. They have not been able to replicate, so they want the world to believe there is nothing to replicate, it was all a mistake in the first place.

When Rothwell told Fleischmann about the NHE's entrainment hypothesis, his first response was the same as Rothwell's. He wondered, “do they claim you cannot distill water with a test tube?” For thousands of years, people have been distilling water and concentrating solutions by boiling small amounts at the bottom of a tall ves-

sel. When they say they can explain “all of Pons and Fleischmann's results” the NHE is, in effect, claiming that this technique can fail catastrophically. If they could prove such a radical claim about an ancient technique, they would win a Nobel prize.

Fleischmann agreed that the NHE results were probably caused by foam, as others have observed. He pointed out another possible problem with the NHE set up. At various times when he visited the NHE lab, he noted that they added too much water to the cell, which raised the water line too high, which would greatly enhance entrainment. During open cell electrolysis, water continually leaves the cell. Every day or every few days, new water must be added. This is done with a syringe at the NHE, to avoid contaminating the heavy water by exposing it to air. The amount that leaves



One section of the NHE Laboratory in Sapporo—Wasted Space? —Photo: EFM

the cell can be computed by Faraday's law. Unfortunately, someone at the NHE made a mistake, and they began adding 4 ml per day instead of 2 ml. Fleischmann warned them about this, but they did not appear to fix the problem.

Kennel also claimed there are significant problems with isoperibolic calorimetry:

“... problems with boiling isoperibolic calorimetry, [add] another level of complexity ... [W]e are also able to achieve 100% reproducibility of excess heat using Pons and Fleischmann's own ICARUS-2 boiling calorimetry cells (we use their cell, their palladium, their calorimeter). Unfortunately, here again we are quite sure that our positive results are due to flaws in the calorimetry, rather than to real excess heat.”

Rothwell asked him whether he meant

they have replicated the 300% excess heat and proved that it is an artifact. He did not respond. I asked him why the null boil-off experiments with platinum performed at IMRA Europe and the French AEC showed no excess. He did not respond. Rothwell asked him whether the NHE also performed null boil off experiments with platinum electrolysis or joule heaters to test their cell geometry and instruments, because it is highly unlikely that such an ancient technique does not work. He did not respond. His only reference to problems in the isoperibolic calorimetry was a reference to a paper: T. Saito et al., “Studies on the Pons-Fleischmann Calorimetry with ICARUS-1,” *Proceedings ICCF5*, p. 105. He claims it proves there can be a 20% error in the calorimetry. However, this paper describes low-level heat detection, not the boil-off phase calorimetry. The Saito paper is over my head. Rothwell asked Fleischmann what he thought of it. He agrees that Saito showed a large error, but that is because the data set Saito chose is noisy. You can prove anything you like with this particular data. Fleischmann showed Rothwell two other samples of data from other runs at the NHE with much smaller random oscillations in the Y-axis. This data shows does not fit the Saito hypothesis.

Many things can go wrong in an experiment. A wet thermistor will produce a bogus reading. If your thermistor gets wet, you should not jump to conclusions, call a press conference and tell the *Yomiuri* Pons and Fleischmann must have had a wet thermistor and that explains why their experiment failed. You should first review the literature or ask them whether they checked for this problem. The NHE and other establishment labs do “science by press conference.” First they attack a rival scientist in the mass media without revealing the technical reason for the attack; then they circulate rumors about the reason; then, much later (or never) they publish a paper describing the supposed problem. The problem they cite is orders of magnitude too small to explain anything, so they refuse to do a quantitative analysis. They pretend that a 3% error can explain away a 300% result. They wait until the public has forgotten the dispute and the rival's reputation is permanently damaged.

