



# More Candid Interchange is Necessary with IAEA, the UN, and European Government

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[www.fas.org/RLG/](http://www.fas.org/RLG/)

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## [The Garwin Archive](#) - 2000-2008 (Some links selected for ESOF):

- ["Nuclear Power in the World's Energy Future," \(text and slides\)](#) by R.L. Garwin, Felice Ippolito Lecture, Rome, Italy, May 22, 2008.
- ["Nuclear Power in the World's Energy Future," \(slides\)](#) by R.L. Garwin, Felice Ippolito Lecture, Rome, Italy, May 22, 2008.
- ["Limiting the Hazards of Nuclear Weapons in a World of Nuclear Power,"](#) by R.L. Garwin. A talk for The Santa Fe Council on International Relations, Santa Fe, NM, December 1, 2007.
- ["How the mighty have fallen,"](#) Essay in *Nature*, Vol. 449, p. 543, October 4, 2007.
- Commentary by R.L. Garwin, ["The rush to replace Trident,"](#) from *Nature Physics*, May 2007.
- ["GNEP: Leap before looking,"](#) by R.L. Garwin. Presented at session NUCL 61, American Chemical Society annual meeting, Chicago, Illinois, March 27, 2007.
- ["GNEP and Plutonium Recycle in the US Nuclear Power System,"](#) A briefing for House staff, House of Representatives, March 19, 2007.

- ["Personal Experience in Advising the U.S. Government: 1956-2007+,"](#) by R.L. Garwin. A contribution to the session Science Advising on Security Issues II in the Cornell-PRIF Conference on Science Advising and International Security, February 23-24, 2007, Cornell University, Ithaca, NY.
- ["Supplementary memorandum from Prof. Richard L. Garwin"](#) of Feb. 19, 2007, responding to Ministry of Defence testimony of Feb. 6, 2007 that bears on R.L. Garwin written evidence and oral testimony of Jan. 23, 2007 regarding the matter of replacement submarines for the 4 UK Trident boats.
- ["Plutonium Recycle in the U.S. Nuclear Power System?"](#) by R.L. Garwin. Presentation on GNEP at AAAS Symposium session in San Francisco, CA, February 17, 2007.
- [Written evidence submitted to the Defense Committee of the House of Commons in the matter of replacement submarines for the 4 UK Trident boats.](#) The [attachment](#) is relevant 1978 correspondence with the U.S. Navy. Evidence authored by Richard L. Garwin, Philip E. Coyle, Theodore A. Postol, and Frank von Hippel. Testimony presented orally 01/23/07.
- ["U.S. national security and U.S. governance,"](#) by R.L. Garwin, first of four contributions by R.L. Garwin to The Bulletin On-line, January 2007. To be found at <http://www.thebulletin.org/columns/richard-garwin/20070109.html>

- ["Analyzing the Global Nuclear Energy Partnership-- GNEP,"](#) by R.L. Garwin. Presentation to the NRC Committee on Internationalization of the Nuclear Fuel Cycle, October 17, 2006.
- ["Nuclear Power Need Not Lead to the Acquisition of Nuclear Weapons,"](#) paper by R.L. Garwin, presented at the 10th PIIC Beijing Seminar on International Security, Xiamen, Fujian Province, China, 25-28 September 2006.
- ["06/16/06 Letter R.L. Garwin to D.R. Spurgeon regarding GNEP"](#)
- ["R&D Priorities For the Global Nuclear Energy Partnership,"](#) by R.L. Garwin, (Slides) 5-minute oral testimony at hearing of the Subcommittee on Energy of the Committee on Science, U.S. House of Representatives, "Hearing on R&D Priorities in the Global Nuclear Energy Partnership," April 6, 2006, Washington, DC.
- ["R&D Priorities for GNEP,"](#) by R.L. Garwin, prepared testimony for hearing of the Subcommittee on Energy of the Committee on Science, U.S. House of Representatives, "Hearing on R&D Priorities in the Global Nuclear Energy Partnership," April 6, 2006, Washington, DC. (Supplemented for the Record with material added 06/25/06).

- "[Expanding Nuclear Power While Managing the Risks of Accident and Proliferation](#)," by R.L. Garwin, presentation for Euronuclear ENA2006 Brussels, March 29, 2006. All presentations can be found at [www.ena2006.org](http://www.ena2006.org).
- "[A conversation with Richard Garwin](#)," with D. Kestenbaum of National Public Radio, and the ensuing Q&A, sponsored by American Association for the Advancement of Science, January 10, 2006. Video and audio available at: [http://www.aaas.org/programs/centers/cstsp/Events/Events\\_2006\\_0110.shtml](http://www.aaas.org/programs/centers/cstsp/Events/Events_2006_0110.shtml)
- "[Chernobyl's real toll](#)," by R.L. Garwin, revealing the deception in the Chernobyl Forum report. Published as an "outside view" in Europe Features of UPI.com, November 9, 2005

*and much more at [www.fas.org/RLG/](http://www.fas.org/RLG/)*

# **Expanding Nuclear Power While Managing the Risks of Accident and Proliferation**

Richard L. Garwin, IBM Fellow Emeritus

[www.fas.org/RLG/](http://www.fas.org/RLG/)

Euronuclear ENA2006  
Brussels

# **Market-driven expansion only if economics are favorable:**

- **Overnight cost**
- **Operations and maintenance**
- **Prospective fuel costs and supply**
- **Cost of disposal of spent fuel**
- **Cost of implementing nonproliferation measures**
- **Continued operability**
- **Assumed \$50 /tonC carbon tax**

# Can operators and analysts have confidence?

- **October 2003 WANO session, "... a terrible disease that originates within the organization..." and can lead to "a major accident..." that could "destroy the entire organization."**
- **Sellafield THORP shut down since April 2005**
- **Chernobyl Forum Report of September 2005 that predicts only 4000 deaths total from Chernobyl—by considering only the exposure of 60,000 person-Sv and not the 600,000 person-Sv established by the 1993 UNSCEAR report. Argue instead that the corresponding 24,000 cancer deaths are much less than those due to 10,000 GWe-yr of coal-fired plants**



# Fuel supply and disposal of spent fuel

- **Ten-fold expansion (3000 GWe) of LWR would consume 0.6 million tons natural uranium/yr**
  - **Ultimate recoverable resource:**
    - **Gen-IV: 34 million tons at < \$130/kg NU**
    - **Gen-IV: 170 million tons at <\$260/kg NU**
    - **Seawater: 4500 million tons NU at unknown cost of recovery—Red Book suggests \$300/kg NU. *Governments should invest to learn cost***
- **Operators can well afford to "buy ahead" to obtain assured fuel supply (G.W. Bush and Mohamed ElBaradei)**

## **Disposition of spent LWR fuel**

- **Not a ton of spent LWR fuel in the Yucca Mountain repository**
- **Not a ton of vitrified fission products in the French Underground Laboratory.**
- **Take-back of spent fuel, and then what?**

*States should take initiative to change the rules and laws to encourage competitive, commercial, mined geological repositories for spent LWR fuel and packaged vitrified fission products.*

# *Both repositories and fuel forms to be IAEA approved*

# **Global Nuclear Energy Partnership—GNEP announced February 2006 by Pres.G.W.Bush**

## ***Garwin comments on GNEP/ABR (1):***

- Of \$250 M first-year funding, \$155 M for engineering scale demo of UREX+ reprocessing of LWR fuel. *Highly premature***
- Repository benefits from low waste heat only if many tens of ABR are deployed in the U.S. (ABR: Advanced Burner Reactor using fast neutrons to consume transuranics) *liquid sodium? molten lead?***

## *Garwin comments on GNEP/ABR (2)*

- *What fuel form for ABR—metal, MOX, carbide, nitride?*
- *A 2002 ENA report, 3109ch1-2.pdf, notes for such an ABR a "conversion ratio" of 0.5, so a 1-GWe reactor has a net disposal of only about 0.5 ton of TRU/yr. Does GNEP assume "sterile fuel"?*
- *Recycle of MOX into LWR results in spent MOX fuel element with as much decay heat after 100 years as 4 UOX FE.*

## *Garwin comments on GNEP/ABR (3)*

- *The ABR is such a large bet that several design approaches should be funded and evaluated, and at least two contractors for the option eventually selected.*

**Can we expand the use of nuclear power while managing the risks of accident and proliferation? *With a greater investment in openness than has been evident.***

## News

*Nature* **440**, 982-983 (20 April 2006) | doi:10.1038/440982a; Published online 19 April 2006;  
[Corrected](#) 21 April 2006

### *Special Report: Counting the dead*

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#### **Abstract**

**Twenty years after the worst nuclear accident in history, arguments over the death toll of Chernobyl are as politically charged as ever, reports Mark Peplow.**

No more than 4,000 people are likely to die as a result of Chernobyl. That was the conclusion released by the United Nations and the governments of Ukraine, Belarus and Russia in September last year, in the most comprehensive assessment of the accident so far.

But despite promising "definitive" answers the report, based on two decades of research, has done little to resolve the debate over Chernobyl's impact. The estimate drew howls of protest from environmental groups, which accused the UN's Chernobyl Forum of a whitewash. And scientists whose work is cited in the report are concerned about how their figures were presented, pointing out that the true cost of the disaster will not be known for decades to come, if ever.

## *Special Report: Counting the dead (continued)*

Melissa Fleming, a press officer working at the International Atomic Energy Agency in Vienna, who helped coordinate the report's publicity, says the scientists involved checked the press material. But she admits a decision was made to focus on the lower 4,000 figure, partly as a reaction to the inflated estimates of past decades. "I was sick of seeing wild figures being reported by reputable organizations that were attributed to the UN," she says. "It was a bold action to put out a new figure that was much less than conventional wisdom." The figure has been removed from the final summary, however, published this month.



# The “4000 excess deaths figure persists

Richard A. Muller, Professor of Physics at Berkeley, “Physics for Future Presidents,” W.W. Norton and Company , June 2008 (p. 104: “*In 2006, the International Atomic Energy Agency ( the IAEA, associated with the United Nations) came up with its best estimate for the total dose: about 10 million rem. This implies that the total number of induced cancer deaths from the Chernobyl accident would be about 10,000,000 divided by 2500, for a total 4,000 excess cancers.*” Even the instructor of future presidents, knowledgeable about the ways of nature, was deceived by the deception committed by men and women. **Of the UNSCEAR 1993 collective dose, 90% had vanished.**

# **Portions of a letter from Garwin to ElBaradei**

**April 28, 2006**

**(Via Email to M.ElBaradei at [iaea.org](mailto:iaea.org))**

**(Via Email to Official.Mail at [iaea.org](mailto:iaea.org))**

**Dr. Mohamed ElBaradei  
Director General  
International Atomic Energy Agency  
P.O. Box 100  
Wagramer Strasse 5  
A-1400 Vienna  
AUSTRIA**

**Dear Dr. ElBaradei,**

**As you know from my comments to you at the November 2005 Carnegie Nonproliferation Conference, I have the highest regard for your work and**

**that of your agency. There is, however, a serious problem with the 2006 Report of the Chernobyl Forum.**

**Although there is much in the Chernobyl Forum with which I agree, I cannot condone the Report's ignoring 90% of the radiation dose to the people of the world. The 1993 UNSCEAR Report convincingly totals that exposure as 600,000 person-Sv, while the Chernobyl Forum Report bases its expected "4000 cancer deaths" on only 60,000 person-Sv.**

**I commented on this in a November 2005 UPA article, republished and corrected just recently.**

**There has also been a Nature article published just recently.**

**It should not be the IAEA Press Office but the Director of the IAEA who should issue a statement clarifying this sorry mess.**

**An Italian journalist, Stefania Maurizi, on 04/26/06 properly quotes my view as that there has been a conspiracy, in which IAEA has participated.**

**Attached is my letter of February 21, 1995 to Abel Gonzalez on exactly this point.**

**Sincerely yours,**

**Richard L. Garwin**

**Encl:**

**-04/21/06 "The Real Toll of Chernobyl Remains Hidden in Background Noise," by R.L. Garwin, in UPI.**

**[http://www.terraily.com/reports/The\\_Real\\_Toll\\_Of\\_Chernobyl\\_Remains\\_Hidden\\_In\\_Background\\_Noise.html](http://www.terraily.com/reports/The_Real_Toll_Of_Chernobyl_Remains_Hidden_In_Background_Noise.html)**

**-04/20/06 "Counting the dead," NATURE, 440, 982-983, 20, April 2006.**

**02/21/95 LTR RLG to A.J. Gonzalez. (022195.AJG)**

**RLG:jah:6118MEB:042806.MEB**

# Coda

So, dear colleagues, there is much work to be done not only in the United States and the United Kingdom and France, but also in the evolving European Union and in the United Nations itself.



Here is the recorded text of the talk, to accompany the preceding slides:

Dear friends and colleagues, I regret not being with you in person in Barcelona for the Euroscience Open Forum, but I hope this will be an efficient way of doing my bit for the session. We are here to consider how policy decisions involving scientific components can be taken better in our respective countries, and on that I have substantial experience with the U.S. government in both civil programs and matters of security, as shown in SLIDE 2. In addition, I have at times had something to say about the UK's security programs, most recently with my testimony of January 23, 2007 to the Defense Committee of the House of Commons in regard to the Trident submarine replacement program. The reference is shown on SLIDE 3, and the testimony is available in full both on my website and from the excellent facilities of the British House of Commons.

In February 2006, President George W. Bush announced a Department of Energy program—the Global Nuclear Energy Partnership (GNEP)—that had at its proclaimed goal to make a secure fuel cycle available to most nations interested in using nuclear reactors for the production of electrical power. My testimony is referred to on SLIDE 4. GNEP would provide assurance of fresh fuel and the means to take back the spent fuel from nuclear reactors to avoid the plutonium being recovered in the using country for use in nuclear weapons. Unfortunately, the main part of the program was to begin with a major initiative to reprocess all of the spent fuel emerging from the 103 operating U.S. nuclear power reactors and to destroy the plutonium and “higher actinides” by burning in a new-design fast-neutron reactor. This fantasy was not supported by calculations of the economics, and the proposed proliferation-resistant reprocessing was shown by Frank von Hippel and others to be far from the case. So instead of a contribution to nonproliferation, GNEP would have been a major contributor to proliferation in the George Orwellian “1984” guise of “black is white” in introducing a so-called proliferation-resistant reprocessing system that is nothing of the kind.

But I want to spend my few minutes on a deception practiced by our good friends in the International Atomic Energy Agency (IAEA) which is by now well documented but little known, highlighted on SLIDE 5. SLIDE 6 is the cover slide for my talk in Brussels to the European Nuclear Assembly of March 29, 2006, together with a couple of selected slides from that talk. SLIDE 7 shows the requirements for a successful expansion of nuclear power; SLIDE 8 the problem of confidence, including deception by the IAEA; SLIDE 9 deals with fuel supply; SLIDES 10 and 11 the need to change the rules, while protecting health and environment; SLIDES 12 and 13 some comments on GNEP, and SLIDE 14 a summary comment that success in nuclear power will depend on greater openness.

There has long been controversy in the health physics community about the public health implications of low doses of ionizing radiation such as those received from cosmic rays, the radioactivity of rocks such as granite (coming largely from the potassium-40 radioisotope), and the like. In brief, linearity at the lowest levels is not assured, but its utility was reinforced recently by the seventh in a long series of reports from the U.S. National Academies of Science's Board on Effects of Ionizing Radiation—BEIR VII. My co-authors Georges Charpak and Venance Journé and I treated this matter in our books in French and in English, most recently in the 2005 volume “De Tchernobyl en tchernobyls.” We estimate there from the very extensive analysis and publication of the United Nations Special Committee on the Effects of Atomic Radiation-- UNSCEAR 1993—that the 60 million person-rem (600,000 person-sievert) exposure of the general public would correspond to about 24,000 cancer deaths. Actually, BEIR VII uses a coefficient of 0.057 per person-Sv rather than 0.04 cancer deaths per person-Sv as we did in our book, so that the expected death toll according to BEIR VII would be more in the range of 34,000.

The UNSCEAR 2000 report was careful not to report a collective dose, and when the “Chernobyl Forum” of several governments and international institutions published a report in September 2005, it made no mention of the 60 million person-rem but limited its consideration to the 6 million person-rem of the roughly 600,000 of the most exposed population in the Ukraine and the then Soviet Union.

This report contained the summary that no more than 4000 cancer deaths would be expected, much lower than previous estimates. What is interesting is that IAEA and its co-participants in the Chernobyl Forum adopted the linear hypothesis in this calculation, and many of those exposed in other states had exposures not much less than those taken into account in Ukraine and Russia.

I had complained as early as 1995 to Deputy Director Abel Gonzalez that at a meeting in Atlanta he had not multiplied the collective dose by the dose-effect coefficient, which I thought was considerably less than candid. Now in the Chernobyl Forum report, that was done, but somehow 90% of the collective dose had vanished without explanation. SLIDE 15 provides here an excerpt from a Nature Magazine article, quoting a public relations person from IAEA as indicated on the slide, *"I was sick of seeing wild figures being reported by reputable organizations that were attributed to the UN," she says. "It was a bold action to put out a new figure that was much less than conventional wisdom."* (SLIDE 16)

In any case, the 2005 headlines had done their work, and the “no more than 4000 deaths expected” is firmly fixed in the literature, for instance in a recent book by Richard A. Muller, Professor of Physics at Berkeley, “Physics for Future Presidents,” W.W. Norton and Company, June 2008 (p. 104), as follows, *“In 2006, the International Atomic Energy Agency ( the IAEA, associated with the United Nations) came up with its best estimate for the total dose: about 10 million rem. This implies that the total number of induced cancer deaths from the Chernobyl accident would be about 10,000,000 divided by 2500, for a total 4,000 excess cancers.”* (SLIDE 17). Even the instructor of future presidents, knowledgeable about the ways of nature, was deceived by the deception committed by men and women.

SLIDES 18 reproduces here portions of my letter to Mohamed ElBaradei, a person whom I hold in great esteem for his personal contributions and those of the IAEA. SLIDE 19. But I believe that this deception, which cannot be erased from the public record, should be compensated by an announcement from the Director of the IAEA rather than the removal of the offending “4000” number from the final report of the Chernobyl Forum. (SLIDE 20)

So, dear colleagues, there is much work to be done not only in the United States and the United Kingdom and France, but also in the evolving European Union and in the United nations itself. SLIDE 21.