Presentation to Student-Scientists working at Lawrence Berkeley National Laboratory on US Department of Energy Fellowships

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Scientific Decision-Making and the Public Health Impacts of the US Department of Energy Nuclear Weapons Program: A Community Perspective

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Background: Current US Nuclear Weapons Program

- currently US has a total of 10,000 nuclear weapons deployed and in reserve

- Presidential Decision Directive 60: US will continue to rely on nuclear arms as a cornerstone of its national security for the "indefinite future" *November 1997*

Background: Current US Nuclear Weapons Program

- Nuclear Non-Proliferation Treaty (NPT)
  - 1995: US and other treaty parties reaffirmed their commitment
  - Article VI: obliges US and other parties to "pursue negotiations in good faith on effective measures relating to the cessation of the arms race at an early date and to nuclear disarmament …"

Background: Current US Nuclear Weapons Program

- *DOE "Stockpile Stewardship" Programs*
  - $4.5 billion/year - more $$ than was spent on average during the Cold War on directly comparable activities
  - new and more advanced nuclear weapons facilities
  - continued nuclear weapons design and production

DOE Stockpile Stewardship Program

- **National Ignition Facility**
  - Lawrence Livermore National Laboratory
  - laser inertial confinement fusion facility
  - $1.2 billion to build; $128 million/yr. to operate

- **Dual Axis Radiographic Hydrotest Facility**
  - Los Alamos National Laboratory
  - generation of images during implosion of first stage of nuclear weapons
  - Lawrence Berkeley Laboratory accelerator research contributes to Stockpile Stewardship program

Public Health Legacy of Nuclear Weapons

- US bombing of Hiroshima and Nagasaki caused approximately 210,000 deaths in 1945

- delayed effects: cancer, chromosomal abberations, immunologic effects, orphans, destruction of traditional society, devastation of community life and social systems, psychological effects

Public Health Legacy of Nuclear Weapons

" While no nuclear weapons have been detonated in war since Hiroshima and Nagasaki, a kind of secret, low-intensity radioactive warfare has been waged against unsuspecting populations …"

Bernard Lown, MD, Co-Founder
International Physicians for the Prevention of Nuclear War Nobel Prize for Peace 1985

Public Health Legacy of Nuclear Weapons

- inhabitants of tribal and minority lands foremost among the victims
  - unwillingly served as the main sites for testing nuclear weapons for every declared nuclear power
  - uranium mining on tribal lands and colonial countries

- 235,000 atomic veterans

- 11,300 - 212,000 extra cases of thyroid cancer

Public Health Legacy of Nuclear Weapons

- Long-lived radioactive and hazardous waste
  - 79 million cubic meters soil contaminated
  - 2 billion cubic meters of groundwater contamiated
  - DOE estimates cost of “clean-up” $227 billion over the next 75 years
  - current DOE planning document indicates that *more* wastes will be generated by nuclear weapons related activities over the *next* 20 years than from clean-up of past activities

Public Health Legacy of Nuclear Weapons

“ Every gun that is fired, every warship launched, every rocket fired, signifies, in the final sense, a theft from those who hunger and are not fed, those who are cold and not clothed. The world in arms spending is not spending money alone. It is spending the sweat of its laborers, the genius of its scientists, and the hopes of its children.”

General Eisenhower, 1953

Public Health Legacy of Nuclear Weapons

- $5.5 trillion = overall expenditures of nuclear weapons since 1940 (1996 constant dollars)
- 45-50 million people in US have no health care coverage
- 1 billion people will mark the millennium without being able to sign their name or read a road sign

Considerations for evaluating DOE public health-related scientific decision-making

Are institutional biases present?

Director of the Raw Materials Procurement Division of the Atomic Energy Commission, cautioned against the distribution of a US Public Health Service report warning of the health dangers of the Colorado Plateau mines

"The report might become the basis for press and magazine stories which could adversely affect uranium production in this country and abroad …"

Are institutional biases present?

" No agency responsible for exposures imposing risks on workers and the public should be entrusted with control over efforts to address the health consequences of these exposures."

Advisory Committee on Energy-Related Epidemiologic Research recommendation to the Secretary of the US Department of Health and Human Services 1998

Who defines acceptable risk?

- current reference levels do not incorporate the breadth of current scientific information on the health impacts of “low-level” exposure to radiation.

1943 one fatal cancer per 100,000 person rem expected

1985 one per 10,000 expected

1998 one per 2000 expected

Who defines acceptable risk?

"a cursory glance at NCRP [National Council on Radiation Protection and Measurements], which set radiation protection standards in the United States, sheds some light on whose hand fed those who set levels of permissible exposure. … the NCRP relies upon the nuclear-industrial complex for most of its funding other than income from publication sales."

Karl Morgan The Angry Genie. One Man's Walk through the Nuclear Age. University of Oklahoma Press 1999 p.116.

Where is the burden of proof placed?

- null hypothesis
- data gaps
- secrecy
- introduction of new technology

How is the problem defined?

- cancer and non-cancer health outcomes
- total health risk from multiple contaminants
- scope of research
- potential alternatives

Are risks recognized by the directly affected population?

- Nevada Test Site nuclear weapons explosions
  - Kodak (in Rochester New York) notified
  - community members in NY and elsewhere not notified

How are risks and benefits distributed?

- communities not homogeneous
- more highly exposed, more vulnerable sub-populations
- equity and social justice vs. “NIMBY”

Is scientific uncertainty recognized?

" For over 50 years [Hanford] managers … steadfastly maintained that leaks from underground tanks were insignificant because the radioactive material would be trapped by the surrounding soil. But now they admit they were wrong.

The [DOE] had said for decades that no waste from the tanks would reach the ground water in the next 10,000 years at least, but it is already there.

[DOE] officials reluctantly acknowledged the presence of tank waste in ground water only in November 1997, based on work performed by two "whistle blowers" who had previously been penalized for making safety complaints."

New York Times 3/23/98

Precautionary Principle

"When an activity raises threats of harm to the environment or human health, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically."

Key Elements of the Precautionary Principle

- take precaution in the face of scientific uncertainty
- explore alternatives to possibly harmful actions
- place the burden of proof on proponents of an activity rather than on potential victims of the activity
- use democratic processes to carry out and enforce the principle - i.e., informed consent

Case study #1: LLNL Plutonium Contamination

1967

- LLNL identified a release of plutonium through routine monitoring
- estimated the size of the release at the Radiation Lab (the source) by inferring data points
- compared this estimate to Pu-239 and Am-241 in the Livermore sanitary sewer system using a “reasonably detailed sampling program” and found “good agreement”
- compared estimate of release to current standards --- < 1/2 the permissible drinking water level
- determined no hazard to plant personnel, community

Memo to DC Sewall LRL, June 29, 1967

Case study #1: LLNL Plutonium Contamination

1967

“ all of the radioactivity has gone to the sludge lagoons … The ultimate fate of the sludge in the sludge lagoons is uncertain at this time … The sludge is never used in agricultural areas (food production) unless specific public health approval is granted.” *Memo to DC Sewall LRL, June 29, 1967*

1975

“ Large quantities of the digested sludge from the Livermore sewage treatment plant are used by municipal agencies as a soil conditioner in parks and landscaping around public buildings. The dried digested sludge is also available without cost to the general public, and is commonly used as a soil conditioner for home lawns and gardens.”

Myers et al. “Evaluation of sludge containing plutonium as a soil conditioner for food crops”. September 17, 1975

Case study #1: LLNL Plutonium Contamination

1975

- LLNL study states conditions chosen to "maximize exposure"
- LLNL study concludes: maximum dose a tiny fraction of permissible dose

  Myers et al. "Evaluation of sludge containing plutonium as a soil conditioner for food crops". September 17, 1975

1998

- state and federal health agencies, upon review of existing data, determine that plutonium concentration in sludge at Livermore Water Reclamation Plant likely to have been underestimated

Case study #1: LLNL Plutonium Contamination

1998

"It is known that since the mid-1950s, LLNL released small quantities of plutonium to the sanitary sewer under strict DOE discharge limits." *DOE/LLNL 1998*

"Sanitary sewer sludge was made available for public and City use as a soil conditioner from at least 1961 to the mid-1970s." *DOE/LLNL 1998*

1999

Results of soil sampling at a Livermore Park (1995-1998) demonstrate plutonium levels up to 1,000 times "background" levels; LLNL/DOE concludes that plutonium-laden sludge is responsible for the contamination, but because the levels of plutonium in the park are less than the EPA's "preliminary remediation goal", there is no public health concern.

Case study #2: LBL National Tritium Labeling Facility (NTLF)

- it is not disputed that NTLF releases tritium into the environment
- as a result of tritium releases at levels > EPA's cancer risk screening levels, LBL is eligible for inclusion on the federal "Superfund" list of the most hazardous waste sites which have been identified by EPA as a priority for clean-up
- EPA notes that tritium emissions are well below EPA clean air public health standards
- the accuracy of the NTLF tritium inventory is doubtful

Case study #2: LBL National Tritium Labeling Facility (NTLF)

- environmental sampling is likely to have underestimated ambient tritium levels - unreliable water vapor estimates, and therefore of tritiated water in the silica gel sampling method

- the assumptions of the model used to generate an estimate of community risk bear little relation to the actual topography and other conditions of the surrounding community

- the Berkeley City Council passed a resolution calling for the closure of the NTLF