

## Chernobyl

Doses up to 8,000 mSv killed 28 emergency workers in 1986. The Chernobyl Forum<sup>10</sup>



estimated up to 8,000 children contracted thyroid cancer from milk contaminated with iodine-131, and 15 died. Relying

on LNT theory, the report projected up to 4,000 future fatal cancers might occur, but these have not been observed among the 100,000 fatal cancers normally expected.

## US nuclear shipyard workers

The US studied workers maintaining nuclear submarines who were exposed to low levels of gamma radiation from cobalt-60. The study compared 28,000 nuclear workers and 33,500 non-nuclear workers. People exposed to more radiation (averaging 8 mSv/y) had a death rate<sup>11</sup> from all causes 24% less than the others. This contradicts LNT theory.

## Medical radiation

Radiation medicine exposes a US person to 3 mSv/y on average. Diagnostic radiation doses<sup>12</sup> are low, ranging from 0.001 mSv for a dental X-ray to 20 mSv for a CT procedure.



Therapeutic doses<sup>13</sup> are high. A rotating X-ray beam focused on cancer tissue delivers up to 80,000 mSv. To minimize the risk of causing cancer in nearby tissue, radiologists divide the radiation dose into fractions, administered daily rather than all at once, giving healthy tissue time to recover. If LNT were true this fractionated radiation therapy wouldn't work.

## Fukushima

The tsunami-flooded reactors overheated and released radioactive materials. Residents were evacuated from areas with > 20 mSv/y exposure. (IAEA<sup>14</sup> recommends > 220 mSv/y.) A UN panel of expert scientists concluded<sup>15</sup> that radiation caused no attributable health effects and likely none in the future. Radiation killed no one, but the evacuation stress did kill<sup>16</sup> hundreds. Most refugees could have safely returned home.

## RADIATION POLITICS

Exposure limits that were set by LNT theory ignore observed low-level radiation effects. Public radiation safety limits have become more restrictive, from 150 mSv/y (1948) to 5 mSv/y (1957) to 1 mSv/y (1991).

These rules are political and inconsistent. Nuclear workers are allowed 50 mSv/y, and astronauts 500 mSv/y. EPA's limit for indoor radon is 8 mSv/y, but 0.04 mSv/y for tritium in drinking water. EPA limits Yucca Mountain exposure to < 0.1 mSv/y for 10,000 years.

The LNT fallacy that any radiation can kill you led to the ALARA principle (as low as reasonably achievable). But achievability is based on ever-changing technology capability, not health effects. LNT and ALARA ratchet limits lower and increase costs and fear.

## Radiation is safe within limits.

An evidence-based radiation safety limit would be 100 mSv/y. Ending LNT and ALARA rules will enable the full environmental and economic benefits of green nuclear power.

Ask your senators and representatives to require NRC and EPA to adopt new, scientific, evidence-based radiation safety limits.

# Radiation: The Facts



*Opening eyes to the facts*

## Radiation is safe within limits.

Nuclear power is a green environmental solution. It generates no CO<sub>2</sub>. The fuel is cheap and inexhaustible.

Green nuclear power can solve the global crises of air pollution deaths and climate change. Cheap energy can help developing nations escape poverty and let industrialized nations improve economic growth.

Is it safe? The primary obstacle to nuclear power is misunderstanding of radiation safety.

## Misunderstandings

- There is no safe level of radiation.
- Radiation effects are cumulative.
- Chernobyl killed nearly a million people.
- Nuclear waste is deadly for a million years.

These create public fear, so regulators adopted unnecessary rules to isolate the public from radiation. The excess costs and delays make nuclear power more expensive and impede its benefits to people.

## Radiation is safe within limits.