

## RulemakingComments Resource

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**From:** Norbert T. Rempe <rempent@yahoo.com>  
**Sent:** Thursday, July 30, 2015 10:30 PM  
**To:** RulemakingComments Resource  
**Subject:** [External\_Sender] Docket ID NRC-2015- 0057  
**Attachments:** Comments on Docket ID NRC-2015- 0057, Rempe, July 28, 2015.pdf

Good morning,

The slides of my attached presentation file, which is an integral part of my submittal, support the following recommendations:

1. Discard and disavow the LNT, because it is not based on evidence but has been a fraud (Edward Calabrese, 2011, 2013, 2015) from the start.
2. Discard and disavow the ALARA principle. It makes no sense in light of the huge temporal and spatial variability of background dose on planet Earth, without any evidence of harm or risk resulting from the high end of that range. If you must, replace it with the ALAIN (as-low-as-in-nature) principle.
3. Discard and disavow the concept of collective dose. It never made sense, and no evidence exists to support its application.
4. Declare "below regulatory concern" any chronic exposures below at least 250mSv (25Rem) per year. This is approximately the largely agreed-upon chronic dose to some inhabitants of Ramsar, Iran ( the highest currently known background location on planet Earth), without any evidence of harm or risk caused by that dose. This limit may need to be raised as additional reliable information is obtained. The often-suggested limit of 100mSv (10Rem) is an arbitrary number plucked more or less from thin air.

In conclusion: It is long past time to update atavistic radiation protection standards that not only do nothing to protect against real risk, but that require the expenditure of vast sums for mitigating merely imaginary risks. This unconscionable diversion of resources, both public and private, produces unintended harm and death, similar to the historic destruction of lives when "risk assessment specialists" of the period mitigated the imaginary risk from witches and witchcraft.

I will be happy to answer questions and to elaborate further, if you so desire.

Please use this opportunity to finally do the right thing!

Norbert T. Rempe  
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USA

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Insistence on,  
and cadaverous compliance with,  
regulations without continuously  
questioning and justifying  
their factual and rational basis  
is the last refuge of  
the lazy, incompetent, and malevolent.

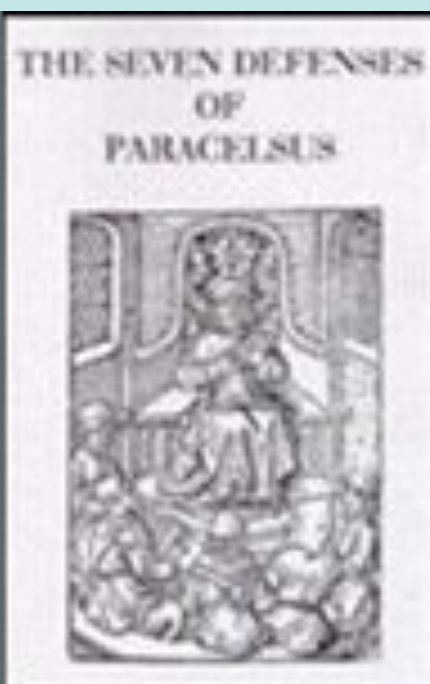
# TEACHING VARIABILITY OF RADIATION AND RADIOACTIVITY IN GEOLOGICAL TIME AND SPACE

REMPE, Norbert T., 1403 N Country Club Cir, Carlsbad, NM 88220-4115,  
rempent@yahoo.com

**Ionizing** natural background **radiation** on Earth **varies** spatially by up to **two orders of magnitude** at present, and its average intensity decreased –for probably most of the time– since before the beginning of biological evolution. Backward extrapolation of the half-life concept indicated the potential for **spontaneous fission reactions during the Precambrian** even before their reality was proven by the discovery of the **Oklo** natural uranium reactors. Claims of hazard, damage, or **risk** to organisms exposed to the upper limits of the **natural background** range remain **unsupported by** observable **evidence**. Radioactivity and radiation (beyond the technical aspects of radiometric dating) must be **understood and integrated** into the teaching of geoscience in the interest of **scientific literacy and integrity**. Appreciation of their variability through time and space **reduces** irrational **fears** and advances comparative and **realistic assessment of real hazards and risks**.



Paracelsus (1493 - 1541)



If you wish justly to explain poison, what is there that is not poison?

All things are poison, and nothing is without poison: the dose alone makes a thing not poison.

For example, every food and every drink, if taken beyond its dose, is poison: the result proves it.

Written 1538, published 1564, in the third of his seven "Defensiones"

**Such is the extent of nuclear anxiety that even scientists seem to forget our planet's radioactive history.**

**Life began nearly four billion years ago under conditions of radioactivity far more intense than those that trouble the minds of certain present-day environmentalists.**

James Lovelock, in Bruno Comby (2006), Environmentalists for Nuclear Energy  
([www.ecolo.org/aa\\_tiroir/Nuclear-en.doc](http://www.ecolo.org/aa_tiroir/Nuclear-en.doc))



## Decrease in the activity of the earth's crust due to the decay of long-lived radioactive isotopes

Million years ago	Relative decrease in radioactivity			
	U-238	U-235	Th-232	K-40
5000	2.14	128	1.29	14.3
2000	1.35	7.05	1.08	2.82
present	~1	~1	~1	~1

Simplified from L.A. Pertsov, The Natural Radioactivity of the Biosphere,  
Israel Program for Scientific Translations, Jerusalem, 1987

Passing through the spiral arms of the Milky Way, our Solar System moves periodically through areas of intensive star creation.

**In these regions, the intensity of galactic cosmic radiation reaching the Earth is 10 to 100 times\* higher than average.**

\*David S. Smith, Seth Redfield, and John Scalo,  
3rd Astrobiology Science Conference, Ames Research Center, 2004 (poster)

## Radiation-driven Ecosystems



Fusion is the process that takes place in stars like our Sun. Whenever we feel the warmth of the Sun and see by its light, we are observing the products of fusion. We know that all life on Earth exists because the light generated by the Sun produces food and warms our planet.

Therefore, we can say that fusion is the basis for our life

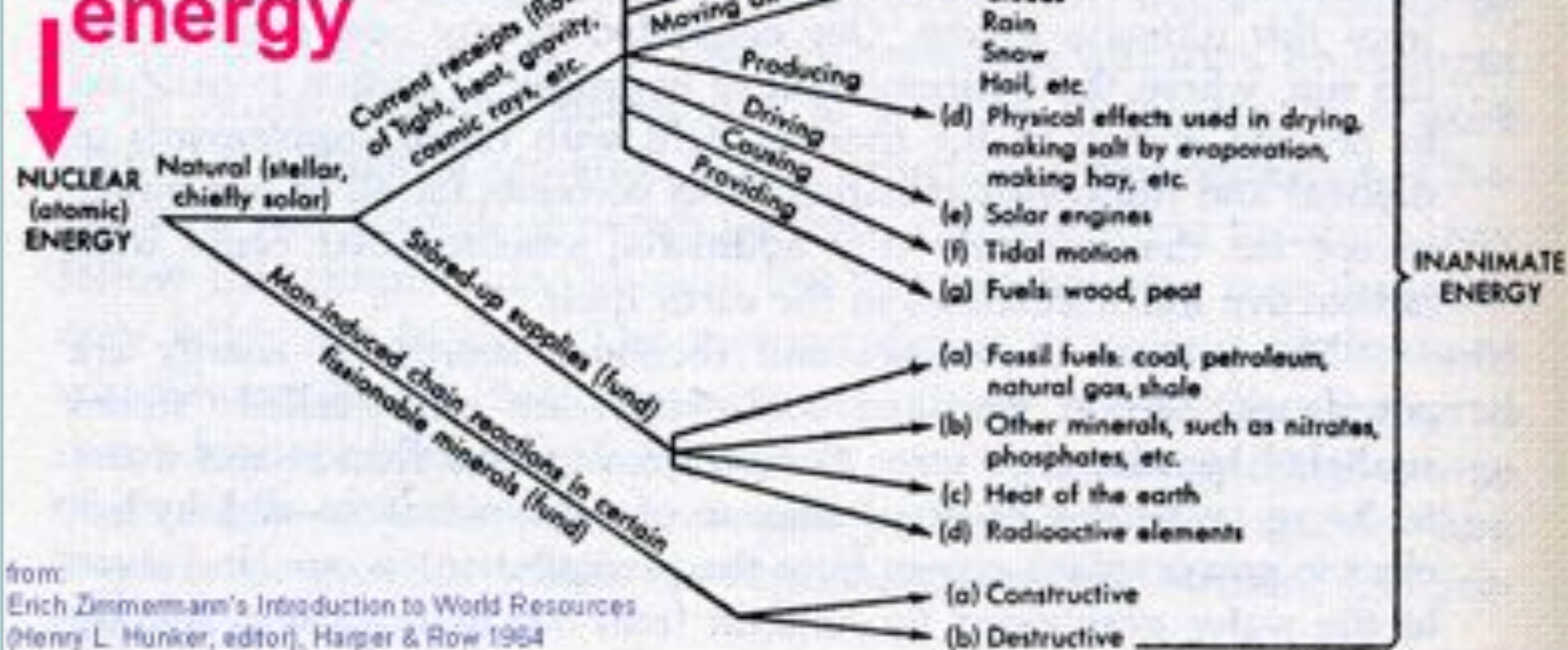
<http://www.ibi.gov/abc/Basic.html>

...virtually all of the energy we use originates in the power of the atom. Nuclear reactions energize stars, including our Sun. The energy we capture for use on Earth comes largely from the Sun or from nuclear forces local to our own planet.

<http://needioknow.nas.edu/energy/energy-sources/the-sun.php>



# Origin of almost all energy



from:  
 Erich Zimmermann's Introduction to World Resources  
 (Henry L. Hunker, editor), Harper & Row 1964



**Romantics** might like to think  
of themselves  
as being composed  
of **stardust**.

**Cynics** might prefer to think  
of themselves  
as **nuclear waste**.

Simon Singh, Big Bang: The Origin of the Universe, p. 389  
(Fourth Estate 2004)

uranium mine



pre-Fermi (*natural*) reactors

**Oklo**  
Gabon



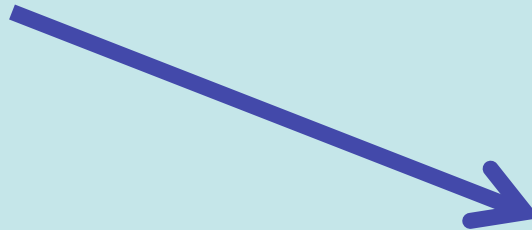
**The strength of the Oklo  
analogue lies in the fact  
that it represents more  
extreme conditions than  
those likely to be met in a  
deep geologic repository**

(D.J. Mossman et al., 2008)



# Scientific American

November 2005



## Oklo Nuclear Geysers (16 individual reactors)

- Operated 1.8 billion years ago,
  - for >150 000 years,
  - in 30-min pulses with 2.5 hr dormant periods,
  - consuming >5t U.
- Prove nuclear fission is natural.
- Suggest other natural reactors waiting to be found.

We also know that nuclear fusion  
(sun and other stars) is natural

## THE WORKINGS OF AN ANCIENT NUCLEAR REACTOR

• BY ALEX P. MESHIK •



Two billion years ago parts of an African uranium deposit spontaneously underwent nuclear fission. The details of this remarkable phenomenon are just now becoming clear

- Oklo is a worst-case analogue:
  - Rocks were jointed and fractured
  - Permeabilities waxed and waned
  - The ore went **critical**, enduring fission and high temperatures
  - Confinement remained effective **without engineered barriers** or carefully designed waste forms
  - Fission products were **available for migration for billions of years**
- Conclusion: geologic repositories did, do, and will confine radionuclides  
(even without human assistance or Yankee ingenuity)

**Nature solved the radioactive waste “problem” 2 billion years ago.**

**Any state is a “nuclear” state.**

**An educated “anti-nuclear” person is an oxymoron.**

William C. Clark, 1980: “Neither the witch hunting hysterics nor the mindlessly rigid regulations characterizing so much of our present chapter in the history of risk management say much for our ability to learn from the past”



## Tri-Valley CAREs

Communities Against a Radioactive Environment

2582 Old First Street, Livermore, CA 94550 • (925) 463-7148 • [www.trivalleycares.org](http://www.trivalleycares.org)



Peace Justice Environment  
since 1983

Avner Vengosh, Duke University

### Rooting Out Radioactive Groundwater (Geotimes, May 2006)

When the **Chernobyl** nuclear power plant exploded in 1986... The accident demonstrated the **fragility of any nuclear facility** and raised the level of awareness over the health **threats that radiation poses** to people and the environment.

...the general population is still **at risk from** a different source: **Naturally occurring radioactive particles** exist in many groundwater systems worldwide...

The global **community must aggressively address these challenges, to ensure a safe water supply.**

Laurence A. Coogan & Jay T. Cullen, University of Victoria

Did **natural reactors** form as a consequence of the emergence of oxygenic photosynthesis during the Archean? (GSA Today, October 2009)

Natural reactors act as point sources of... **toxic byproducts.**

Natural fission reactors would clearly be **environmentally detrimental.**

...whether the formation of these natural reactors had any significant **biocidal impacts**...

## Natural Radioactivity by the Square Mile, 1 Foot Deep

Nuclide	Activity used in calculation	Nuclide mass	Activity found in soil volume
<b>U</b>	0.7 pCi/g (25 Bq/kg)	2,200 kg	0.8 curies (31 GBq)
<b>Th</b>	1.1 pCi/g (40 Bq/kg)	12,000 kg	1.4 curies (52 GBq)
<b>K 40</b>	11 pCi/g (400 Bq/kg)	2000 kg	13 curies (500 GBq)
<b>Ra</b>	1.3 pCi/g (48 Bq/kg)	1.7 g	1.7 curies (63 GBq)
<b>Rn</b>	0.17 pCi/g (10 kBq/m <sup>3</sup> ) soil	11 µg	0.2 curies (7.4 GBq)
<b>Total:</b>			<b>&gt;17 curies (&gt;653 GBq)</b>

**Not everybody realizes  
that geothermal energy  
is just another name  
to describe  
the radioactivity of our planet**

(Bertrand Barré, 2005)



# “Microbes from Hell’s Zip Code”

S. African gold mine & Nevada Test Site

Water plus  
rock plus  
radiation can  
sustain life for  
millennia

Radiation may  
keep life going,  
thriving, and  
evolving

Tullis Onstott, Princeton  
(Hometown: Carlsbad, NM)

*Paras*— **Believe It or Not!**

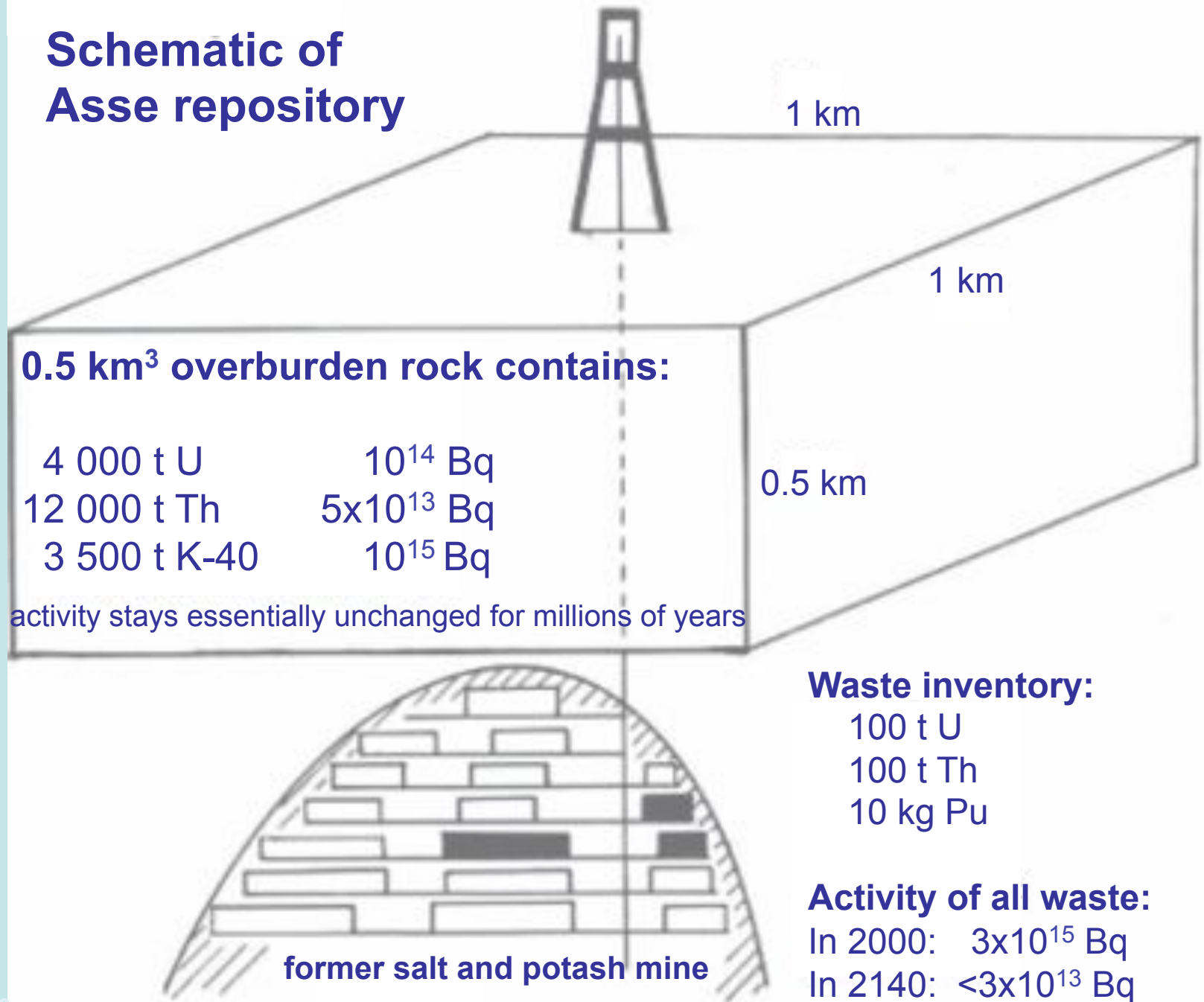


# Geologic Repositories in Germany

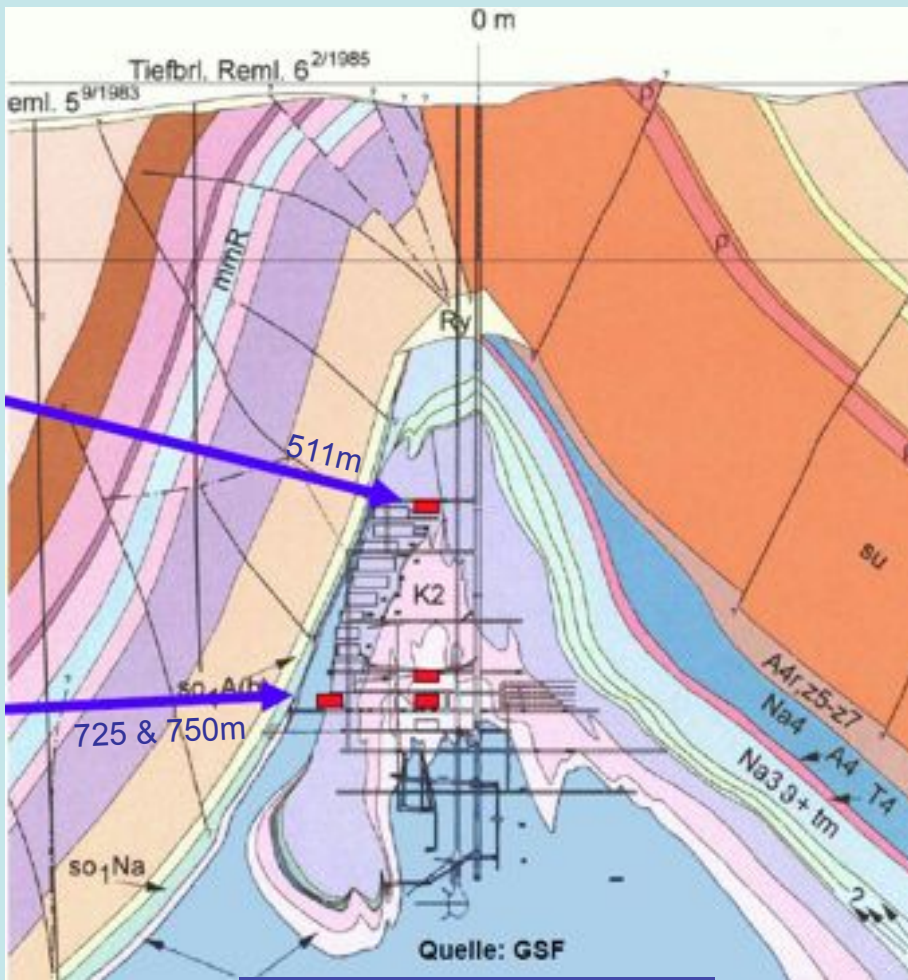


Asse

# Schematic of Asse repository





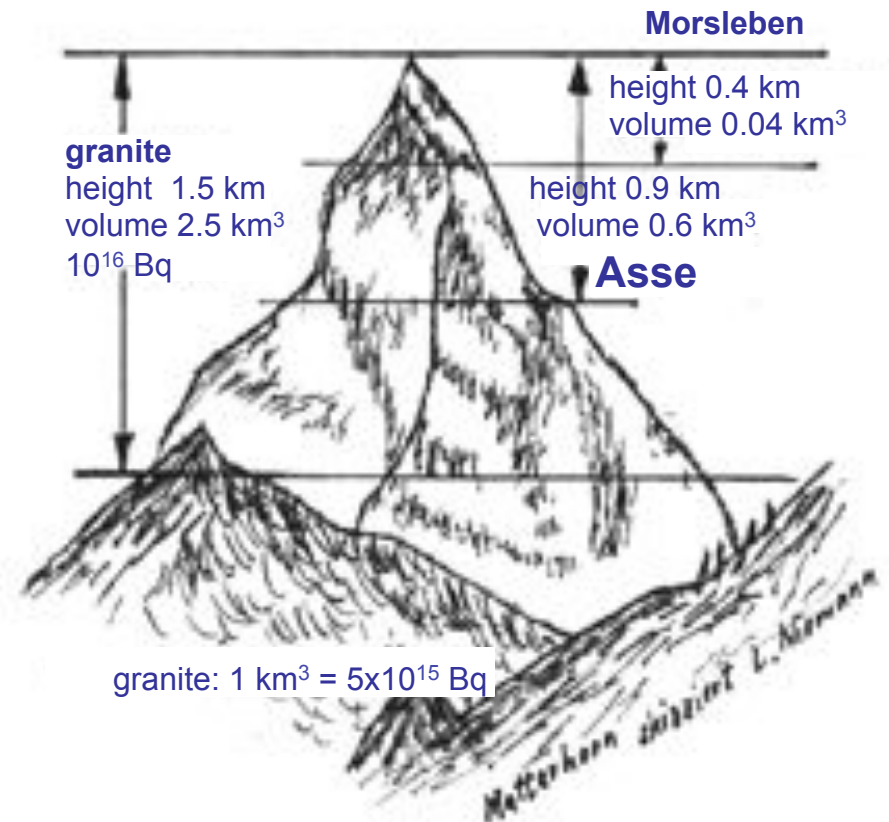


# Asse

(German rad. waste repository in a salt dome)

(Morsleben: German rad. waste repository in a salt pillow)

# Matterhorn







WIPP radiation levels average      3.1  $\mu\text{R/hr}$  at the surface,  
0.6  $\mu\text{R/hr}$  655m underground  
WIPP underground is a **radiation-deprived** environment



ng(o)<sub>3</sub>

Project Gnome  
radioactive waste isolation  
in salt, in the U.S.  
since 1961

Miner for scale

**First re-entry only six months post-shot (and release)**



# Ionizing Radiation Dose Ranges (Sievert)



Office of Science  
U.S. DEPARTMENT OF ENERGY

Whole body, acute: G-I destruction,  
lung damage, cognitive dysfunction  
(death certain in 5 to 12 days)\*

Cancer Radiotherapy  
total dose to tumor

acute exposure = all at once;  
chronic = hours, days, years

Whole body, acute:  
cerebral-vascular  
lesions  
(death in 0-5 days)\*

Life Span Study  
(A-bomb survivor  
epidemiology)

Total Body  
Irradiation  
(TBI) Therapy

Whole body, acute: circulating blood  
cell death; moderate G-I damage  
(death probable 2-3 wks)\*

Acute Radiation  
Syndromes

Whole body, acute: marked G-I  
and bone marrow damage  
(death probable in 1-2 wks)\*

Solar flare dose on  
moon, no shielding

Estimated dose for  
3-yr Mars mission  
(current shielding)

Human LD<sub>50</sub> range, acute exposure  
with no medical intervention  
(50% death in 3-6 weeks)\*

Human LD<sub>50</sub> range, acute exposure  
with medical intervention

\*Note: Whole body  
acute exposures assume  
no medical intervention.

Cancer Epidemiology

Evidence for small increases in human  
cancer above 0.1 Sv acute exposure,  
0.2 Sv chronic exposure

Typical mission doses on  
Int'l. Space Station (ISS)

Natural bkg. /yr  
Ramsar, Iran

EPA guideline for  
lifelong: 0.25 Sv

DOE Low Dose Program

EPA radiological emergency  
guideline for public relocation

"Stereotax" full-body  
CT scanning (dose scan)

Natural bkg. /yr  
Kerala coast, India

DOE administrative control:  
20 mSv/yr = 2 mrem/yr

DOE, NRC Dose Limit for Workers:  
50 mSv/yr = 5 rem/yr

Typical annual doses for  
commercial airline flight crews

Medical Diagnostics (A-J)



NRC cleanup criteria for  
site decontamination /  
restricted use: 0.25 mSv/yr

Natural background,  
U.S. average = 3 mSv/yr  
(includes radon)

Natural bkg. /yr  
Yangjiang, China

Regulations & Guidelines

Max. release  
DOE facilities

Road trip  
NY to London

EPA dose limit applicable  
to public drinking water  
systems: 0.04 mSv/yr

EPA dose limit  
from release in air:  
0.10 mSv/yr

ANSI Standard N41.17 Limit  
Security Personnel Scanners:  
0.25 mSv/yr person  
(0.1-10 µSv /scan)

DOE, NRC Dose Limit for Public:  
1 mSv/yr = 100 mrem/yr  
(OCEP, NCRP)

Medical Diagnostics, mSv

A- Chest x-ray (2 film)	0.1
B- Dental oral exam	1.6
C- Mammogram	2.5
D- Lumbosacral spine	3.2
E- PET	3.7
F- Bone (Tc-99m)	4.4
G- Cardiac (Tc-99m)	10
H- Cranial CT (MSAD) (multiple scans average dose)	50
I- Barium contrast G-I fluoroscopy (2 min scan)	85
J- Spiral CT- full body	20-100

LD<sub>50</sub> = Lethal Dose to 50%  
(the acute whole body dose that results in  
lethality to 50% of the exposed individuals)

Absorbed dose: 1 Gray = 100 rad  
Dose equivalent: 1 Sievert = 100 rem  
1 mSv = 100 mrem  
(1 Sv = 1 Gy for x- and gamma-rays)

Chart compiled by NF Manning, Office of Science, DOE/BER  
"Orders of Magnitude" revised March 2006

Source: Office of Biological and Environmental Research (BER), Office of Science, U.S. Department of Energy  
<http://www.science.doe.gov/ber>

# Background Radiation and EPA and NRC Regulations

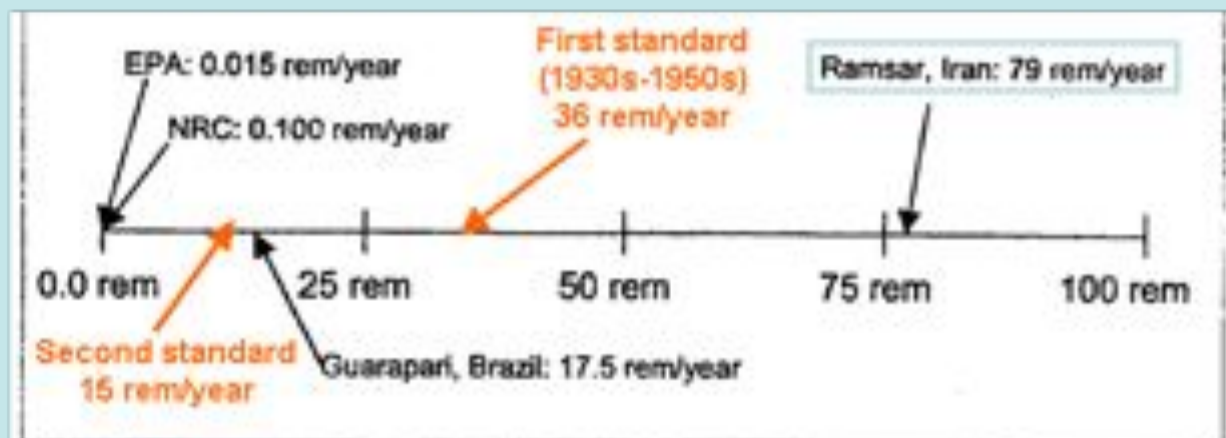


Fig. 2. Scale comparing EPA and NRC regulatory limits to natural background radiation environments (100 rem = 1 sievert; 100 rad = 1 gray)

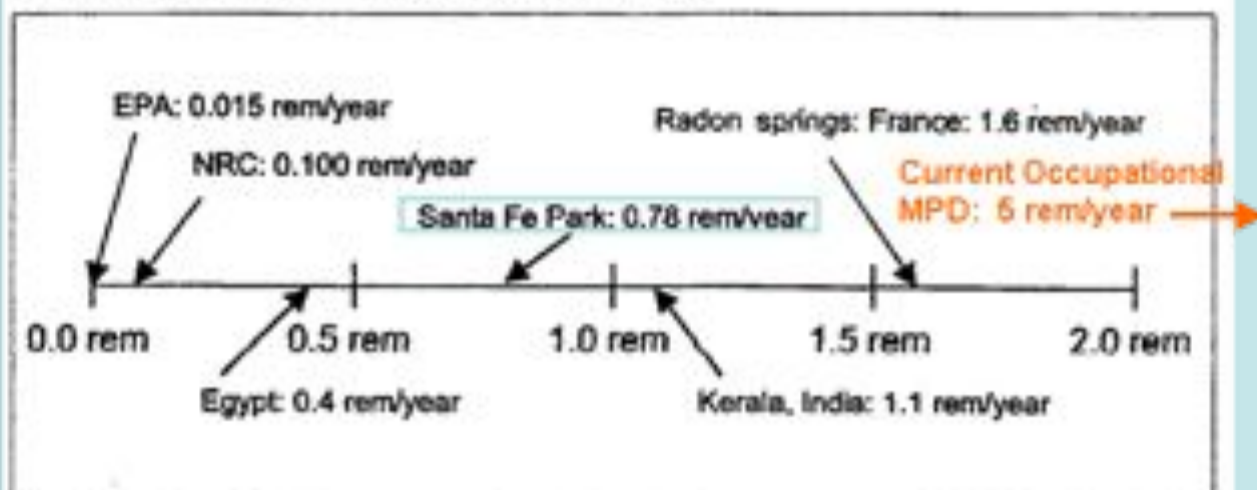
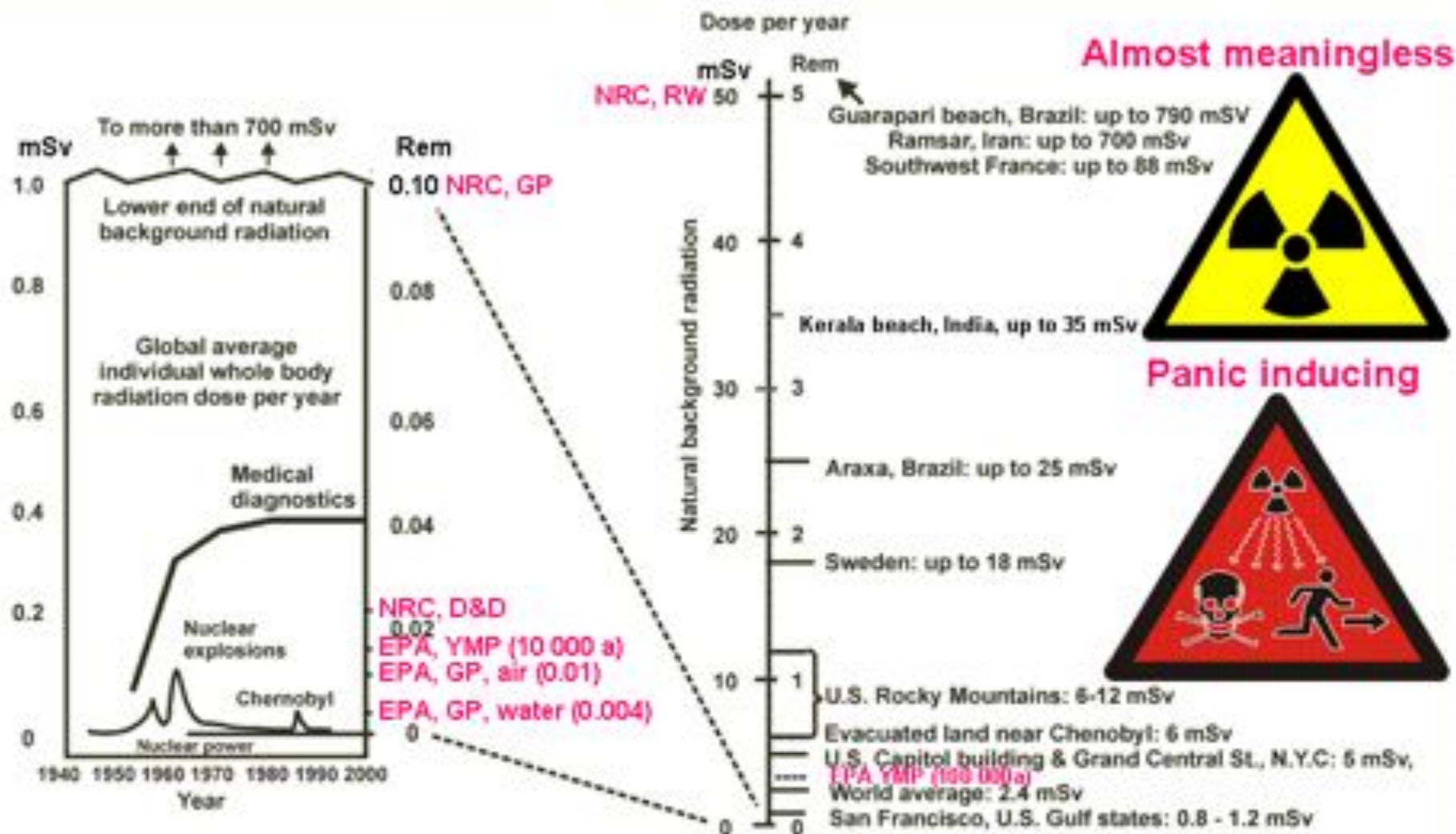


Fig. 3. Expanded scale comparing EPA and NRC regulatory limits to natural background radiation environments (100 rem = 1 sievert; 100 rad = 1 gray)





Modified from a figure prepared by Ted Rockwell from data found in "Radiation Risk and Ethics", Z. Jaworoski, published in Physics Today, American Institute of Physics, September, 1999 and "Ionizing Radiation and Radioactivity in the 20th Century", Z. Jaworoski, presented at the International Conference on Radiation and its Role in Diagnosis and Treatment", Tehran, Iran October, 2000.

[http://www.cns-snc.ca/media/uploads/branch\\_data/branches/Toronto/radiation/natural\\_and\\_human\\_radiation.html](http://www.cns-snc.ca/media/uploads/branch_data/branches/Toronto/radiation/natural_and_human_radiation.html)

<http://hps.org/publicinformation/ate/faq/regdoselimits.html>

<http://space.mit.edu/betstream/handle/1721.1/41588/213482682.pdf?sequence=1>

# UNDER- EXPOSED

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What If Radiation  
Is Actually  
**GOOD**  
for You ?

by Ed Hiserodt

*Laissez Faire Books*

*a Division of the Center for Libertarian Thought, Inc.*

LITTLE ROCK, ARKANSAS

2005

ISBN 0-930073-35-5



1995  
ISBN 0-944838-96-0

# Has radiation protection become a Health Hazard

Gunnar Walinder

Nuclear Training & Safety Center, Nyköping, Sweden  
Medical Physics Publishing, Madison WI, USA

# “Normal” or average v. highest known natural background radiation on Earth

## “normal”

## Ramsar

Radium in groundwater (Bq/l)

<10

~500

Radium in soil, rock, food (Bq/g)

<0.5

~350

Radon inside homes (Bq/l)

<0.5

>4

Population dose (mSv/yr)

2-3

20-250

“no consistent detrimental  
effect has been detected so far”

[http://www.ecolo.org/documents/documents\\_in\\_english/RamsarHENRAPaper.doc](http://www.ecolo.org/documents/documents_in_english/RamsarHENRAPaper.doc)



Source:  
The Very High Background Radiation Areas of Ramsar, Iran:  
Geology, Radiobiology, and Policy  
Andrew Karam, Ph.D., CHP  
University of Rochester  
Presented to NO CHPS, Radiation Safety Without Borders  
November 12, 2002

## Annual terrestrial radiation doses in the world



Area	mean (mGy/year)	maximum (mGy/year)
<b>Ramsar, Iran</b>	<b>10.2</b>	<b>(260)</b>
Guarapari, Brazil	5.5	(35)
Kerala, India	3.8	(35)
Yangjiang, China	3.51	(5.4)
Hong Kong, China	0.67	(1.00)
Norway	0.63	(10.5)
France	0.60	(2.20)
China	0.54	(3.0 )
Italy	0.50	(4.38)
<b>World average</b>	<b>0.50</b>	
India	0.48	(9.6)
Germany	0.48	(3.8)
Japan	0.43	(1.26)
USA	0.40	(0.88)
Austria	0.37	(1.34)
Ireland	0.36	(1.58)
Denmark	0.33	(0.45)





# Radiation and Life

- Life **evolved** in a radiation field (“vitamin-R”) that was much more intense than today:
  - Higher Concentration of Radioactive Elements
  - Natural Reactors
- Natural background radiation levels on Earth **vary** by at least **two orders** of magnitude.

after S. M. J. Mortazavi, 2006, at:

[http://www.ecolo.org/documents/documents\\_in\\_english/ramsarMORTAZAVI-HLR-06.ppt](http://www.ecolo.org/documents/documents_in_english/ramsarMORTAZAVI-HLR-06.ppt)



# Background Radiation Exposure

- US average:  $3.6 \text{ mSv y}^{-1}$   
Worldwide average:  $2.4 \text{ mSv y}^{-1}$
- Recommended max. dose for radiation workers:  $20 \text{ mSv y}^{-1}$   
Goal for members of the public:  $<1 \text{ mSv y}^{-1}$
- Inhabitants of Ramsar, Iran:  $240 \text{ mSv y}^{-1}$
- Exposure of people in Ramsar is  $>200$  times the recommended maximum goal

**The lack of ill effects from receiving this dose  
cannot be reconciled  
with current radiation protection standards**

# Natural background radiation: 3 mSv/y. (range: 1-10 mSv/y.)

20 *Int. J. Low Radiation, Vol. 2, Nos. 1/2, 2006*

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## Cancer incidence in areas with elevated levels of natural radiation<sup>1</sup>

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S.M.J. Mortazavi\*

Senior author: A. Niroomand-Rad

National Radiation Protection Department (NRPD),  
Iranian Nuclear Regulatory Authority (INRA),  
PO Box 14155-4494, Tehran, Iran

### Natural background radiation levels

“... in Ramsar are approximately 55-200 times higher than that of the global average rate.” (typ. 260 mSv/y.)

“... no increased level of chromosome aberrations.

... It can be concluded that prolonged exposure ... decreases the frequency of chromosome aberration and the cancer incidence rate.”





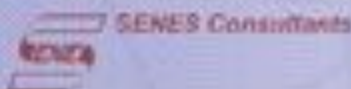
## Annual Background Radiation Exposure vs. Annual Public Exposure Limits: U Mines and Mills

- ❑ Background Levels (from previous slide)
  - > Colorado average = 400 mrem
  - > Leadville, Colorado = 526 mrem
  - > U.S. average = 310 mrem
- ❑ Regulatory Limits
  - > EPA drinking water standard = 4 mrem<sup>1</sup>
  - > EPA limit for all exposure pathways = 25 mrem<sup>2</sup>
  - > NRC Limit with radon = 100 mrem; excluding radon = 25 mrem<sup>3</sup>

<sup>1</sup> U.S. Environmental Protection Agency. Radionuclides in drinking water. Available at:  
<http://www.epa.gov/safewater/radionuclides/index.html>

<sup>2</sup> U.S. Environmental Protection Agency. Environmental radiation protection for nuclear power operations, 40 CFR 190.10; 2005.

<sup>3</sup> U.S. Nuclear Regulatory Commission, Domestic Licensing of Source Material, 10 CFR 40

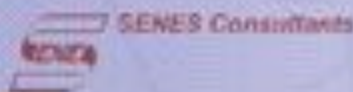


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## Radiation Background in Kerala India

- ❑ Unusually high natural radiation background has been known for many years due to natural thorium in the monazite sands of the region
- ❑ Annual outdoor exposure levels as high as 7000 mrem have been measured where people live
- ❑ Recent epidemiological studies have concluded no excess cancers in over 69,000 residents studied for 10 years<sup>1</sup>

<sup>1</sup>R Nair, B Rajan, et al; Background radiation and cancer incidence in Kerala, India—Karanagappally cohort study; Health Physics, 96,1, January, 2008



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<http://www.nma.org/pdf/urw/brown.pdf>



## How Common are Uranium and its Daughter Products<sup>1</sup> in Nature?<sup>2</sup>

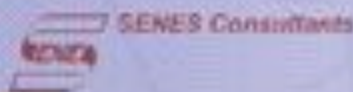
- Typical concentration in soil and rocks (pCi\*/gram):
  - > Uranium = 0.6 – 3.0
  - > Uranium in phosphate rock used for fertilizers = 40 – 80
  - > Radium = 0.4 – 3.6
  - > Thorium = 0.2 – 2.2

<sup>1</sup> Daughter products = those chemical elements that uranium decays into as a result of its radioactive properties. Thorium and radium are also radioactive.

<sup>2</sup> Sources: (1) National Council on Radiation Protection and Measurements. Natural background radiation in the United States. Washington, DC: National Council on Radiation Protection and Measurements; NCRP Report No. 45; 1975.

(2) National Council on Radiation Protection and Measurements. Exposure of the population in the United States and Canada from natural background radiation. Bethesda, MD: National Council on Radiation Protection and Measurements; NCRP Report No. 94; 1992 (updates and supersedes NCRP Report No. 45).

\*pCi = picocurie, one-trillionth of a curie, the amount of radioactivity where approximately two atoms decay per minute. Picocurie is a measure of the amount of radioactivity.



SHB, Inc.

## Example Conclusions from Studies on Health Impacts on Populations Living Near Uranium Mines and Mills

"The absence of elevated mortality rates of cancer in Montrose County over a period of 51 years suggests that the historical milling and mining operations did not adversely affect the health of Montrose County residents."<sup>1</sup>

"No unusual patterns of cancer mortality could be seen in Karnes County over a period of 50 years suggesting that the uranium mining and milling operation had not increased cancer rates among residents."<sup>2</sup>

<sup>1</sup> *Cancer and Noncancer Mortality in Populations Living Near Uranium and Vanadium Mining and Milling Operations in Montrose County, Colorado, 1950 - 2000.* Boice, JD, Mumma, MT et al. *Journal of Radiation Research*, 167:711-726; 2007

<sup>2</sup> *Mortality in a Texas County with Prior Uranium Mining and Milling Activities, 1950 - 2001.* Boice, JD, Mumma, M et al. *Journal of Radiological Protection*, 23:247 - 262; 2003

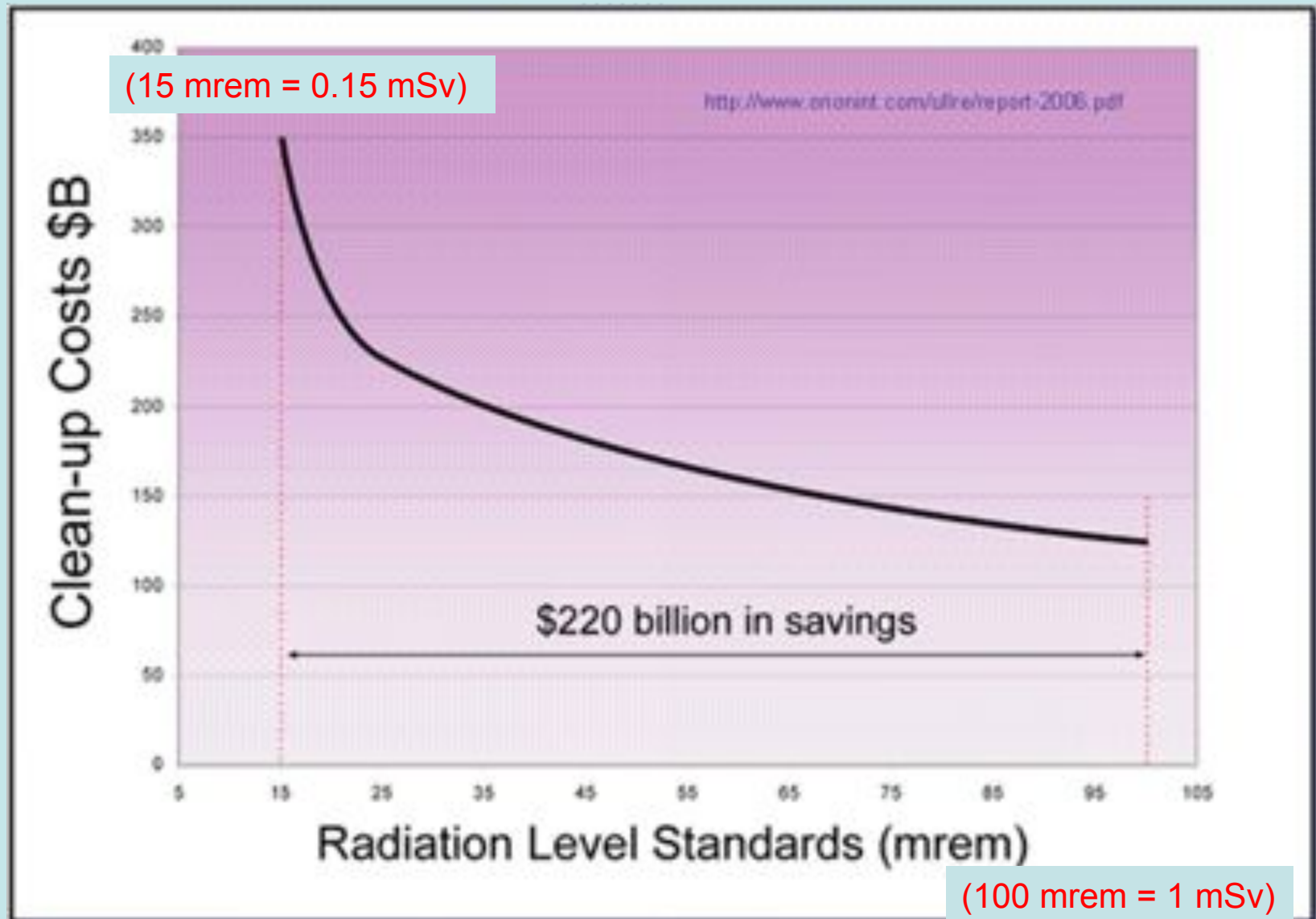


Senes Consultants



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**Current clean-up cost for US/DOE facilities is estimated at \$350 billion for EPA standard of 15 mrem above background**  
(15 mrem is <5% of average natural background in USA)





Excerpts from William C. Clark, Witches, Floods, and Wonder Drugs: Historical Perspectives on Risk Management. (International Institute for Applied Systems Analysis, Laxenburg, Austria, 1980)

From the Renaissance through the Reformation, risk assessment was used to justify witch hunting.

Then, as now, experts were called upon to provide explanations of the unknown. Rather than acknowledge their own limitations and ignorance, they assigned the generic name “witchcraft” to the phenomenology of the unknown. They founded a new professional interest dedicated to the investigation and control of “witchcraft”.

Witch hunting became the growth industry of the day, offering exciting work, rapid advancement, and wide recognition to its professional and technical workers.

Creative and energetic efforts to create a “witch-free” world unearthed risks in the most unlikely places.

**(People are deluded in groups and come to their senses as individuals)**



# Precautionary Principle

In Action



Anneken Hendriks, Amsterdam, executed 1571

Insistence on, and  
cadaverous compliance with,  
regulations without continuously  
questioning and justifying  
their factual and rational basis

**is the last refuge of  
the lazy, incompetent, and  
malevolent**