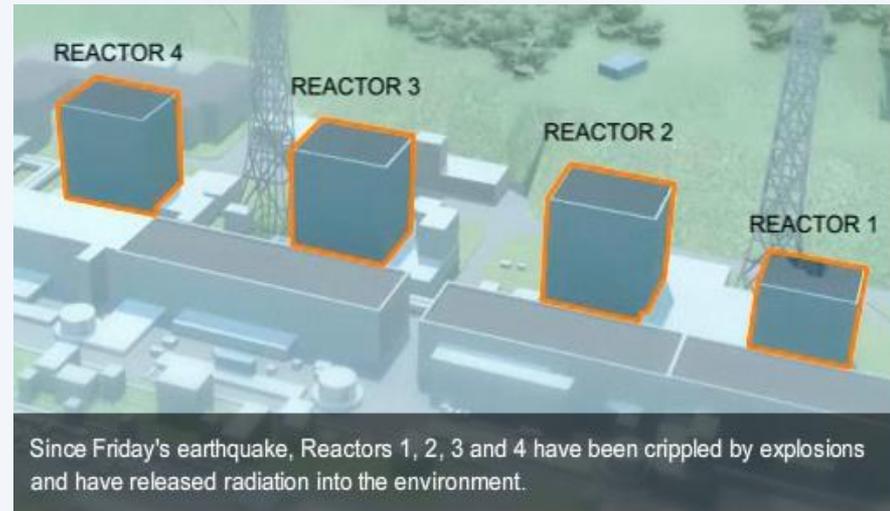


FUKUSHIMA RADIATION CONCERNS IN ALASKA



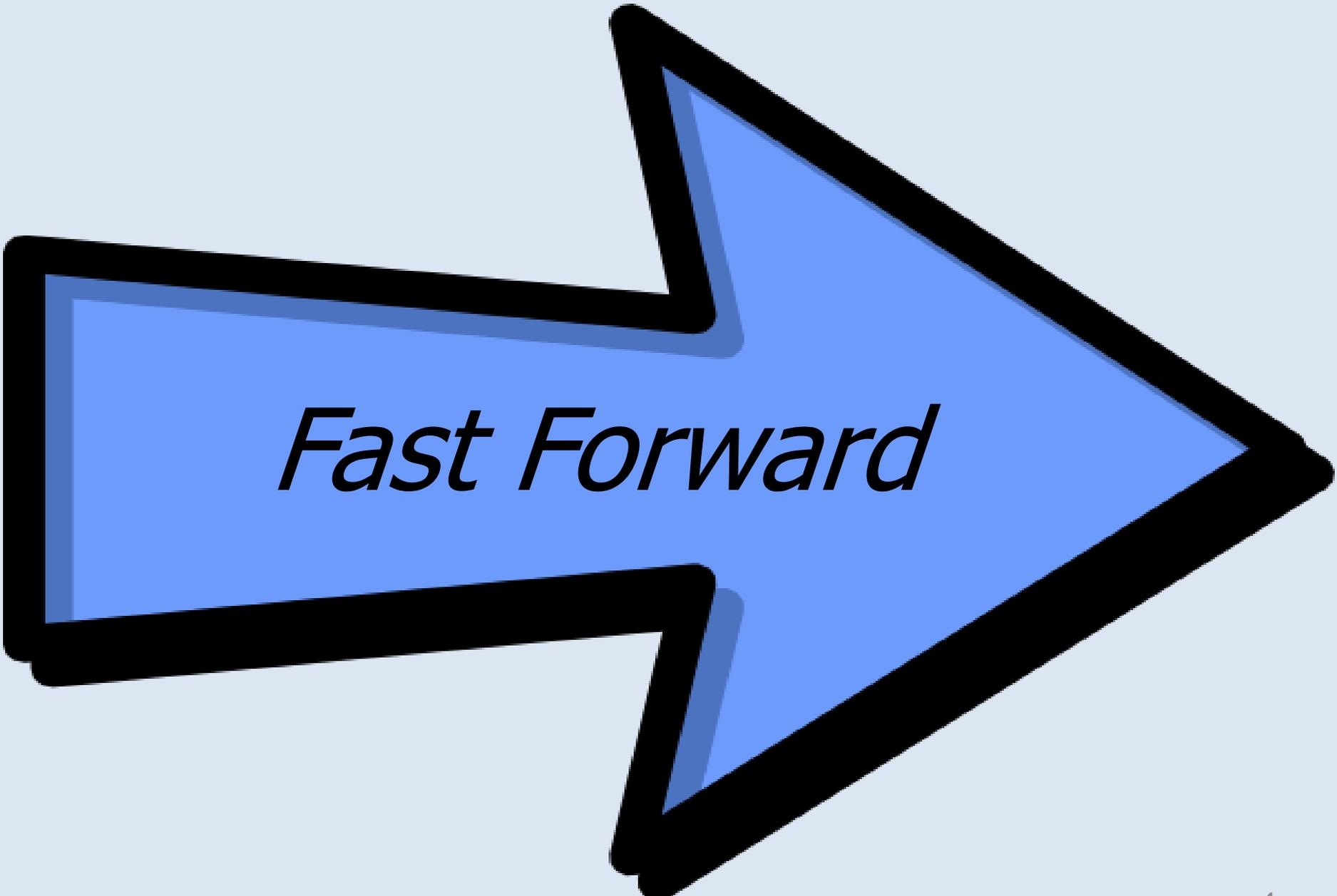
Fukushima Dai'ichi Nuclear Power Station Incident

- March 11, 2011
 - 9.0 magnitude earthquake
 - 45-ft tsunami
- Catastrophic failures at Fukushima Dai'ichi nuclear power station
- Thousands of people evacuated



Initial US Response to Incident

- Heightened monitoring immediately following event
 - Additional mobile EPA RadNet monitors deployed
 - FDA food monitoring
 - NOAA – marine debris
 - Pacific states monitoring
- Nuclear Regulatory Commission (NRC)
 - 24/7 Ops Center
 - Technical support to Japan
 - Environmental monitoring coordination with DOE & EPA



Fast Forward

Fukushima Contaminated Water Issues

- Continued groundwater flow into/through facility
- Circulating water to cool reactor debris
- Leakage from storage tanks
- Accident water left in trenches



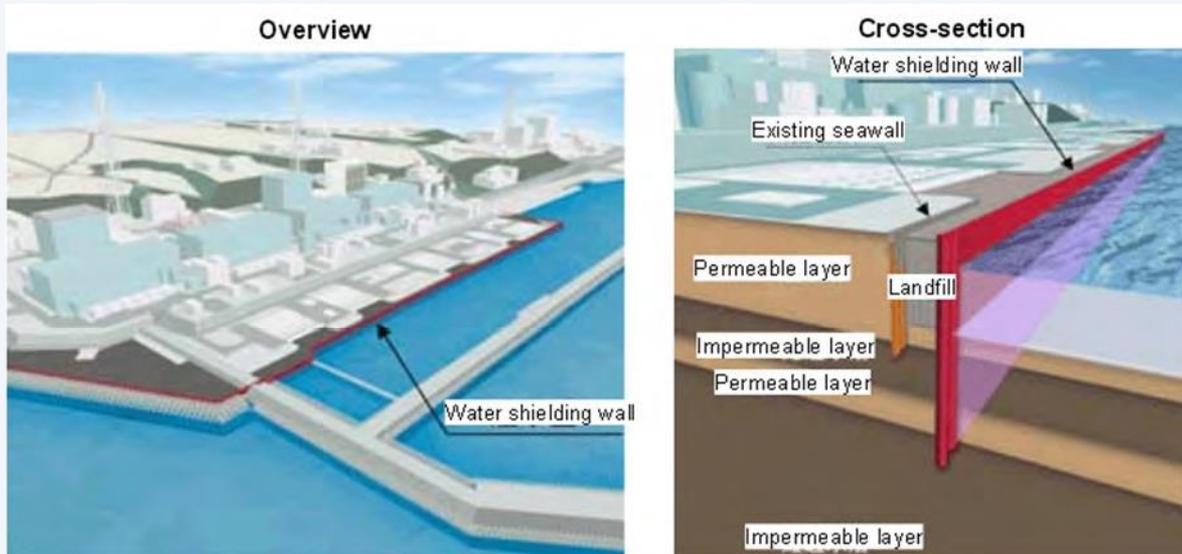
Countermeasures to Address Contaminated Water

- Sea wall to prevent leaks
- Land-side wall (by soil freezing) keeping groundwater away from contamination
- Removal of highly contaminated water inside trenches
- Preventing contaminated groundwater flow into port through ground improvements (paving land surface, inject sodium silicate & pump groundwater)
- Groundwater bypass (pumping up groundwater from mountain side of buildings)

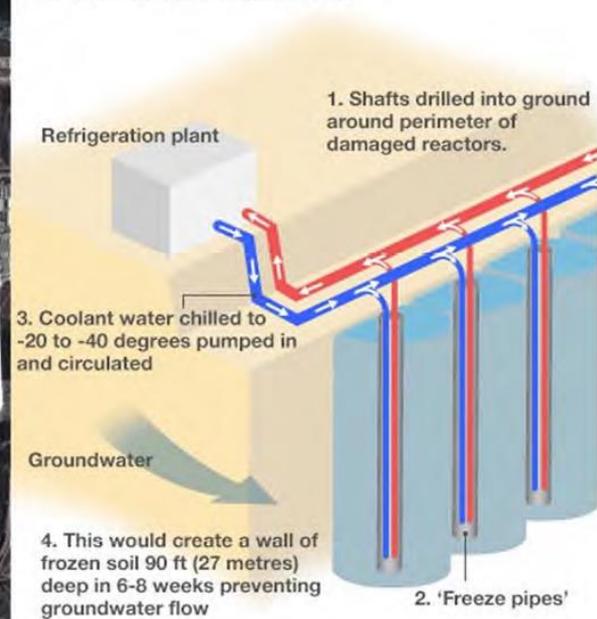
Countermeasures addressing leaks from tanks

- Increased patrol personnel & frequency of patrols (4/day)
- “Visual Check” & “Dose Measurement”
- Water level indicators with remote central monitoring system
- Replace flange-type tanks with welded type tanks
- Accelerated processing of contaminated water stored in tanks

Sea-side & Land-side Walls



How the 'ice wall' could work



Source: Tepco / Reuters

Switching from flange-type tanks to welded-type tanks



Monitoring in Japan

Comprehensive Monitoring Plan (2011, updated in 2012 & 2013)

- Air, dust in air
- Tap water
- Freshwater (surface & groundwater)
- Seawater
- Sediment
- Soil
- Food Products

Japanese Fukushima Doses

- **Japanese Worker Doses**

- Average effective dose of 25,000 workers over 19 months was ~ 12 mSv (1.2 rem)
- 2 employees dose of 2-3 Sv (200-300 rem) from standing in contaminated water that flooded their boots.
- Standard worker dose limit for Japanese workers is 50 (5 rem) mSv/year & 100 mSv (10 rem) over 5 years

- **Japanese Residential Doses**

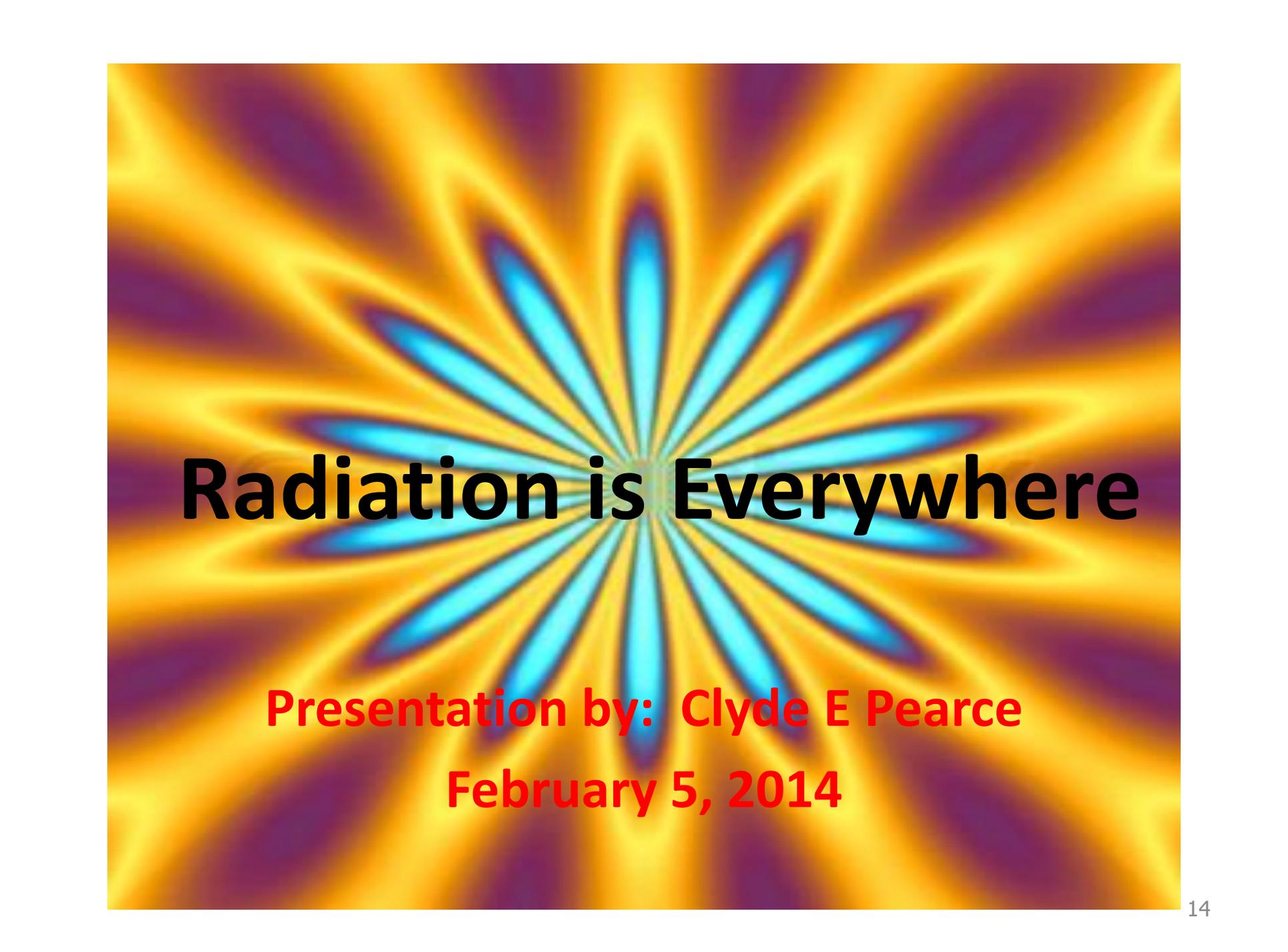
- Most residents of Fukushima & surrounding areas received whole body doses <10 mSv (1 rem)
- Namie & Iitate residents received doses in the range of 10-50 mSv (1 to 5 rem).
- Japanese government goal is to keep public exposure <20 mSv (2 rem) per year with a long term goal of decontamination so that doses are <1 mSv/yr (100 millirem).

Long-term Health Effects Studies

- Japanese Health Monitoring Program
 - 2 million residents in Fukushima prefecture, with 30-yr follow-up study planned.
 - Long term Thyroid Study
 - thyroid gland scans of 360,000 children < 18yo
 - thyroid checkup every 2yrs til 20yo, then every 5yrs for rest of lives
 - health exam of people in the proximal area, including blood exams.
 - special survey of 20,000 pregnant & nursing mothers.

Radiation Exposure

Clyde E. Pearce



Radiation is Everywhere

Presentation by: Clyde E Pearce

February 5, 2014

Hiroshima and Chernobyl are not



We are all exposed to radiation virtually every day

- Background – Cosmic, terrestrial, radon
- Commercial products
- Airport, customs and prison security
- Microwaves, television, computer monitors
- Cell phones
- In flight
- In foods
- CFL and other fluorescent lighting
- Sitting or sleeping next to another person

What is the Risk?

- Everything we do involves risk & some risks are unavoidable
- 3 categories of risk
 1. Lifestyle choices (smoking, drinking, extreme sports) – These are risks we can control
 2. Uncontrolled natural events (earthquakes, floods, hurricanes, tsunamis)
 3. Human caused (pollution, domestic violence, stress, homicide, war)
- Some people think of radiation risks as somehow being different from other risks.

Lifestyle: We Have Control



Natural: We do not Control



Days Lost

Health Risk	Est. life expectancy lost
Smoking 20 cigs a day	6 years
Overweight (15%)	2 years
Alcohol (US Ave)	1 year
All Accidents	207 days
All Natural Hazards	7 days
Occupational dose (300 mrem/yr)	15 days
Occupational dose (1 rem/yr)	51 days

One in a million chances of dying (Relative Risk)

Smoking 1.4 cigarettes (lung cancer)

Eating 40 tablespoons of peanut butter

Spending 2 days in New York City (air pollution)

Driving 40 miles in a car (accident)

Flying 2500 miles in a jet (accident)

Canoeing for 6 minutes

Receiving 10 mrem of radiation (cancer)

Examples of Absolute Risk

- 44,000 people die each year in automobile accidents
- 40,000 women die each year from breast cancer
- 30,000 men die each year from prostate cancer
- 3,200 Alaskans were diagnosed with cancer last year

Relative Risk

The odds ratio, meaning “What are the chances something will happen?”

- Winning the Powerball lottery if you buy one ticket 1:75,000,000
- Cancer, from Amchitka shellfish 1:10,000
- Death by auto accident 1:272
- Chance of getting breast cancer in your lifetime 1:8
(if you are a woman)
- Death from PSP toxin due to eating Alaska shellfish 1:7
- Chance of getting prostate cancer (men) 1:6

(Deaths by breast or prostate cancer were 1:36)

Relative Risk and Radiation

- Getting cancer from medical imaging 1:100
- Getting cancer from eating shellfish harvested in Amchitka 1:10,000
- Dying of cancer from eating wild caught salmon harvested in Alaska 1:100,000
- Dying in an auto accident, no alcohol 1:272
- Dying in an auto accident when alcohol is involved 1:70
- Getting cancer from smoking one pack of cigarettes a day 1:3

Risk - Radiation

- Being exposed to radiation - 100%
- Getting radioactivity in your own body- 100%
- Eating food containing radioactivity -100%
- Dying from excessive exposure to radiation in seafood -0.000001%
- Getting cancer from exposure to radiation in medical imaging – 1% to 5%

Radioactivity in Foods

- Brazil nuts (6,000 pCi)/kg
- Bananas (3,520 pCi)/kg
- Carrots (3,400 pCi)/kg
- White potatoes (3,400 pCi)/kg
- Beer (390 pCi)/kg
- Red meat (3,000 pCi)/kg
- Lima beans (4,640 pCi)/kg
- Water (0.17 pCi/kg)

***All the above, except the beer, also contain radium**

Radioactivity normally found in Human Body

- Uranium (30 pCi) [*30 pCi*]
- Thorium (3 pCi) [*3 pCi*]
- Potassium 40 (120 nCi) [*120,000 pCi*]
- Radium (30 pCi) [*30 pCi*]
- Carbon-14 (0.1 uCi) [*100,000 pCi*]
- Tritium (H-3) (0.6 nCi) [*600 pCi*]
- Polonium (1 nCi) [*1,000 pCi*]

Risks Are Personal

- What is acceptable risk differs between different people
- Vary with perception of risk
- Vary with time
- Vary with financial resources to address them
- Vary with technological change

Summary

- Based upon exposure & levels detected, there is no public health concern for Alaskans.
- Continued assessment of the situation consulting with federal agencies, including NRC, NOAA, EPA, & FDA as well as State agencies like ASMI, DHSS, F&G, and academia as well as other Pacific states.
- Public outreach & education

Sources of Information

- ADEC Air Quality *Japanese Nuclear Reactor Radiation Information* webpage
<http://dec.alaska.gov/air/am/rad/radhome.htm>
- ADEC EH *Fukushima Radiation Concerns in Alaska* webpage
http://dec.alaska.gov/eh/fss/Food/radiation_news.html
- DHSS *Radiation Information* webpage
<http://www.epi.hss.state.ak.us/eh/radiation/default.htm>
- Environmental Protection Agency (EPA) RadNet
<http://www.epa.gov/radnet/radnet-data/online-data.html>
- EPA Fukushima Information and Resources <http://www.epa.gov/radnet/>
- EPA's Radiation Monitoring. Of Japanese Nuclear Emergency
<http://www.epa.gov/japan2011/>
- Food & Drug Administration (FDA)
<http://www.fda.gov/NewsEvents/PublicHealthFocus/ucm247403.htm#new>
- National Oceanic & Atmospheric Administration (NOAA)
<http://marinedebris.noaa.gov/tsunamidebris/>
- Nuclear Regulatory Commission (NRC)
<http://www.nrc.gov/reactors/operating/ops-experience/japan-dashboard.html>
- California's Radiological Health Branch
<http://www.cdph.ca.gov/programs/Pages/RHB-RadReport.aspx>

Sources of Information

- California – “Kelp Watch 2014)” <http://newscenter.lbl.gov/science-shorts/2014/01/13/berkeley-lab-and-cal-state-long-beach-researchers-launch-%E2%80%98kelp-watch%E2%80%99-to-determine-extent-of-fukushima-contamination/>
- Canada - Bedford Institute of Oceanography <https://www.pices.int/publications/presentations/PICES-2013/2013-MEQ/MEQ-1700-Smith.pdf>
- Hawaii Department of Health Current Public Health Concerns Related to Japan <http://health.hawaii.gov/about/current-public-health-concerns-related-to-japan/>
- Health Canada’s Environmental Radiation webpage <http://www.hc-sc.gc.ca/ewh-semt/contaminants/radiation/index-eng.php>
- International Atomic Energy Agency Japan’s Nuclear Regulation Authority Reports on Conditions at TEPCO’s Fukushima Daiich Nuclear Power Station <http://www.iaea.org/newscenter/news/2013/japan-basic-policy-full.html>
- Oregon’s Radiation Protection webpage <http://public.health.oregon.gov/HealthyEnvironments/RadiationProtection/Pages/index.aspx>
- Washington Fukushima 2013 Update webpage <http://www.doh.wa.gov/CommunityandEnvironment/Radiation/FukushimaUpdate.aspx>
- Woods Hole Oceanographic Institution <http://www.ourradioactiveocean.org/>
- Japan - Current situation of Fukushima Daiichi and Daini nuclear power station <http://www.tepco.co.jp/en/nu/fukushima-np/index-e.html>



Contacts

Marlena (Marty) Brewer
Alaska Department of Environmental Conservation (ADEC)
Division of Environmental Health
marlena.brewer@alaska.gov

Douglas H. Dasher, P.E., Ph.D.
University of Alaska Fairbanks (UAF)
Research Professional V
School of Fisheries and Ocean Sciences
dhdasher@alaska.edu

Ali Hamade, Ph.D.
Alaska Department of Health & Social Services
Division of Public Health
Section of Epidemiology
ali.hamade@alaska.gov

Clyde E. Pearce, RHS
Alaska Department of Health & Social Services
Division of Public Health
Radiological Health
clyde.pearce@alaska.gov

Raphaela Stimmelmayer
Veterinary surgeon, M.Sc. Ph.D.
On-site coordinator 2011 Northern Pinnipeds UME
Wildlife Veterinarian and Research Biologist
Raphaela.Stimmelmayer@north-slope.org