Canadian Nuclear Safety Commission | Commission canadienne de sûreté nucléaire

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Supplementary Information

Oral Presentation

Presentation from Jerry Cuttler

Renseignements supplémentaires

Exposé oral

Présentation de Jerry Cuttler

In the Matter of

Ontario Power Generation Inc., Pickering Nuclear Generating Station

Request for a ten-year renewal of its Nuclear Power Reactor Operating Licence for the Pickering Nuclear Generating Station

Commission Public Hearing – Part 2

June 2018

À l'égard de

Ontario Power Generation Inc., centrale nucléaire de Pickering

Demande de renouvellement, pour une période de dix ans, de son permis d'exploitation d'un réacteur nucléaire de puissance à la centrale nucléaire de Pickering

Audience publique de la Commission – Partie 2

Juin 2018

Canada

CNSC Public Hearing – Part 2

Pickering, Ontario, June 25-29, 2018

OPG application for renewal of operating licence for Pickering NGS

Intervenor Presentation

Part A: Licence renewal application

Part B: Health effects of radiation

by

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June 26, 2018

Part A: Review of documents and presentations

- OPG application for renewal of operating licence
- OPG CMD submission: Request for 10-year licence
- CNSC Staff CMD submission: A licence renewal
- OPG presentation, Public Hearing Part 1
- CNSC Staff presentation, Public Hearing Part 1
- Commission members questions and the responses

Part A: Intervenor conclusions

- OPG application and CMDs are of high quality and detailed.
- Public Hearing presentations were effective and convincing.
- Pickering NGS design very safe; many barriers against release.
- Plant in good condition; well managed; CNSC is very watchful.
- Pressure tube *fracture* in 1983 showed calandria tube can take full HTS pressure. No public or worker safety concern.
- 3-inch pipe *failure* in 1994. No release of radioactive material.
- With on-going maintenance and pressure tube monitoring, Pickering NGS could operate safely beyond 2024.

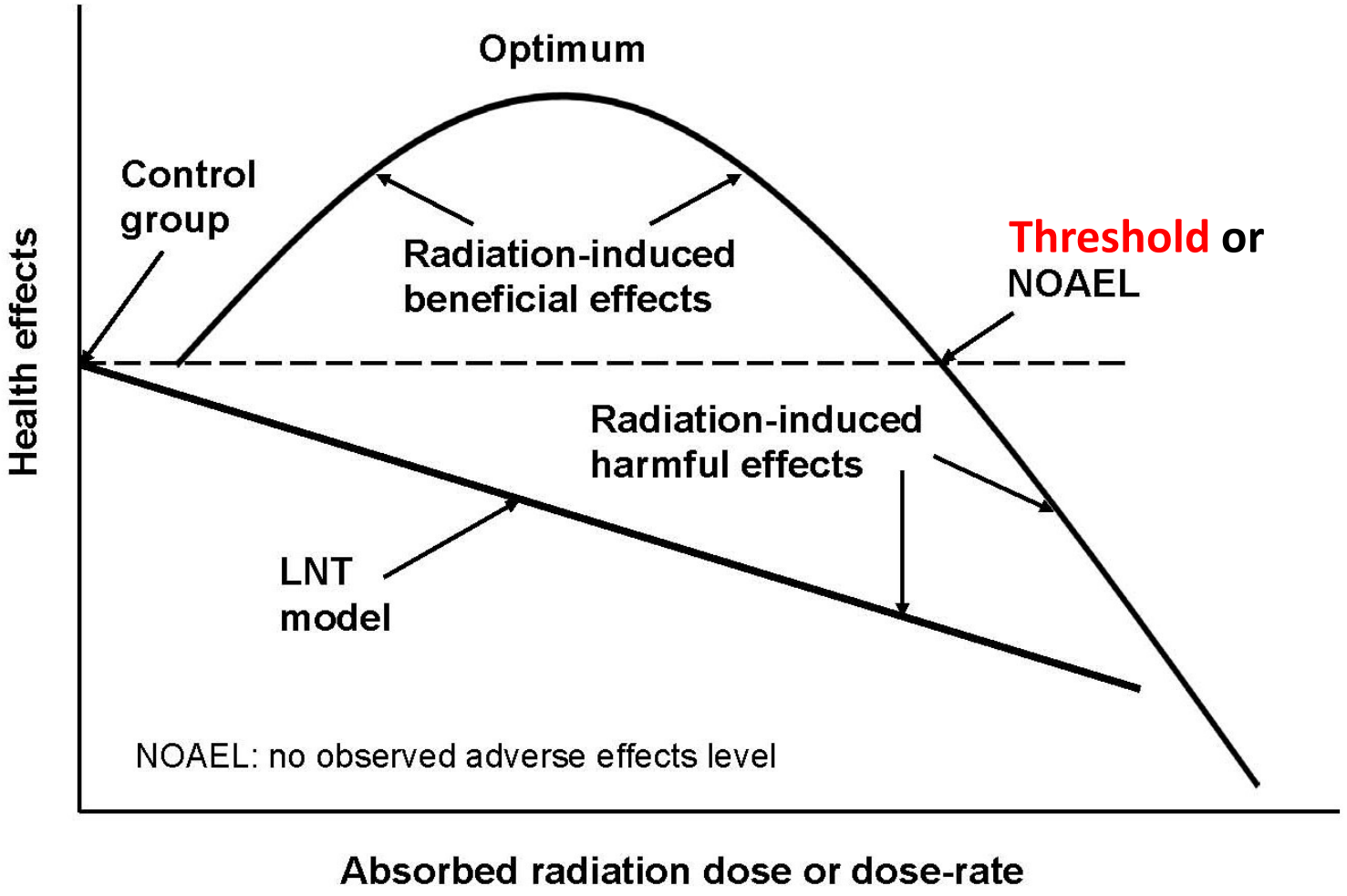
Part A: Intervenor recommendations

- CNSC to approve of OPG application for 10-year licence.
- OPG to apply for licence to operate Pickering NGS beyond 2024, if economic conditions become favourable.

Part B: Health effects of radiation exposures

- X-rays and nuclear radiation used in medicine since 1896 --- for more than 120 years.
- Low doses treated many illnesses: cancers, infections, wounds, asthma, inflammations.
- *Tolerance dose limit* of 2 mSv/day in 1924 for rad protection.
- U.S. National Academy of Sciences started *radiation scare* in 1956 for political purpose of stopping atomic bomb testing.
- LNT model to calculate risk of radiation-induced cancer.
- No evidence presented to support the change from tolerance dose limit to ALARA.
- All government regulators accepted it without reviewing facts.

Stimulation dose-response model vs. LNT model

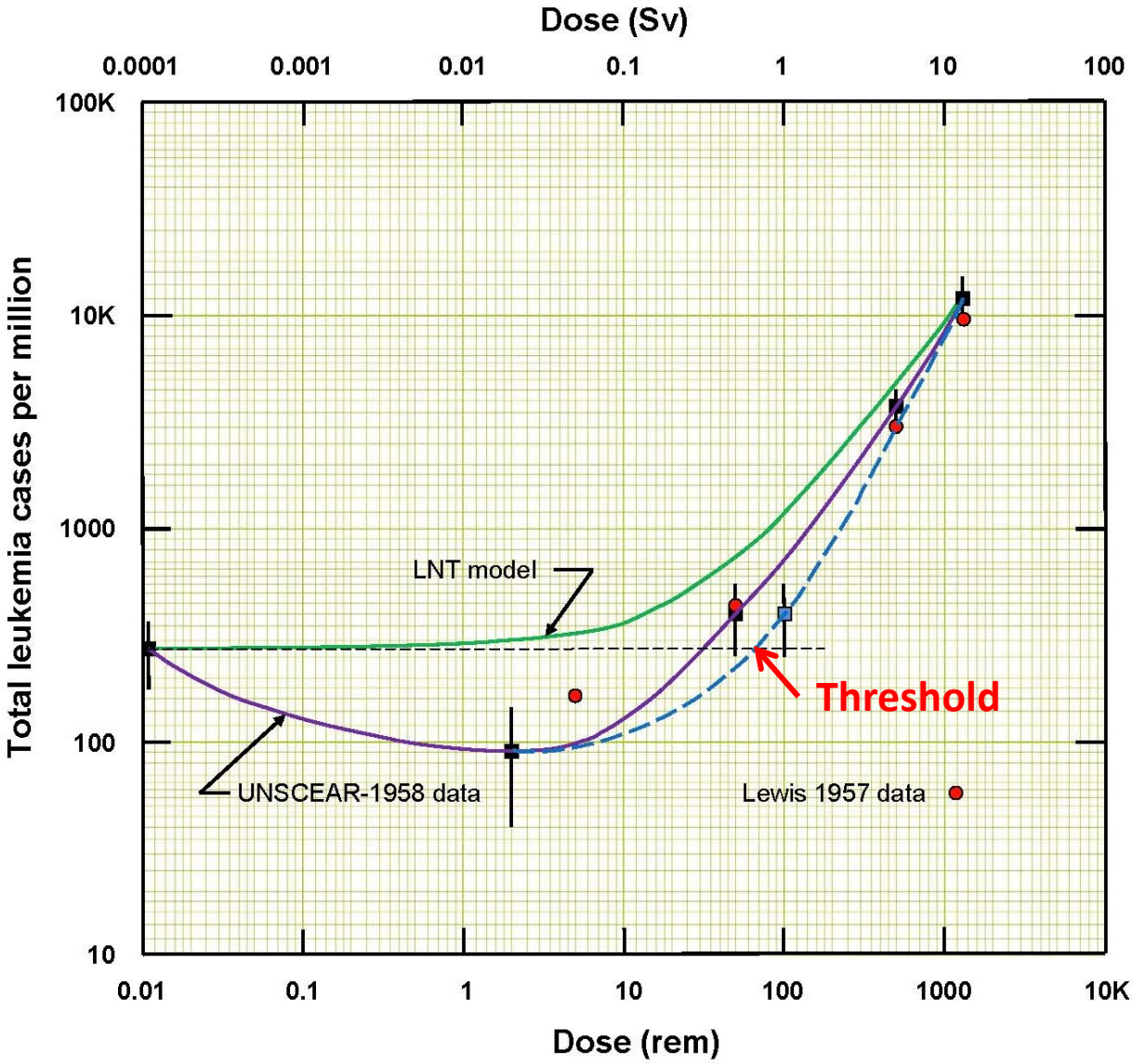


Part B: Modern understanding of radiation effects

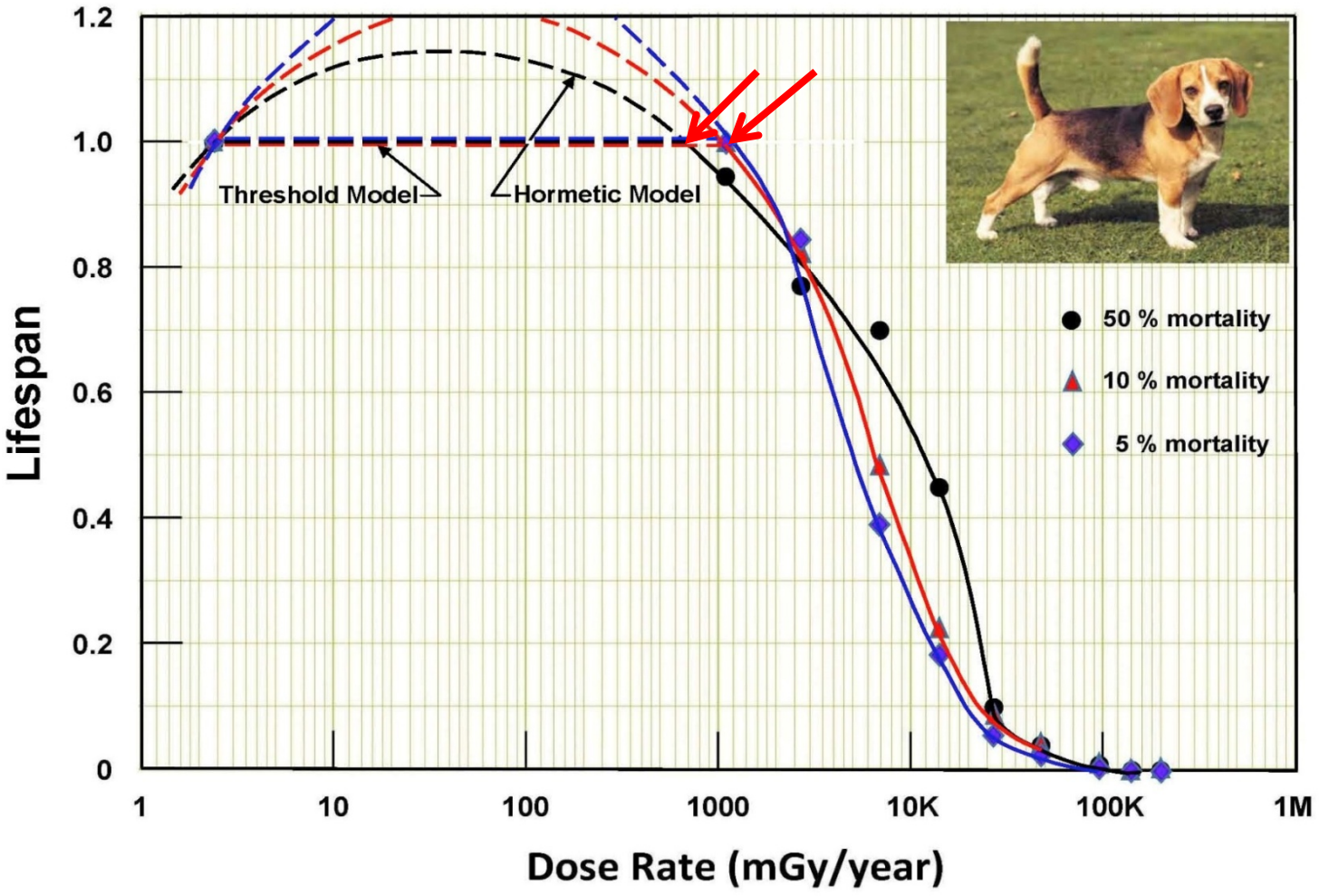
- Aerobic metabolism (breathing air) produces reactive oxygen species (ROS) that damage biomolecules-DNA at *very high rate*
- Organisms have many *very powerful protection systems* that: 1) produce antioxidants to prevent damage, 2) repair damage 3) kill/remove unrepaired cells, toxins 4) immune system kills cancer cells and pathogens 5) replace cells, restore health.
- Low level radiation: a *million times lower* damage rate than naturally-produced ROS.
- Low radiation dose *stimulates* the protection systems.
- Small burst of *hits*/ROS causes beneficial health effects.
- Large dose *inhibits* protection, causing harmful effects.
- The thresholds for onset of harm are known.

Hiroshima leukemia threshold at 500 mSv (50 rem)

***J*-curve, not LNT model**



γ-radiation dose-rate threshold > 700 mGy/year



Chernobyl NPP Workers April 26th 1986

- 134 workers were treated for acute radiation syndrome
- 28 of them died within 3 months (doses: 2 to 16 Gy)
- 106 remained alive.
- 22 died over 19 years; their mortality = 1.09% per year
- It's lower than average mortality rate = 1.4% (in 2000).
- Their cancer mortality was 26% (in 2001), about the same as normal cancer incidence in Central Europe.
- No evidence of radiation-induced delayed effects.

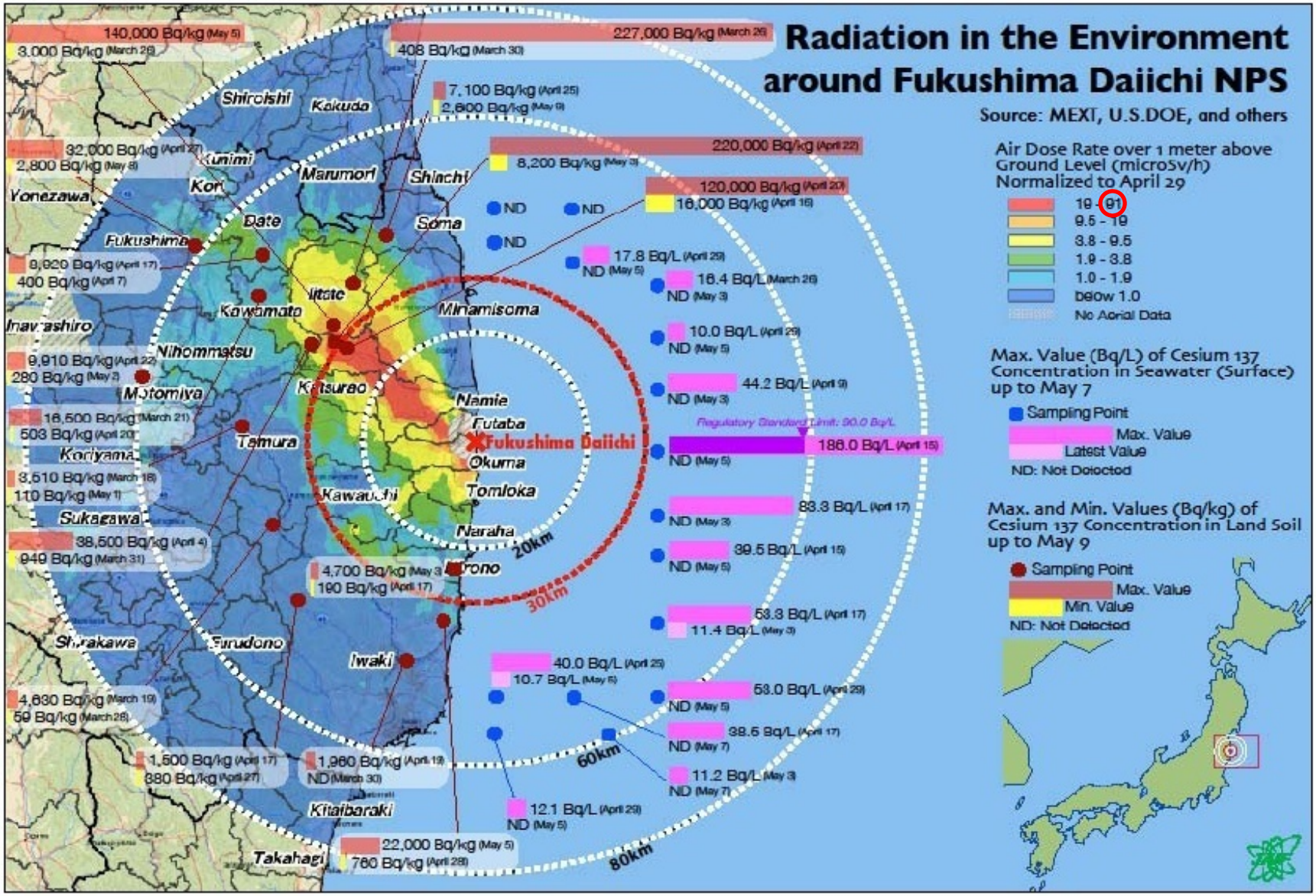
Chernobyl NPP Residents April 26th 1986

- 116,000 residents were evacuated, within 30 km radius.
- Their average dose was 17 mGy, which is very low.
- Many suffered post-traumatic stress; many early deaths due to fear of “health effects”, i.e., risk of cancer.
- Screening for thyroid cancer. Average dose to thyroid gland = 1.4 Gy for 2,400 children 0 to 3 years old.
- Hyperthyroid patients receive average 300 MBq of I-131, which delivers 300 Gy dose to thyroid gland; no cancers.
- Screening results in large overdiagnosis of *natural* occult thyroid cancer nodules. These nodules are rarely fatal.
- Unnecessary thyroidectomies are harmful.

Fukushima-Dai-ichi NPP March 11th 2011

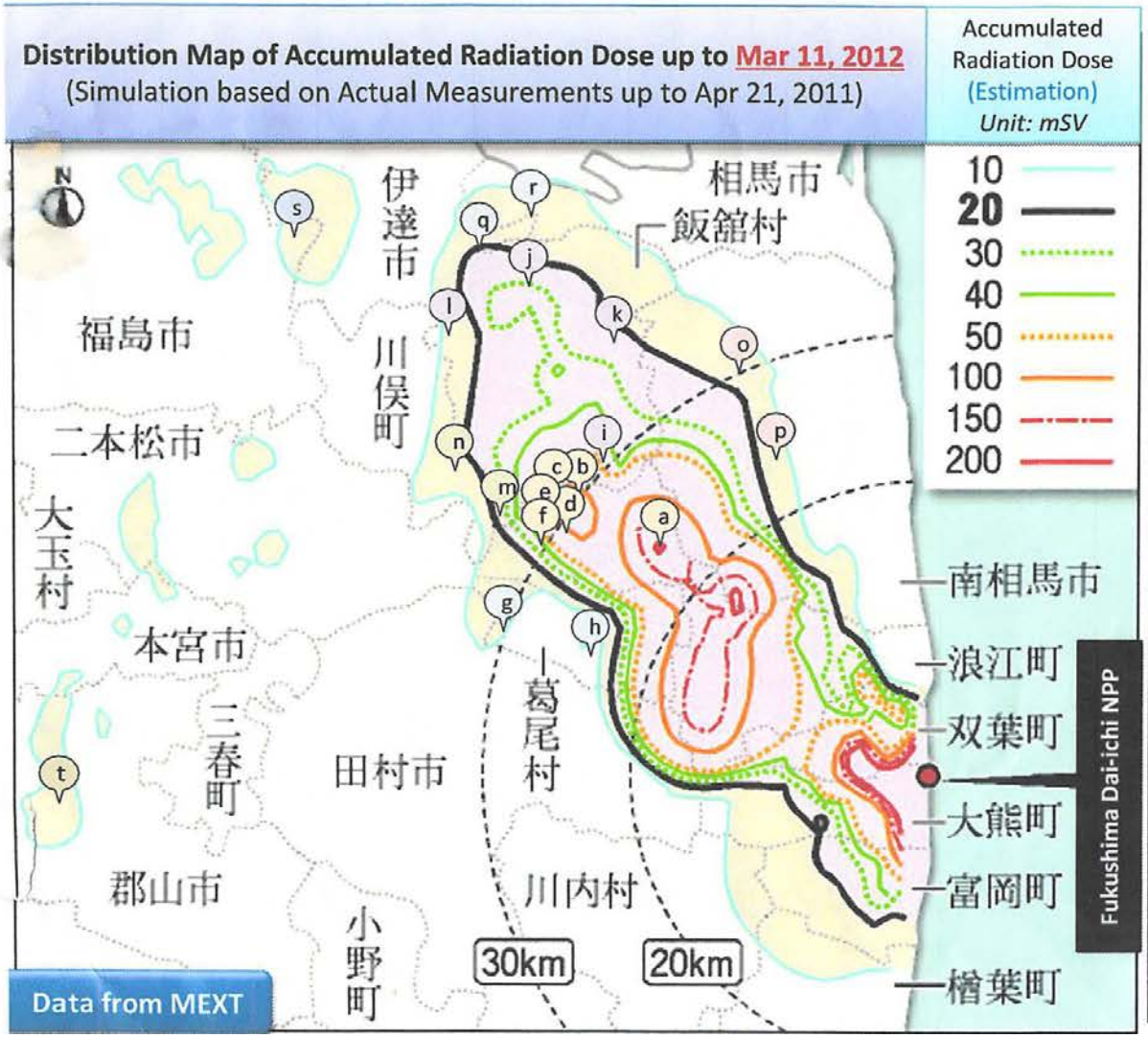
- Plant worker doses did not exceed 700 mSv/y limit (1924).
- 300,000 residents evacuated due to ICRP limit 1 to 20 mSv/y.
- By 2012 March 31st, 1632 died of disaster-induced stress, aggravation of existing illnesses; > 95% were > 60 years old.
- Highest total dose 1st year = 235 mSv; < 260 mSv in Ramsar.
- Precautionary evacuation did not prevent harm. Resulted in 1632 premature deaths and extreme hardship.
- More than 70,000 are still evacuated.
- Returning residents are fearful of “health effects”.

91 μSv/h x 8766 h/y = 798 mSv/y ~ natural HBRAs



Cumulative dose City of Ramsar, Iran up to 260 mSv/year

Accumulated Radiation Dose around Fukushima Dai-ichi — Estimation



MEXT has released a map showing how much radiation will be accumulated around Fukushima Dai-ichi Nuclear Power Plant.

Place		Distance from Fukushima Daiichi	Accumulated Radiation (Estimation) unit:mSV
Namie-machi	a	NW 24km	235.4
	b	NW 31km	188.6
	c	NW 31km	110.2
	d	WNW 29km	56.2
	e	WNW 30km	48.2
	f	WNW 30km	24.2
Katsurao-mura	g	WNW 32km	18
	h	NW 25km	11
Iitate-mura	i	NW 33km	61.7
	j	NW 39km	34.8
	k	NW 36km	26.3
	l	NW 44km	10
Kawamata-machi	m	WNW 34km	24.2
	n	WNW 40km	19.6
Minamisoma-shi	o	NNW 30km	15.6
	p	NNW 25km	11.9
Date-shi	q	NW 48km	21.2
	r	NW 46km	16
Fukushima-shi	s	NW 56km	10.6
Koriyama-shi	t	W 60km	10.1

Part B: Intervenor conclusions

- Regulators accepted tolerance dose of 2 mSv/day in 1924.
- Antinuclear political activity led to LNT model, ALARA in 1956.
- Fear of cancer cut dose limit from 700 down to 10 mSv/year.
- Now have biological explanations for low-dose stimulation of protection systems against high natural oxidative DNA damage.
- Nuclear regulators should return to dose thresholds and limits: 500 mGy acute and 700 mGy per year instead of LNT and ALARA
- Nuclear accidents do not harm residents; no evacuation needed
- Low doses should not be regulated; they are beneficial.
- Should study radiation-induced *longevity* instead of *cancer*.
- Fear blocks important applications of low-dose treatments.

Low-dose therapy to *prevent* cancer recurrence

Alzheimer's dementia patient *in hospice*.

Three CT X-ray scans of brain in July – Aug 2015.

Quick recovery of appetite, cognition

Also Parkinson's patient recovers after CT scan.

No pills needed to control tremors.

Part B: Intervenor recommendations

- Nuclear regulators should examine the biological and medical evidence and study the mechanisms.
- Discuss this information in international meetings.
- Canadian authorities should find a way to inform Canadians about the real effects of ionizing radiation on their health.
- Then revise the radiation protection regulations.