

Fukushima: Nuclear Response

The Foundation for Science and Technology
The Royal Society

Sir John Beddington
Chief Scientific Adviser to HM Government and
Head of the Government Office for Science

18th May 2011

Great expectations



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MPs demand greater involvement of scientists in national emergencies

Commons Science and Technology Committee report criticises the government for its use of scientific advice in emergencies such as the swine flu pandemic and Iceland volcanic ash cloud

Alok Jha, science correspondent
guardian.co.uk, Wednesday 2 March 2011 22:00 GMT
Article history

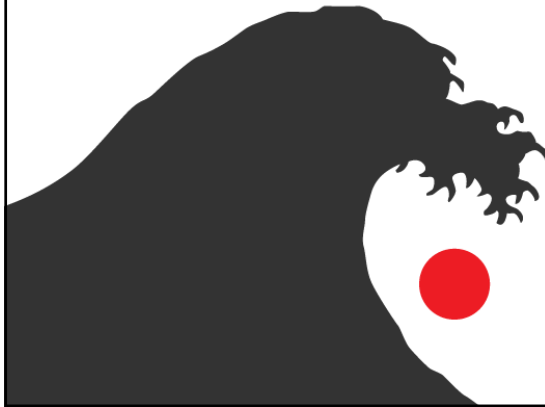




Government Office for Science

Japan: earthquakes, tsunamis and nuclear crisis

The events of Fukushima 2011



Government Office for Science

Chain of events

THE EARTHQUAKE

MAGNITUDE

The fifth most powerful earthquake ever recorded.



Over 500 aftershocks of a magnitude of 4.5 or greater occurred since the initial quake.



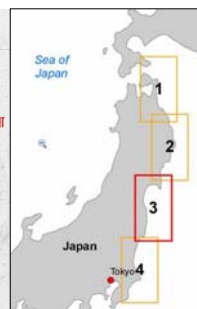
Source: USGS/Wprld-nuclear.org

THE TSUNAMI

TSUNAMI HEIGHT



A warning issued by the Japan Meteorological Agency stated that the tsunami would be at least 9.8 feet high. The actual wave height was over 3x higher.



Source: German Aerospace Centre

① Reactors shut down



③ Cooling needed

② Tsunami cut the Power



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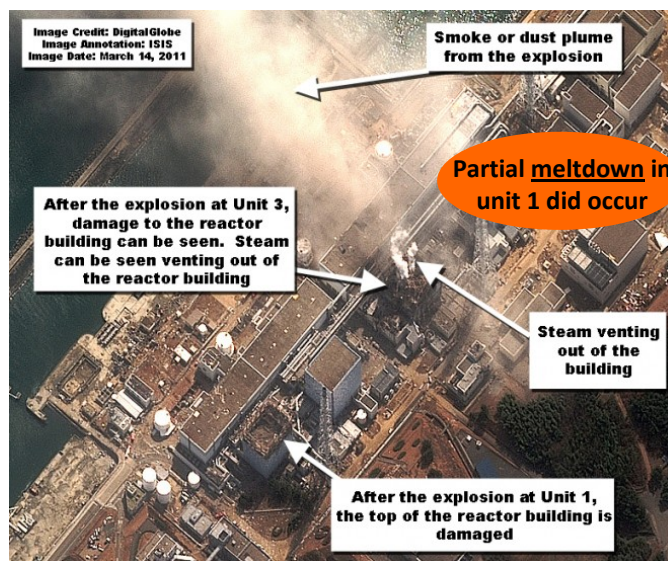
Fukushima Daiichi nuclear power plant



Source : NNL – 18 March 2011



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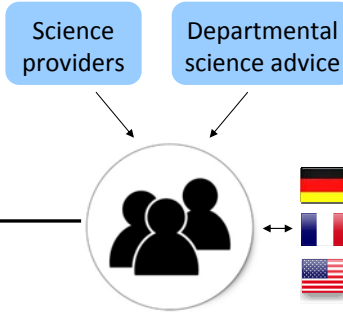
SAGE and COBR



Source: Cabinet Office



COBR(A)



“Should the UK evacuate its nationals?”

24hr emergency response

- Reasonable worst case scenario
- Travel Advice
- Food, water...seafood?
- Plume modelling / Risk assessment



Transparency: SAGE Members

Members

- British Geological Survey
- Cabinet Office
- Department for Health
- Department for the Environment, Food and Rural Affairs
- Department for Transport
- Department of Energy and Climate Change
- Food Standards Agency
- Foreign and Commonwealth Office
- Health and Safety Executive
- Health Protection Agency
- Home Office
- Met Office
- National Nuclear Laboratory
- RIMNET
- UK Chief Nuclear Inspector
- Department for International Development
- Professor Robin Grimes (Independent)
- Dame Dr. Sue Ion (Independent)
- Professor Richard Wakeford (Independent)

Observers

- Civil Aviation Authority
- Scotland Office - CSA
- UK Borders Agency
- British Energy



Source: GO Science website

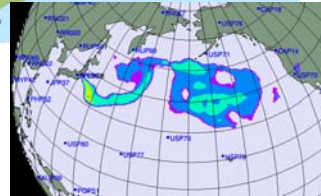
Collaboration



Reasonable Worst Case Scenario

What was the reasonable worst case scenario?

- Cooling activities fail
- Failure of the reactor pressure vessels
- Explosive reaction between molten fuel and reactor buildings
- **Radioactive material ejected up to 500 metres**
- **Wind blowing consistently toward Tokyo with rainfall over the city**
- **A cascade of reactor meltdowns and cooling pond failures.**

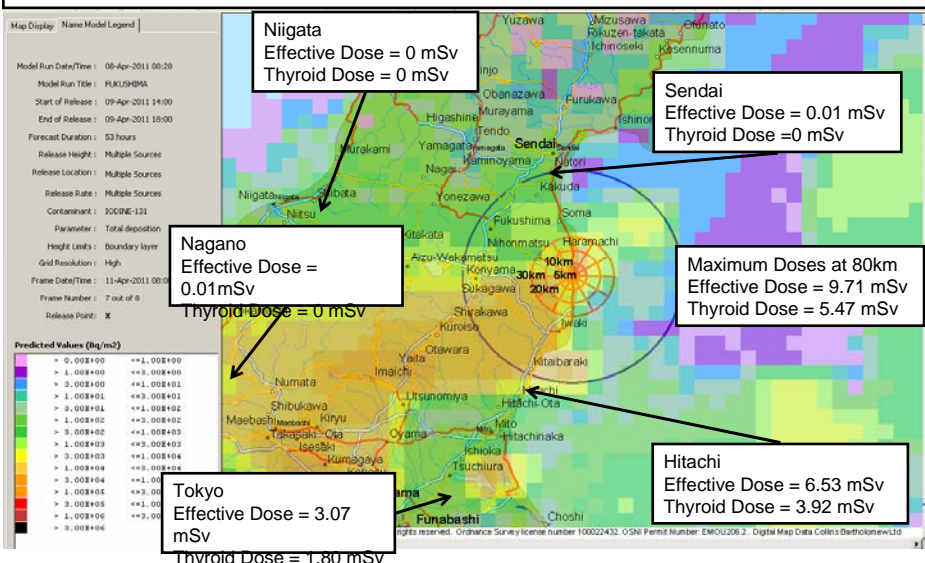


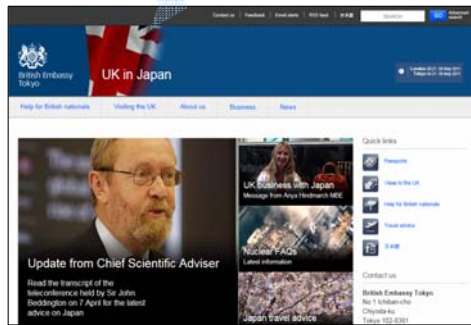
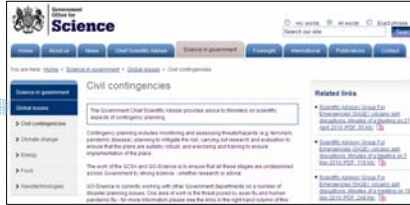
Prevailing winds
Key to forecasting radiation plume path

Image source: nytimes.com



Effective Dose & Thyroid (Equivalent) Dose To Children Outside Over 48 Hours (milli-Sieverts)

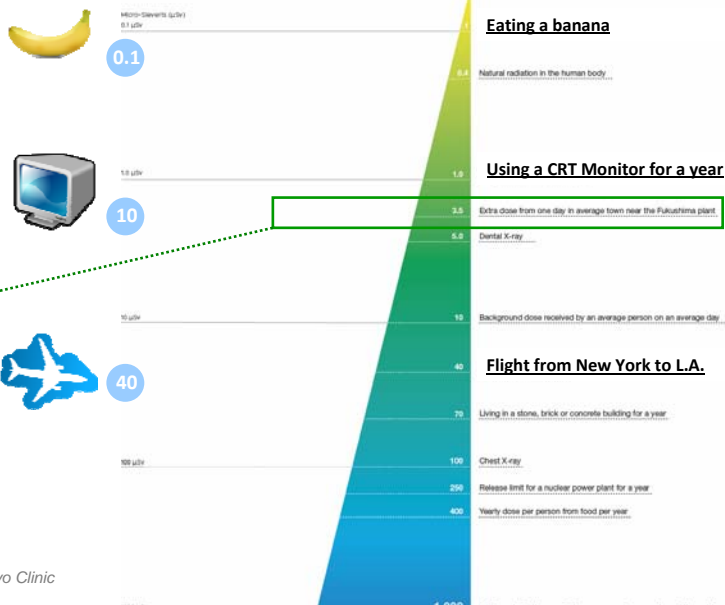




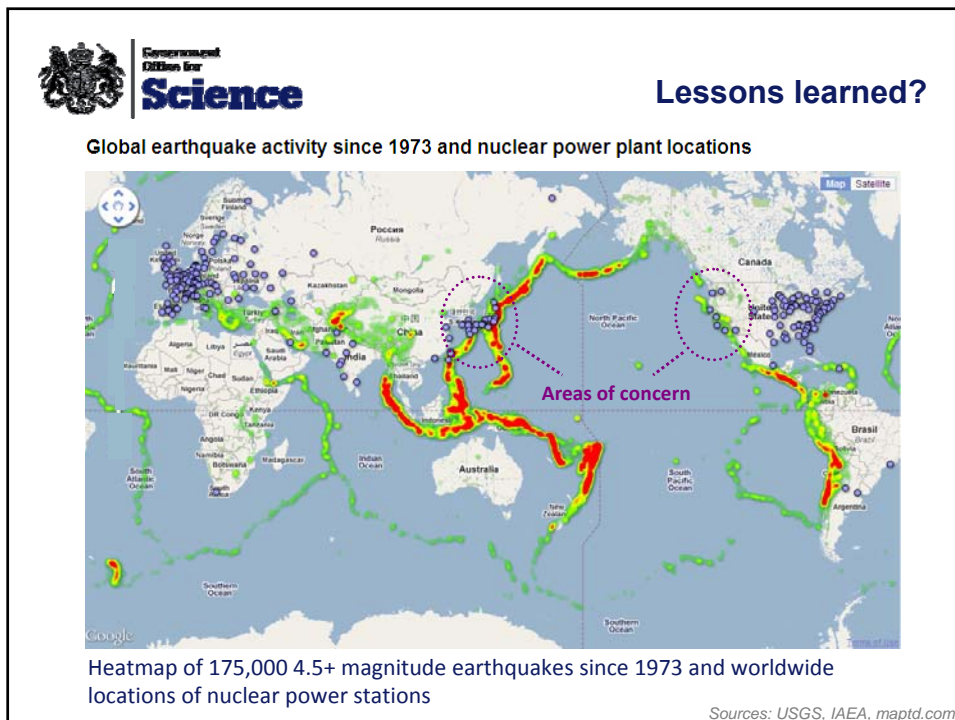
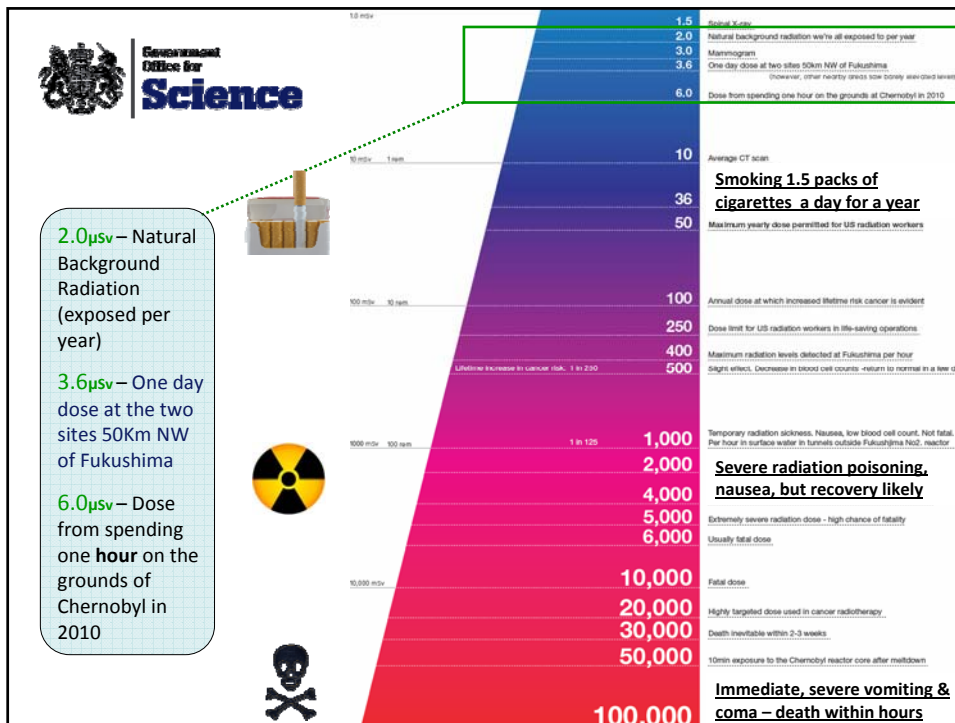
Teleconferences with Tokyo Embassy

Publication of SAGE Advice

Radiation Dosage Chart



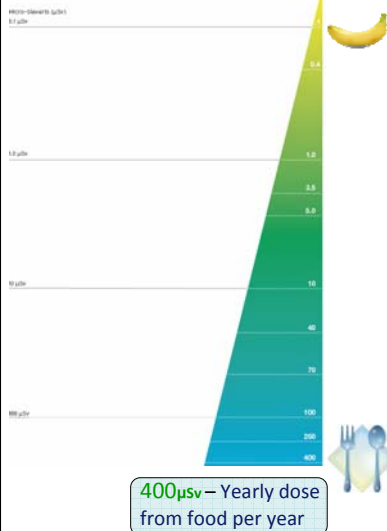
Sources:
 InformationIsBeautiful.net
 BBC, Guardian Datablog, Mayo Clinic
 data: bit.ly/radiationchart





EU and radiation limits

Keeping Hazards in Perspective



REUTERS U.S. News & Markets Sectors & Industries Analysis & Opinion

EU to further tighten radiation limits on Japan food

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BRUSSELS | Tue Apr 5, 2011 12:28pm EDT

(Reuters) - The European Union said it will further reinforce its radiation controls on imports of food and animal feed from Japan from next week, in response to the crisis at the Fukushima Daiichi nuclear power plant.

The announcement came the day after Japanese Prime Minister Naoto Kan asked Europe for a "calm, logical response" to the issue of Japanese food imports, and two weeks after the 27-nation bloc tightened its limits on such goods.

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Japan stops leaks from nuclear plant

EU tightens radiation limits on Japan food imports

09 April 2011, 09:04 CET

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(BRUSSELS) - The European Union tightened on Friday the acceptable level of radiation in Japanese food imports as Japan battles to contain a nuclear emergency.

The 27-nation EU agreed to reduce the maximum acceptable levels of three radioactive elements - iodine-131, caesium-134 and caesium-137 - in food and feed from Japan after the accident at the Fukushima Daiichi power plant.

The new levels "are now consistent" with those enforced by Japanese authorities in the wake of the nuclear accident, the European Commission said in a statement.



What's next?

Conclusions for the UK

- No reason to curtail operation of nuclear plants or facilities in the UK
- UK nuclear power industry has reacted responsibly
- Creation of the Office for Nuclear Regulation
- No significant weaknesses in the UK nuclear licensing regime
- Flooding risks unlikely to prevent construction
- No reason to change present siting strategies for new nuclear power stations
- No reason to depart from multi-plant design
- **UK's gas-cooled reactors give longer timescales for remedial action**

Office for Nuclear Regulation
An agency of HSE

Japanese earthquake and tsunami:
Implications for the UK Nuclear Industry

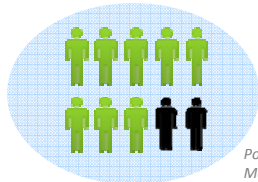
Interim Report

HM Chief Inspector of Nuclear Installations

15 May 2011

Source: ONR Report, Mike Weightman May 2011

Work is underway to develop "Stress tests" for nuclear power stations



Populus, May 2011

Nuclear is best way to tackle Climate change / Has a role to play in UK's Future Energy Mix

FT.COM FINANCIAL TIMES		Energy
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<ul style="list-style-type: none"> Front page World Companies Energy <ul style="list-style-type: none"> Energy Source Mining Oil & Gas Utilities Industrials Transport Retail & Consumer Health Technology Markets 	<p>Fukushima fails to dent UK nuclear support</p> <p>By Kiran Stacey Published: May 8 2011 22:43 Last updated: May 8 2011 22:43</p> <p>The partial meltdown at the Fukushima plant in Japan has left no dent in public support for nuclear power in Britain, a new poll has found.</p> <p>The Populus survey found more than eight in 10 people were either fully supportive of nuclear as the best way to tackle climate change or thought it might have a role to play in the UK's future energy mix. Only 16 per cent opposed it under any circumstances. These are about the same figures Populus has found every time it has asked the question since 2007.</p>	

Source: FT

“Recent opinion polls in Japan by media showed that a majority of those polled are in favour of continuing or increasing the use of nuclear power. In last week’s elections in Tsuruga-City where several nuclear power facilities are located, a pro-nuclear power mayor was re-elected.”



Koji Omi, STS Forum, May 2011



“Probabilities direct the conduct of the wise man”

Marcus Tullius Cicero
106- 43 BC

