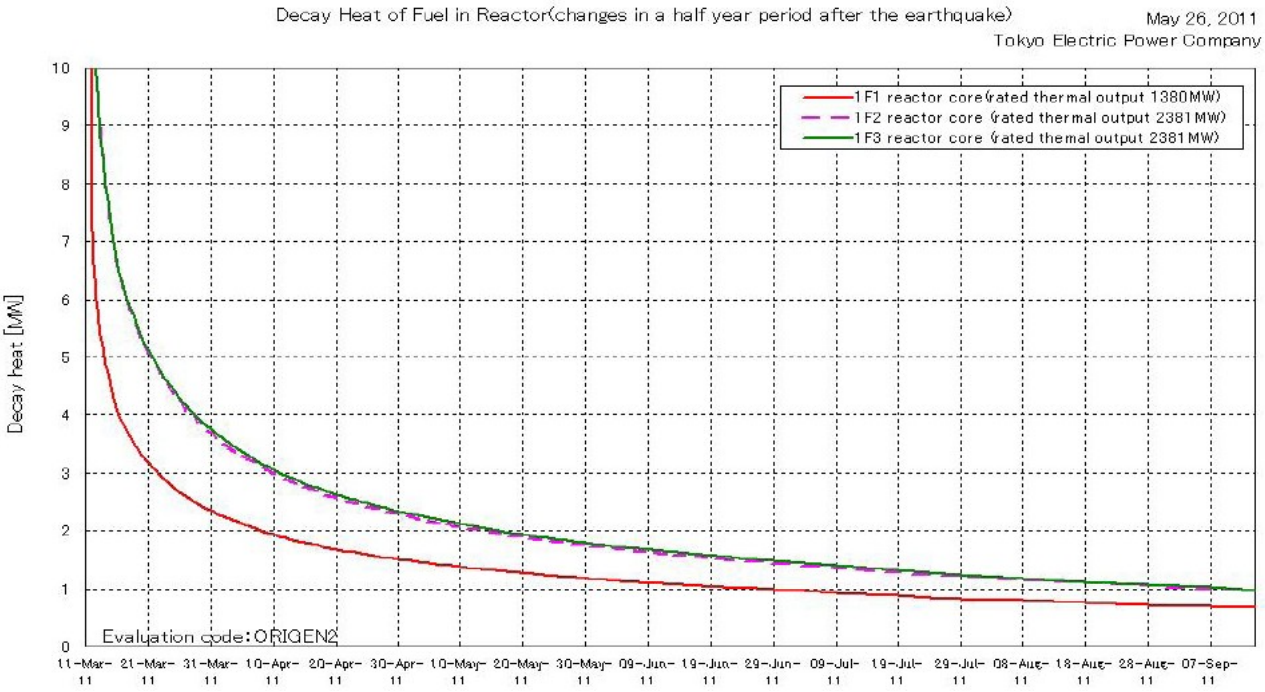
Nuclear Power's Fatal Flaws **Gordon Taylor** **2014-02-21**

Summary

The UK government insists that nuclear power is necessary but ignores it's fatal flaws, with the first being fundamental nuclear physics. Once self-sustaining nuclear fission, or criticality, has been achieved, all nuclear fuel continues to release decay heat after shut-down. Unless this is removed continuously by cooling, the containments, the physical barriers between the reactor core and the environment, can fail, leading to major releases of radioactive fission products. These can be carried hundreds of kilometres, falling to land at concentrations that have adverse health effects on humans and livestock. As well as injuries and prompt deaths within a month and latent deaths thereafter, the radioactivity can cause cell mutations, leading to genetic damage, manifest in all later generations. With such consequences, probabilities are irrelevant, since logic and experience shows that if a disaster is physically possible, it will happen. This was recognised from the beginning of civil nuclear power by the worldwide insurance industry, which refused to cover such risks. Without asking their citizens, some governments exempted the nuclear operators from full insurance cover, both nationally and internationally, amounting to an unlimited implicit subsidy. They also allowed nuclear power plants to be sited only tens of kilometres from towns and cities. Yet most governments worldwide recognised that this was wholly unethical, as there were ample safe and sustainable alternatives. So any government proposing continued or new nuclear power must now explain siting distances less than hundreds of kilometres and why they are still 'licensing random premeditated murder'.

Decay Heat and Nuclear Releases

Almost all existing and proposed nuclear power plants have reactor cores cooled with ordinary, 'light', water. These have several hundred fuel rods containing uranium enriched to about 3 to 4% U235. In normal operation, one or more loops, carrying water at high temperature, pressure and flowrates, transfer heat from the reactor core to the steam turbines. For the Fukushima Daiichi reactors 1 to 3, the heat releases at full power were 1380, 2381 and 2381 MegaWatts thermal (MWth). However, unlike fossil-fired power plants, nuclear decay heat must be removed from the reactor core after shutdown, whether normal or emergency. While this heat declines with time, each reactor releases around 10 MWth for the first day and around 1 MWth after six months. [1]



Moreover, if both grid power and backup diesel power are lost, the standby batteries will power the emergency cooling valves and pumps for only four to eight hours, after which the reactor cores will melt down in a day or so. Also the spent fuel pools will overheat and containments fail, releasing radioactive fission products to the environment. Yet the 'worst-case' nuclear releases are about 100 times greater than those from Chernobyl and Fukushima, with far worse consequences, as shown by three reports originating from within nuclear circles.

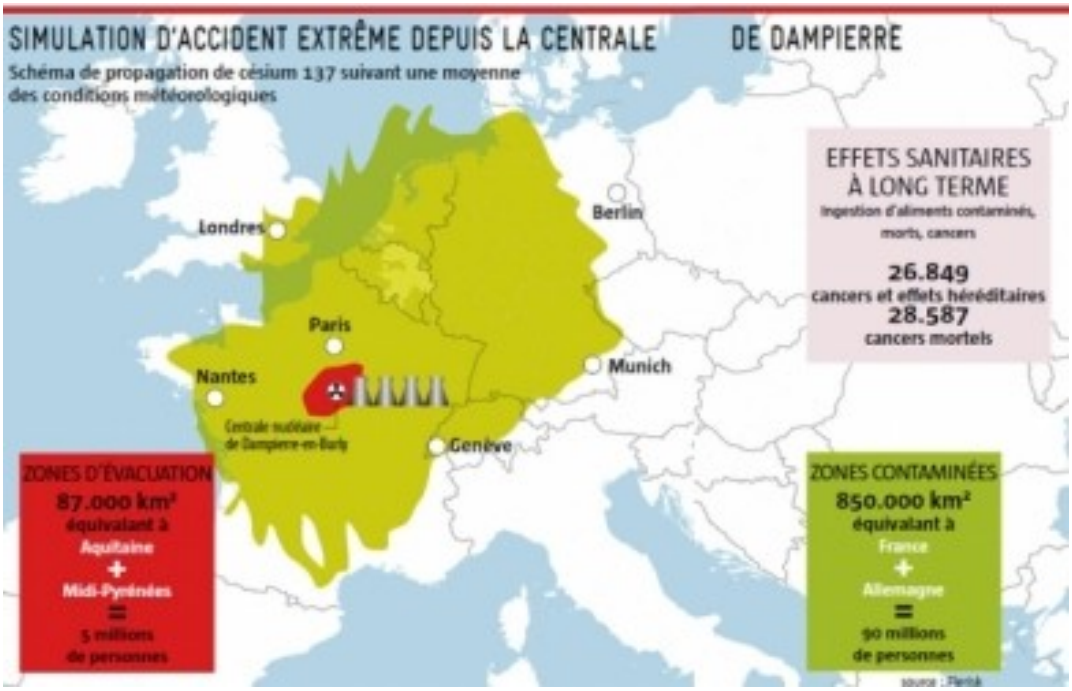
Reports on 'Worst-Case' Releases

1) The UK Nuclear Installations Inspectorate, the forerunner of the Office of Nuclear Regulation, produced a report immediately after Fukushima. [2] and [3] The worst-case release is taken to be the three reactors that had been operating prior to the earthquake and all six cooling ponds (spent fuel pools).

2) Shunsuke Kondo, chairman of the Japan Atomic Energy Commission, was required by the then Prime Minister, Naoto Kan, to produce a report immediately after Fukushima. This only became public knowledge in 2012. [4] The worst-case scenario imagined the melting of 1,535 fuel assemblies, an equivalent of fuel used for two reactors, kept in a spent fuel storage pool at the No. 4 reactor. The scenario said areas within a 170-km radius of the plant would have been contaminated with 1,480 kilobecquerels per square meter, a level that requires mandatory evacuation. Areas where the government would have requested voluntary evacuations were predicted to have 555 kilobecquerels per square meter, extending to a 250-km radius, which included Tokyo and surrounding areas.

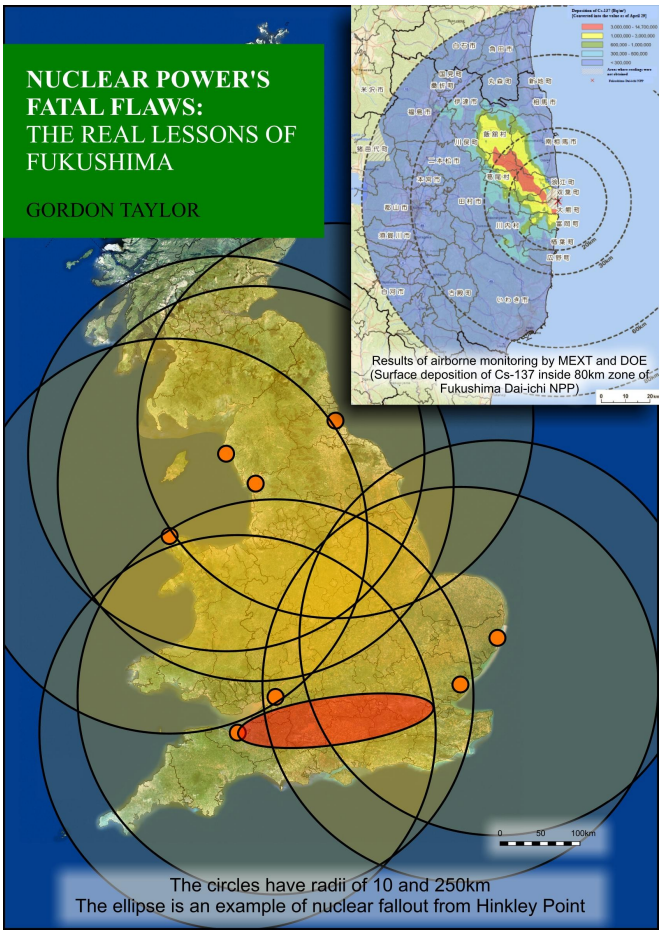
3) The French Institute for Radiological Protection and Nuclear Safety (IRSN) produced such a report in 2007. This only became public knowledge in 2013. [5] This includes:
'Le plus lourd tribut découle de l'impact économique sur la zone contaminée au césium 137, où habitent 90 millions de personnes. Une région de 850.000 km², qui correspond à la superficie de la France et de l'Allemagne. L'indemnisation des agriculteurs, des salariés, des entreprises, mais aussi les coûts environnementaux et les dépenses de santé explosent à 4.400 milliards d'euros'.
[The heaviest cost results from the economic impact on the area contaminated with cesium 137, inhabited by 90 million people. This is of 850,000 km2, corresponding to the area of France and Germany. The compensation of farmers, their earnings, the businesses, and also the environmental and health costs would increase to 4400 billion euros].

The extent of the fallout from the 'worst case' release, together with the long-term health effects, is shown in the map at the end of the article.



The fallout of radioactive cesium 137 from Dampierre could reach London, a distance of 457 km. Yet many French nuclear plants are even nearer to the UK.

The above three reports show that the consequences of 'worst-case' nuclear accidents are utterly horrendous. Thus almost all the citizens of Britain are threatened by the existing and proposed nuclear power plants. This is shown on the front cover of my report 'Nuclear Power's Fatal Flaws: The Real Lessons of Fukushima'. [6]



This is based on my reports: 'The Case Against Nuclear Power', of 15 pages and 89 references, and 'The Real Lessons of Fukushima', of 89 pages and 231 references. [7] [8] Almost all the references are on the web, with the links included.

Conclusions

The current UK siting criteria for new nuclear power plants consider a radioactive release of 1000 Curies (3.7E13 Bq) of I-131 and a distance of 30 km. [9] Yet the Fukushima release was about 4000 times as much and the NII Fukushima 'reasonable worst-case scenario' release about 270,000 times as much. According to the Kondo Report worst case, the fallout would require evacuation to 170 or 250 km or more, e.g. from Hinkley Point in Somerset to Birmingham or London. So the failure of the UK government and the designated agencies to alert Parliament and the people to such 'worst-case' consequences is a gross betrayal of trust. In the words of Dr John Gofman, this is 'licensing random premeditated murder'. After Fukushima, Japan, Germany, and Switzerland announced nuclear phase-outs, and Italy decided against nuclear power. So the existing UK nuclear plants must also be phased out and any new ones abandoned forthwith.

Gordon Taylor, B.Sc., M.Sc., M.I.Mech.E.
19 The Vale, Stock, Ingatestone, Essex, CM4 9PW
Tel: 01277-840569
Email: gordon@energypolicy.co.uk
Web: http://www.energypolicy.co.uk

1 Tokyo Electric Power Company. 'Decay Heat of Fuel in Reactor (changes in a half year period after the earthquake)', 2011-05-26. (http://www.tepco.co.jp/en/nu/fukushima-np/images/handouts_110526_01-e.pdf)

2 Guardian. 'UK government's Fukushima crisis plan based on bigger leak than Chernobyl', 2011-06-20. (http://www.theguardian.com/science/2011/jun/20/japan-earthquake-and-tsunami-japan)

3 Nuclear Installations Inspectorate, 'Worst Case Release Involving Three Reactors and Six Cooling Ponds', No Date. (http://www.scribd.com/fullscreen/58313487?access_key=key-1amf2uutax7h93geh699).

4 Asahi Shimbun. 'Government envisioned Tokyo evacuation in worst-case scenario'. 2012-01-07. (http://ajw.asahi.com/article/0311disaster/fukushima/AJ201201070039).

5 LeJDD, 'Le scénario noir du nucléaire', 2013-03-10. (http://www.lejdd.fr/Economie/Actualite/Exclusif-JDD-le-scenario-noir-du-nucleaire-595593).

6 Gordon Taylor. 'Nuclear Power's Fatal Flaws: The Real Lessons of Fukushima'. 2013-11-01. (http://www.energypolicy.co.uk/Nuclear_Power%27s_Fatal_Flaws_10-2k.pdf).

7 Gordon Taylor. 'The Case Against Nuclear Power'. 2011-06-06. (http://www.energypolicy.co.uk/TheCaseAgainstNuclearPower.pdf)

8 Gordon Taylor. 'The Real Lessons of Fukushima'. 2012-04-11. (http://www.energypolicy.co.uk/FukushimaRealLessons.pdf).

9 Highton J. and Senior D., Health and Safety Executive, Nuclear Directorate, Nuclear Installations Inspectorate. 'The Siting of Nuclear Installations in the United Kingdom'. 2008-07-03. (http://www.hse.gov.uk/aboutus/meetings/iacs/nusac/030708/p12-sittingpaper.pdf pp 4, 7).