Together Against Sizewell C

TOGETHER AGAINST SIZEWELL C (TASC) WRITTEN REPRESENTATION

SIZEWELL C PLANNING APPLICATION INQUIRY (IP no. 20026424)

HEALTH, WELLBEING AND LOW LEVEL RADIATION

Summary: This report was written by **Pete Wilkinson** and examines the possible health consequences the inhabitants of East Suffolk may suffer as a consequence of the 12+ years of construction work for Sizewell C and the potential long-term radiological impacts on the health of the local population as a result of exposure to routine discharges and emissions from Sizewell C.

April 2021

1. The prospect of a 12+ year construction period for the proposed Sizewell C complex will have a deleterious impact on the health and wellbeing of thousands of people in the east Suffolk area. Householders under the threat of compulsory purchase orders, business people, already suffering the impacts of the pandemic, now face a 12+ years period of disruption through noise, light and air pollution, increased traffic, and the imposition of conditions which militate against buoyancy of their companies[1]as well as those thousands awaiting the outcome of the planning inquiry to learn if their lives will be compromised and blighted by the development are all suffering different levels of anxiety.

2. The gross imbalance between a huge international company like EdF with its endless resources and financial backing from the French government as well as from a UK government prepared to open the doors of its key industries to foreign owners of crucial elements of its core infrastructure, and the attempts by individuals and small opposition groups to fight an evenly matched campaign against the development is painfully evident. Add the 18 months-long pandemic restrictions and the reluctance of the authorities to delay the planning process to allow greater scrutiny of ever-changing elements to the 56,000 pages of evidence and the scale of the task facing threatened communities begins to take shape. Put bluntly, Sizewell C puts a mental strain on huge numbers of people and tears at the very fabric of east Suffolk society to the point where it threatens to destroy it. Gone will be the tranquillity which drew people to the area to live and work and which still attracts millions to its peaceful villages, reserves and diversity of landscape and coast.

3. Gone will be the quirkiness of its lanes and country roads fit only for tourists and farm traffic. Its individuality will be subsumed beneath a blanket of urbanisation brought on by the drive for ‘regeneration’ and growth – all for a plant which is surplus to the requirements of the electricity needs of the UK, to its climate change, cost or overall energy targets. Over

[1] https://www.eadt.co.uk/news/sizewell-c-construction-opposed-by-suffolk-businesses-2700468

1500 HGV movements are expected every day, together with the flood of worker traffic to and from the site. Work to 'improve' the A12 is expected to take two years, after which it will feature five new roundabouts to accommodate new junctions which in themselves will generate more traffic and more congestion, leading to greater air pollution from the thousands of additional road vehicles. The health consequences of Sizewell C's construction - respiratory, mental and physical due to accidents from massively increased road miles travelled - should be assessed and of themselves be sufficient to bring the entire development into question.

Radiological health effects – the imperfect 'linear no threshold' principle.

4. Anecdotal evidence of health impacts around nuclear facilities is nothing new: people living in close proximity to a nuclear plant, be it weapons-related or electricity producing, will privately acknowledge the existence of one disease or another which they rightly or wrongly ascribe to the presence of nuclear activity. Getting to the bottom of these rumours is difficult in that talk of illnesses are naturally sensitive and personal, not the subject of public debate. The phenomenon of the 'doughnut effect' around a nuclear facility is real and present: the closer to a nuclear plant, the greater the public support for it and the less criticism is tolerated as it represents a wealth creator for those living in its shadow.

5. Local authorities are also generally supportive of nuclear developments as they tend to subscribe to the belief that this sort of infrastructure project brings wealth, employment, growth and general happiness to an area. Such cheerleading from nuclear communities and the local authorities, all backed up by central government's fixation with nuclear power, makes prising open the truth about the health impacts of exposure to radiation virtually impossible to broach, let alone examine, but there is much to suggest that such an examination is long overdue.

6. The controversy can be summed up as follows: predictions of health impacts from exposure to ionising radiation[2] using official methods are invariably contradicted by the physical evidence in the aftermath of such exposures. Official methods of calculating risk, as recommended by the International Commission on Radiological Protection (ICRP), rely on the principle of 'linear no threshold' (LNT) – that the effect or risk of exposure occurs in a linear proportion to the dose experienced in the exposure: the higher the dose, the greater the effect or risk of effect.

7. It is this relationship between dose and risk which needs careful attention. There is mounting evidence[3] that the LNT principle, while convenient, does not allow sufficient discrimination between different types of radiation and different ways in which the body could be affected to be an accurate predictor of health impact.

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[2] **Ionizing radiation** is a type of energy released by atoms that travels in the form of electromagnetic waves (gamma or X-**rays**) or particles (neutrons, beta or alpha). The spontaneous disintegration of atoms is called **radioactivity**, and the excess energy emitted is a form of **ionizing radiation**. See https://www.who.int/news-room/fact-sheets/detail/ionizing-radiation-health-effects-and-protective-measures

[3] There are 60+ studies which identify elevated numbers of cases of harm in those living close to nuclear installations which should not be theoretically possible if the official interpretations are accurate.

8. In the early 1980s, concern was voiced by people living on the Cumbrian coast about the numbers of people in their community suffering from cancer and, in particular, the number of children suffering from leukaemia. Unofficial investigations showed that, in the small village of Seascale close to the Windscale nuclear complex which had been discharging high levels of radioactive material to the Irish Sea (and still does do so to this day, although levels are lower thanks to environmental group action), childhood leukaemia over a thirty year period had been ten times higher than the national average rate. These concerns became widely publicised on 1st November 1983 when the Yorkshire TV (YTV) documentary 'Windscale – the Nuclear Laundry'[4] was broadcast.

9. Within weeks of the film's transmission, the Thatcher government set up an investigation under Sir Douglas Black which led to the establishment of the advisory Committee on Medical Aspects of Radiation in the Environment (COMARE). Between 1986 and 2016, COMARE produced eight reports on childhood leukaemia and other childhood cancers, examining whether incidence rates could be attributed to releases of radioactivity from fuel reprocessing plants at Sellafield and Dounreay, from nuclear power plants (NPPs), and from the Atomic Weapons Research Establishment and the Royal Ordnance Factory in Berkshire. Epidemiologists and official radiation protection bodies in other countries also investigated. A leukaemia cluster was identified near the French reprocessing plant at Cap de la Hague.[5]

10. Epidemiologists Baker and Hoel of the University of South Carolina noted in 2007 that in response to the Black committee, "numerous studies" had been conducted in many countries to assess the possible childhood leukaemia risk due to irradiation from nuclear sites. Baker and Hoel reviewed that literature, eventually selecting seventeen studies whose methods and data were sufficiently well-specified to allow them to be compared with each other. This meta-analysis covered 136 nuclear sites in nine countries. The authors report that the majority of studies found elevated rates of childhood leukaemia near the sites, although they were not usually statistically significant. Despite the 'statistically insignificant' nature of the findings, they reported that the excess "cannot be ignored" although they warned that it does not support a hypothesis to explain the elevated rates. An earlier study by Cook-Mozaffari and others did find statistically significant results; they analysed data from England and Wales showing that deaths from leukaemia and other cancers in young people near nuclear facilities were 15% higher than in districts further away[6].

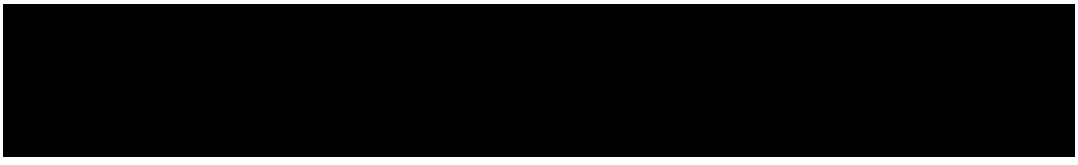
11. In 2008, the debate was re-ignited by the publication of the KiKK[7] report which identified a 60% increase in cancers and a 120% increase in leukaemia in children

[4] https://www.youtube.com /watch?v=gidQewCtTqY

[5] Case-control study of leukaemia among young people near La Hague nuclear reprocessing plant: the environmental hypothesis revisited. D. Pobel and J. F. Viel BMJ. 1997 Jan 11; 314(7074): 101–106.

[6] Geographical variation in mortality from leukaemia and other cancers in England and Wales in relation to proximity to nuclear installations, 1969-78 Cook-Mozaffari P, Darby S, Doll R, Forman D, Hermon C, Pike M, Vincent T Br. J. Cancer (1989), 59, 476-485.

[7] http://www.alfred-koerblein.de/cancer/english/kikk.htm



under 5 years living within 5kms of nuclear plant in Germany, with results falling off monotonically out to 50 km, suggesting that it was truly related to the nuclear power plants and not to chance or other factors.

12. According to a 2012 EU workshop report, KiKK was emulated in several other countries and it was noted that even when the findings were not statistically significant, they, like KiKK, showed an elevated risk of childhood leukaemia in 0 - 4 year olds living within 5 km of a NPP. The continuous slope or fall-off in numbers to 50 km was not mentioned.

Low level radiation from alpha emitters – a hypothesis

13. The gulf between official guidelines and the caution against those guidelines by the critics of ICRP is wide. The most recognised, if largely ignored, critical body is the European Committee on Radiation Risk (ECRR)[8]. In the UK, the Low Level Radiation Campaign (LLRC)[9] is pre-eminent in the campaign to have the differences examined. Both centre their argument around the hypothesis that external and internal doses of radiation have been historically measured and continue to be measured by the same principle which is, crudely, that the dose of radiation in either case is averaged over the whole body and therefore diluted in its possible effect to comply with the LNT model. In fact, goes the hypothesis, external doses of alpha emitting radiation, due to their energetic behaviour but short-range impact, are relatively harmless; however, if ingested, inhaled or entering the body through a cut, that same energy can be imparted to a small group of cells or even a single cell. As a simple example of the reasoning, the amount of radiation to which a person is exposed has traditionally been calculated by averaging it out over their whole body. However, radiation is often concentrated in high energy hot particles which if inhaled or ingested can result in damage to the surrounding cells. A useful comparison is the amount of heat in a hot bath and the heat in a burning cigarette. The hot bath may contain far more heat, but when the heat is concentrated in the end of the cigarette it is far more painful and damaging when applied to the skin. If not passed through the body, that damage can continue for long periods of time, potentially causing cells to corrupt and mutate. Such corruptions can lead to a variety of conditions from genetic malformations to cancers.

14. This is a simplistic articulation of a very complex and rarified sphere of science which requires, in the opinion of a growing body of experts, thorough investigation and examination in an atmosphere of co-operation and positivity. Hitherto, government and its agencies such as the Committee on the Medical Aspects of Radiation in the Environment (CoMARE) has been reluctant to discuss these issues and has routinely dismissed the arguments while deferring to ICRP and its UK advisory body, Public Health England (PHE). A history of the attempts at engagement between government agencies and critics

[8] www.euradcom.eu

[9] https://www.llrc.org

of ICRP can be found in the preliminary report commissioned by Children with Cancer UK[10].

15. TASC is of the view that, where substantial disagreement exists between expert bodies such as ICRP and ECRR, government has a responsibility to host discussions, preferably based on the joint-fact-finding model in which both sides agree to the terms of the engagement as well as to accept the outcome of the programme, in order to achieve greater consensus on this critical issue of health before embarking on a programme of nuclear expansion in both the civil and military applications of the technology. This is called the precautionary principle.

Uranium and plutonium in the environment

16. Since the end of WW2, there have been around 2,100 tests of nuclear weapons, over 520 of which have taken place atmospherically which have released unknown quantities of uranium and plutonium unto the atmosphere. These materials circle the planet in the atmosphere and are washed out gradually in rainfall, or they wash around in our seas and are re-suspended through wave and wind action. The plutonium and uranium contamination of atmosphere has been increased in more recent years by accidents at Windscale, Chernobyl and Fukushima. The Sellafield nuclear reprocessing plant in Cumbria, the French equivalent at la Hague, similar plants in Russia, the USA, Iran, North Korea (we assume) and others are likewise adding to the volume of alpha-emitting waste in the environment creating health damage about which we can only speculate in terms of quantifying the numbers of genetic malformations, cancers and other illnesses for which they may be responsible.

17. As an example of our cavalier attitude to environmental contamination, it is estimated that around the outfall of the Sellafield waste pipeline in the Irish Sea through which 2 million gallons of contaminated waste flow daily, lies around a quarter of a tonne of plutonium which is being inexorably driven back to shore by the action of currents, tides and winds, to be dried by the sun and re-suspended in the atmosphere. Such re-suspension, which can also occur through the action of spume and spray generated by the sea being whipped up by the wind, makes particulate matter available for inhalation and ingestion. But still the authorities have long argued that the doses to which the Seascale children were exposed were too low to cause their illnesses. Perhaps it was our underestimation of the effect of inhaled or ingested alpha emitters that was at fault.

Routine emissions from nuclear facilities

18. All nuclear facilities, from fuel processing plants, research establishments and nuclear power sites release small quantities of radioactive material to the environment on a routine, daily basis. The levels of discharge are strictly controlled, a fact which sadly gives no room for complacency as the relationship between dose and risk to health has been shown, particularly in respect to internal exposure, to be poorly understood.

[10] http://ww[redacted]

19. Some of the isotopes of radionuclides routinely discharged and identified in the Radioactivity in Food and the Environment (RIFE) report[11] as contributing to the dose of radiation experienced by the public are:

Caesium 137 (half-life 5,730 years)
Plutonium 239 (half-life 24,100 years)
Plutonium 240 (half-life 6,560 years)
Americium 241 (half-life 432 years)
Strontium 90 (half-life 65 days)
Carbon 14 (half-life 5,730 years)
Tritium (half-life 12 years)

20. It is interesting to note that, from the RIFE report 2019, discharges from the nuclear fuel production plant at Capenhurst, small gaseous discharges are reported to contain traces of Technetium 99, Uranium 234 and Uranium 238 which reach the body through pathways identified in the report as, 'Terrestial foods, external and inhalation near the site.' While Technetium has a relatively short half-life[12] of 6 hours, it remains a significant cancer risk if it reaches the lungs as dust. Uranium 234 has a half-life of 246,000 years, while Uranium 238 has a half-life of around 4.5 billion years. As alpha-emitting substances, they are of particular concern if inhaled or ingested.

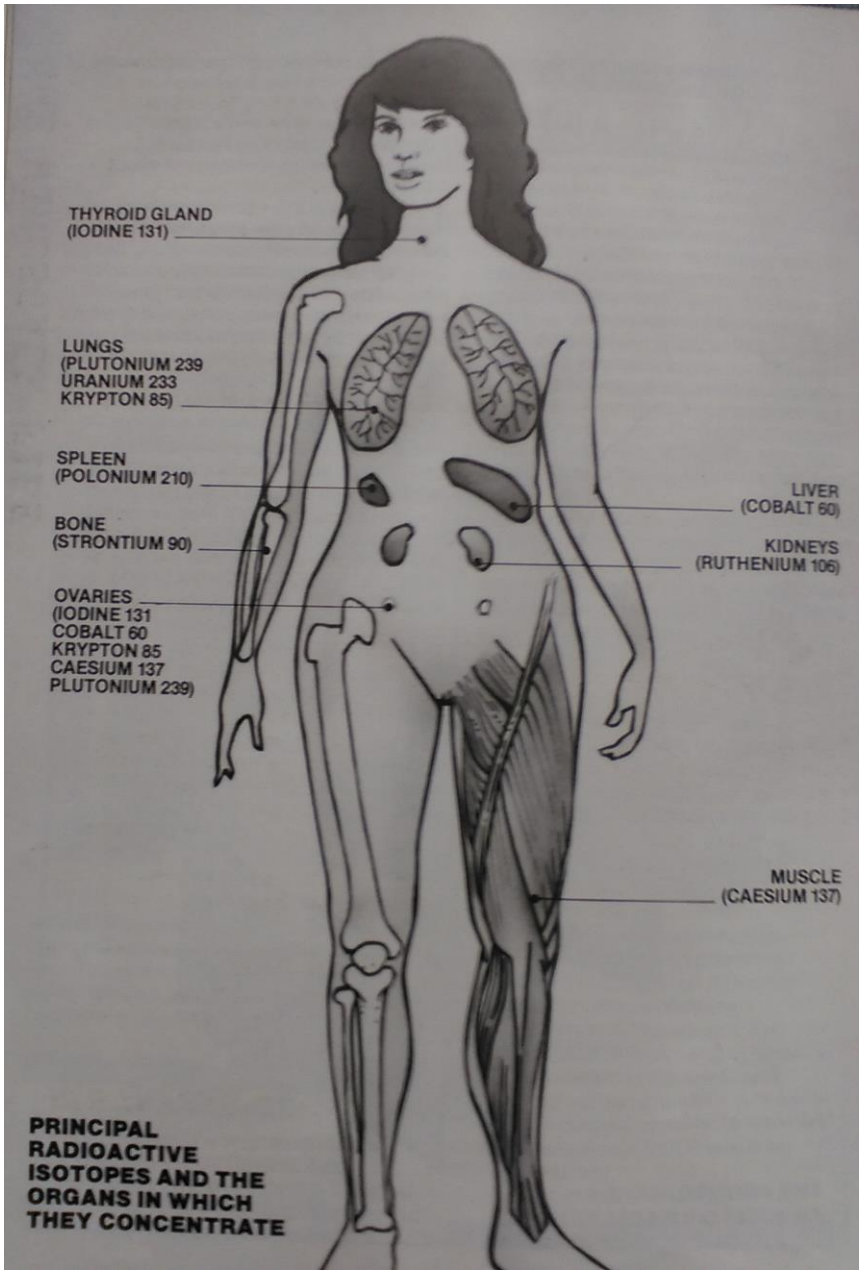
21. The RIFE report is a very well-documented publication and involves a huge amount of work to compile. It demonstrates that contamination from nuclear activity is widespread but unsurprisingly concludes that the doses to which people are exposed are at levels which represent only small fractions of those authorised. This is the crux of the issue: if doses are low, it is assumed that they are safe, but it is universally accepted that there is no safe level of exposure to radiation. What is at issue is the effect on the health of the public and especially the health of the young and unborn of inhaling or ingesting even tiny particles of alpha-emitting substances. Until that question is answered to universal satisfaction, embarking on a new nuclear build programme which entails the production of nearly 4,000 tonnes of spent nuclear fuel at each new reactor site and unimaginable amounts of radioactivity with which we can do nothing but pass onto future generations is not a good idea.

Bio-accumulation

22. Certain isotopes seek out different organs in the body.

[11] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/932885/Radioactivity_in_food_and_the_environment_2019_RIFE_25.pdf

[12] Half-life is the length of time it takes for a material to lose half of its potency. Ten half-lives must pass before a material is deemed stable.



Summary and conclusion

23. The prospect of building a twin reactor site at Sizewell will have a deleterious effect on the health and wellbeing of thousands of people in the East Suffolk area from the noise, dust, light and traffic its construction will entail. The anticipation of the outcome of the inquiry, the uncertainty around the level of disruption that will actually occur and the worry over the wholesale change in lifestyles the influx of thousands of workers to the area will bring will cause anxiety and concern among those communities faced with the consequences of the 12+ years of construction work and the inexorable transformation of their familiar, rural environment into an urban, industrialised sprawl. There is no doubt that the increased road traffic – HGVs, workers' buses, private cars, LGVs and other motorised activity – will lead to greater particulate and gaseous air contamination which will have a health cost. An increase in road traffic accidents is likely to result.

[redacted]

24. The tourism industry in Suffolk – a mainstay of its economy – will suffer as people will avoid the traditional holiday areas due to the blight of construction, congested roads and an impoverishment of the environment.

25. Some people will lose their homes through compulsory purchase orders and some farmers will have their land appropriated for construction purposes. The overall impact of the development will be negative for the health of the population of East Suffolk.

26. In addition to these consequences related mostly to the construction phase of the project, the longer terms impacts are likely to be radiological. TASC refers the ExA to its documents on nuclear waste management and emergency planning for its views on the risks associated with operating a nuclear plant on the edge of a 5,500 strong population in a remote area which is supported by inadequate road infrastructure. There is, however, an ill-defined but all-pervasive worry in many living in the shadow of nuclear facilities that exposure to radiation at even very low levels has cost to health which is poorly understood. That risk according to a growing body of evidence from around the world, is that the inhalation or ingestion of even tiny particles of alpha-emitting material found in the daily, routine discharges from nuclear facilities can have a disproportionate impact on health, particularly in the young who are known to be more radio-sensitive to such exposures.

27. For a summary and brief explanation of the origins, history and current dialogue concerning evidence that there are grounds for an urgent re-evaluation of the link between ionising radiation and health problems, particularly in children and young people, please see the Low Level Radiation preliminary report, *Radiation and reason: The impact of science on a culture of confusion* at http://www.llrc.org/children.htm.

28. The report authors stated in prefacing their work:
"There is clear evidence that releasing some forms of radioactivity to the environment has unexpectedly large health consequences although the doses involved appear to be minuscule. Examination of the concept of "radiation dose" reveals that its administrative convenience and apparent precision mask a complex and poorly understood area of science. This demands a thorough forensic review which should be regarded as an urgent priority since a number of policy areas including waste management, the management of contaminated land, and nuclear weapons and power generation are likely to be significantly affected."

Selected sections of TASC's views on the Environment Agency's Sizewell C permitting programme follow as Appendix A:

[redacted]

APPENDIX A

Three new environmental permit applications for the proposed Sizewell C power station site, Sizewell, Suffolk, IP16 4UR

A response from Together Against Sizewell C:

Sizewell C is, at the time of writing, at least 15 years away from being 'deployed', if it ever is. For these permitting consultations to be carried out so far in advance of such a contentious and uncertain development coming to fruition is bizarre, especially in light of the fact that authorised discharge levels are likely, in that period of time, to be dramatically reduced as more evidence is brought to light on the issue of low level radiation and its effects on health, especially the health of children, and force the authorities to accept the inadequacies of the current regime.

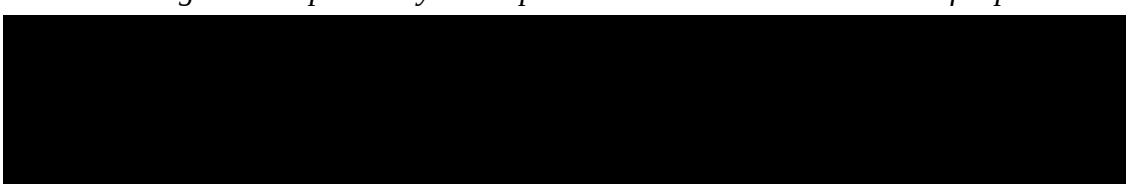
TASC 30 September 2020

A new Radioactive Substances Activities environmental permit application (reference EPR/HB3091DJ/A001): this is for the proposed disposals of radioactive waste to air, water and by transfer. Following our determination of this application, we will only issue an environmental permit if all legislative requirements are met. Any granted permit will require the operator to minimise the radiological impact on people and the environment.

TASC response:

The meeting of legislative requirements which appear to be the criteria used to determine the application, represents a false standard in that the legislative requirements themselves are based on flawed science, ignorance and a refusal of the regulatory authorities to engage with the growing body of evidence which strongly suggests that contemporary exposure limits woefully underestimate the true impact of ionising radiation. The 'linear no threshold' principle which underpins authorisations for radioactive waste discharges has long been discredited as flawed: the relationship between 'dose' and 'risk' from that dose can no longer be relied upon and therefore even tiny doses, such as those from alpha-emitting 'hot particles' of plutonium and uranium, which are incapable of detection by 'groundhog' machines which scour the beaches of Cumbia to suck up such material, are now thought to be capable of delivering a concentrated dose to an individual cell or small group of cells within the body after ingestion or inhalation.

In the light of these uncertainties, minimising the radiological impact on people and the environment is itself a hollow statement and offers no comfort to those living and working in close proximity to the plant. The EA should set a level of exposure which



they are confident is safe and hold operators to that limit rather than asking them to adhere to the 'as low as reasonably achievable' principle which simply allows discharges to increase to the level of funding a company is prepared to commit to reduction strategies. That presents the problem of determining what is a 'safe' level and, as there is no absolute safe level and as the basis on which radiological protection is founded is deeply flawed, it would seem that no company can meet these criteria with confidence. The EA should have the courage to acknowledge these uncertainties, draw them to the attention of the Department of Health, BEIS and other agencies such as the Committee on the Medical Aspects of Radiation in the Environment, and urge a thorough examination of the glaring inconsistencies in the 'linear no threshold' approach and the discrepancies between theoretically predicted outcomes from radiological incidents and the actual health consequences experienced.

The EA operates a yardstick by which it assumes that the maximum risk presented by any nuclear facility must cause no more than one fatal cancer in a million people (the 10^{-6}) principle. This is a placatory and entirely theoretical yardstick which has more to do with encouraging acceptability in the population than it has to do with science. It can no more be demonstrated than can the other fatuous claim made by regulators about the safety of the dose to the workforce or to the public as a result of an accident.

Text of a recent email to Alan McGoff, policy lead for new nuclear build at the Environment Agency:

At the recent EA/NGO telephone conference to discuss EA environmental permitting for a notional Sizewell C, you kindly suggested that any information I wished to pass on to you relevant to low level radiation would be taken up with Public Health England.

To that end, I draw your attention to the weblink for the Children with Cancer UK-funded report on ionising radiation which clearly demonstrates that evidence from around the world points to far greater health impact than predicted from currently accepted dose/risk models (see: http://www.llrc.org/children.htm). I would be pleased to hear PHE's reactions to this report and, more specifically, to the question:

With reference to the communication recently submitted to Health Physics by Dr.

draftbusbyamission...

Busby (attached) will EA ask PHE to appraise the dose from uranium234 to the Life-Span Study population and will they consider the impact of that information on the reliability of ICRP risk factors as applied to the SZC fuel cycle cradle to grave?

In terms of more general questions, I would appreciate EA's response to the following:

[redacted]

1. At what point does the EA say to government that the environmental impact of a notional Sizewell C on the proposed site is too great?
2. What yardsticks does the EA use in terms of tonnage of fish killed, acres of AONB destroyed, hours a day of noise and dust created, potential impacts from coastal erosion etc before it advises HMG that the development should be halted?
3. What will be the total gaseous alpha emissions and total particulate alpha emissions from the notional Sizewell C plant in terms of volume over the lifetime of the plant?
4. In what isotopic form will these emission be?
5. What size will the particulates discharged be?
6. How will the size of the particulates be monitored?
7. How will the EA calculate the health impact of these discharges?
8. Will the EA calculate a range of potential health impacts using ICRP/PHE recommendations as well as those from the European Commission on Radiation Risk (ECRR) – i.e. optimistic and pessimistic?
9. Will their calculations and results of expected health impacts be made public and if not, why not?

I look forward to your responses at your earliest convenience, Alan, and thank you in advance for your considered replies and for those from PHE.

With kind regards,

Pete Wilkinson

Chairman TASC

30 September 2020