

Report to: Natural Resources Wales

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Misleading information from the Environment Agency concerning evidence for Plutonium Microparticles in the Hinkley Point sediment

The National Resources Wales (NRW) report *Response to report NRPB-M173* has been brought to my attention. It is undated and has no identifier, but hopefully can be located from the title.

The NRW report contains a number of misleading statements that I assume originated with the nuclear regulator the Environment Agency (EA). I would appreciate this report being forwarded to the EA with a request that they give immediate attention to the questions and requests raised. I would be grateful to be copied into the email correspondence as it will be clear from Refs. 1 and 2 (attached) that I have relevant expertise. NRW's contacts may wish to question me directly.

- 1) It is a matter of public record (Hansard, 19582) that the Hinkley Point A reactors 'could' be used to produce Plutonium for the weapons programme but the regulator (EA) has no evidence that they were ever used to produce Plutonium for the weapons programme. Moreover, were Plutonium produced in the Hinkley Point A reactors, this could not have been extracted from the fuel as this could only take place during the fuel repossessing at NRPs such as Sellafield.**

As Ref.1 describes, in 2000 the Ministry of Defence reported that it had found 0.37 tonnes of weapons grade plutonium, the origins of which they could not identify. The calculations which we published in 1985 [2] show that the UK Magnox reactors produced 0.36 tonnes of weapon's grade plutonium in their early years, the bulk of this from Hinkley Point A (HPA). This is relevant to the discussion of Plutonium Microparticles (PMPs). The requirement to extract the fuel while the plutonium was still weapons grade and to get it to Sellafield before the start of the NPT (which would forbid the practice), resulted in more than half the HPA core being extracted in 1968 with equipment designed to change 20% of the core a year. This resulted in the accidents which compromised the Magnox cladding of the spent fuel elements. Then in 1969, according to a MAFF report [3], an accidental release of sulphuric acid into the pond resulted in

"irreparable damage.....to the particularly large amount of spent fuel that was there at the time.....not merely corrosion of the magnox which has in some cases disintegrated completely, but extends.....to extensive surface corrosion of the uranium itself."

Whoever at the EA wrote that plutonium could only be extracted at Sellafield appears unaware that these accidents were the origin of the plutonium in the waste discharge recorded in NRPB-M173. This prompts the first question for the EA:

Q.1 When the original decision was taken in 2018 to dredge and dump the sediment without alpha testing, were those who took the decision aware of the extent of the accidents recorded in Ref. 3 and the plutonium record in liquid waste in NRPB-M173?

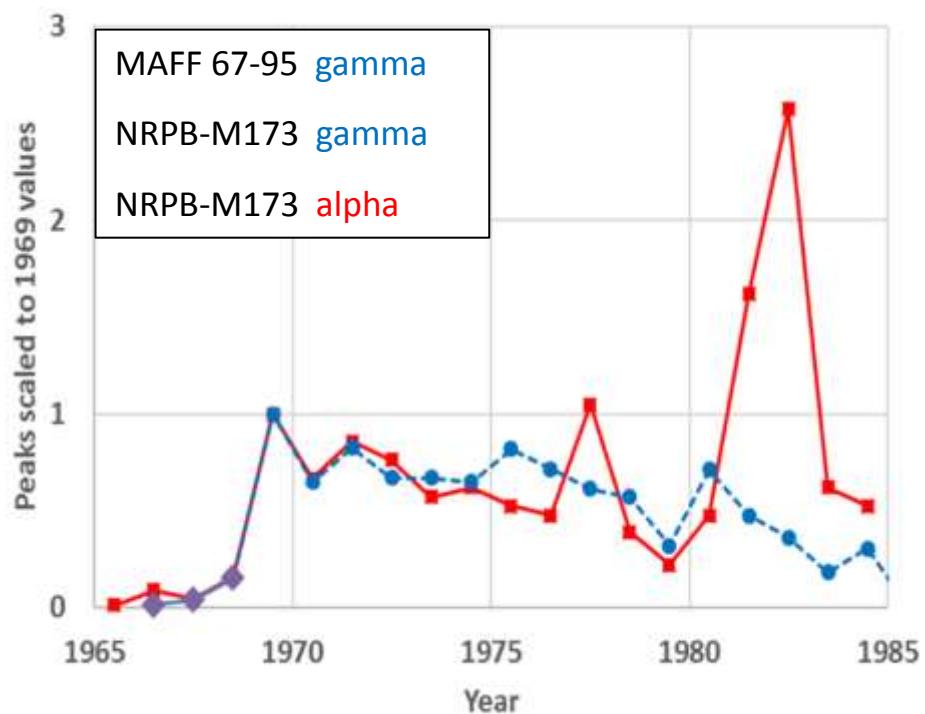
2) Over many years of annual monitoring, and to the best of our technical advisors' knowledge, hot particles have never been identified around the Hinkley area. The high levels emitted by these particles will mean that they would have been detected by gamma spectrometry in the first instance. Furthermore, no hot particles have been identified in the previous subsurface or surface sediment samples taken for the previous dredging application for Hinkley Point.

Plutonium Microparticles were identified in the liquid waste discharged from HPA by their alpha emissions recorded in NRPB-M173 (red line in Fig.1). All the plutonium signal recorded in NRPB must have come from particles of less than 5 micron diameter as this is the size of the filters at the exit of the cooling ponds. Note the MNP peak in 1982 is larger than the original peak due to the accidents in 1969. Clearly a lot more PMPs got through the filters in 1982 but there is no sign of a peak in the dotted blue line, which is the gamma signal. The PMPs in the Hinkley sediment do not emit gammas and cannot be identified by gamma spectroscopy.

Q.2 What do the EA records indicate was the origin of the large number of PMPs emitted in 1982?

Q.3 Were any alpha measurements made on liquid discharges from HPA in later years than 1984. If so, please provide them. If not, why not?

Q.4 Have those dealing with the clean up of the HPA cooling ponds measured the plutonium content of the sludge at the bottom of the ponds?



- 3)levels of Americium-241 measured by gamma spectrometry can be used to infer the presence ofsome radioisotopes of Plutonium – as they would be expected to behave similarly in the environment. Plutonium concentrations are estimated using a model that assumes their activities are proportional to the ratio in Sellafield discharges..... Alpha spectrometry has not been necessary for the samples from the Hinkley dredge area as the doses from all contributing radionuclides, including measured concentrations of Americium-241 and those estimated for Plutonium concentrations, were not exceeded.**

The bulk of the plutonium in sediments in the Hinkley area probably originated in the discharges from the HPA cooling ponds. Your model can therefore be refined:

- 1) The correction for Americium-241 decays can start from 1968, the most likely date for generation.
- 2) Our calculations estimate that the isotopic ratio of Plutonium-241 in these discharges was

$$\text{Pu-241/all isotopes} = (3.05 + 0.39/-0.25)\% \text{ by weight.}$$

Finally two requests:

Request 1. Please use your model to recalculate the plutonium concentrations from the measured Americium-241 in the dredge area referred to above, using these two corrections and compare the results with safety limits.

Request 2. Given that Fig. 1 clearly shows that the HPA PMPs are not detectable by gamma emission, we request that all samples be tested for PMPs by techniques such as those used in Ref. 4, whether or not they show a gamma signal.

References

- 1) K.W.J.Barnham et al., *Nature*, **407**, 833, (2000). (attached)
- 2) K.W.J.Barnham et al., *Nature*, **317**, 213, (1885). (attached)
- 3) MAFF “Liquid Waste Disposal Authorisation, CEGB Hinkley Point”, PDRW (69) 74
- 4) S.R.Aston. D.J.Assinder and M.Kelly, *Estuarine, Coastal and Shelf Science* (1985),20,761-771