BANNG

Blackwater Against New Nuclear Group

Requests by Magnox for:

- ***An extension to continue discharging liquid effluent, from the fuel element debris treatment process (FED) at Bradwell, into the Blackwater estuary;***

- ***An option to switch the existing discharges to a new outfall structure in case the existing outfall becomes blocked by siltation***

- ***A Radioactive Substances application to allow the switch to the new outfall structure when necessary***

Response from the Blackwater Against New Nuclear Group (BANNG)

BANNG Paper No. 31

1. Introduction

BANNG wishes to state at the outset that it continues to oppose the discharges of radioactivity and heavy metals into the Blackwater estuary and the atmosphere arising from FED dissolution at Bradwell. It, therefore, wishes the Environment Agency (EA) to put a stop to these discharges. BANNG believes that the FED should be packaged and stored as will now be the case at other sites.

BANNG is incredulous that it is still claimed that the dissolution plant continues to be Best Available Technology (BAT) for dealing with the Bradwell FED. This plant has suffered from extremely serious problems and continues to experience 'operational difficulties' and, in BANNG's opinion, could better be regarded as a White Elephant. BAT at the other Magnox sites now appears to be encapsulation and storage of FED, as a result of the bad experience at Bradwell with the untried and obviously unsuccessful technology of dissolution with nitric acid.

BANNG believes that economics has become the determining factor in the continuing, belaboured operations of FED dissolution at Bradwell: a large amount of taxpayers' money has already been expended on the plant. This will be increased significantly as the entry of Bradwell into Care & Maintenance recedes into the future.

The reasons for its opposition to the discharges arising from FED dissolution have been laid out by BANNG on several occasions, including at its Public Meeting in West Mersea on 24 June, 2014, and remain valid. Among them are:

- the Blackwater is a vulnerable, shallow estuary with a slow refresh rate;
- the Blackwater has many national and international designations, including the recent award of Marine Conservation Zone (MCZ) status, primarily aimed at protecting the Colchester Native Oyster and its breeding grounds;
- the Blackwater estuary is relied on as a place of work for many fishermen and oystermen;
- the Blackwater estuary is a place that has sizeable populations living around it;
- the Blackwater is a tourist area and in the summer many people sail and wind/kite-surf on and swim in the estuary; many of these activities take place close to the existing outfall pipe and will also take place close to the proposed new outfall structure;

However, it seems that the EA is minded to grant the permit variations to Magnox to extend the period of the discharges from 12 months and now to leave the date of completion open-ended as it is not possible to give a date when the unreliable FED dissolution operations will end.

BANNG wishes to raise points that it believes need to be taken into consideration. These are provided below.

2. Problems with the Environment Agency's current consultation on the Magnox application to vary permits relating to FED dissolution

In order to justify approval of the Magnox applications to vary permits, the Environment Agency (EA) has gone to great lengths. Its consultation documents comprise an overwhelming 2,000 pages in 97 separate files of information (which brings to mind something Shakespeare said about protesting too much). However, the consultation process has been poorly managed and is opaque. No overview has been given to hapless consultees as to how this large amount of information may be best used.

It has also taken the Agency much longer than it anticipated to reach its draft deliberation: three months has become over a year. In an e-mail on 23 August, 2016, the Permitting Support Officer (Water Quality) informed the Secretary of BANNG that the EA's deliberations had taken a long time 'due to the technical complexity of the case and making sure that our decision will be the right one for the very sensitive receiving environment'. A reminder was also given that 'It is the environmental consequences of using the new outlet structure that require lengthy, detailed, assessment because it will produce different dispersion and dilution characteristics in the estuary'.

BANNG believes that these comments imply that the Blackwater estuary is the wrong environment for discharges of radioactivity and heavy metals and that ensuring that they do not pose a potential danger to people and the marine environment is a very complex affair. This is the position that BANNG has held from the beginning.

BANNG further believes that there must be severe challenges with a process that was supposed to be finalised at the end of 2015 having taken a period of a year to accomplish. It is not now certain when it will finish and quite unknown when the Bradwell site can enter into Care & Maintenance.

BANNG considers that the FED dissolution process is unnecessary, unnecessarily complex and unnecessarily expensive. It should be stopped immediately.

The EA has been at pains to make clear the methods used in reaching its draft deliberation in the current consultation. The documents frequently assert that the EA is minded to approve the applications making the Agency's plan to announce this decision in early January 2017, only a few weeks after the consultation closes, look like a foregone conclusion whatever the public may say in their responses.

2.1 Selective public consultation

As far as this and the previous consultation are concerned, Mersea island, which lies 2 miles directly across and downwind from the former nuclear power station at Bradwell, has been forgotten. While Maldon District Council and the Kent & Essex branch of the Association of Inshore Fisheries & Conservation Authority ((IFCA) are statutory consultees – neither of whom responded to the first consultation – West Mersea Town Council and Colchester Borough Council are not consulted at all. It is as if Mersea Island and its population simply do not exist.

Nuclear at Bradwell is a transboundary issue and it cannot be right that one Council on the Dengie Peninsula should be afforded preferential treatment. The Government's National Planning Policy Framework (NPPF) requires co-operation between neighbouring councils on transboundary impacts.

BANNG demands that in future Colchester Borough and West Mersea Town Councils, which have a large population exposed to what takes place at Bradwell, should be consulted. This population should not be ignored.

In its response to the first EA consultation, BANNG pointed out the many inconsistencies in the EA's description of the scope of its selective public consultation. The situation does not seem to have changed.

BANNG believes that the EA needs to improve its methods for and scope of any public consultations it undertakes in future.

3. Justification of the new and untried practice of FED dissolution with nitric acid

The Nuclear Decommissioning Authority (NDA) was keen to use dissolution with nitric acid of FED at Magnox sites as it offered a significant opportunity 'to reduce the overall costs, environmental impacts and timescales of decommissioning by consolidating Intermediate-Level Waste (ILW) management at fewer locations'

(consultation on 'Optimising the number and location of FED treatment (Dissolution) facilities in Magnox Limited', May, 2013, Section 1.1).

This consultation by the NDA may have attempted to provide a justification for the use of FED dissolution at Magnox sites but it is clearly stated therein that the consultation does not include Bradwell 'because Bradwell is well- advanced in implementing dissolution of its own FED on its own site in line with its accelerated Care & Maintenance programme'.

It is not known if there was ever any official Justification under the Justification of Practices Involving Ionising Radiation Regulations, 2004, for the use of the untried practice of dissolution of nuclear waste with nitric acid.

BANNG has written to the relevant authorities (the EA, the Department for Business, Energy and Industrial Strategy and the Justification Application Centre) to say it believes that such a Justification is required and awaits their responses.

4. A potentially dangerous situation that should have led to withdrawal of the EA permit and the cessation of dissolution at Bradwell in 2014

It is strange that once the serious problems associated with the FED dissolution plant became clear, the Agency did not withdraw its permit and stop the process. A leak had been found in the abatement plant (ADAP) which may have dated from May, 2014, i.e. before the discharges began. It now seems this was the main factor, along with other problems (see below), that caused the extended outage of the dissolution plant from June, 2014 to March, 2015.

That the EA must have had serious concerns about the problems with the dissolution process was clear from BANNG's meeting with the Agency's representatives on 21 November, 2014. At that meeting, the Nuclear Regulation Group South Team Leader reported that he had asked the EA's Bradwell Nuclear Regulator to discuss with the Site Operator the adoption of a Plan B, i.e. encapsulation of the FED. Magnox did not adopt Plan B but soldiered on with a malfunctioning plant.

The initial, potentially dangerous problems with the dissolution plant were finally made public at the meeting of the Bradwell Local Communities Liaison Council (LCLC) held on 9 December, 2015 (Minutes, para. 2682) and make for horrifying reading:

- three safety barriers had failed;
- broader issues had questioned whether installation and commissioning were carried out properly and whether the operators had sufficient skill and experience;
- the leak was only detected by luck and may have been ongoing since the date of commissioning (May, 2014);

- the plant had been put into service without operators having a full set of quality controls;
- time pressures had been placed on operators due to the shortfall in throughput;
- calibrations associated with the ADAP had still to be undertaken.

(It was thanks to a Freedom of Information request to the Office for Nuclear Regulation (ONR) from Graham Farley, of the Mersea Island Environmental Alliance, that this information came into the public sphere.)

At this meeting of the LCLC, the ONR Site Inspector reported (Minutes, para. 2686) that the ONR responded to the incident by issuing a formal letter detailing the breaches in terms of the application of good practice, which can be summarised as follows (more horrifying reading):

- flange not properly installed;
- leak went into intended bund but sensor to activate the alarm for the bund was incorrectly installed;
- the containment of the bund was compromised by inappropriate controls over the installation of the plant.

The ONR Inspector said that the ADAP did not present a threat to the nuclear safety of the local area.

The report from the National Nuclear Laboratory (NNL), dated 9 March, 2016, makes clear the concerns of its experienced operator who visited Bradwell. The Magnox laboratory was 'small, full of equipment for other analytical techniques, rusting metal exposure, effluent discharged in the laboratory sink and large volumes of samples were being stored'. These conditions made for 'potential contamination of samples of the [FED] effluent affecting calibration and sample repeatability'. The NNL operator also had concerns with the level of experience of the analysts carrying out the sampling, who appeared to have insufficient training 'to enable competent operation'. This could have led to possible errors in sample analysis results.

This information implies that for some 21 months, any discharges from the new and untried nitric acid dissolution process using a new and untried dissolution plant could have been outside the required limits.

BANNG is concerned that this is an unacceptable measure of the EA's oversight and asks how the public can be confident that controls will remain securely in place to ensure there is no possibility of a recurrence.

BANNG considers the information above makes it clear that the dissolution plant was unfit for purpose and that the operators lacked the appropriate skill and experience. These are very serious issues in relation to dealing with intermediate-level nuclear waste. And that is most likely the reason that they were not revealed, the public being told instead at various LCLC meetings that e.g. the outage was planned.

BANNG believes that in view of the potentially dangerous problems outlined above, dissolution of FED at Bradwell should have been stopped in 2014. In view of the continuing problems, it should cease immediately.

5. The optimism of the past and the reality of the present

In Section 2.3.3 of the Nuclear Decommissiong Authority/Magnox consultation of May,2013, it is acknowledged that dissolution 'carries some risks in terms of the ability of the process to deliver the required throughput' and optimistically adds 'However, this risk will diminish as more experience of the dissolution process is obtained at Bradwell'.

At the end of 2016, the reality is that the experience at Bradwell has resulted in the plans for FED dissolution with nitric acid being abandoned at all other Magnox sites, where the FED will now be encapsulated and stored – as BANNG believes should have happened at Bradwell.

The reality is that only two discharges were made after the commencement of dissolution on 23 June, 2014 and an outage was caused lasting seven months that had implications for the planned date for the entry of the site into Care & Maintenance, the end of 2015. Notwithstanding this, the malfunctioning plant returned to operations in March, 2015, with discharges taking place on a less frequent basis than one per day. Since then it is unclear how many discharges have taken place.

Decision Document EPRDP3127XB is peppered with references to continuing problems, e.g. on p. 82 'we have been allowing the operator to make the FED discharge **(when they are able to)**' and on p. 83 ' whilst this enforcement position has been in force, Magnox have made FED discharges but they have been **limited by further operational difficulties'**. And Magnox have now informally 'intimated that 24 months may not be enough time to treat the remaining tonnage of waste material they need to dispose of' (p. 83). In other words, the date of entry of the site into Care & Maintenance is not known and operations at Bradwell will continue into the foreseeable future. Meanwhile, Bradwell and the Blackwater estuary continue to be guinea-pigs for a failed experiment with which Magnox insists on persisting and the EA persists in approving.

BANNG believes that the continuing 'operational difficulties' being experienced by this unnecessary and potentially dangerous process should mean that FED dissolution should cease immediately.

BANNG considers that the untried and problematic dissolution process has put paid to the much-vaunted accelerated entry into Care & Maintenance of the Bradwell site.

6. Why is FED dissolution continuing at Bradwell when it is not considered to be Best Available Technology (BAT) for other Magnox sites?

The question must be asked, 'Why is FED dissolution with nitric acid continuing at Bradwell?', given that it is so obviously unsuccessful that it is not considered to be BAT for other Magnox sites.

It is difficult to understand how FED dissolution can be regarded as the BAT for dealing with FED at Bradwell.

At the meeting of the Bradwell LCLC on 4 March, 2015, Mr. Ireland, of Magnox, stated that the original plan had been to re-use some of the Bradwell dissolution plant in a plant at Hinkley Point A. He went on to say, apparently in justification of this proposal: 'Further analysis has shown that FED waste at Hinkley Point A site is ILW. It is now proposed that encapsulating this in $6m^3$ concrete boxes will be more cost effective than processing by dissolution'.

But the majority of the Bradwell FED is ILW and so surely the same rationale should apply to it, i.e. it would also be more cost effective to encapsulate it.

Unfortunately, an expensive White Elephant in the form of the FED dissolution plant has been built at Bradwell and it now seems that, come what may and no matter how often there are 'operational difficulties', it will continue to be used.

BANNG believes that the BAT for dealing with the Bradwell FED would be to employ the same BAT for the FED as will be used at the other Magnox sites.

7. The economics of the failed experiment at Bradwell

It is estimated that taxpayers have paid in the region of £100M+ for the dissolution plant. BANNG believes that economics is the reason that the plant is to be allowed to hobble on for years to come. There seems to be no other reason for persisting with this failed experiment other than the large amount of money already expended on it.

It was planned that when Bradwell entered Care & Maintenance at the end of 2015, the site would be monitored from a remote hub (this rather minimal arrangement is being reviewed by the ONR). As noted above, the problems with the dissolution plant mean that it is not now known when the site will enter Care & Maintenance and operations there will now be ongoing long after the planned date and will add significantly to the costs to the taxpayer of decommissioning.

BANNG believes that FED dissolution with nitric acid has failed in its purpose of 'reducing the overall costs, environmental impacts and timescales of decommissioning' (NDA consultation, May, 2013, Section 1.1).

BANNG contends that economics should play no part in how radioactive wastes are dealt with as this could lead to a misplaced enthusiasm for untried

and ultimately unsuccessful practices such as FED dissolution. The NDA and the EA should at all times have as their main concern the protection of both people and the environment.

8. A bright side for the EA; serious concerns for BANNG

The EA sees a bright side to the situation as the discharges into the Blackwater will be significantly fewer than planned, spread over a much longer period and, therefore, it claims, less damaging (assuming the new, untried outlet structure works as intended).

BANNG has recently been made aware of new research undertaken by the University of Plymouth and supervised by the UK Government's Centre for Environment, Fisheries and Aquaculture Science (CEFAS) which has found that Tritium damages the DNA of mussels and similar species e.g. oysters, cockles, etc., all of which are found in the Blackwater estuary. While the research relates to climate change, the warmer conditions on which the study is focused already exist in the River Blackwater (compared to the open sea), given that it is shallow and has a large intertidal area which causes further warming of the sea as it flows in at each high tide.

BANNG believes that this new research must be taken into account and the precautionary principle applied to the current discharges. Given the importance of the shellfish industry to the local area and the designation of the estuary as a Marine Conservation Zone, the discharges should stop immediately.

BANNG notes that in the context of any nuclear new build at Bradwell that further raised temperatures will occur causing further likelihood of this effect if, as has traditionally happened, Tritium is discharged together with the cooling water. There is no process available to capture Tritium before it is discharged.

BANNG also questions why the issue of the discharges of Tritium to the atmosphere, currently taking place as a result of the FED dissolution process, is not mentioned in the documents for either the first or this second EA consultation.

9. Contradicitions in EA's position

There is an irony in the position in which the Agency finds itself: in the consultation documents, it emphasises its duties to conservation and to fisheries and outlines DEFRA's requirements of the Agency: 'to protect, enhance and restore the environmental quality of inland and coastal surface water and groundwater' (p. 41). In what seems a direct contravention of its duties and reqirements, it is allowing some very nasty radionuclides and heavy metals (see the attached list in Appendix 1) to be discharged into the shallow Blackwater estuary, an estuary with a very slow refresh rate which is also a Marine

Conservation Zone. As noted above, the estuary has also been defined by the Agency itself as a 'sensitive receiving environment'.

The irony continues in the terminology the Agency employs, e.g. in Decision Document EPRDP3127XB '….the varied Permit will **provide exactly the same protection** to the receiving environment as the existing Permit….' (p. 43).

BANNG is concerned that such terminology is misleading: the Permits do not 'provide protection' but, on the contrary, potential damage to people and the marine environment.

BANNG believes that it is wrong to discharge radionuclides and heavy metals into the Blackwater estuary, acknowledged by the EA to be a 'sensitive receiving environment'. The dissolution process is unnecessary and is continuing to prove itself to be an expensive failure. It should be stopped immediately and the remaining FED should be encapsulated and stored in the Bradwell ILW store, as will be done at the other Magnox sites.

A further irony arises in the EA's statement that the suggestion made in the first round of consultation to transport the FED effluent in tankers for discharge into the open sea would contravene International Law, e.g. OSPAR.

The Agency also maintains that no damage will be caused by the discharges of radionuclides and heavy metals or the discharges of other pollutants being proposed to any of the many designated zones around the estuary, including the Marine Conservation Zone which was set up specifically to protect the Colchester Native Oyster and its breeding grounds. The EA also maintains that no health risk is posed to any humans coming into contact with or even swimming in the area where the discharges take place.

It seems paradoxical to suggest that it would be illegal to discharge a perfectly safe effluent into the open sea but perfectly legal to discharge it into what is effectively a three-sided, shallow lake. This surely cannot be true.

Although BANNG prefers to adhere to the principle of self-sufficiency with each site looking after its own FED, it does support the suggestion that the FED could be put into tanks for transport to and discharge into the open sea at Sizewell or Dungeness. This would compensate for the ILW coming from those sites for storage at Bradwell.

10. The Colchester Native Oyster

Magnox state that there are only 2 oyster beds near the outfall pipe, at 600m. and 8km. This statement is untrue.

It is unclear why the numerous oyster beds in the parishes of West Mersea, East Mersea and Tollesbury have not been listed in the environmental studies.

The statement by Magnox that oysters only grow in intertidal areas is also not true. The protected Native Oysters grow below the intertidal areas throughout the

estuary and the belief that the effluent will not pass over or harm any areas where native oysters breed and grow is, therefore, untrue.

The EA was advised of the inaccuracy of the Magnox information on oyster bed locations in BANNG's response to the first consultation but have clearly not investigated this adequately before continuing to use the same incorrect information.

BANNG is surprised that this misleading information is being reproduced in this second consultation and would like Magnox and the EA to check the facts.

11. The proposed 100 metre mixing zone

The modelling reports for dispersal of discharges allow a 100 metre mixing zone from the new discharge structure before measuring the acceptability of pollution and radiation levels from the discharges. Within this zone it is likely that pollution levels will be higher than permitted limits.

Oysters move on the seabed with the tides and many will pass within the mixing zone on their travels during their 4 or 5 years before harvesting.

BANNG would like the EA to state categorically that conditions within the mixing zone meet the specific protection levels under the Marine Conservation Zone status for Native Oysters.

12. The PC-CREAM Programme

It has been suggested to BANNG that the PC-CREAM programme is unsafe and is not applicable for use in determining the effects of radioactive discharges into estuaries. This information is based on recent work by J. G. Smith and J. R. Simmonds 'The methodology for assessing the radiological consequences of routine releases of radionuclides to the environment used in PC-CREAM 08'. (2015, Health Protection Agency).

The following statement on p. 121 of this work appears to confirm the statement 'Models for discharges to estuaries are not currently included in PC-CREAM 08'.

In light of this statement, BANNG would like to know why the EA considers this programme to be appropriate for assessing radiation exposure risks in the Blackwater Estuary.

13. Assessment and measurement of particulate residues

It has been suggested to BANNG by Dr. Chris Busby that Magnox 'is being permitted to release significant quantities of particulate residues containing Uranium and Actinide alpha emitting nano-particles which are not being assessed nor measured since the draft Permit only requires total beta assessment. Since

these particulates are known to adhere to sediment and since they are the most dangerous of all the emissions, it is unacceptable that they are not quantified nor measured'.

BANNG believes that the information in this suggestion is extremely concerning and would like to receive the EA's comments on the assessment and measurement of the particulate residues.

14. Conclusion

- ***For all the reasons included in this response, BANNG believes that dissolution with FED at Bradwell should cease immediately.***

- ***We believe that the EA needs to preserve its reputation for protecting the public interest and that this is particularly important with the prospect of new nuclear build at Bradwell on the horizon.***

- ***BANNG believes that the EA should have withdrawn the Permit to allow the operation of the dissolution plant in 2014 when it was clear that there were serious problems with both it and its operation.***

- ***Unfortunately, the Agency has allowed the potentially dangerous farce of the manlfunctioning FED dissolution plant at Bradwell to continue and is now 'minded' to grant Permits that will prolong its operations for a number of years.***

(If the EA persists in allowing the discharges into the estuary and a 100m mixing zone of higher pollution, will it also require Magnox to ensure:

1. ***The location of the mixing zone is clearly marked for estuary users by appropriate buoyage, possibly as an exclusion zone.***
2. ***The actual occurrence of discharges taking place is clearly indicated by means of warning lights or other clearly understood methods.***

This will ensure no persons unknowingly venture into any higher risk area when discharges occur.)

Alas, poor Blackwater.

Prepared on behalf of the Blackwater Against New Nuclear Group (BANNG) by,

Varrie Blowers, Secretary & Media Relations Officer
and
Barry Turner, Vice-Chair 15 December, 2016

NDA FED discharges to UK coastal waters- NFLA request under FOI Act (April, 2014)

1. List of expected constituent/individual radionuclides in the proposed liquid radioactive waste discharge stream.

Radionuclides	
Tritium (H3)	Yttrium (Y 90)
Carbon (C 14)	Silver (Ag 108m)
Chlorine (Cl 36)	Cadmium (Cd 113m)
Calcium (Ca 41)	Samarium (Sm 151)
Iron (Fe 55)	Europium (Eu 154)
Cobalt (C 60)	Europium (Eu 155)
Nickel (Ni 59)	Thallium (Tl 204)
Nickel (Ni 63)	Plutonium (Pu 240)
Krypton (Kr 85)	Plutonium (Pu 241)
Strontium (Sr 90)	Americium (Am 241)

2. Estimated quantities of each consistent radio nuclide in the liquid waste stream (Bqs/ l)

Table 1. Environmental Permitting Regulations 2010

Discharge to River Summary **(approximately 18 month campaign)**

Parameter	**Consent (TBq/year)**	**Predicted TBq/year**	**Predicted Tbq Total(18months project)**
Tritium	7	6.55	9.82
Cs137	0.7	1.62E-05	2.43E-05
Other	0.7	0.28	0.42

3. List of expected heavy metals in the proposed liquid waste discharge stream

Heavy metals
Boron
Cadmium
Chromium
Copper
Iron
Lead
Mercury
Nickel
Zinc

4. Estimated quantities of each heavy metal in the liquid waste stream (µg/l)

Table 2. Environmental Permitting Regulations 2010

Substance	Limit Total Concentrations (µg/l) Surface Waters
Cadmium	0.4
Lead and its compounds	14.4
Mercury and its compounds	0.1
Nickel and its compounds	40

Other metals expected in the liquid discharges will be at levels such that the Environmental Quality Standards (EQS) will not be exceeded for the Blackwater Estuary.

Table 3. Environmental Permitting Regulations 2010

Discharge source and discharge point ref. & location	Parameter	Limit (including unit)
Trade effluent consisting of treated dilute nitric acid	Maximum daily discharge	$30m^3$/day

5. Expected temperature of the FED dissolution liquid waste stream at point of discharge

The liquid discharged from site will be at the ambient temperature of the estuary. This is because of a fifty fold pre dilution with water abstracted from the estuary which will occur prior to discharge.

The temperature of the effluent will be a maximum of 24 degrees Celsius. This information is referenced in the permit application to the Environment Agency- Form B6, Q7 and is this information is available on the public register.

6. Clarification of whether the proposed discharge will be pulsed/intermittent or continuous over the 5 to 7 year period.

The FED dissolution programme has been scheduled to last for approximately 18 months and the proposed discharge will be of a batch process.

7. If pulsed/intermittent details of the proposed chronology i.e.

a. yearly frequency

b. time scale, (length of each pulse)

c. relationship to tidal cycle

a-c; Discharges are expected to happen once daily for a period of 18months. The discharges are planned on the high tide (ebb tide) for approximately one hour.