Nuclear Free Local Authorities
RADIOACTIVE WASTE POLICY
Briefing No.65 – Sellafield and reprocessing overview

Prepared for NFLA member authorities, September 2016

'The Nonsense of Nuclear Fuel Reprocessing' (Report for The Ecologist) and NFLA concerns following the recent BBC Panorama programme on nuclear safety failings at Sellafield

i. Preamble

The NFLA reproduces in this Policy Briefing an article by independent consultant on the effects of radioactivity to the environment, Dr Ian Fairlie, which will appear in 'The Ecologist' magazine. It provides wider background to some of the key issues at the Sellafield and its ongoing work in reprocessing nuclear fuel. It is published at this point following a BBC 'Panorama' programme which includes serious allegations made by a former Sellafield manager, turned whistleblower. A NFLA media release on these serious allegations is attached as Appendix 1. NFLA sincerely thanks Dr Fairlie for permission to reproduce the article as a NFLA Radioactive Waste Policy Briefing.

1. Introduction

Many readers will have seen the interesting Panorama programme on the poor safety record at Sellafield broadcast on BBC 1 on September 5:
http://www.bbc.co.uk/iplayer/episode/b07v80s4/panorama-sellafields-nuclear-safety-failings

The BBC press release stated this was a "special investigation into the shocking state of Britain's most hazardous nuclear plant…" and it certainly was. The most important of several whistleblower revelations was that the previous US managers had been shocked at the state of the plant when they took over its running in 2008.

Although the programme producers are to be congratulated for tackling the subject, it was only 30 minutes long and tells merely a fragment of the whole sorry story. This article tries to give more background information, and importantly, more analysis and explanation. The full story would require several books and would be painful reading.

2. What is reprocessing?

Reprocessing is the name given to the physico-chemical treatment of spent nuclear fuel carried on at Sellafield in Cumbria since the 1950s. This involves the stripping of metal cladding from spent fuel assemblies, dissolving the inner uranium fuel in boiling nitric acid, chemically separating out the uranium and plutonium isotopes and storing the remaining dissolved activation products in large storage tanks.

It is a dirty, dangerous, unhealthy, expensive process which results high radiation doses to the ~9,000 workers employed at Sellafield.

3. Environmental consequences

The Sellafield plant is host to several hundred radioactive waste streams and processes which result in large discharges of radioactive liquids to sea and even larger emissions of radioactive

gases and aerosols to the atmosphere. Raised levels of childhood leukemias in villages nearby are considered to be linked to the inhalation and ingestion of these radionuclides.

Sellafield, and a similar plant in La Hague France, continue to be, by some margin, the largest sources of radioactive pollution in the world. For example, the Irish Sea is the most radioactively polluted sea in the world with about half a tonne of plutonium sitting on its seabed from reprocessing. The collective doses to the world's population from the long-lived gaseous nuclides C-14, and I-129, and from medium-lived Kr-85 and H-3 (tritium) emitted at Sellafield are huge and are estimated by radiation biologists to cause tens of thousands of early deaths throughout the world.

Another result is the 140 tonnes of unneeded, highly radiotoxic plutonium (Pu) stored on site at a cost of £50 million a year. Pu is fissile and, in the wrong hands, this amount could be made into ~20,000 warheads, ie it is a serious proliferation danger.

4. The Liquid Waste Tanks at Sellafield

Even more serious are the ~20 large holding tanks at Sellafield containing thousands of litres of extremely radiotoxic fission products. Discussing these tanks, the previous management consortium Nuclear Management Partners stated in 2012 "there is a mass of very hazardous (nuclear) waste onsite in storage conditions that are extraordinarily vulnerable, and in facilities that are well past their designated life".

The National Audit Office (NAO) stated these tanks pose "significant risks to people and the environment". One official review concluded that, at worst, an explosive release from the tanks could kill two million Britons and require the evacuation of an area reaching from Glasgow to Liverpool. These dangerous tanks have also been the subject of repeated complaints from Ireland and Norway who fear their countries could be contaminated if explosions or fires were to occur.

https://www.regjeringen.no/globalassets/upload/MD/2011/vedlegg/rapporter/sellafieldrapport_straalevernet_250111.pdf

http://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736(01)06620-X.pdf

5. The Sorry History of Reprocessing

The history of Sellafield (previously named Windscale) is littered with accidents - some very serious, and hundreds of leaks, spillages, scandals, cover-ups, secret reports, redactions, plant failures, botched management contracts, and examples of gross financial mismanagement.

These have been discussed in scores of critical reports by various Commons Committees, by the NAO, by commissioned consultancies, and by many environmental groups. Also by reports from several European Governments, by the HSE, by RWMAC, and not least by several TV programmes in the 1990s alleging political dirty tricks and manipulation of Government Ministers.

In short, the practice of reprocessing at Sellafield has been and remains a monumental national disgrace.

The final irony is that, if more intelligent spent fuel policies had been chosen, nuclear reprocessing would have been quite unnecessary, as shown in the BOX below.

6. Why reprocess?

The initial rationale for reprocessing in the 1950s to the 1980s was the Cold War demand for fissile material to make nuclear weapons. Several studies at that time stated that reprocessing was a "dominating edifice of policy". As a result, strategy-setting, regulatory functions, government reorganisations, and health and safety considerations always had to revolve around it. All

Government Departments had to operate within the "rigid framework imposed by the imperative of reprocessing." Reprocessing decisions were always made at Cabinet level.

The domination of reprocessing even extended to official inquiries. For example, in the late 1970s, the Windscale Inquiry was set up set up to determine a planning application to build the THORP plant. Inter alia, it had to assess the best way to handle spent nuclear fuel. Its 1978 Report strongly defended reprocessing. This was a nonsense even then (see BOX), but it held sway as nuclear defence considerations were paramount.

The Policy Horror of the Windscale Inquiry

How did the Windscale Inquiry conclude that nuclear reprocessing was a good way to deal with spent fuel? Largely by using unproved assertions, unsupported assumptions and unwise predictions. For example, it asserted impending uranium ore shortages and high uranium prices, despite evidence to the contrary even then. It asserted that the mooted glassification of HLW liquid wastes was the best way to proceed despite zero evidence that it would actually work, and despite testimony from Canadian scientists that untreated ceramic spent fuel was a much better waste form than glassified wastes.

Perhaps the most egregious assumption concerned the wisdom of storing spent fuel under water for relatively long periods. Such storage meant that spent fuel, especially Magnox fuel, had to be reprocessed, as the degradation of its cladding rendered it unfit for long term dry storage. Indeed, all or almost all, of the Report's recommendations on the rationale for reprocessing were later shown to be incorrect.

A major procedural flaw which probably explained much of the nonsense of the report was that Justice Parker, who knew next to nothing about nuclear technology, was advised by two senior advisors from UKAEA and MOD who sat on either side of him throughout the inquiry.

This inquiry is perhaps an extreme example of policy-led "science". It is much preferable of course to have science-led policies. But when it comes to nuclear power, this rarely, if ever, occurs, even today.

After the Windscale Inquiry's report, the policy of wet storage was maintained - in major part to ensure the continuation of reprocessing, as fissile material for weapons has not existed as a rationale at least since the early 1990s.

7. MOX Fuel

The next purported justification for reprocessing was the need to use plutonium as a reactor fuel in mixed oxide (MOX) fuels. However again this was and is a mirage as nuclear companies have repeatedly been unable to manufacture MOX fuel to the exacting standards required for Pu fuels. In addition, nuclear utilities in Europe and the US have generally refused to use it, unless forced to do so by Government agencies.

One reason is economics: MOX fuel costs about 4 to 5 times more than ordinary fuel per tonne and delivers 20% less energy output per tonne.

Another is that spent MOX fuel presents serious problems for utilities. It cannot be reprocessed as it is far too radioactive, and it has to be stored for 15 years rather than 5 years in cooling ponds as it is very hot when it exits reactors. This triples the cost of storing spent fuel. And it causes high radiation exposures to workers - even to managers in distant offices.

All in all, MOX fuel is a bad idea, but even in 2016, such is the dominance of nuclear thinking in Britain, that much evidence to the Parliament's recent POST report was still suggesting MOX fuel as a solution to deal with the UK's large unwanted plutonium stocks.

8. Are there other ways of dealing with spent nuclear fuel?

Yes. About 90% of nuclear fuel annual arisings around the world are NOT reprocessed but stored either in ponds or, increasingly, in dry storage facilities. Only the UK and France still carry out commercial reprocessing. This not to say that storage is problem-free or is a final solution but it does not suffer from the massive immediate dangers of reprocessing.

However the incoherence of reprocessing is gradually catching up with nuclear utilities and agencies, as the annual tonnages of reprocessed fuels are slowly declining. Most European utilities (apart from those in France and the UK) stopped ordering their fuels to be reprocessed about a decade ago.

9. Where are we now with reprocessing?

The UK (and France) still carries out reprocessing, but its days are numbered at least in Britain

Although all Magnox power stations are now closed, their spent fuels have not yet all been reprocessed. The latest NDA draft Business Plan: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/489358/Draft_Business_Plan_2016_to_2019.pdf shows its Post Operational Clean Out (POCO) plan lasting until 2023 with Magnox reprocessing ending in 2020.

With about 3,000 tonnes of Magnox fuel still to be reprocessed it could achieve the 2020 date, if the plant managed to continue operating at the current rate. But the Magnox plant is 50 years old, and could break down at any time as amply shown in the Panorama TV programme. So there is no guarantee of meeting the final closure date.

As for AGR fuel, the NDA stated in its draft Business Plan that the Thermal Oxide Reprocessing Plant (THORP) would close in November 2018, mainly because of the significant costs required to keep it going longer (including new HLW tanks costing £500 million) - costs that NDA said could not be justified.

The NDA stated its Post Operational Clean-Out plans (POCO) and timetable for THORP closure were now mapped out and firm, but whether these will be adhered to is a moot point. The problem is that the UK's 14 AGR reactors are expected to continue for another ~10 years on average (even although most are past their sell-by dates). This means at least another ~ 5,000 tonnes of AGR fuel will need to be catered for. The NDA has stated that this fuel will be stored at Pond 5 at Sellafield by chemically treating its pond water with strong alkalis. Will this work? Again it's hard to say as no safety case for the long-term storage of AGR fuel in treated ponds has been published.

Of course, the NDA should really be building dry storage facilities like those at Sizewell. (Sizewell, a PWR reactor, stores all its spent PWR fuel initially in ponds then in its dry stores.) However its latest NDA management plan omits any mention of dry storage. This is despite the fact that, back in the 1990s, the former company, Scottish Nuclear, had advanced plans for such dry stores for their AGR fuels. But BNFL, with Government connivance, ensured these plans were abandoned. It is instructive that none of the mooted new UK nuclear power stations contains plans for reprocessing their spent fuel.

Perhaps the most eye-watering revelations in the BBC programme were that, although reprocessing was going to cease, the waste containment functions of Sellafield would continue for another 110 years at an estimated cost of up to £162 billion. In other words, the mess of Sellafield will mainly be paid for by future generations. This is utterly unethical and an affront to any notion of sustainability.

10. Why did Britain reprocess for so long?

Mostly because of institutional mindsets, as the need to reprocess was deeply buried within the core beliefs of officials with nuclear responsibilities. Such institutional biases are powerful and long-lived as the NDA (formerly BNFL) is even now resistant to planning dry stores.

Another reason is that no one agency by itself seemed powerful enough to point out the folly of the matter and get the Government to stop reprocessing. When, in the past, environmental groups, Commons' Committees and audit agencies etc opposed reprocessing, the Government fobbed them off with platitudes. For example, in 1993, during a public consultation over airborne radioactive releases from THORP when over 70,000 individuals called for a wider public inquiry, the Government simply ignored them.

11. What are the lessons for us today?

What lessons can we gain from this shameful debacle?

One is that we must as a nation properly account for the environmental and other external costs of our policies. We must be wary of creating large permanent institutions over which Parliament has little or no control. We must learn to listen to people who have different views from the Government, and that includes putting critics on government committees. And we must try to use science-led policies rather than fitting up false evidence around pre-conceived policies.

Most of all, we should recognize that, over the past 60 years nuclear policies, in both weapons and energy, have poorly served the nation.

Appendix 1: NFLA media release on the BBC Panorama documentary on Sellafield nuclear waste failings

NFLA media release - for immediate release, 6th September 2016

"Sellafield: a nuclear site struggling to deal with the basics" - NFLA call for regulator, Government and Parliamentary inquiry into whistleblower allegations

The Nuclear Free Local Authorities (NFLA) calls today for the Office for Nuclear Regulation (ONR), the Government and Nuclear Decommissioning Authority (NDA) and the Parliamentary Public Accounts Committee to investigate the shocking claims made by a high-level 'whistleblower' at the Sellafield site in last night's BBC 'Panorama' documentary. (1) NFLA also publishes today an overview of the wider issues of Sellafield reprocessing provided by independent radiation consultant, Dr Ian Fairlie.

Amidst the serious allegations made in the documentary include:

- 'Panorama' found parts of the Sellafield site regularly have too few staff to operate them safely. During one quarter there was **19 times** that such issues occurred. Meg Hillier MP, who chairs the Public Accounts Committee was shocked by the figures and said in the documentary: ***"It is incredible. It defies belief actually that anything could be working at below safe staffing levels. There is no excuse."***
- Radioactive materials like uranium and plutonium have been stored in degrading plastic bottles in cupboards for a number of years. Only now are they beginning to be dealt with.
- The whistle-blower (a former senior manager at Sellafield) said his biggest fear was a fire in one of the nuclear waste silos or one of the reprocessing plants, saying: ***"If there is a fire there it could generate a plume of radiological waste that will go across Western Europe."***
- Parts of the site are "dangerously run down" and officials from its former managing company Nuclear Management Partners raised concerns some sites could collapse over time, creating a potential environmental catastrophe and a dangerous radioactive release.
- The full cost of decommissioning Sellafield could be as high as ***£162 billion*** and take over a century to undertake.

NFLA have consistently raised similar concerns over the past 20 years (2), and it is not particularly surprised with some of them. However, the comments made by the whistleblower and by former senior officials at Sellafield within the documentary emphasise the urgency of the problem, the decrepit nature of much of the facility and the intolerable risk it continues to pose to the public, not just in Cumbria but across the north of England, across the Irish Sea, and even the whole of Western Europe.

NFLA share the concerns of the local campaigning group CORE that, whilst many of the issues raised by 'Panorama' may relate to the 'bad old days', the blame still remains with the Nuclear Decommissioning Authority and their inability, despite billions of pounds of taxpayer money, to rectify what the documentary called even the most 'basic mistakes'.

As CORE said: "Many of the failures are inexcusable – under-staffing as just one example – and the complacent and somewhat cavalier explanations offered to Panorama by Sellafield, NDA and ONR will have swayed few viewers and will do nothing to boost public confidence in the safety of the site." (3)

NFLA praises the courage of the whistleblower and for the BBC to show such a programme, given their paucity of critical coverage on the nuclear industry in recent years. NFLA note there has been some recent improvements at the site, but these are still completely inadequate in comparison to the level of intolerable risk and the amount of hazards on site. Issues like staff shortage are particularly unacceptable given the huge £1 billion+ annual budget the facility receives. It really is time for more openness and transparency in the operation of the Sellafield site. Just last week the new Minister for Energy Baroness Neville-Rolfe praised the Sellafield site after visiting it. NFLA hopes she and other ministers have now watched the 'Panorama' documentary and instead of nice platitudes get down to putting the appropriate measures in place to ensure the NDA does its job properly.

NFLA will send to the Government the latest analysis on Sellafield by Dr Fairlie, which widens the concerns of the NFLA to the reprocessing facilities on the site. Dr Fairlie's report concludes:

"Most of all, we should recognize that, over the past 60 years (UK) nuclear policies, in both weapons and energy, have poorly served the nation." (4)

Sellafield lies at the heart of why NFLA remains concerned over the development of nuclear power and new reactors generating more nuclear waste. It is why the current Government review on Hinkley Point should lead to cancellation of the project. The Government should rather move to safer, clean energy alternatives like renewable energy. Furthermore, the Public Accounts Committee and the National Audit Office should resume its close scrutiny of the Sellafield site and the Office for Nuclear Regulation should continue the ongoing tight regulation of the site, and explain how some of the serious allegations made in the documentary have been allowed to occur.

NFLA Chair Councillor Ernie Galsworthy said:
"The allegations made by this courageous former high level manager at Sellafield in the BBC 'Panorama' programme are serious, safety-critical and alarming to say the least. They show that, despite some limited improvements, there are huge problems in resolving the most dangerous nuclear facility in the world. I call on the Government to stop making nice platitudes about Sellafield and find out why these allegations made by the whistleblower are continuing to occur. The problems at Sellafield remains a key reason why the UK should not embrace new nuclear but rather concentrate its attention on resolving our nuclear legacy and moving towards safer renewable energy alternatives."

NFLA All Ireland Forum Co Chair Councillor Mark Dearey adds:
"The BBC Panorama documentary on Sellafield highlights yet again why this hazardous site some hundred miles from the Irish coastline remains of such alarm to Irish Councils. I call on Charlie Flanagan to immediately contact its UK counterpart and demand the issues raised by the Sellafield whistleblower are dealt with urgently. He should also ask the Irish Radiological Protection Institute to review its risk assessment of an incident at Sellafield. A fire in the reprocessing facilities could endanger much of Western Europe. That is why such facilities must be closed down and the priority become completely with the safe management and decommissioning of the entire Sellafield site."

Ends. For more information please contact Sean Morris, NFLA Secretary, on 0161 234 3244.

Notes for editors:

(1) BBC Panorama, 5th September 2016 http://www.bbc.co.uk/iplayer/episode/b07v80s4/panorama-sellafields-nuclear-safety-failings

(2) See, for example, a report by the NFLA SC Policy Advisor Pete Roche for Friends of the Earth Cumbria, 'Towards a Safer Cumbria: How government, regulators and the Nuclear Decommissioning Authority have neglected nuclear waste in Cumbria', March 2013 http://www.nuclearpolicy.info/docs/radwaste/Towards_a_Safer_Cumbria(March2013).pdf

(3) Provided to the NFLA Secretariat by CORE Cumbria and will be on its website shortly – http://corecumbria.co.uk

(4) NFLA Radioactive Waste Policy Briefing 65, 'The Nonsense of Nuclear Fuel Reprocessing' by Dr Ian Fairlie, 6th September 2016, is attached with this media release and will be placed on the homepage of the NFLA website http://www.nuclearpolicy.info.