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IN THE CROWN COURT AT CARLISLE

Courts of Justice
Earl Street
Carlisle
Cumbria
CA1 1DJ

B

16th October 2006

Before:

THE HONOURABLE MR JUSTICE OPENSHAW

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BRITISH NUCLEAR GROUP SELLAFIELD LTD

Transcript prepared from the official record by Cater Walsh Transcription Ltd,
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Mr R Matthews appeared on behalf of the Prosecution.
Mr M Monaghan appeared on behalf of the Defendant.

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PROCEEDINGS
SENTENCING REMARKS

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A THE CLERK: Mr Monaghan, on behalf of British Nuclear Group Sellafield Limited do you admit that at Whitehaven Magistrates Court on 8 June 2006 British Nuclear Group Sellafield Limited was convicted of three offences of breaching licence conditions pursuant to Section 46 of the Nuclear Installations Act 1965 as amended?

B MR MONAGHAN: Yes.

THE CLERK: And is it right that in respect of those convictions British Nuclear Group Sellafield Limited has been committed to this court for sentence?

MR MONAGHAN: Yes. I have instructions to deal with the matter on behalf of the defendant.

C MR JUSTICE OPENSHAW: Thank you very much indeed.

MR MONAGHAN: Thank you, my Lord.

MR JUSTICE OPENSHAW: Yes, Mr Matthews?

MR MATTHEWS: May it please you, my Lord.

D MR JUSTICE OPENSHAW: I am very grateful to you for your case statement, which I have read. There is obviously a high degree of public interest in the case, so of course it has to open fully, but so far as I am concerned you should not feel under any obligation to read each of the 41 pages.

MR MATTHEWS: My Lord, I will not. There are substantial sections I intend to summarise.

E MR JUSTICE OPENSHAW: That will be very helpful but, as I say, plainly the matter must be opened fully and please do so.

MR MATTHEWS: I am very grateful, my Lord. My Lord will have seen the copy exhibits are in one volume and the case statement and other supporting documents in another.

F Clearly it has been a substantial investigation and my Lord will appreciate that the papers that you have are condensed enormously from the original material.

It is right that the summonses were issued on 3 May of this year and the company entered its guilty pleas on 8 June, very much at the earliest possible opportunity and I stress the company co-operated with the investigation throughout.

G Nuclear site licence conditions are attached to site licenses and the HSE issues the licence and the conditions to each site and operator engaged in nuclear activities in the United Kingdom. Under the Nuclear Installations Act it is an offence to breach a condition of such a licence and my Lord is concerned with three breaches of three licence conditions over a period of time.

H The licence and the conditions are the cornerstone of safety in the nuclear industry. They are the means by which the HSE, on behalf of the State, regulates safety and regulates

A the activities that are undertaken on the sites. At paragraph 9 of the case statement much
reference will be made to documents produced by the company that form part of the safety
case and my Lord will have seen from the case statement that a safety case is embodied in
the conditions attached to all nuclear site licenses. It is effectively the means by which the
company operating the site demonstrates in writing that relevant standards have been met
and that risks have been reduced to a level which is as low as reasonable practicable. In this
B way the safety case underpins all safety related decision made by a licensee.

My Lord no doubt has read the explanation of radiation. What we are concerned with
in this case is ionising radiation. Clearly that is something that can be harmful to the human
body in excessive doses because it damages individual cells and results in damage to organs
or other long term effects. However, effective protection from radiation can be gain by
C containing it, shielding against it, moving away from it or removing the source, but if a body or
any substance picks up or is covered by radio-active material then it is said to be
contaminated. Throughout the time that it is contact with radio-active material it will be
irradiated by the radiation produced by that material.

D Presently we are concerned with uranium and plutonium. Different isotopes of each of
these elements can have different physical properties, even though they are chemically
identical. Many matching occurring elements have unstable isotopes which are radio-active.
Very few types of atom, such as uranium 235, which refers to the protons and neutrons, and
plutonium 239, have nuclei that can easily by destabilised by collision with a neutron. These
E nuclei, instead of undergoing normal radio-active decay, can split into two, which is known as
fission, releasing much more energy or radiation than by simple decay, and again more
neutrons which in turn can cause further fissions in nearby atoms. This fission process, a
chain reaction, is the basis of mankind's use of nuclear energy. In a nuclear reactor the
number fissions is controlled to produce a steady supply of heat.

F Sellafield is located on the West Cumbrian coast just north of the village of Seascale
and covers an area of about four square kilometres. It is the largest nuclear licensed site in
the United Kingdom and due to the scale, the nature and complexity of site operations it is
also the most hazardous nuclear site in the UK. Nuclear operations commenced at the site in
the late 1940s with the purpose of producing materials for Britain's nuclear weapons and in
G the 1950s two plutonium producing reactors were operated, known as the Windscale
Farms[?]. From 1971 British Nuclear Fuels PLC owned, managed and operated the farms on
the Sellafield site and was the subject of the nuclear site licence for Sellafield. Since that time
the site has mainly engaged in commercial operations, using the site chemical plants to take
used fuel from the United Kingdom and overseas reactors for re-processing.

H On 1 April 2005 the Sellafield site became managed and operated by the same
company but with a changed name, this defendant, British Nuclear Group Sellafield Limited,

but ownership of the Sellafield site passed to the Nuclear Decommissioning Authority and my Lord will have seen from the addendum an explanation of who the NDA are and what they do.

In effect, what has occurred in the past year is that the Nuclear Decommissioning Agency has issued contracts to various companies within the British Nuclear Group, one of them being this defendant, to operate and effectively pays them a fee to do so. This company, British Nuclear Group Sellafield Limited, is effectively state-owned, the shares being held by the Treasury Solicitor and the Minister for the Department of Trade and Industry.

Can I turn then, my Lord, to the incident that my Lord is concerned with and that is at paragraph 16. It was on 20 April 2005 that the company discovered a leak from a pipe that supplied highly radio-active liquid or liquor to an accountancy tank in part of the THORP re-processing plant at Sellafield known as the feed clarification cell. In total approximately 83,000 litres of dissolver product liquor containing about 22,000 kilograms of nuclear fuel, mostly uranium incorporating about 160 kilograms of plutonium, it was discovered that it had leaked on to the floor of the cell. That leak had begun prior to 28 August 2004 and had remained undetected until April 2005.

My Lord will have seen, as a result of the investigation carried out by the Nuclear Installations Inspectorate, that various recommendations concerning shortcomings at the Sellafield site were made to the company, in total some 55 recommendations. My Lord's bundle in file 2 at tab 25 there is a letter that sets out 27 of those recommendations. Can I tell my Lord that others were communicated to the company within a matter of weeks of this incident and still others on a slightly later time scale. Some of them were highly technical in nature. The ones set out at tab 25 come behind a letter dated 13 December 2005. Can I draw my Lord's attention simply to page 1271 in that bundle, which I think neatly summarises the nature of the findings.

MR JUSTICE OPENSHAW: Yes, I have it.

MR MATTHEWS: And my Lord sees under a heading "Operations" what was identified was failures to comply with the existing arrangements for responding to alarms, undertaking sampling and in maintenance and testing, inadequate arrangements for response to alarms and sample results, inadequate maintenance and proof test arrangements for leak detection devices, inadequate provision of means for operators to identify which alarms were important and what action should be taken in response to them, which may include shutting the plant down, and sampling and trending and monitoring of information, inadequate provision of means in respect of those two and this resulted in many items of plant status information that masked important indicators, an inadequate understanding of the importance of sump alarms as a result of an inadequate safety case, failures to identify or provide other diverse leak detection systems as safety related or safety mechanisms and that there were difficulties in identifying non-routine faults on complex parts.

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And my Lord sees also under the heading "Management and systems" a lack a adequate management controls and supervision resulting in the inadequate monitoring, challenge, review and leadership of plant operations at all levels, a lack of an adequate safety management system, in particular independent monitoring, audit and review of operations and the resources to do this, and the lack of clarity in roles and responsibilities for long term plant trending and monitoring, coupled with a lack of specific resources to provide this function.

Then under the heading "Cultural" there is a culture of tolerating alarms, non-compliance with instructions and a lack of a questioning approach.

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My Lord, really those criticisms feed into the breaches of these licence conditions. Paragraph 18 of the case summary importantly, the Crown say, the investigation identified that the company had been in breach of licence conditions. Three of these breaches can be demonstrated to have been serious, to have continued over a long period of time and to have directly contributed to the incident that involved the loss of primary containment of the 83,000 litres of liquor over a period of at least nine months. The Crown say the company fell well below the standard required by the licence conditions and these breaches amount to serious offences.

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The THORP plant then; Sellafield is principally now involved with re-processing fuel. It includes units whose activities are centred on the mediation, decommissioning and the clean up of the historic legacy of radio-active waste. Sellafield as such is divided into several operating units. These include the THORP and Magnox[?] re-processing plants and the Sellafield Mox[?] Plant and a wide range of waste management and effluent treatment facilities.

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My Lord is concerned in this case with THORP, an acronym for the Thermal Oxide Reprocessing Plant. This operating unit contains several ponds and plants which have been reprocessing fuel on nuclear power plants since 1994. Used nuclear fuel from reactors is transported to one of the THORP ponds for cooling and storage. Once it has cooled the fuel is then moved to another of THORP's ponds for marshalling immediately prior to reprocessing. The used nuclear fuel is then moved in customer specific batches to the THORP head end plan where it is sheared into small chunks, dissolved in nitric acid and that is what then forms the dissolver product liquor. It is then centrifuged to clarify the product liquor and accounted to ensure non-proliferation and safeguarding.

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Once accountancy is completed the clarified dissolver product liquor is fed forward into the chemical separation area and other downstream areas within THORP where it is separated out and reprocessed into three streams; uranium, plutonium and highly radio-active liquid waste effluent.

A The feed clarification cell is one of the cells within THORP. It is known as Cell 220 and is part of the head end chemical plant. Tanks within this cell accept the dissolver product liquor from upstream plants. Every litre of product liquor contains about 250 grams of nuclear fuel, mostly being uranium. There are, of course, many vessels within the feed clarification cell. It is literally an enormous building. They include centrifuge tanks, the centrifuges, diverters and principally what my Lord is concerned with; two head end accountancy tanks and three buffer storage tanks. They hold the accounted clarified liquor prior to feeding forward into chemical separation. Each of the accountancy tanks holds 23,000 litres and is suspended from the roof of the cell. The liquor in the tanks is sampled for isotopic content and weighed, which enabled an accurate account of the amount of uranium and plutonium.

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C My Lord will no doubt have seen the photographs behind tab 4. If I might simply hold up *this* photo and indicate that the feed clarification cell is at about *this* area of the Sellafield site and I think most usefully directly behind that is a schematic of the cell which, I hope, contains all the relevant information. As I say, the feed clarification cell is very substantial, both in size and in construction. It is designed to contain the high radiation levels from the material process within the cell. It is 119 feet long, 68 feet high and at a maximum 47 feet wide. The walls are constructed of a special, extremely dense, concrete containing byrites[?] and is approximately one and a half metres thick. That equates to a much greater depth of ordinary concrete.

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E The floor of the cell is clad with stainless steel, as are the walls of the cell from the floor to a height of around one and half metres. This cladding, together with the substantial wall and roof thicknesses, form a secondary containment, in order to contain any leaks from the many tanks, and long lengths of high quality pipe work within the feed clarification cell. The cell is divided into two areas by a small wall which is at the same height as the cladding. One floor area is known as the feed clarification Area and is commonly referred to as the Feed Clari. The accountancy tanks and the buffer storage tanks are in the other floor area known as the Buffer Area. Each of the four areas slopes down into a stainless gully running around the edges of the floor and these gullies run into two sump areas, one each side of the small wall. The sumps are at low points in the cell floor cladding to collect leaked liquor and they provide both the means of detecting leaks from the tanks and pipe work and they allow recovery of any product back to safe primary containment. Within each sump is a level detection system known as pneumericator and a means of emptying the sumps called an ejector.

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H The sumps should always be primed with about 30 centimetres depth of clean acid in order for the pneumericators to work and to avoid potential cross-contamination of the feed clarification cell ventilation systems through exposure of the feed pipe to the ejector. Pneumericator is a commonly used system to measure depth of liquor. It is installed so that any

A changes in level as a result of leakage into the sump can be identified and will initiate an alarm in the control room. The numerator control comprises two pipes. One is open to the feed clarification cell atmosphere, while the other is at the bottom of the sump and
B pressurised air is pumped via a motor meter which is a floating bobbin in a glass tube and that measures the air flow down each pipe. Difference in air pressure between the open pipe and the pressure of air required to pass through the depth of the liquid in the bottom of the sump is measured by a pressure transducer. That sends a signal to the control room desk.
C The signal is translated into a depth and displayed in metres and a display in the THORP control room informs the operators at the plant and its status provides high, low, high/high and low/low alarms. Too high a level in a sump may increase the potential for a criticality, although I make it clear in this instance there was no risk of a criticality. Too low a level poses a risk of cross-contamination between ventilation systems. The air supply is regulated by a control that should always be set to a minimum of 300.

D According to the THORP safety case, the vessels and pipe work in the feed clarification cell and Accountancy Cell are of welded construction and are fabricated to a high standard of integrity and thus a major leak on to the cell floor is regarded as unlikely. Nevertheless, if such an event were to occur, and it did occur in this case, the operator should be alerted to the situation by the sump alarm.

E In terms of the hazards that are posed by a loss of primary containment, the pipe work and the accountancy tanks are the primary containment of this highly radio-active liquor. Any loss from this containment would result in liquor spilling on to the floor of the feed clarification cell building. The last line of defence between the liquor and the building's foundations was the stainless steel feed clarification cell cladding. That secondary containment formed by the cladding was designed to catch leaked liquor, not to store leaked liquor for a prolonged period of time. The store foundations, although extremely substantial, are porous. Any leak through the floor would result in highly radio-active liquor seeping into the ground and in such
F circumstances could possibly be detected over the course of time by the sampling of the ground through boreholes.

G My Lord may have seen the THORP safety case behind tab 26 in file 2, but that states that leaks of dissolved product liquor in the feed clarification cell would be detected and recovered certainly within a few days. Examination of the result of a sample taken from the buffer side sump on 28 August 2004 demonstrates that the leak from the pipe work of this liquor had begun prior to that time. It is not until June 2005 that recovery from the floor of the bulk of the liquor was accomplished. It is right that to date borehole testing of the ground
H around the feed clarification cell has not produced any evidence of an actual leak to ground. Calculations based on values within the THORP safety case indicate that losing the line of defence afforded by the pipe work significantly increased the likelihood of a leak to the ground

A from one expressed as having a probability of occurring once in every 40,000 years to one occurring once in 250 years. It is right still a very remote possibility but my Lord will see the odds have been reduced by more than a hundred times.

B Mr Finsey[?] is a specialist Inspector of Health and Safety in critical safety and radiological protection and he estimated the consequence to workers and public from a leak to ground. He estimated that the most affected person, ie a person who lives next to the site and lives off the land, could not have received a level of radiation sufficient to cause a possible serious health effect, nor one above the maximum stated as the legal limit for doses to public from normal operations.

C Can I turn then to criticality and danger; a criticality accident occurs when a nuclear chain reaction is accidentally allowed to occur in fissile material. This releases neutron radiation which poses a great hazard to personnel and equipment. The purpose of nuclear criticality safety is to prevent a nuclear chain reaction in operations with fissile material outside a nuclear reactor.

D Can I turn to paragraph 35. Mr Finsey, the same expert, has considered this incident that occurred at THORP and gives his opinion that for a number of reasons a criticality would not have been credible. He does, however, point out that the existing safety case for the accountancy tanks considers uranium enrichment of up to 4 per cent. It is right that administrative controls on blending limited this enrichment at THORP to 1.6 per cent and historical data shows that enrichment levels have never exceeded 1.6 per cent. Again I repeat, so in relation to this incident the conclusion is there was no risk from criticality.

E In short then, dealing with risk, it is not alleged that anyone was harmed as a result of this incident. Nor that there was the possibility of exposure to increased radiation levels. All indications suggest that none of the liquor escaped from the cell and it is not alleged that there was a possibility of a criticality. It has been estimated that the consequences of any leak to ground as a result of this incident would not have caused any health effect to the public. My Lord may have seen the mitigation statement. Can I reassure my Lord that there really is no issue between the prosecution and the defence in this respect. The HSE's position, as they have set out, is there was no possibility in this incident of a criticality. The company's position is slightly at odds with the HSE in that Mr Finsey's view is that there may have been some circumstances where criticality could have been a possibility. The company's position is that there were no circumstances where it could have been a possibility. And in relation to the leak to ground, all parties are agreed there is no evidence of any leak to ground. The HSE cannot say there is no possibility of such a leak to ground occurring, but simply that there is no evidence and no indication that such leak has occurred and had such a leak occurred it would not have caused any health effect to the public.

A My Lord, then moving to the International Nuclear Event Scale, that scale is devised
as a means internationally for promptly communicating to the public in consistent terms the
B safety significance of events reported at nuclear installation. Behind tab 31 is the chart. The
scale is intended as a means of putting events into proper perspective by providing a
common understanding among the nuclear community, the media and the public of the
C significance of events. By way of example, the 1979 accident at Three Mile Island in the
United States resulted in a severely damaged reactor core and an off site release of radio-
D activity that was very limited. That event is classified as level 5 based on the on site impact.
The 1973 accident at the Windscale, which is now Sellafield Re-Processing Plant, involved a
release of radio-active material into a plant operating area as a result of an exo-thermic
E reaction in a process vessel. That incident is classified as level 4 based on the on site impact.

C This particular incident of the loss from containment at THORP was categorised by the
company as level 3 on the International Nuclear Events Scale. That my Lord will see is
termed a serious incident and there are broad criteria to support that level 3. Those include in
which a further failure of safety systems could lead to accident conditions or a situation in
D which safety systems would be unable to prevent an accident if certain initiators were to
occur.

The detailed guidance gives an example of a level 3 incident as one specifically
concerned with non-reactors as involving events resulting in the release of a few thousand
E terrabekkes[?] of activity into a secondary containment where the material can be returned to
a satisfactory storage area. And it is for that reason that this incident was classed as a
serious incident on level 3 of the scale.

F Following this incident the THORP reprocessing plant was shut down. It remains shut
to this day. The company, once it had made this discovery, used the installed sump ejector
system to transfer the spilled liquor in batches into the buffer storage tanks. Lifting of liquor
from the floor began on 23 May and continued to 14 June 2005 and in between ejection steps
the in cell wash ring system was used to lightly spray diluted nitric acid around the walls of the
cell stainless steel liner to try and flush off any sediment that had settled.

G On completion of the liquor removal, there remained a thin layer of silt, presumed to
be highly radio-active, on the cell floor. The buffer cell sump was left primed with dilute nitric
acid and with the sump level monitor communicator operational. The cell is thus currently safe
with all the mobile leaked material within the primary containment of the buffer storage tanks.
A proposal for how to continue to process this material, which is contaminated with iron
H constituents from corroded steel components within the cell, has now been developed but is
not yet underway.

A Can I invite my Lord's attention to the photographs and perhaps assist with a little explanation which will allow me, I think, very much to shorten matters. The schematic of the cell ...

MR JUSTICE OPENSHAW: Sorry, I missed the page.

B MR MATTHEWS: I am sorry, behind divider 4 and it is page 4 of divider 4. The process moves from right to left on the picture. The stream flows *this* way. My Lord will see the two accountancy tanks. The important one is in red and an enlarged view of the fractured pipe, which is the only pipe put in in this schematic, that went to that accountancy tank. The buffer tanks are on the other side. *This* is the bonded wall my Lord sees and the other side of the bonded wall are various other vessels. *That* is the feed clari side and *this* side with the accountancy tanks and the buffer tanks is the buffer sump side. And my Lord sees towards the top of the schematic the cell side and I hope that the colours are clear.

C MR JUSTICE OPENSHAW: Yes.

MR MATTHEWS: Really effectively, it works like a cup and the liquid drains into the cup, any that is collected on that floor, and there is the pipes that go in for the part of the numerator system.

D If my Lord looks on in the bundle, the purpose of the next schematic is really to give an idea of the mild steel supporting around those buffer accountancy tanks. They do not support the weight of the tanks. They are effectively only used if and when the process of accountancy is undertaken to affect the weigh of the tanks. But they are made from mild steel. My Lord sees the stainless steel rods coming out from the top of the tanks. They are effectively what support those tanks.

E If my Lord then looks through, the next photograph gives a very good view and was taken by the camera inserted after the discovery. That is the view of the pipe that sheared off from the top of that accountancy tank. Then perhaps the most dramatic picture my Lord sees; that is taken from the same camera and is the area by that sump and my Lord sees in the inset an old photograph, I think taken from 1994, of what the sump and the steel cladding looked like and the arrows in each photograph indicate the same point. So my Lord gets an idea of the level of the liquid. At its shallowest depth the leaked liquor was 24 centimetres in depth approximately, but at its deepest point something approaching two foot. And if I tell my Lord that the diameter of that sump is 60 centimetres my Lord can have an idea from the inset photograph of the level that that leaked liquor is at. Then perhaps very briefly the other photographs -

F MR JUSTICE OPENSHAW: The cladding, the secondary containment, I think was 1.5 metres high, was it?

G H MR MATTHEWS: Yes, 1.5 metres high. The next photograph is instructive because my Lord sees the cladding on the floor. Those are the stainless steel panels and the welds where

A they have been welded. It almost looks like tiling. Then of course the next photo the arrow marks the same spot giving my Lord an idea of the depth and similarly the photograph thereafter.

Can I draw my Lord's attention to *this* photograph which is, as it were, the before photograph showing that mild steel support framework in its virgin state. Then the next photograph I hope gives my Lord a good idea of the effect -

B MR JUSTICE OPENSHAW: You have got much better copies than me. I have only got laser copies and it is never quite the same.

MR MATTHEWS: Can I pass my Lord my photographs. With that explanation they speak for themselves. My Lord will see that the nitric acid has corroded the mild steel framework.

MR JUSTICE OPENSHAW: Thank you.

C MR MATTHEWS: It has not affected the buffer tanks, other than to cause some staining. They have not and will not corrode.

MR JUSTICE OPENSHAW: Sorry, just repeat that point.

MR MATTHEWS: In the schematic I draw my Lord's attention to the mild steel framework that is only used when -

D MR JUSTICE OPENSHAW: Yes.

MR MATTHEWS: Because that is made of mild steel that has corroded, having been in contact with the nitric acid substantially.

MR JUSTICE OPENSHAW: Which photograph is that? You probably cannot tell because I have got yours.

E MR MATTHEWS: I think from recollection 12 shows it in its virgin state and the photograph thereafter really shows the metal eaten away.

MR JUSTICE OPENSHAW: Yes, I understand. Thank you.

F MR MATTHEWS: Can I briefly – on the shipper receiver difference and that is at paragraph 41, that my Lord will have read and no doubt understood is an accountancy measure. It is used for security purposes. It is a calculation at the end of each reprocessing campaign and it is the difference between the amount of uranium the customer has estimated to be in the fuel and sent to THORP and the amount of uranium that has effectively come out the other end. That accountancy is done via the accountancy tanks and the calculations used as an accurate measure of what has been fed forward to the chemical separation plant. It is not part of the plant safety monitoring system. It is a requirement of various European agreements on non-proliferation and safeguards and for the company to account to its customers. Nuclear accountancy is not identified, nor does it provide support to the company's safety case. That SRD figure, for short, is measured as a percentage and has an upper limit of 0.45 per cent above which the company's operational procedures require an internal investigation to be instigated. I think perhaps in tab 1 of file 2 my Lord can see the figures set

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A out and on the second page of that one sees the figures for campaigns from 30 January 2005. The figure on the right hand column is expressed as a loss or a difference in grams, so the campaign that ended on 30 January 2005 resulted in 6,910,842 grams difference, which is a figure of 3.9 per cent. If my Lord then looks down to the campaign that ended on 29 March, one sees something like 8.3 tons. That is the 8.3 million grams and that was a difference of 10 per cent.

B These figures did not become available to the company straight away. It took about six weeks to be calculated and so the 3.5 per cent figure was determined on 17 March 2005 and an internal investigation was initiated immediately. As a result of the numerator outputs failing to reveal elevated levels with the sumps, the investigation focused on administrative areas. In other words, checking the paperwork rather than the operation of the plant. That 3.5 per cent figure relates to the fuel that had been processed between 9 September 2004 and 30 January 2005.

C At the beginning of 2005 it was noticed that the volume flows changed. The company, in other words, became aware that the accountancy tanks were taking more feed in order to fill up and calibration checks were made on what is called the constant volume feeder in order to confirm this was not the problem. And it appears to have been concluded that the cause was a discrepancy in the accuracy of the constant volume feeder.

D Simultaneously the company became aware that approximately 8 per cent more dissolver batches were required to fill the buffer storage tanks and that, it was concluded, was due to uncertainty over the amount of dilutant being added during the process. Further SRD data became available on 13 April 2005 and that showed that the campaign from 30 January to 25 February 2005 had an SRD of 3.9 per cent and that is the one I have taken my Lord to on 30 January. Perhaps it is instructive to look back at earlier figures and see quite how different they were with grams no more than the hundred thousands and often in the tens of thousands.

E So the campaign, as I say, that ran from 25 February 2005 to 29 March, that was reported on 15 April and that is the one that had this SRD figure of 10 per cent. On 14 April during the investigation into the initial elevated SRD figure, the company's employees became aware of the existence of routine feed clari sump sample results that dated from November 2004 and February 2005 and they concluded that the problem was on the feed clari side of the cell. A meeting was held by THORP staff on 15 April to discuss the findings and by then that included the estimate that 83,000 litres containing 22,000 kilograms of uranium had been lost.

F G The company's THORP Fuel Services Section oversees head end operations and a plan of action to insert cameras into the cell was drawn up for the work over the weekend of 16 to 17 April. The plan did not include the immediate shutting down of THORP operations,

A although it was acknowledged that liquor movements within the feed clarification cell would have to stop when the cameras were to be inserted into the cell. Over that weekend concerns were raised that this insertion of cameras was too great a task for weekend shift staff and the decision was made to defer the camera inspections until after the weekend. Preparation for the camera inspection resumed on Monday 18 April 2005.

B The Crown do say that it was a remarkable decision to continue to keep THORP operational and re-processing fuel over that weekend, as I say, in the knowledge of the effectively missing 83,000 litres. Can I add that the company's own board of inquiry it appears criticised this decision by senior management and that was one of its findings.

C In any event, on Monday 18 April the company's Nuclear Material Custodian performed a complicated summation of the volumes of liquor present in the tanks prior to ejection over the previous eight months. It is not a calculation routinely done. It is complex and not automated and is not reliably accurate, but that calculation confirmed the SRD data and as a result of this on 18 April the decision was finally taken to shut THORP down. The shots that my Lord has seen are from the camera inspections that took place on 19 April. Inspections that took place in the feed clarification site found no evidence of a leak or
D fracture. It was confirmed at about 2 pm on 20 April that the buffer side showed a fractured pipe, the pipe that my Lord has seen, and that there was staining due to leaked liquor on the side of the tank and, as I say, severe corrosion of cell support steelwork and this large volume of liquor on the floor of the buffer side of the cell. The Health and Safety Executive was notified at 5 pm on 20 April.

E MR JUSTICE OPENSHAW: Can you just go through those dates again? The anomaly was first spotted because of the shipper receiver difference on -

F MR MATTHEWS: Firstly, 13 April but the more significant, ie the 10 per cent figure, was 15 April, but by the 14th there is an investigation into the first figure, which is 3.9 per cent, and they have become aware of some sample results, that I will take my Lord to in due course, and conclude there is a problem. Then on 15 April they become aware that in fact 83,000 litres and that 10 per cent figure. And it is on the 18th, the Monday, that the plant is shut down.

G On 22 April they carried out some investigations and an instrument mechanic discovered that the flow indication to the buffer sump numerator was showing that it was all correct. The initial movement of the needle valve controlling the air flow was as if the air flow was shut off or nearly shut and so the instrument mechanic simply returned the flow to the normal setting but he noticed that the rotor meter ball, the bobbin, was sticking in a position that indicated the flow was in the operational range, even if the air flow was much lower than this and it seems simply tapping the side of the rotor meter cured the fault. My Lord will
H appreciate the rotor meter is remote from the feed clarification cell. There is one pipe in the cell and the air pressure indicator is somewhere remote and, as I say, simply tapping that cured the

A fault and as soon as that instrument returned to operation it showed that the sump level was 1.8 metres. Clearly that instrument had not been in good working order.

A sump sample was then taken on 26 April and the results showed that the liquor on the floor was dissolved product liquor. That 83,000 litres of liquor lost from primary containment had collected on the buffer side. It was over three times the liquid volume of a single of those accountancy tanks and we ask my Lord to bear in mind that the amount of liquor required to raise the level in that buffer sump from the operational 30 centimetre to the higher arm level of 40 centimetre was only 30 litres.

Can I summarise the operation, the fractured pipe and the operation of the accountancy tanks really in a few lines. There is absolutely no dispute that this incident was caused by that pipe shearing away from the tank and what would have occurred is that it would have formed, as it were, a fracture before it sheared off over a period of time. Initially then the breach area would have been small and it would only grow a complete guillotine failure in the later stages. There has been consideration of how the tanks were designed and commissioned and changes to the way they were operated. Effectively what occurs is they are agitated on the steel rods and it appears over a period of time a decision was made to agitate them half full and the Crown would say, and I think the company accepts, that it does not appear that the possible effects of this change was properly considered. By agitating them in that way that has placed far more stress on the joins of the pipe to the top of the buffer tanks. I think that summarises that section of the matter.

Can I turn then to Licence Condition 34 and my Lord may feel that Condition 34 is perhaps central to the licence conditions. It is entitled "Leakage and escape of radio-active material and radio-active waste". It provides:

1. The licensee shall ensure, so far as reasonably practicable, that radio-active material and radio-active waste on the site is at all times adequately controlled or contained so that it cannot leak or otherwise escape from such control or containment.
2. Notwithstanding paragraph 1 of this condition, the licensee shall ensure, so far as is reasonably practicable, that no such leak or escape of radio-active material or radio-active waste can occur without being detected and that any such leak or escape is then notified, recorded, investigated and reported in accordance with arrangements made under other licence conditions.

The company's arrangements for addressing this nuclear site licence condition are in file 2, tab 17. I think my Lord does not need to refer to it. In paragraph 3.1 that document provides a definition of leak or escape which states "Leak or escape means a discharge or a loss of control of a radio-active substance beyond its intended containment and in a quantity which is readily detectable" and at paragraph 4.2.2 states that "In such circumstances at least one

barrier will remain intact following any leakage or escape” and clearly that is what occurred here.

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It is the Crown’s case that in breach of this licence condition the company failed over a period of some eight months to ensure, so far as was reasonably practicable, that radio-active liquor in the pipe work feeding nozzle N5 of accountancy tank B did not leak or otherwise escape and during this time the leak grew from a few litres containing a few kilograms of uranium to one involving many thousands of litres with many thousands of kilograms of uranium. It is the Crown’s case that in breach of the licence condition and over at least the same period of time the company failed to ensure, so far as was reasonably practicable, that such a leak could occur without being detected.

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The company’s own hazard analysis of leakage to ground from area 200, this area, recognises that the cell area has an engineered means of leak detection and an engineered means of leakage recovery back into the primary containment. Now that means the numerator is designated as safety related equipment. Other documents consider the criticality safety assessment of the accountancy tanks and then specifically considered the potential for the leakage of liquor. The document recognises the apparent high standard of the construction of the vessels and pipe work in the cell and thus regards a major leak as unlikely. However, in order to safeguard against the potential for liquor leakage resulting in gradual accumulation of plutonium and uranium two safety measures have been identified.

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The first of these is an operating instruction and the second is that sump numerator which again is designated safety related equipment. Operator instruction 0491 contains the actions to be taken in response to a high or high alarm and to a low and low sump level alarm in the feed carrying the buffer sumps. Can I take my Lord to that document behind tab 19. The first page to note is page 593. It seems it is headed “Operating instruction” and it is concerned with safety requirements and plant safety case requirements. Indented we see:

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“In order to prevent a build up of plutonium in cell 220 sumps, if there is an unexpected level rise in either cell 220 sump a sample must be taken and analysed for plutonium as soon as reasonably practicable.”

At 598 identified at number 24 and 25 are the operator instructions concerned with the responses to high level alarms in the buffer storage sump and responses to low level alarms in the buffer storage. If my Lord very briefly turns to page 622, we have that operation 24 and the arrangements include at 24.3:

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“Arrange with the auto sampler to have an ad hoc sample taken from the sump.”

Then at 624, operation 25 states “L2596”. That is the buffer sump numerator, so response to low and low alarms, low/low alarms in accountancy and buffer storage sump. If my Lord looks at 25.2 one has to return the sump to the normal operating level of 300 millimetres, add wash acid from the wash cabinet.

H

A So in other words, if there is a low alarm or a low/low alarm then the sump numerator has to be returned to its normal level and there are operating instructions for routine level monitoring of the sumps and actions to be taken for sampling the sumps in the event of the level of the sump numerator approaching or exceeding high level.

B Again, there behind tab 16 specifically an operator instructions dealing with the operation of these sumps. Perhaps the first thing to note at page 271 again it is reiterated other safety precautions, both sumps should be maintained at a level above the low level alarm set point. Then at 276 – and perhaps this is more important – my Lord sees at page 276:

“Operator instruction level monitoring for the two sumps:

1.1 Once per shift check the level indication on L2596.”

C That is the buffer sump numerator and L2584, that is the feed clarification numerator, or whenever a cell wash down or sump emptying operation is to be undertaken. Then over the page:

“If the level indicator is approaching or exceeds the high position, then sample the sump contents ready for transfer as described in operation 2.”

D So a sample has to be taken. So at paragraph 73 the operational arrangements require routine samples to be taken every three months and analysed for the presence of uranium. That sump should only contain fresh acid unless a leak has occurred from a pipe or vessel and it is the Crown’s case that these samples were rarely taken from the buffer sump. There were only eight successful efforts made out of the 22 routine sample dates, notwithstanding that the samples had been requested every three months. Following the requests that were made the head end chemical plant operators were not extracting liquor and this resulted in a nil volume being shown in the sampling bottle.

E Another operator instruction required if such a nil volume or a failure to [inaudible] sample occurred, that the staff in auto-sampling had to request a repeat sample. This, it appears, they did but, as I say, no such samples were taken.

F Set out in the following paragraphs are various extracts from statements of operators at the THORP Head End plant. Each of them confirm that they were not aware of the result of the sample taking exercise. So if it resulted in a nil volume sample, they simply would not be aware. One describes how “If there was a nil volume sample the procedure should be repeated, but I have not been aware of any nil volume samples. I have no access to the sample results”. My Lord can see those sample results set out. The routine buffer sample taken on 28 August 2004 detected 50 grams per litre of uranium within the sump. This was the first routine sump sample found to contain any levels of uranium. It is the Crown’s case that this was the first indication of the existence of leak and it demonstrates that this leak had occurred prior to 28 August 2004. The previous routine sump sample to be obtained from the buffer

A sump was as far back as 2 December 2003. That showed the presence of no uranium, but no routine samples were obtained for 1 March or 30 May, despite the requisite requests that they be obtained.

B At paragraph 77 one of the manufacturing team leaders or the shift team manager, who has worked at Sellafield since 1985 and had been in his present post for six years, he acted as a duly authorised person and as a safe system of work controller for the Head End plant. He was also the radiological protection supervisor and as the area controller his role included responsibility for the whole of THORP under emergency arrangements. He also acted as the control room supervisor of operations in personnel. He describes how sump level monitoring was carried out via the operators and states how the response to these low sump level alarms is not a significant concern. Low level sump alarms, if they are not affecting the cell ventilation, would generally be left for a period of time before requiring action. My Lord, C part of the reason of taking you to the operating instruction is that demonstrates that was contrary to that operator instruction.

D He goes on to explain the priming of a sump is a crude operation. It can easily result in a high level alarm being generated. It is very difficult to balance a sump between the low and high level alarms at the first attempt. It can take several hours. He did state that sump high level alarm would prompt immediate action by the operator, who would inform a supervisor. He went on to describe that:

E “During production shifts numerous sample results are reported to me from various areas of the plant, the Head End chemical plant. The sample results come to me on a computer screen. Typically on a production shift 50 or more lines of sample results will arrive. These results cover more than one day of results, eg if a sample was analysed over a fortnight period this result may come in at the top of the list of sample results which could then require scrolling through several screens of data. Due to the space F between sampling, three months, a routine buffer sample result can easily be missed, eg if I am not at the desk at the time that the result appears on the computer you would not necessarily go looking for it. The sump samples are prompted automatically to be taken but the results are reported without prompting and these results appear amongst the mass of other sample results. There are instance when the computer is G not available and under those circumstances sample results are reported by fax. This results in many faxes accumulating over a short period.”

H He relates how on Friday (it should be) 27 August 2004 he was the shift team manager at the Head End chemical plant. During the course of that night a buffer area sump result was faxed, it appears, to the THORP general areas as that computer system was not operating. That is the result that showed the presence of 50 grams of uranium in the sump instead of fresh nitric

acid. The shift manager claims that he never received the result but says if he had received the result then he would have been prompted to contact his line manager.

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What is clear is somebody on that night shift requested a second sample of sump liquor to be taken. It is the Crown's case that the defendant company simply did not react effectively to this sump sample result. It appears that someone within the company received the result and requested that a second sample be obtained. That appears to be the only occasion that a second sample has ever been requested following a successful sample being obtained from the feed clarification cell sump and the HSE investigations discovered no evidence revealing the identity of who requested the second sample.

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That second sample failed to obtain a volume of liquor. Then a routine sample was requested from each of the two sumps on 26 November 2004. The feed clari side detected 9 grams of uranium.

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MR JUSTICE OPENSHAW: Sorry, 26 November? I thought it was 8 November, but perhaps I am wrong.

MR MATTHEWS: I could be wrong. I will check tab 29.

MR JUSTICE OPENSHAW: It does not really matter. Is this November anyway?

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MR MATTHEWS: In short, the buffer sump was not successful. It failed to obtain a volume. That 9 grams in the feed clari side is likely to have been present as a result of what was ejected from the August 2004 buffer sump sample.

Another THORP Head End chemical shift team manager describes his understanding of how the safety case refers to the buffer cell sump in respect of unexpected occurrences and the potential to accumulate plutonium. He states an indication of a plutonium content above 3.5 grams per litre shows there is a cause for concern as material is reaching the cell sump where it should not be. Such arisings must be notified to the site nuclear safety liaison officer before any action is taken. He can remember how in December 2004 that buffer sump was in low alarm. He correctly says that:

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"If the sump goes into low alarm normal procedures apply and the sump should be re-primed. This had been attempted to recover the situation but failed. I was not able to do anything on my shift as we were operating short handed, so there was insufficient resource to put someone on plant."

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He describes how he would get about 2,000 alarms a day and a low alarm in the buffer cell sump would not be seen as a high priority because a lot of alarms come up during normal operation that do not indicate there is a problem but arise, for example, because the plant has changed states. And he says that alarms were not routinely logged and he was unaware of any log that would record repriming of the sumps with fresh acid.

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The logs do show that repairs to that buffer sump indicator were attempted throughout December 2004. The output was in low alarm and unsuccessful attempts were made to raise

A the low level. At one point on 9 December 2004 the deliberate addition of liquor was attempted and verified by staff hearing the sump fill up. However, the numerator output was observed not to have arisen. Again others simply repeat how they would be asked to take a sample, they would press the requisite button effectively but would not know whether it resulted in a nil result. He, that other worker at the control desk, relates he was unable to reprime the buffer sump in 2004. He claims to have informed his manager. My Lord will
B recollect that that is the numerator that is effectively found at the end to have the air turned down very low and is rectified by a tap.

C On 6 January 2005 banging noises were reported coming from the feed clarification cell. They were investigated by the company and it was concluded that this was simple normal pipe working creaking, but records reveal the temperature within the buffer sump started to rise from 15 January 2005 and it appears to the HSE that that temperature rise was due to an increased leakage weight into the sump.

D The level of liquor within the operational sump, the feed clari sump, also began to rise on 15 January 2005 and that appears to have been due to leaked liquor splashing or running off into that side of the cell. So it appears that significant liquor loss from the system on to the feed clarification cell had begun in early January 2005 and my Lord will recollect that the campaign that ended on 30 January had resulted in a loss of 7,000 kilograms of fuel. That was on the cell floor from that date and is an amount that equates to over 20,000 litres of liquor. However, at that time the buffer sump numerator was only reading its normal level of
E 30 centimetres or about 83 litres.

F On 24 February a routine sample was requested from the two sumps. This time the feed clarification cell detected 60 grams per litre of uranium. The buffer sump sample again failed and was not reported and the Crown say on this occasion that level of uranium in the feed clarification side sump was almost certain to have been due to leaked liquor splashing or running off into the feed clari side and the company entirely failed to perceive the importance of this result and wholly failed to take any action as a result.

Can I turn then to Licence Condition 24. Much of this has perhaps been covered in referring my Lord to operating instructions, but the Condition provides:

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1. The licensee shall ensure that all operations which may affect safety are carried out in accordance with written instructions, the operating instructions.
 2. The licensee shall ensure that operating instructions include any instructions necessary in the interests of safety and any instructions necessary to ensure that any operating rules are implemented.

H I take my Lord to that operating instruction concerned with the operation of the sumps and, in short, examination of the data that has been obtained from the company reveals significant extended periods during the previous five years prior to the discovery of the leak when the

A buffer sump level has been recorded below low alarm level. The company failed to carry out the operation in accordance with this operating instruction over this prolonged period. And again, my Lord has seen once per shift check the level indication on pneumerators. Put shortly, this operation was not carried out routinely in accordance with the instruction, again, over a period of five years. Again I have taken my Lord to that operation 1.4: "If the level indicator is approaching or exceeds the high position then sample the sump contents" and my Lord may have notice in bold at that point it is stated "**This is to comply with operating instruction 3.1.5 on another document**". That instruction states how "If there is an unexpected level rise in either cell 220 sump the sample must be taken and analysed for the plutonium content as soon as reasonably practicable." And that other document is in fact the criticality safety assessment for the sumps.

In summary, that feed clari sump started to show the increase in level from mid-January 2005. That level went through the high alarm on 14 March 2005 and through the high/high alarm on 23 March 2005. The output of the numerator shows that the rate of level rise slowed from 27 March 2005. That would be because by now the sump would have been full, a depth of .6 of a metre, and the level would have been slowed by the increase of the surface area as the liquor flooded the cell floor. In breach of the company's operating instructions the sump was simply drained on 30 March 2005 without any sample being requested and with no explanation appearing in any operational log.

It is the Crown's case that the failure to carry out these operations had a very significant impact on the failure to detect the leak and the failure recognise that the numerator was not in good working order.

Which brings me to Licence Condition 27. Again, my Lord may think an important condition - safety mechanisms, devices and circuits and states:

"The licensee shall ensure that the plant is not operated, inspected, maintained or tested unless suitable and sufficient safety mechanisms, devices and circuits are properly connected and in good working order."

Examination of the historical records from the buffer sump numerator show the depth of the liquor in the sump reveal how the system was not in good working order, again, over prolonged periods dating back to 2000. There are a significant number of prolonged occasions when the numerator was in an alarm state, was showing a zero reading and was producing erratic results. Between 1 July 2004 and 22 March 2005 the instrument system had raised over 100 low or low/low alarms and it is the Crown's case that the plant operators were aware of this state of affairs as documented attempts were made, as I have described, to remedy the abnormal output. The nature of these results provides a very strong indicator that

this buffer sump numerator was seriously malfunctioning and was not in good working order over what was a sustained period of time.

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MR JUSTICE OPENSHAW: Five years perhaps.

MR MATTHEWS: Yes. I have not troubled you with this, but effectively it is produced from the company's computer and it is the -

MR JUSTICE OPENSHAW: It was giving anomalous readings over a long period.

B

MR MATTHEWS: It is the trend figures. It is trending the readings, the blue line being the buffer sump, the pink (which may be more difficult to see) being the feed clarification sump.

Can I move to paragraph 109. Perhaps it is obvious but Mr Jennings, one of the superintending inspectors of Health and Safety, he has examined that data obtained from the company. He points out how the sumps are designed to hold any leakage from the tanks or pipes until the source of the leak can be identified and isolated and how to detect the leaks each bond[?] is provided with a liquid level sensor, as we know, which gives sufficient warning through alarms in the control room of a leak so actions can be taken to avoid harm of effects that could arise. At paragraph 112 his analysis of the data shows a very distinct contrast, as I have shown on those graphs, between the buffer sump and the feed clari sump and as my Lord is aware from early 2000 it is distinctly different, the buffer sump. It is not working stably, it is out of line with expectations and, apart from times when the device was taken out of service over the five year period, the feed clarification side was working correctly throughout and the measurements make sense against what we know of how the plant was operating.

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At 113 the buffer sump indicators, wild fluctuation with the mean level below the low alarm for 85 per cent of the operating period in that five years and it was often falling well below the lowest alarm rate. In his opinion it is clear that good evidence had been available to the company for 63 months of even a serious incident of malfunction. The most plausible reason was serious problems with the liquor level control in the buffer tank area. And he says the significant difference between the performance of the two instruments was a very strong indicator that it was seriously malfunctioning and not in good working order and the evidence for this was available to the company over a five year period and I stress that that graph is effectively produced through the company's results and the company's computer.

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Which brings us to the 1998 incident because back in 1998 pipe work in the Head End dissolver cell had eroded through and leaked a relatively small quantity of dissolvable product liquor into the sump. There was a management investigation and a report made 28 recommendations concerning future recommendations. Two of them are particularly important. One stated that the four production support managers should ensure that where relevant and appropriate procedures are put in place requiring that all cell sump analysis results are recorded and trended by shift team managers as soon as practicable following receipt. Another stated that the THORP production support managers should ensure, where relevant and

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appropriate, procedures are put in place requiring that cell sump analysis result trends are reviewed by production support personnel on a regular basis. That is exactly what these are.

It must be, the Crown say, that these recommendations were directly related to and transferable to what was discovered following this investigation. 98 was a similar but less serious event and it should have resulted in the recommended arrangements being put in place to improve leak detection and monitoring in respect of Head End. It appears the company has no formal record of how or to what extent THORP Head End implemented the 1998 recommendations, but it is the view of the HSE that few of the older recommendations had been effectively implemented otherwise, had they, this leak would have been detected much earlier.

I do not doubt with the first part of the summary, I think having opened the case in detail, my Lord has the facts. Can I turn simply to paragraph 125. As a result of breaches, put simply the company lost its ability to detect leaks into the feed clarification cell and leaks from the cell and the company was reliant upon the last line of defence against the leak to ground of highly radio-active dissolvable product liquor which occurred during normal operation and, as I have stressed, over a prolonged period of time. And this substantial quantity, 83,000 litres, remained undetected for months. Again, I stress there is no evidence of a leak to ground from the incident and no person was put at risk or harm, none the less the probability of a leak to ground, as I have explained, increased significantly. These were thus serious offences. They amount to a significant departure from the relevant safety standard over a long period of time and a failure to comply with important conditions which I stress are concerned with safety attached to a licence to operate the most hazardous undertaking in the United Kingdom.

My Lord, I have set out, as we are enjoined to do, the relevant sentencing factors, but can I make this caveat; this is not a prosecution of a breach of the general duties under Section 2 or 3. It is not concerned with the risk in the sense of possibility of danger and very much the gravamen is the failure to comply with the conditions which are necessary in the interests of safety which I say are part of a commissioning regime that allows this defendant to engage in this hazardous activity and that licence is the primary means which the State regulates the safety of nuclear installations. It is also the foundation for public confidence in such safety. So to the extent that it is relevant I have set out the factors. Clearly the degree of risk and extent of danger it is not alleged that persons were exposed to danger as a result of the breaches and I think I have repeated more than once why we say the breaches are grave and where that gravity stems from. The Crown does point to a failure to heed warnings from the 1998 report in the way I have explained and the company does have a number of relevant previous convictions and to assist my Lord I have given something my Lord has not had before the briefest facts to support, behind tab 5, the previous convictions. If I can ask -

MR JUSTICE OPENSHAW: Thank you.

A MR MATTHEWS: I am grateful. Thank you very much. I do not know if my Lord will be
assisted by me reading out the previous convictions. Simply can I summarise them. One in
July 1990 for the same offence. Pleaded guilty to a breach of Section 4.6 of the Nuclear
Installations Act and relating to the transfer of fuel. The penalty imposed a fine of £1,000 and
costs of £4,600. Then in 93 four breaches of licence conditions. Fined again in the
B Magistrates Courts £1,500 for each offence and £10,000 costs. In 1995 a breach of Section 3
of the Act and five counts of breaching licence conditions. That related to an internal fuel flask
being transported without water in the magazine. A £15,000 fine for the Section 3 offence and
five fines of £3,000 plus costs. 12 April 1996 a breach of Section 3; a sub-contractor was
contaminated with radio-active material, which I think sounds perhaps more dramatic than it
C was, but for that offence the company was fined £25,000 and costs of £16,000. 2 February
2000 an offence contrary to Section 2.1, which I am afraid I have not provided particulars for,
but it involved spilled nitric acid, not radio-active material, in which an employee was injured.
This Crown Court a £20,000 fine. Then lastly, in October 2000 charges under the Ionising
Radiation Regulations 1999, fines of £3,000, £3,000, £4,000 and £14,000. Lastly, 6 March,
D again the Ionising Regulations and a breach of Section 3 relating to the storage of radio-
active material, a £9,000 fine for the Section 3 and two £3,000 fines. It is right to say that in
none of the previous matters had there been loss of containment.

E I have also provided principle sentencing authorities which I am sure my Lord is
familiar with. And I hope I will be forgiven for saying that the paradigm shift that occurred in
1999 with Howe - Milford Haven case simply assists in dealing with public authorities and
public bodies and I think provided welcome guidance for that particular conundrum which no
doubt my Lord has read. And Jarvis Facilities similarly perhaps the important point from that
F case is the relevance of a public element where a company is engaged in activities that have
a public impact, that is a factor to be taken into account. And I think perhaps most helpfully
Balfour Beatty Rail Infrastructure Services Limited this year, the present Lord Chief Justice
really reiterated a summary of the guidance from Howe and onwards at paragraph 22, set out
13 points which I think helpfully summarise all the relevant guidance and then perhaps added
something to that at paragraph 40 under "Discussion" endorsing the guidance by the previous
G decisions set out in those 13 propositions. Only one of these propositions, number 10, deals
expressly with the objects of the sentence, namely to achieve a safe environment for the
public and to bring the message home, not only to those who manage a corporate defendant
but to those who own it as shareholders. And then his Lordship spelt out Section 1.42 of the
Criminal Justice Act and the purposes of sentencing and said how most of them could be
H applied in the case of the company, although a notion of the reform and rehabilitation of an
offender provides some difficulty.

A Then his Lordship went on to consider principally Section 3, as I say, the general
duties of the Act and the nature of systemic failures and failures that are simply due to
perhaps a single act of inadvertence on the part of a junior manager and said how in the latter
cases a deterrent sentence was neither appropriate nor possible. Where the consequences of
an individual's shortcomings have been serious the fine should reflect this but it should be
smaller by an order of magnitude than the fine for a breach of duty that consists of a systemic
failure. I know my Lord has been provided with a copy of the Transco decision in the Court of
Appeal which was a case that I appeared in and that was perhaps an unusual, if not unique,
case where the fault really was a single manager who simply took the wrong decision with
disastrous consequences and that was the basis of the allegation. And again, the Lord Chief
Justice a few weeks before the Balfour Beatty case considered the issue of the relevance of a
company's financial status and the information to be provided to the court and no doubt my
Lord will have seen that.

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D My Lord, can I move away then from the guidance and I think address you simply on
the question of costs, which I am happy to say are agreed by the company and so can I give
my Lord the figure which is £67,959.48. That is £67,959.48 and that, of course, includes
investigation costs.

My Lord, unless I can assist further -

MR JUSTICE OPENSHAW: No, you have been most helpful. Thank you.

MR MONAGHAN: My Lord, I trust that your Lordship has received the defence response
to my learned friend's prosecution opening.

E MR JUSTICE OPENSHAW: Yes, I have and I have read it with care. It is extremely detailed
and helpful and I am grateful to you for it.

MR MONAGHAN: Just as my learned friend indicated, I do not propose to go through
every aspect of that seriatim. I doubt that would be particularly of assistance to your Lordship.
There are matters none the less which it is necessary to deal with in some little detail but I
hope to be relatively brief.

F MR JUSTICE OPENSHAW: It is an important matter, you should take as long as is
necessary.

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H MR MONAGHAN: Thank you, my Lord. Can I first of all simply say that it is right that that
defence document is somewhat lengthy. It was intended to ensure that all significant points,
whether they were facts or interpretation of facts, or aspects of the mitigation generally, were
dealt with. There may well be a number of points, factual in particular, which your Lordship
ultimately concludes do not bear particularly, or even at all, on the question sentence. One of
those, perhaps a good example of that, is the fact that on the question of criticality there is a
difference of opinion between the defendant and the prosecuting authority as to whether in
different circumstances to this, hypothetical circumstances which have never arisen, the

A possibility of a criticality might exist. We have in effect agreed to differ because it seems to us
all that the reality is that all parties are of the view that there was no possibility of a criticality,
that is an uncontrolled nuclear reaction, in this case. All parties equally seem to agree that
there would be no possibility of such a criticality in the vast majority of situations that could
possibly arise in the THORP reprocessing plant. There is what I might, I suppose, call a grey
area somewhere at the other end of the spectrum where if certain theoretical conditions arose
– and as I say they never have – there is a difference of opinion as to whether a criticality
might potentially be possible. But that seems, with respect, to be so far removed from the
situation with which your Lordship is dealing that it does not seem, with respect, to have any
bearing on these matters or this incident or to be relevant to sentence.

MR JUSTICE OPENSHAW: I agree.

C MR MONAGHAN: None the less, there have been certain factual differences or
differences in interpretation which the defendant company, perhaps understandably, was
unhappy about ignoring, even when it was felt that ultimately they may not affect your
Lordship's view and therefore the document is perhaps somewhat [inaudible] than it otherwise
would have been.

D That said, may I deal firstly with the preliminary, though none the less important,
aspects of the mitigation and there is certainly no contention about. My learned friend has
been kind and fair enough to allude to them in the course of his opening. The first of those is,
of course, a guilty plea at the first opportunity. The second is the full cooperation that was
E given by the defendant company once the investigation of this matter by the Health and
Safety Executive, and in particular the Nuclear Installation Inspectorate, the NII, had begun.

F It has already been the subject of some allusion by my learned friend that the
defendant company carried out its own board of inquiry. That was a full and wide ranging
inquiry into what had gone on. Particular reference was made by my learned friend to the fact
that the board of inquiry criticised the fact that the plant had been left to operate over the
weekend within that short period that there was reference to in April when the insertion of the
cameras because of logistical difficulties had to be put off from the Friday until the Monday.
So it is clear that the board of inquiry that the defendant company set up pulled no punches
and acted in no way to justify that which it felt ought to be criticised. And that is indicative of
G the level of cooperation and the level of seriousness with which the defendant company views
these matters.

H There is, of course – it has not been suggested but it is appropriate that it be said for
the record because it is a matter within the various aggravating mitigating features set out in
the authorities – there is, of course, no question of corners being cut or matters not done in
order to save money. That was the case in the case of Howe, the seminal sentencing authority
which your Lordship has. It is not the case here.

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A factor to which the court must have regard, following on from those same sentencing authorities, is the company's reaction in the sense of steps taken to put matters in place to resolve the difficulties and, one would hope, to ensure that a recurrence of the same is not likely or possible. Those steps which were taken by the British Nuclear Group Sellafield Limited are set out in considerable detail at paragraph 60 onwards, which begins on page 13 of the defence document. I do not believe that it is necessary to go through those word for word. As, in effect, an overview it is right that increased numbers of operation meetings have been introduced, along with reviews, amendments of maintenance arrangements and other matters, all of which are designed to increase communications within the plant, as it is clear that a lack of communication in one sense underlies the difficulty that arose with the sump and numerator matters.

In addition, there have been insulated cameras, re-assessment of safety issues, significant investment into certain matters which in some ways are peripheral. One of them is, for instance, the [inaudible] of condensation – condensate forming within the sumps. That is mentioned because your Lordship may have seen that at one stage it was thought that the increase in condensation within one of the sumps was the cause of a particular reading and a necessity to empty the sump. So it is clear that there has been a very comprehensive review and the other thing that it seems could usefully be done from a technical and an organisational point of view done to – in response to these matters by way of resolving the difficulties which led to this incident occurring.

I do not want – I say I do not want, I do not believe that it is necessary unless your Lordship requires it - and I know that your Lordship has read the document in detail and carefully – to go through any of those particular individual details of that aspect of that piece of mitigation, but your Lordship sees in summary that a great deal has been done in response and that is a significant mitigating feature.

As to the record, it is right that there are convictions recorded against the defendant company. It is equally right that there is nothing of this sort and so far as these matters are concerned one matter at THORP - which again is perhaps less serious than its bald description makes it sound of some low level contamination of a contractor. THORP is a large complicated and potentially very hazardous operation. It is in effect to the company's credit that there has been no history of incidents here. There has been nothing at all of this sort and I would ask your Lordship to conclude that this is not a record which reflects badly for sentencing purposes upon this defendant.

My learned friend has alluded to the fact that this is not a Section 3 prosecution but of course most of the authorities that have been produced are and in the context of my learned friend's prosecution case statement and his opening to your Lordship it has been thought appropriate to deal with and refer to matters such as the overall seriousness of the breach and

A the level by which this company has fallen below the required standards. Now, it is a significant plank of the defendant's mitigation which we submit is of very considerable importance that there is an absence of risk in this case; risk of criticality, risk of contamination and risk of environmental impact. And so far as the last is concerned, it perhaps bears noting that in the Milford Haven case, which my learned friend referred to towards the end of his opening, the failure, in effect the negligence by the defendant company, was limited. The environmental -

B MR JUSTICE OPENSHAW: Yes, but that was a straight liability case.

MR MONAGHAN: It was a strict liability case. The fine was considerable. The environmental impact was immense and it might well be regarded in this way; that the considerable fine reflected an enormous environmental impact that had occurred.

C MR JUSTICE OPENSHAW: Yes, but an absence of fault, so I do not myself think that that was very helpful.

D MR MATTHEWS: Well, perhaps it is not helpful in overall terms. It is none the less, as I say, accepted by the prosecution that these risks were all absent. If I might deal with them individually, but I hope briefly, criticality is an uncontrolled nuclear reaction and the defence say that it cannot be stressed -

MR JUSTICE OPENSHAW: I agree with you on criticality.

MR MONAGHAN: Yes, there is no possibility of any criticality at any stage in this incident, at any stage in any process, the defence say, with the caveat that there is some minor disagreement for the potential circumstances far removed from this.

E The question of contamination which, as my learned friend has called long term damage, as described in his opening, is equally one where the defence say there is no risk. The reality is that all of the liquor that leaked from the fractured pipe was contained within this cell. Your Lordship has heard and seen photographs and plans of the cladding made in stainless steel to a height of approximately – and I think your Lordship clarified this with my learned friend – 1.5 metres in height. It is the nature of stainless steel that it is not affected by nitric acid. I anticipate that when these parts of the installation were designed that of course is one specific reason for the materials being chosen.

F MR JUSTICE OPENSHAW: Yes, but the welds are vulnerable.

G MR MONAGHAN: I am not sure if vulnerable is fair, in all fairness.

MR JUSTICE OPENSHAW: All right, but there is a potential weakness at the welds.

H MR MONAGHAN: In theory, yes. It is right, however, that the welds are of the highest integrity imaginable. They were tested with the approval of the Nuclear Installations Inspectorate by various methods, various technical methods which were the limit of that which was technologically possible when the installation occurred. It is slightly odd, I think, that x-ray is referred to in the prosecution's documentation because x-raying, because of the nature of

A these welds, I am instructed, would simply not have been physically possible. Air box testing
and other technologically advanced tests established to everybody's satisfaction at the time of
the installation that there were no breaches, no holes, no loss in any way of the integrity
where the welds had occurred. There has been no incident or occurrence since the
installation that could be pointed to as something which is likely to affect that integrity. That is
one factor. In addition to that there have been careful and complex calculations carried out by
B the defendant company based on measurements of volume and separately upon
measurements of mass. The calculations which have been carried out show, certainly in the
case of the mass calculations, relatively narrow margins of error that there has been no loss.
That is consistent with the defendant company's findings in relation to the ground testing via
boreholes which shows no increase attributable to this.

C And the combination of the nature of the construction of the cladding, its being of the
highest integrity to begin with and there having been no occurrence which could be said to be
likely to affect that, plus the boreholes and the measurements and calculations, the combined
effect of those matters is such that the defendant company is satisfied that there has been no
leak. That in turn is consistent with the concession made on behalf of the prosecuting
D authority by my learned friend that there is no evidence of any leak to ground. The defendant
company would say that when one looks at the design parameters, it is consistent with the
various purposes within the design of this cell and consistent with the cell's purpose or
purposes in avoiding the risk of any leak to ground, contamination or environmental damage.
E And I say this for this reason; as your Lordship will have read, the point of the cladding is in
effect, within the context of its design, so that in the event of a – it is not a phrase I would
often use – worst case scenario perhaps, a traumatic, catastrophic failure of the vessels in
the feed clarification cell caused by potentially some sort of seismic event or similar and, as
your Lordship sees, these are matters which had to be considered in the design and
F construction of this feed clarification cell. In the case of such a catastrophic failure the
contents of the vessels would be deposited into the vessel formed by the cladding within the
base of this feed clarification cell. It is there to contain that and it is axiomatic that it would
take some not inconsiderable time in the case of such a traumatic catastrophic failure to find
somewhere to put the dissolver liquor which had been deposited into the base of the cell in
G those circumstances, simply because there is no other part of the reprocessing plant which
operates as spare capacity sufficient to evacuate that amount of liquor into. It follows that in
reality the liquor would have to remain for potentially a significant period within its secondary
containment, containment designed to hold it and avoid contamination and environmental
H impact until alternative arrangements were made. Although these were not the circumstances
anticipated, that secondary containment has done the job it was intended for. It has minimised
risk. It has avoided contamination and environmental impact. In short, it was not designed so

A that part of its normal function would be to hold dissolver liquor for any period of time, but it was designed so that it could do so if circumstances arose in which that happened. So it is slightly incorrect for it to be suggested that it was never part of its function.

As to the – I think it is referred to in my learned friend's addendum – the question of any agitation or cooling, that of course is part of the clarification process. The holding of this liquor is not part of the clarification process. It is simply holding until it can be removed.

B Perhaps moving on from that slightly, as to the question of risk, it is important to note that the concession by my learned friend within my learned friend's case statement goes this far; that if there had been a leak to ground, for which there is no evidence, it would not have been sufficient to take the level over the maximum legal limit for [inaudible] to the public from normal operation. It follows – and I say again that this is very significant – there is no risk to health from contamination, there is no risk to environmental impact and we have already said that there is no risk of criticality.

C I am sorry if I have taken a little while to go through those questions of risk or hazard. It seems to me to be necessary because it is something upon which the question of the seriousness of the breach, to some extent, hinges. I say that because in the Transco case – and this is at paragraph 36 of the judgment which your Lordship will find at tab 3 of the defence bundle -

D MR JUSTICE OPENSHAW: Yes, I have got the case. What paragraph?

MR MONAGHAN: I am sorry, I have written down the wrong paragraph number. May I come back to that in a moment?

E MR JUSTICE OPENSHAW: Yes, I do not think 60 exists.

MR MONAGHAN: No, it does not. I shall find the appropriate number and refer your Lordship to it in a moment.

F The gravamen of the point that I wish to make is their Lordships defined seriousness as an amalgam of consequence and culpability. (It is 26. I am grateful to my learned friend) The defence say that that seems to be, when one looks at other aspects of matters which come within the criminal calendar, that that seems to be a not unreasonable way of their Lordships to assess it.

G Consequence and culpability ought to be considered by your Lordship in assessing the seriousness of the matters here. Although – and it is referred to elsewhere – consequence may be to some extent a matter of chance, one sees an analogy with some other aspects of the criminal calendar and I have particularly cases causing death by dangerous driving in mind, where equally the fact of the death can be a matter of chance but it is a serious aggravating feature. In the case that I have just referred to in Transco the consequence was the death of one man, the unfortunate Mr Brady, and not inconsequential

H

A injury to others. So whilst my learned friend seeks to some extent to differentiate Transco from the instant case, it is right that consequence is a factor within the question of seriousness.

B As to culpability, that is to say the other constituent part of seriousness, that clearly must include the question of risk and I say that because it is clear from the case of Jarvis, which your Lordship has already been taken to in tab 5 of the prosecution bundle, that the most important factor within the learned trial judge's assessment of the factors in sentencing appears to have been the element of risk involved and even though on appeal their Lordships felt that the learned judge had estimated those risks a little too high – though it is right that an actual derailment of a train had occurred of course – they reduced the sentence on appeal. C But what that makes clear, in my respectful submission, is that risk is an element of culpability as well as consequence, which must be relevant to the question of seriousness. In this case, although there were failings in relation to the sampling and numerator – and I will come to those, if I may in a moment – it is right that so far as consequence is concerned there is nothing which the prosecution can point to which has been a relevant consequence of this incident.

D As to risk, which clearly forms part of the other constituent element of [inaudible] ability, there is no risk of criticality. There was in reality no risk of contamination and no risk of environmental impact. So that is a very significant part and a very significant area when the question of the overall seriousness which is relevant to the appropriate level of fine that your Lordship ultimately sets, where the matters that can be put forward are very much in favour of E this defendant. I would ask your Lordship to have regard to those in coming to the ultimate conclusion that your Lordship does.

F Can I say something about the numerator and the sampling. It is right that there have been difficulties with the numerator over a lengthy period. It is not right that those difficulties had gone unnoticed or that they had not been acted upon in any way. It is clear that there had been numerous attempts to resolve whatever the fault was with the numerator which caused it to give regular inaccurate readings. It must follow from the circumstances which ultimately pertained that those efforts to repair the numerator and resolve the problem had failed. It would -

G MR JUSTICE OPENSHAW: No-one had previously tapped it? It was not -

H MR MONAGHAN: Well, I do not think it is that simple, with respect, my Lord. It was tap – the bobbin had become stuck. It was also linked to the adjustment of the air flow going through. The air flow going through had been set to a lower level. It is not possible to discern from this distance in time why that was done or who it was done by. It would seem that some adjustment at some stage had led to the conclusion that the numerator was now functioning properly. The reality is that that adjustment would seem to have prevented the numerator from changing its

A reading and showing the high reading. When the adjustment of the air flow was put back to what it should have been, the bobbin was stuck and when tapped it went to its correct level. That may be a little bit of a red herring because it really seems to have been the adjustment of the air flow which led to a particular reading being given, but not thereafter altering because of the reduction in the air flow so that looking at it – and if I have understood correctly, even tapping it with that air flow adjusted down, as it should not have been, would not have caused the correct reading to become apparent. Why that was done, as I say, is impossible to see at this distance. What does appear to have been the case is thereafter, because of the way it had been adjusted, that pneumercator carried on showing a steady but inaccurate reading. That was certainly one of the factors which influenced the conclusion that the discrepancy must be in the figures.

C There had been difficulties on occasion with the calculation of the shipper receiver difference. It is, as my learned friend has alluded to, a complex calculation which takes a very considerable length of time, some six weeks even with the benefit of computers. Mistakes, it seems, are not wholly unknown and have been detected in the past by re-checking. It seems to have been the view held by some that the figures that were obtained from the shipper receiver difference were likely to have been caused by accounting error. That seems to have been behind the decision to leave the plant running over the weekend. And I am talking here, of course, about that very short period of time when figures became clearly apparent and action was in fact taken over a short period. That chronology seems to be this; 13 April, figures obtained showing the earlier campaign shipper receiver difference of 3.9 per cent; 14 April, the discovery of the sample results from November 2004 and February 2005 which seemed to show a discrepancy in the levels of uranium that were such that they were not consistent with the sumps being in their normal state. That in turn – and I believe this is referred to within the defence case statement – is not a clear cut and simple issue because there had previously been difficulties caused by contamination at the laboratory end with the result that there had been samples which had been believed to have been contaminated, which would indicate some sort of leak. No leak was found, subsequent samples were normal and it was ascertained by a process of elimination that there had been some contamination at the laboratory. None the less we have the 13th the first figures, 14th the sample results, 15th the figures from the later campaign showing a 10 per cent shipper receiver difference and on the same day a meeting where the decision was made that cameras should go in and see what was going on. So we are then talking about three days there. The cameras actually went in on the 18th. By the 18th – and this is also part of my learned friend's opening – further calculations had concluded that the shipper receiver difference was accurate. That in effect, in itself, would have been sufficient to illustrate the fact that there was a problem, that that problem did not lie in the accounting and it therefore lay within the fuel cell itself. It is fair to say

A that this incident could not have gone on beyond 18 April because at that stage it was not possible for there to be any conclusion other than that there was problem within the feed clarification cell.

B It follows that, although there had been difficulties with the gauge in particular which had led to the incorrect and erroneous belief that things were normal and supported the view that the difficulty must be in the [inaudible] once the figures came in for the shipper receiver difference – and these are things in April going back to before Christmas. This is the first opportunity that there is to look at them. We are talking five days for consideration, reaction, re-calculation and for the cameras to go in [inaudible].

C My learned friend's observation is somewhat surprising that it went on over the weekend. In retrospect, it did but not a helpful decision perhaps. But that must be seen in the context of the risk, the consequences, the fact that when the cameras were put into the feed clarification cell the liquor was roughly some 10 centimetres in depth. That is 10 centimetres up the 150 centimetre metal cladding [inaudible]. And steps immediately began to deal with the problem; the washing, the ejection and the shutting down of the THORP reprocessing plant.

D So when your Lordship comes in due course to assess the overall seriousness, the primary difficulty here comes from, it seems, one of certainly well over a thousand instruments to develop the fault that had been the subject of attempted repairs. Therefore – and I am sorry that I have to say this again, but for reasons which are not clear had been dealt with in a way that made it look as though repair had been successful when it in fact had not, but which led to a belief that the level was appropriate. And indeed led to that belief being maintained until the shipper receiver difference was received, calculated, re-checked because there were understandable concerns that it may not be the shipper receiver difference, especially given that the faulty numerator was still giving a normal reading, and then stopped. It is quite right that that machinery, that one out of 12 or 13 hundred gauges, should have been more carefully dealt with, that there should have been better communication to allow that difficulty with the numerator to have been tied up with the samples, at least one of which seems to have been overlooked and a number of which seem to have been the subject of nil samples. E
F
G The nil sampling difficulty, as referred to within the defence case statement, the process is, I think one of the witnesses said, rather crude. It sometimes means that what captures the sample is not in exactly the right spot at the right time. It does not mean that nobody has tried to do it. It does not mean that the implement has not gone to the right place and tried to pass on that which should have been received. There is a difficulty here with communication, I think, H
which again is one of the matters has been referred to in terms of the steps that have been taken by the defendant company since this incident. But if we fall back again, it seems, on to the fact that we have got a nil reading but the other safety measures, including the gauges, are

A indicating that it is in fact a sump with an appropriate level within it, when my learned friend makes the point that the operator instructions - and there are several, although the first one, I think, came up at page 593 – unexpected rise in level requires a sample to be taken and the difficulty is because this numerator seems to have been for some period in its position where having been adjusted in this attempt to repair and it did nothing of the sort, it was showing a normal reading, there was no unexpected rise detected and therefore no trigger for that specific, rather than the periodic sump sample to be taken. I have already explained, by B reference to the matters in the defence statement, how it is that the steps taken since have been put in place with a view to preventing that from happening in the future.

C In summary, when one looks at the question of seriousness, my submission is that first of all it would be a mistake to equate length of time, length of breach directly with seriousness of breach without anything further. It may be that a short breach, a breach which lasted a very short time, is serious and a breach that lasts a long time is serious. A breach of whatever licence or requirement there is upon an undertaking, an employer, etc. is not of necessity serious because it lasts a long time. These are matters which unfortunately, D because of the relatively minor nature of the equipment – and I say that in that way because it is one of many, it is a small item, it is not as simple as a motor car fuel pump perhaps, but it is not the most complicated machinery in the THORP reprocessing plant either. That perhaps is equally one reason why it may have been dealt with in the way that it was, but one must put that into the context of the risk and consequences that flow there from, which I have dealt with at length. E

F It is the defence submission that when one looks at those questions of risk, culpability and consequence and the overall circumstances of this incident, which are set out in length in the defence case statement to which I have referred to at some length, the seriousness is not as high as perhaps the Crown's case would initially suggest, particularly given the lack of consequences or indeed risk. The defence would say that this is a matter which certainly ought to be put below the Transco case which is in the defence bundle in terms of its seriousness and in terms of its place in the hierarchy of things. There are no reported cases that my learned friend or I have been able to find which are directly on the point. This is G certainly not a rail disaster case. It is not, unlike any of the sentencing authorities that your Lordship has, a case where injury has been caused or there has been a risk of injury or a cause of huge environmental impact. The defence submission would be that because of the absence of both risk and consequence it falls somewhat below.

H I am sorry, my Lord, I seem to have gone slightly longer than I had planned. I do not really have very much more. I am quite happy to conclude now or later as your Lordship pleases.

MR JUSTICE OPENSHAW: I think if you conclude now it would be very convenient.

A MR MONAGHAN: I am grateful to your Lordship of course. There are some minor matters which might be worthy of at least allusion. There is some criticism of the defendant for not responding to some banging noises that were heard on 6 January 2005. When that is put into its proper context there are all sorts of noises which occur, sometimes expected, sometimes unexpectedly, in any plant. It is paragraph 46 of the defence document. There are often noises caused by expansion and contraction of metal, heat, cold and various mechanical processes.

B MR MATTHEWS: My Lord, can I say it is certainly not meant to be a criticism, just relating the fact.

MR MONAGHAN: Well, lest it be thought that it is a criticism -

MR JUSTICE OPENSHAW: Well, you can forget about it.

C MR MONAGHAN: I shall. The 1998 incident led to some recommendations being made. There is perhaps a distinction which can be made and I have sought at paragraph 50 and 51 of the defence document -

MR JUSTICE OPENSHAW: The difference between disregarding warnings and failing to heed advice.

D MR MONAGHAN: Well, in effect that is certainly the point to some extent, my Lord, yes. There were different matters that had gone on in 1998. It is unfortunate that there has been very little written record of what was done. That is not helpful, nor is it something that will happen again. There is an indication that a significant number of the recommendations were dealt with but some, particularly relating to cell sump analysis reports, do not seem to have been implemented throughout and that is something that the defence concede within the document that has been provided. But there was not perhaps inadequate monitoring so much as the discovery that nil samples had been taken and nothing done about it. The one exception – and as I say in the document too few attempts at re-sampling, with the one exception of the single sample that seems to have gone astray after being sent as a fax. None the less, as I say, that seems to have been against the background of other safety measures, in particular the numerator reading normal. The submission that the defence would make in those circumstances is that that is not properly a case to be seen as a failure to heed warnings. That ultimately is a matter for your Lordship of course.

G In short, the seriousness of this matter, the defence would say, comes from three factors; the consequences, the element of risk within culpability which is clearly described in Jarvis and the nature of the breaches themselves. The first two I have dealt with at some length and I simply renew my submissions that they are at the very lowest level, no risk and no consequences of contamination or of environmental impact. The nature of the incidents themselves in reality amount to one gauge which should have been repaired but was dealt with H in a way that made it look as though it had been repaired when it had not and sadly, as I say, I

A have no explanation for that, and a lack of re-sampling when the nil volume samples that
seemed to make up the vast majority of the samples over a period had been brought out of
the sampling process. That must be seen against the fact that once what acted as a fall back
position, the information from the shipper receiver difference, was brought to the knowledge
of the defendant, we have a period of three days inclusive, the Wednesday, the Thursday and
B the Friday, between the receipt of the first set of results and the decision that at least that part
of the process has to stop so the cameras can go in and investigate and in fact a five day
period before that actually happened and THORP re-processing plant was then shut down.
The defence would say, when everything is taken as a whole that those matters which form
the actual failings are not of the most serious, that the risk is nil, the consequences were nil
and therefore this is a matter which falls into place in the hierarchy certainly below the matters
C which have been presented to your Lordship as sentencing authorities.

I do not seek to say anything about the finances of the defendant company to your
Lordship. I think there was reference also in the Transco case to it being sufficient in some
cases for a large public company simply to indicate that it was capable of paying the fine and I
do not seek to deal with the question of finances any further.

D I do not know if I can usefully assist your Lordship any further. Would your Lordship
excuse my back just for one moment to ensure that there is nothing that those instructing me
[inaudible] -

MR JUSTICE OPENSHAW: Surely.

E MR MONAGHAN: [Sotto voce conversation] I am pleased to say that there is not. Thank
you, my Lord.

MR JUSTICE OPENSHAW: There is nothing you want to -

MR MONAGHAN: No, thank you, my Lord.

F MR JUSTICE OPENSHAW: No? Thank you both very much indeed. I will pass sentence at
two o'clock.

[Luncheon adjournment]

G

H

SENTENCE

A

MR JUSTICE OPENSHAW: The defendant British Nuclear Group Sellafield PLC has been committed to this court for sentence by Whitehaven Magistrates Court on 8 June of this year, following its pleas of guilty to three offences contrary to Section 4.6 of Nuclear Installations Act 1965 as amended. They are accordingly liable for the penalties provided by Section 33 of the Health and Safety at Work Act 1974 which permits an unlimited fine.

B

The prosecution have opened this case from a carefully prepared statement of case which was circulated in advance. The defence have also put their mitigation into writing. It would serve no useful purpose for me just to repeat what they have already said. I shall confine myself therefore to identifying what seemed to me to be the relevant considerations to sentence.

C

I have read each of the authorities put before me. The general principles of sentencing in Health and Safety cases are most helpfully set out in the judgment of the Court of Appeal Criminal Division in the well known case of F Howe and Son Engineering Limited [1999] 2 Cr.App.R. [Sentencing[?]] at page 37. These principles were recently re-stated by MacKay, J. in Balfour Beatty Rail Infrastructure Services Limited in terms specifically approved by the Lord Chief Justice, giving judgment on the appeal in that case, reported at neutral citation[?] [2006] EWCA Crim. 1586.

D

There has been in recent years an increasing recognition of the seriousness of health and safety offences, however the infinite variety of circumstances makes it impossible to lay down any practical term or scale of penalties. Each case depends on its own circumstances, which I now seek to identify.

E

By reason of its huge scale, its nature and its complexity Sellafield on the West Cumbrian coast is the most significant and potentially the most hazardous nuclear site in this country. Its principle business is now re-processing spent nuclear fuel from home and abroad. Since 1 April 2005 the site has been managed and operated by the defendants.

F

Having regard to the unique dangers presented by nuclear material, the storage processing and disposal of nuclear waste is strictly regulated by the Health and Safety Executive, who are required by Section 4 of the Nuclear Installations Act to impose such conditions on the nuclear site licence as they deem necessary to secure the public's safety. Compliance with the terms of the licence is therefore of the greatest importance.

G

This case concerns the processes carried out within the THORP unit at Sellafield, THORP being an acronym for Thermal Oxide Re-Processing Plant. The operation of the plant has already been outlined by Mr Matthews and, as I have said, it is unnecessary for me to repeat what he has already said. I will, however, give a summary. It is considerably over-simplified but it explains the principle points of the process.

H

A The used nuclear fuel is dissolved in concentrated nitric acid producing dissolver
product liquor which is itself highly radio-active. The liquor, as I shall call it, is then variously
treated and processed in a variety of different containers. One such container is the so-called
accountancy tank in the fuel clarification cell. This was the primary containment which was
designed and built on a massive scale to prevent any escape of radio-active material. There
B was a secondary containment in that the floors and walls were covered in thick five grade
stainless steel cladding to a height of one and a half metres because it tended to hold and
contain any leaks or spills. There was a gully running round the floor draining into a sump.
This was part filled with nitric acid. There was a device for measuring the amount of liquid in
the sump called a numerator which had attached a sump alarm which was intended to alert
C the defendants to any increase of depth of liquids or liquor in the sump from which the
existence of leaks or spillages could be inferred.

D The stainless steel cladding was intended as a failsafe device. It was not intended for
long term storage of the liquor. Although stainless steel is entirely resistant to acid and the
specification and workmanship was to the highest standards attainable by technology, there
is, as the prosecution have pointed out, always the theoretical potential for weakness at the
welds. Furthermore, the sump itself has no proper means for control of temperature, nor is it
possible to move liquids around when in the sump without this movement or agitation, as it
E is called. Any liquor present might crystallize and would then be more difficult to remove. Nor is
it easy to remove so much liquor once it has entered the sump. Indeed it took some months to
do so in this case. Furthermore, and perhaps most importantly, there is no absolutely secure
secondary containment of the sump itself. It was surrounded by heavy duty concrete of quite
extraordinary density and although that was not technically porous it would contain any
escaped liquor for a long time, but there was, as I have put it, no absolutely secure secondary
containment of the sump.

F There were a number of security checks to ensure that all was well. All customers,
called shippers, supplying nuclear fuel for reprocessing are required by contract to provide a
detailed estimate of the amount of uranium which they expect to be recovered from the fuel
which they have supplied. After each process the amount of uranium actually recovered is
measured and the difference, the so-called shipper receiver difference or SRD, between what
G has been recovered and what should have been recovered is calculated. It is a highly
complex exercise in advanced mathematics and even with powerful computers it takes many
weeks to complete. Using this method an anomaly was spotted in the shipper receiver
difference on 13 or 14 April 2005.

H The defendants then initiated an investigation. A meeting of senior THORP
management was held the next day, which was a Friday. Production at the plant continued
over the weekend. It should have been shut down at once but in the scale of an eight month

A failure to detect the leak a couple of days seems to me to have made no practical difference to what happened. On the Monday a camera was inserted. Over the course of the next few days various images were taken and on 20 April a leak was found in a pipe feeding from the top of the accountancy tank. There was plainly visible in the photographs extensive corrosion of the mild steel work which supported the tank and extensive pooling of liquor on the floor within the secondary containment of the stainless steel cladding. That same day, as was their duty, the defendants informed the Health and Safety Executive of what had happened.

B Investigations by the defendants and by the Nuclear Installations Inspectorate of the Health and Safety Executive showed that the leak had started as long ago as 28 August 2004 and had remained undetected for at least eight months. During that time fully 83,000 litres of the radio-active liquor had spilled, which liquor contained 22,000 kilograms of nuclear fuel, mostly uranium, with 160 kilograms of plutonium. Considered in isolation these statistics would be shocking indeed but I accept that they should be seen in the context of all the other relevant circumstances of the case.

C The Inspectorate found a number of breaches of the licence, which are the basis of this prosecution. I will deal with each in turn later.

D Again, I am conscious that my description is an over-simplification of an immensely complex process, but some summary is plainly necessary.

E It was always intended that the liquor in the accountancy tanks would need, from time to time, to be stirred or agitated. The original plans provided for the tanks to be agitated only when full. When the tanks are full the movement of the liquor within the tank is slight, with the result that there is very little lateral pressure on the tank and very little lateral movement of it. It was, to all intents and purposes, held immobile but in order to overcome another quite separate and unrelated problem identified some years ago, which resulted from the risk of crystallization of the liquor if it was left unagitated, a change was made to the process by which agitation would happen regularly and not just when the tanks were full. Agitation of half tanks resulted in a more significant movement of the liquor within the tanks. This created lateral pressure which in turn created lateral movement. No change should have been made to one part of the process without a most detailed examination of the impact that such a change would have on the other parts of the process. This was not done or, if it was done, it failed properly to identify the altered loads upon the mountings of the tank. As a result, the risks to the pipe work for unforeseen whereas they were or should have been foreseeable by skilled examination. Over a long time lateral movement set up stresses in the pipe work attached to the tank. Gradually metal fatigue set in leading first to a leak and then eventually to complete rupture of the pipe work, as shown in the photographs taken on 20 April.

A As a result, liquor escaped. It is self evident that no such leak should ever have taken place. This leak is a breach of Licence Condition 34 which prohibits leakage or escape of radio-active material.

B Furthermore, it is obvious that the defendants should have had in place a system which could detect leaks on such a scale over these eight months. I have already explained how there was a device which measured the level of liquor or liquid in the sump. This was the numerator. Examination showed that a floating bobbin, the moving part of the numerator, was sticking in one position thereby giving a false reading. Indeed, an analysis of readings over a five year period showed wild and unaccountable fluctuations which are now obviously only explicable on the basis of a malfunction of that device over that full period. An unsuccessful attempt was made to fix it in December 2004 and possibly before also, but the attempt failed, C was not renewed and the failure of that attempt was not properly recorded.

The failure of the numerator over that long period is, it seems to me, a serious matter and so it was that the rising levels in the sump went undetected. This failure is a breach of Licence Condition 27.

D More than that, the numerator was often in a state of low alarm. The defendants say that there were, from various parts of the process, hundreds of such alarms. Such a system is failing properly to identify and isolate significant risks. There was, as the Nuclear Safety Directorate accurately put it, a culture of tolerating alarms, so the alarm was not effective. It did not detect or warn of particular failures which should have been apparent in this case.

E There was another check which could and indeed should have detected this fault. The sump, as I have said, was part filled with concentrated nitric acid. Following the leak of the radio-active material the pure nitric acid in the sump would have been contaminated by the radio-active material. The change in the chemical and physical composition of the acid in the sump, and indeed in the radio-activity levels, should have been measured. Samples should F have been taken every three months. For a variety of reasons the checks were ineffective.

G Mr Matthews has carefully taken me through these cumulative failings. A routine sump sample taken on 28 August 2004 showed excess levels of uranium. As the prosecution point out, plainly the leak had already sprung by that date, which does indeed allow the commencement to be dated. The significance of this finding was not appreciated by the defendants at that time, at least it was not appreciated at a proper level of seniority.

H A second sample was ordered but that could not be analysed since insufficient liquid was obtained. No-one ordered another effective sample to be taken. A further routine sample was taken in November 2004. That also detected excess uranium but no action was taken or, at any rate, the significance of the reading was not appreciated and the same goes for a routine test on 24 February 2005. I might add that during the same period a rising temperature

within the sump was noticed. That now seems plainly to have been attributable to the leak but not such conclusion was drawn at the time.

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These are, as I put it, cumulative failures. Various explanations have been put forward. Sometimes there is a defect in the sampling process and insufficient material for analysis was obtained or the sample was taken from the wrong place or in the mass of material provided on the operators' computer screens the readings did not come to the attention of anyone who understood their significance. For whatever reason, the rising levels of radio-active material in the sump went unnoticed. The explanations put forward are inadequate and unsatisfactory and do not begin to excuse what amounts to a series of serious and culpable failures.

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It is to me obvious that one way or another this leak of radio-active material from the fractured pipe should have been detected soon after it happened, certainly within weeks, probably within days. That it went undetected for fully eight months is a serious failing deserving of condemnation.

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Those breaches of their operating instructions in relation to allowing too much fluid to gather in the sump and failing properly to monitor the levels of fluid in the sump, failing properly to take samples and failing properly to act upon such analysis as was provided are cumulative failures amounting to a breach of Licence Condition 24.

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It is relevant to note that in 1998 a small leak had been detected in pipe work leading to a similar accountancy tank. At that time the company undertook a major review of safety procedures and a series of recommendations were made; to strengthen the system, recording the numerator readings, monitoring the sump levels, taking samples and ensuring that the resultant analyses were considered at a suitably senior level within the company and any relevant trend regularly monitored and reviewed so that any necessary action could be identified and taken. It is plain that although some of these recommendations were implemented others were not. If they had been the leak would have been detected much earlier. In my judgment a failure to follow safety procedures which were recommended by the company's own safety experts is plainly a relevant factor in this case and it does go to aggravate these matters.

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I ought to say something of the previous convictions of this company and of its predecessors. In the half century or so of nuclear operations at Windscale and Sellafield some breaches of statutory duty have, from time to time, resulted. Some were a long time ago. Some plainly were not serious, being dealt with at the Magistrates Court with very modest fines. It is true that there have been no previous convictions relating to the THORP plant which has been operating for 10 years and more, but there have been significant breaches of safety before, notably the two cases which led to appearances before this Crown Court in 1996 and in

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A the year 2000. I do not think that in the light of these convictions the defendants can reasonably claim to have a good safety record so as to amount to substantial mitigation.

B I turn then to such mitigation as there is. I accept, of course, that once the leak was found the defendants have done all they can to co-operate with the investigation. They have always accepted responsibility for what happened. They entered pleas of guilty at the Magistrates Court at the earliest opportunity. Furthermore, the defendants have accepted and implemented each of the 55 recommendations which the Health and Safety Executive have made in their report following this incident.

C I move on to consider the consequences of these faults and failings. I accept that on any realistic basis there was no danger whatsoever of the nuclear material reaching the point of criticality. More than that, there is no evidence of escape of radio-active material from the cell, neither into the atmosphere nor into the ground. No-one was injured. No-one was exposed to any radio-active material. The liquor was held within the stainless steel cladding. The system within the feed clarification failed the secondary containment, the failsafe system worked. All this I accept.

D Therefore, say the defence, since no harm resulted this is not a serious case. I reject that submission. The licence provides for two systems to protect the public against accidental exposure to radiation and one of those systems failed. That failure went undetected for fully eight months. Appreciating, as I do, that seriousness is a combination of harm and culpability I accept the prosecution's essential conclusion set out at paragraph 126 of their case statement in these terms; that these were serious offences, the breaches amount to a significant departure from the relevant safety standard over a prolonged period of time and a failure to comply with important conditions concerned with safety attached to a licence to operate the most hazardous nuclear undertaking in the United Kingdom.

F A fine must, of course, balance the gravity of the offending against the means of the offending company. It must mark public disquiet at the offence. It must be sufficient to ensure that health and safety issues are driven up the board room agenda and serve as an ever present reminder to all levels of management and indeed across the factory floor that health and safety issues matter and achieving public safety is a matter of paramount importance.

G I turn now to identify what seems to me to be another relevant consideration discernible in the authorities. In particular in *Jarvis Facilities* [2005] 1 Crim.App.R. Sentencing[?] 247, the court is entitled to take a severe view of breaches of health and safety at work where the defendant is undertaking a public responsibility. In this case these defendants are entrusted with this uniquely hazardous material. They have a public duty imposed by statute to act in accordance with the terms of their licence. It is not an answer to these breaches of duty to say that their failsafe systems were effective or that no-one was in fact injured or put at risk. The fact is that the defendants did not properly discharge their public

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duty and as a result public confidence will be seriously damaged. As was pointed out in Milford Haven Port Authority [2000] 2 Crim.App.R. Sentencing[?], public bodies are not immune from appropriate criminal sanctions. Indeed the policy of Parliament would be frustrated if such an idea gained currency. No doubt the court should not impose a penalty which is so large as to hinder the authority from the proper performance of its public duty, but having identified that pitfall I shall endeavour to avoid it.

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For all these reasons I have no doubt that the defendants are guilty of serious faults and failings and this must be marked by a significant fine. Taking into account all the matters to which I have referred, I think that after a trial a proper fine would be three quarters of a million pounds. I give credit of one third for an early plea. That will result in a fine of half a million pounds. That will be allocated between the various charges as follows; Charge 1, breach of Condition 27, there will be a fine of £300,000; Charge 2 and Charge 3, alleging respectively breaches of Conditions 34 and 24, there will be a fine of £100,000 on each, making half a million pounds in all.

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There will be an order that the defendants pay the whole of the prosecution costs in the sum of £67,959.48. I think strictly I should make an order that it is payable within 28 days.

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