

## **The sentencing of British Nuclear Group over the accident at THORP**

On 16th October 2006, British Nuclear Group, the operator of the massive Sellafield nuclear complex, faced sentencing in the Crown Court in Carlisle over an accident that led to the shut-down of the THORP spent nuclear fuel reprocessing plant. This is a transcript of the judge's sentence:

### **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.

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.

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.

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.

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.

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.

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.

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 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 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.

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 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.

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 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.

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 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.

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 radioactive 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.

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.

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

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.

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.

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, 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.

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.

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 have been taken every three months. For a variety of reasons the checks were ineffective.

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.

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.

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.

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.

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.

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.

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 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.

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.

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.

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.

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.

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 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.

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.

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.