UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
BEFORE THE COMMISSION

In the Matter of

Docket No. 11005440

U.S. DEPARTMENT OF ENERGY

(Plutonium Export License)

2nd SUPPLEMENTAL DECLARATION OF 23 MARCH 2004 OF JOHN H LARGE IN SUPPORT OF PETITIONERS' HEARING REQUEST AND PETITION TO INTERVENE

Under penalty of perjury, I, **John H Large**, declare as follows:

1 INTRODUCTION

1.1 On 26 November 2003, I submitted a Declaration and technical report R3112-A3 in support of Petitioners' Hearing Request and Petition to Intervene. I also submitted a Supplemental Declaration on 9 December 2003 that dealt with matters of detail relating to the security arrangements and vetting by the UK government for the sea transit stages of the Eurofab program.

1.2 My report, R3112-A3, addresses security and environmental issues relating to the proposed *Eurofab* programme to transport plutonium dioxide from the United States to France for fabrication into MOX fuel assemblies, and thence return these to the United States.

1.3 Since the time of compiling both Declarations I have completed a study into the hazards and risks of the transportation of French-sourced plutonium dioxide from the COGEMA plant at la Hague to Cadarache and Marcoule, a road journey of about 700 miles – I mentioned this then impending work in para 8.2 of my report.

1.4 I believe that it would contribute to the Commissioners' consideration of the application for the export license for me to summarise the findings of my French study[1] as this applies to the proposed Eurofab movement of plutonium dioxide in France.

2 ASPECTS OF FRENCH-PuO_2 TRANSPORTATION RELATING TO THE US EUROFAB PROGRAM

2.1 Other than the additional short road leg from the landing port at Cherbourg to the COGEMA works at la Hague (about 10km) and that the French-sourced plutonium is *'reactor grade'* and not *'weapons grade'* as in the Eurofab programme, the transportation arrangements and the transport route for French- and US-sourced plutonium will be identical.

2.2 The plutonium dioxide is consigned in FS47 flasks, the flasks are transported held in a rack loaded into what seems to be a standard 20ft long intermodal standard or ISO container piggy-backed onto the trailer of commercial truck, each vehicle carries up to 10 FS47 flasks held in a rack that is a snug fit into the ISO container. The road route is known to observers of these things (notably Greenpeace France) and rarely varies, and the en-route security comprises two light vehicles (a car and minibus) carrying 4 to 6 lightly armed gendarme personnel.

A 10-capacity rack with 8 FS47 flasks installed awaiting loading into the ISO container – note that the rack and flasks occupy virtually the whole of the ISO container cross section

2.3 This is quite different to the transportation arrangements to be adopted for the Eurofab shipment across the United States where the number of FS47 flasks per vehicle is to be limited to a maximum of 3 and the vehicles themselves are *Special Secure Transports* (SSTs) or *SafeGuards Transports* (SGTs).

2.4 Presently, French-sourced consignments of about 280 to 300kg PuO_2 are carried in two vehicles making up a convoy that regularly passes south of Paris on the A6 highway, and to the east of Lyon where the A6/A7 crosses the River Rhône, thereon travelling further due south to the Marcoule and Cadarache plants. Since, in terms of physical security and

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1 Large & Associates, *Potential Radiological Impact and Consequences Arising from Incidents Involving a Consignment of Plutonium Dioxide Under Transit from Cogema La Hague to Marcoule/Cadarache*, March 2004 – this paper is available in English and French on http://www.greenpeace.org/international_en/multimedia/download/1/424600/0/Large_report.pdf, a copy of which is appended as Exhibit 1.

safeguarding the plutonium consignments, these established shipments are acceptable to the French authorities there is no reason to suppose that the French would amend or uprate their procedures especially for the US Eurofab consignment.[2] If so, the assumption should be that the total 9 FS47 flasks of the Eurofab consignment are likely to be carried by a single truck in much the same fashion as the present and regular French-sourced consignments.

Comparison of French (left) and United States road transport vehicles – the French vehicle is a commercial tractor unit with an unarmoured ISO container on the trailer – the US safe secure transport (SST) is a fully armoured custom-built vehicle with anti-access and removal equipment and devices built-in – the US vehicle is limited to 3 FS47 flasks whereas the French vehicle carries 9/10 FS47 flasks. The US SST shown may now have been replaced with a similar but upgraded SGT vehicle.

2.5 This leads me to correct paragraph 3.9 of my previous report RL3112-A3 noting that special 'SIFA' vehicles would each carry just 3 FS47 flasks to Cadarache. Now it is obvious to me that the French are, as is their present practice, expected to carry all 9 flask of the Eurofab consignment by a single truck, not a SIFA vehicle but which is little more than a commercial vehicle fitted with an ISO container.

2.6 For the French study, I sought to investigate the outcome of two severely damaging incidents involving the FS47 flasks and the carrying truck.

2.7 The first of these was a hypothesised road accident with an engulfing fire in the confines of a road tunnel with the fire burning for many hours. This scenario drew on the facts of the Mont Blanc road tunnel fire of 1999 which, initially triggered by a truck carrying a mixed load of margarine and flour, raged for about 50 hours.

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2 Indeed, if the French were to treat the Eurofab consignment exceptionally then this might serve to attract criticism that its own French-sourced plutonium shipments were inadequately safeguarded in transit.

2.8 The second incident centred round a well-planned and executed terrorist attack on the convoy where the plutonium consignment vehicle was isolated, then the terrorists enter the ISO container and explode shaped charges against the FS47 flasks to breach the containment, thereafter setting a fire either in the confines of a tunnel or in the protected space under an overbridge. These arrangements would maximise the release and dispersion of the plutonium dioxide.

2.9 My analysis of these situations considered only a release to atmosphere, its passing and subsequent dispersion and ground deposition, omitting any consequences of the plutonium run-off into watercourses. The fraction of plutonium dioxide released in either accident or terrorist scenario, is taken directly from the United States Department of Energy (DOE) environmental impact study (Supplemental Analysis)[3] relating to the Eurofab project that is to involve the movement of US-sourced weapons-grade plutonium to France for conversion to mixed oxide fuel (MOX). In its study, the US DOE assumes that a severely damaging accident could result in a release of respirable-sized aerosol of 595g (about 3.5% of the total carried in a single flask) from the *weapons-grade* plutonium dioxide of one of three FS47 flasks carried in a single, armoured road vehicle (a US SST/SGT).

2.10 For my analysis, I adopted the US-defined release conditions and fractions and applied these to the French-sourced consignments of *reactor-grade* plutonium dioxide carried in the unarmoured trailer compartment of each of the two vehicles making up the convoy, but with each vehicle carrying 9 full FS47 flasks compared to the 3 identical FS47 flasks per vehicle in the United States Eurofab proposal.

2.12 These release fractions are applied to the more radiotoxic *reactor-grade* consignment for i) a severely damaging road accident in which one FS47 flask is breached, ii) a similar road accident where the same proportion of FS47 flasks fail in a single vehicle (ie 1:3 so 3 of 9 flask failures); iii) a road incident in which both vehicles of the convoy are caught in a road tunnel fire in which all flasks fail, and iv) a well planned and executed terrorist attack centred on one of the vehicles of the convoy.

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3 Supplement Analysis*, Fabrication of Mixed Oxide Fuel Lead Assemblies in Europe*, November 2003, US DOE/EIS-0229-SA3

INCIDENT TYPE	i) SEVERE ROAD ACCIDENT – 1 VEHICLE	ii) SEVERE ROAD ACCIDENT - 1 VEHICLE	iii) SEVERE TUNNEL ACCIDENT 2 VEHICLES	iv) TERRORIST ATTACK 1 VEHICLE
Nº OF FS 47 FLASKS BREACHED	1	3	18	9
RESPIRABLE-SIZED PuO_2 RELEASED	0.595kg	1.785kg	10.71kg & 25.22kg	5.355kg

2.13 The above table shows the range of respirable-sized releases considered for my French analysis. Each release mass derives from the US DOE release fraction cited in the Supplement Analysis,[3] except for the severe tunnel accident (Case iii) above) of 25.22kg which assumes a release fraction consistent with NUREG Category VIII (~1E-01).[4]

2.14 To be satisfied that these release fractions were viable under the conditions specified, I established two numerical models relating the thermal and explosive performance of the FS47 flask. In order to confirm the results of my own analytical modelling of the thermal and explosive cases I searched for literature and papers relating specifically to the performance of the FS47 flask.

2.15 Two papers of interest were found.

2.16 The first was a somewhat generalized paper by the radioactive transport security division (SSTR) of the French Institut de Protection et de Sûreté Nulcéaire (IPSN)[5] referring to the thermal performance of the FS47 flask under engulfing fire conditions that extend in both time and temperature beyond the IAEA TR-1 thermal test conditions - *Rapport Scientifique et Technique 2000, Section 2 Safety Margines for Radioactive Material Transport Packages Subject to Fire – Experimental Work-Development of Numerical Simulation Tools.*[6]

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4 *Final Environmental Impact Statement on the Transportation of Radioactive Material by Air and Other Modes*, NUREG-0170, December 1977. NUREG – publications of the US Nuclear Regulatory Commission.

5 IPSN and IRSN are really the same institute, named before or after its definition changed in February 2002. The same applies to the DSIN (Direction de la sûreté des installations nucléaires) and the DGSNR (Direction générale de la sûreté nucléaire et de la radioprotection), the French nuclear safety authority. The change in statutes was mainly about integrating the radioprotection in the existing safety expertise body (then IPSN) and authority (then DSIN). That meant the split of another body, OPRI (Office pour la protection contre les rayonnements ionisants), which played both the role of expertise body and authority in the radioprotection field (corresponding services have thus been integrated in IRSN and DGSNR).

6 S Felix, et al – this paper dates from about 2001/02 although it is not clear when it was made publicly available. This paper is now available on http://www.irsn.fr/vf/09_int/09_int_3_lib/pdf/rst2000/087-93.PDF, a copy of which is appended as Exhibit 2.

2.17 The second paper, prepared by the French Institut de Radioprotection et de Sûreté Nulcéaire (IRSN), refers quite specifically to the performance of the FS47 when subject to explosive charges - *The French Approach Concerning the Protection of Shipping Casks Against Terrorism.*[7]

2.18 The empirical fire tests on the FS47 flask conducted by IPSN[6] suggests that the flask elastomer sealing gasket can withstand a 800^{o}C fire for about 5 hours or longer if a viton or silicon gasket is used. In my hypothesised tunnel fire accident fire temperatures were assumed at 1,000^{o}C and fire duration longer than 10 hours, under which conditions my model predicted yielding and failure of the outer and inner containments of the FS47 flasks (particularly along the bottom radial welds).

2.19 The second paper related the outcomes of a series of explosive trials on a geometrical mock-up of a reduced scale FS47 flask, including the detonation of a large amount of explosive nearby (simulating a nearby truck bomb) and, separately, a conical perforating charge simulating a shaped charged and/or a bullet-like projectile. [8]

2.20 The first explosive test resulted in a complete removal of the ISO container sides,[9] rupturing of the outer shell of the flask, and distortion but not failure of the inner tube containing the plutonium dioxide. In the particular trial, the flask was free-standing and not restrained within the spider-like frame of the vehicle rack that, if present, would likely increase the equivalent plastic deformation of the inner tube locally to beyond its ductility threshold, bringing it to failure.

2.21 The second explosive trial was based on the relatively inefficient type of weaponry believed to be available to terrorists. The results show quite clearly that a conical shaped charge will penetrate the outer shell, with its jet passing into and through the inner tube, passing out of

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7 B Autrusson, D Brochard – this paper seems to have been first published in or about 27 January 2004 as part of ASME Pressure Vessel and Pipework proceedings of a conference in Chicago of late 2003 but it would not have been available to anyone but conference delegates at that time, it seems to have become first publicly available when it was placed by IRSN on its web site on or about 23 February 2004. This paper is available on http://www.irsn.fr/net-science/liblocal/docs/ docs_DEND /frenchapproach.pdf, a copy of which is appended as Exhibit 3..

8 A conical charge was chosen to simulate the types of weaponry known to be available to terrorist. The actual charge used, referred to as CSC1 was relatively inefficient but the paper refers to a more efficient charge CSC2 which has been modeled numerically, although no results of this modeling are available.

9 Which, incidentally, are shown to be unarmoured by the modelling device adopted for the trial.

the flask through the backside of the outer shell, whilst taking with it a volume of the plutonium dioxide powder scavenged by the interaction of its passage.

2.22 So, it is quite clear from this French work[6,7] on the FS47 flask that the flask design would fail under both prolonged thermal conditions and explosive charge. My point here is that although the FS47 flask has been certified compliant with the IAEA TR-1 standard for accidents, it is not at all resilient against prolonged fire engulfment or terrorist attack, conditions that cannot no longer, particularly in today's climate of international terrorism, be dismissed as most unlikely.

2.23 The weakness of the FS47 flask is particularly relevant because recently it has been subject to review of its containment and revalidation by the US Department of Transport (DOT).[10] Although the revalidation date was set at August 2003 there seems to be nothing in the public domain as to whether this process has been completed or not. Since it is now public knowledge[6,7] that the FS47 fails both realistic tunnel fire conditions and explosive attack, it seems to me that common sense should dictate that these two factors be taken into account for the revalidation of the FS47 certificate of worthiness.

2.24 Once that I had established realistic release fractions for the nominated scenarios, the dispersion and health detriment analysis was undertaken using the software modelling suite COSYMA. This European Commission developed and approved software is seeded with population and weather data applicable across Europe, and it includes for the implementation of countermeasures during the progression of the release.

2.25 The results of this analysis[11] indicate that the consequences of a radiological release during the road transit of plutonium dioxide in quantities that are potentially available, from both terrorist attack and road accident, are mainly long-term in nature, giving rise to increased cancer incidence, particularly lung, bone, and liver cancer. Apart for the short-term risk to

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10 Memorandum To: Larry W. Camper, Deputy Director Licensing and Inspection Directorate Spent Fuel Project Office, NMSS From: Nancy L. Osgood, Senior Project Manager /RA/ Licensing Section Spent Fuel Project Office, NMSS, dated 29 May 2003 – the relevant text is under item 2 *"Model No. FS47. The FS47 is designed for transport of up to 140 kg of plutonium dioxide powder. The package description is provided in the meeting handout. One shipment will be made using nine loaded packages along with an empty spare package. The package evaluation was discussed. PacTec plans to provide separate criticality and containment analyses using U.S. codes and methods, specifically addressing the contents needed for this shipment. PacTec plans to request DOT revalidation of the French certificate in August 2003."* – this memorandum is available on http://www.nuclear.com/archive/2003/06/10/MOX_transport_pkg_design/ML0315403421.pdf

11 As a cross check to COSYMA, I also run the Lawrence Livermore National Laboratory Hotspot software.

those individuals engaged in the transport activity (drivers, guards, etc) and emergency personnel attending at the scene of the incident, exposure levels are unlikely to produce early effects of radiation sickness and mortality.

2.26 For the road tunnel location at Versailles (about 17km from the centre of Paris) the numbers of individuals projected to suffer late mortality are:

LOCATION	SCENARIO WITH COUNTERMEASURES[12]	MEAN	MAX
Paris Outskirts	Road Accident – 0.595kg release	**68**	**523**
Paris Outskirts	Road Accident – 1.785kg release	**204**	**1572**
Paris Outskirts	Tunnel Fire – 10.71kg release	**613**	**4879**
Paris Outskirts	Tunnel Fire – 25.200kg release	**1323**	**11520**
Paris Outskirts	Terrorist Attack – 5.250kg release	**467**	**4691**

2.27 These projections are of increased incidence of mortality arising as a direct result of the releases, with the range of the forecast being determined by weather conditions. The increased (over existing from other causes) incidence of cancers would be expected to peak after a delay of 15 to 30 years, with a shorter determination for leukaemia of, perhaps, 5 years from the date of exposure. Because the population exposed is so large, not only would the impact of the health detriment and fatalities remain hidden for several decades, but the significance of the numbers directly attributable to any of the earlier plutonium releases might be masked by the high 'natural' incidence, particularly of lung cancers in smokers, in the population.

2.28 For the terrorist triggered incident, the numbers of public requiring to shelter, around Paris for example, ranges from some 40,000 to several million individuals over an area of up to 900km^2 depending on the prevailing weather conditions and the particular incident scenario.

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12 These results are for *'reactor grade'* plutonium dioxide and not for the *weapons grade* that is to be shipped under the Eurofab proposals – the mortality results are expressed in percentile, included in the table are just the 99th and mean percentiles. Any such analysis for the Eurofab consignment would have to be rerun for weapons grade plutonium, which has a lesser health impact although, that said, the French are likely to run the Eurofab in one of two trucks of a convoy, which individually would not be

2.29 Of course, such projections are hypothetical particularly because advice from the authorities to shelter might, itself, prompt a mass self-evacuation. The model assumption is that, at any time, 90% of the public are indoors and thus are already sheltering at a 50% reduction in dose uptake, so the additional benefit of implementing the organised sheltering countermeasure only applies to 10% of the potentially exposed population. Self-evacuation is likely to result in more individuals coming onto the streets without much protection and, indeed, some may unknowingly move into contaminated areas and/or become trapped for hours in the jams and traffic chaos that is almost bound to arise. The conundrum for the authorities being that the introduction of countermeasures might (indeed is likely to) increase the exposure and, hence, health detriment to many more members of public.

3 IN CONCLUSION

3.1 US -v- French Standards

3.2 For the proposed Eurofab shipment, the United States will use the same transport flask (FS47) but is to restrict the number of flasks per vehicle to 3 when overland in the United States, whereas the French transport up to 9 or 10 fully loaded flasks per vehicle.

3.3 The US road convoy comprises custom-built Safe Secure Transport (SST or SGT) trucks that are fully armoured and equipped (so I understand) with at least two systems that automatically prevent the removal of the flasks, and armoured personnel carriers accompany the convoy throughout its transit, whereas the French vehicle seem to be little more that a commercial tractor unit hauling a trailer with a standard ISO container attached.

3.4 That is not to say, that the apparently superior SST/SGT transport system to be used in the United States is invulnerable to terrorist attack. Obviously, an attacker would seek to identify and exploit the weaknesses of any transport system to gain access to the FS47 flasks that may be penetrated by small shaped charges.[7]

3.5 Completely at odds with the French, the US Supplement Analysis[3] reaches the conclusion that the FS47 flask could fail in a road accident and that there is a potential for 595g respirable-

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identified as carrying either the US-sourced or French-sourced plutonium – any consequence analysis could therefore involve either weapons or reactor grade, or a combination of both.

sized release. However, the French express utter confidence that the FS47 flask is failsafe, so much so that the worst credible accident would only result in a 0.07g release (ie 8,500 times less than the US projection).

3.6 Because the French authorities do not concede that in a real incident an amount of plutonium greater than the 0.07g could be released, a maximum long-term dose of 10mSv is assumed for any member of the public located within the immediate vicinity, and that no emergency actions will be required further than 200 metres from the point of release. This contrasts to the consequences of real incidents in which realistic amounts of plutonium are released, where sheltering distances extend from 1km to 110km depending on the incident severity and, even with this countermeasure being deployed, the long-term radiation dose to the lung, for example, could be several hundred milliSieverts.

3.7 **Double Standards**

3.8 In paragraph 4.13 of my report R3112-A3, I noted that although the US DOE acknowledged that the *'likelihood'* of acts of terrorism were *'not precisely knowable'*, it was to put in place transport methods and arrangements that are designed *"to afford security against sabotage or terrorism, as well as safety in the event of an accident."*.

3.9 In this respect, my studies of the French security and physical protection arrangements now strongly endorse the conclusion that I drew in paragraph 5.11 of my report R3112-A3, which is that that the French application of IAEA INFCIRC/225.Rev 4 alone falls far short of the levels of physical protection and security sought by the United States for such movements on its own territory.

3.10 I am, quite frankly, very surprised that the US DOE is acquiescent to such double standards.

3.11 **The French Approach**

3.12 Not surprisingly, the French authorities robustly defend their transportation arrangements for plutonium dioxide, going so far as to be critical of the US DOE Supplement Analysis in that:

> *". . .*
>
> *'the 595g release was based on an "empirical or envelope value" for [a] release coefficient specified in a 1977 document, [that was] never updated'*

and that

> *". . .*
>
> *"the [US] DOE had concluded that the FS47 could open and spill its contents; rather, he said, that was merely a "mathematical calculation" of how much would get out in case of an accident, based on a theoretical number".*[13]
>
> *[my additional explanation]*

3.13 In my opinion, the 595g respirable-sized release quantity (3.52E-02 or about 3.5% release fraction) for a severely damaging road incident is realistic, being commensurate with proven levels of release in transportation incidents. I am therefore surprised that the French choose to reject the US DOE's assumption in such a dismissive manner.

13 Nuclear Fuel, Volume 29 , Number 6 - March 15, 2004

3.14 **FS47 Resistance to Severe Accidents and Explosive Attack**

3.15 IPSN literature[6] recently made available in the public domain, shows that although the FS47 flask appears to be compliant with the IAEA TR-1 30 minute thermal test, when subject to tunnel fires with realistic burn duration, the flask seals would break down in about 5 hours and the flask would rupture after about 10 hours. Given this, I am reliably informed by Greenpeace France, having tracked the plutonium convoys for several years,[14] that no special precautions or arrangements are undertaken when the convoy vehicles transit the road tunnels nearby Versailles and Cadarache.[15]

3.16 IRSN literature made publicly available in the last month shows the FS47 flask to fail when subject to a relatively crude conical shaped charge (like a RPG round) and that the ISO container carrying the rack of flasks is not armoured.[7] Moreover, the performance of the FS47 has been numerically modelled when subject to a more advanced and efficient weapon (CSC2), for which a projection of the amount of plutonium dioxide dragged out of the inner containers has been calculated, although the actual amount dispersed has not been published.

3.17 My own analysis of this situation suggests that, even for CSC1, the amount of plutonium dioxide interacted with and dragged out of the FS47 would be considerably greater than the 0.07g adopted by the French for emergency planning.

3.18 It seems to me that the US Department of Transport (DOT), in revalidating the certificate of worthiness (if, in fact, this has been completed at this time), should have taken into account the unsatisfactory thermal and explosive performance of the FS47 flask. It is a precarious if not tempting situation to have papers in the public domain that identify such fundamental weaknesses in the performance of the flask design.

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14 The Greenpeace France web site documents the convoy movements with maps, photographs and videos – see http://www.stop-plutonium.org/

15 For example, in the United Kingdom hazardous loads are generally prohibited from entering road tunnels and, where they are permitted such as at the Thames tunnel crossing at Dartford (near London), the loads are marshalled into convoys which is then accompanied by guard vehicles through the tunnel.

3.19 **Terrorist Actions**

3.20 In Section 6 of my report R3112-A3 I was critical of the lack of detailed account of terrorism included in the EIA of the Supplemental Analysis, particularly that the relevance of such acts was somewhat tenuous and not at all substantiated.

3.21 My unease is substantiated by recent events with the railway bombings in Madrid during the 2nd week of March, and in France in mid-February,[16] that suggest an increase of terrorist activity in Europe. In fact, the French road consignments of plutonium dioxide have been, reportedly,[17] specifically identified by a named terrorist as potential targets, viz *'Il aurait avoué avoir commis des vols et un braquage de banque à l'occasion de retours en France, où il entretenait également des projets d'actions martyres" visant notamment une raffinerie de pétrole, une synagogue et "des camions transportant du plutonium".*'[18]

3.22 Of course, a terrorist act could also involve the removal and theft of parts of the plutonium dioxide consignment. For example, the terrorists might first isolate a convoy truck in a secure area, then enter the ISO container and break or burn open (by explosives or thermic lance) one or more FS47 flasks, removing a number of 'AA-432 convenience' cans each holding 3.4kg of plutonium dioxide. A number of these cans (each about 4 inches diameter by 8 inches long) could be moved from the immediate area of the incident by, for example, cross-country motorcycles.

3.23 These factors - increased terrorist activity in Europe, the plutonium dioxide convoy being specifically cited by a terrorist, and the possibility of theft – strongly suggest to me that an assessment should be made of the proliferation and terrorist threat issues that might be targeted directly on the Eurofab consignment.

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16 The actions of the self-styled 'AZF' group which placed a bomb under the tracks of a main railway line near Toulouse then informed the French authorities of its location on 21 February 2004.

17 Article in Le Monde, 25 August 2003, although more recently this particular individual, Pierre Robert alias 'Abou Abderrahmane', has been linked to the Madrid bombings.

18 Literally translated *'It is acknowledged to have made air flights and established bank accounts at the time in France, where it also maintained martyrdom projects, in particular aiming an oil refinery, a synagogue and trucks transporting of plutonium'.*

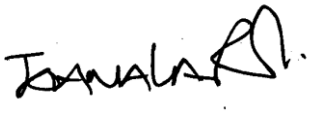
4 CONCLUSIONS AND RECOMMENDATIONS

4.1 At the time that I submitted my first Declaration (November 2003) I had then to complete a detailed case study of the plutonium dioxide transport regime in France.

4.2 Over the last three months, I have studied the French transportation arrangements in detail, I have driven over much of the route taken by the convoy, and I visited the locations at Versailles, Lyon and Aix en Provence where, quite incredibly, the plutonium convoy passes through the town itself.

4.3 I have also undertaken comprehensive modelling of a number of what I consider realistic release scenarios, deploying European Community dispersion and health impact software that includes for emergency countermeasures to reduce the health impact. Even so, the long-term health impact (albeit for reactor grade plutonium dioxide) is very significant and sufficient, I suggest, to consider the French transportation arrangements, together with the post-release emergency planning, NOT to be suited to the safe and secure transport of plutonium dioxide.

4.4 I conclude that, given the irrational intention and motives of international terrorists that the Eurofab plutonium dioxide convoy could be at threat of terrorist attack – I believe this threat to be greater because the Eurofab consignment is US-sourced.



JOHN H LARGE

23 March 2004