LAA/15/D

APP/L2250/V/10/2131934 & APP/L2250/V/10/2131936

SECTION 77 TOWN AND COUNTRY PLANNING ACT 1990 – REFERENCE OF APPLICATIONS TO THE SECRETARY OF STATE FOR COMMUNITIES AND LOCAL GOVERNMENT

TOWN AND COUNTRY PLANNING (INQUIRIES PROCEDURE) (ENGLAND) RULES 2000

REBUTTAL PROOF OF EVIDENCE OF DAVID NICHOLLS BSc

NUCLEAR SAFETY

21st April 2011

In respect of:

Planning Application Reference: Y06/1647/SH (New Terminal Building)

Planning Application Reference: Y06/1648/SH (Runway Extension)

relating to land at London Ashford Airport, Lydd, Romney Marsh, Kent, TN29 9QL

LYDD London Ashford Airport

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1. Introduction

Qualifications and Experience

1.1. My name is David Bryan Nicholls. I have a BSc Hons degree in Engineering Mathematics from the University of Bristol. I am a Principal Consultant at AREVA Risk Management Consulting Ltd (AREVA RMC), where I am responsible for our activities in aviation. I have over twenty years' experience in safety and environmental risk consultancy, helping clients with risk assessments and the development of safety cases, and providing training in risk topics, with a particular focus on risk tolerability and the relationships between safety risk, environmental risk and land use planning. My experience has been gained in sectors ranging from air and rail transport to nuclear and chemical plant, working for many different industries, regulators and European institutions.

1.2. Much of my work in aviation has been for airport operators, air traffic service providers, airlines and airport planning and engineering consultancies, in the areas of air traffic management, flight deck operations and airport operation.

1.3. I have carried out many assessments of aircraft crash risks around airports in the UK, in connection with planning applications and inquiries relating to development at or in the vicinity of the airports. I also reviewed the international state-of-the-art in Public Safety Zone policy and assessment, on behalf of a planning consultancy in the Republic of Ireland.

1.4. At European level, I frequently work for Eurocontrol, the European organisation for safety in air traffic management. Projects have included contributing to the development of their generic safety assessment methodology, and to the European Action Plan for reducing the risks associated with aircraft straying into unauthorised airspace.

1.5. For the UK Civil Aviation Authority I have carried out research (with CSL, now Fera) into bird strike risks, and have developed guidance on the design, presentation and use of electronic flight deck emergency checklists.

1.6. In the nuclear area, my experience in the safety of power stations has included an analysis for AREVA and EdF of how arguments and evidence within the evolving safety case for the proposed EPRTM nuclear power station design would satisfy the NII Safety Assessment Principles (SAPs).

1.7. I have also carried out several projects associated with the development of safety assessments and safety cases for radioactive waste transport systems and operations, on behalf of the Nuclear Decommissioning Authority (NDA).

Background

1.8. In 2009, together with colleagues at AREVA RMC, I prepared a report [1] for London Ashford Airport (LAA) on the risk associated with aircraft crash onto the nuclear power stations at Dungeness.

1.9. Our predictions indicated that, for the forecast aircraft traffic corresponding to 500,000 passengers per annum, the crash frequency would remain below a tolerability criterion derived from the 'design basis' criteria in the NII SAPs. Consequently, the risk would not, as objectors had claimed [2], be intolerable on the basis of crash frequency alone. We concluded, rather, that the risk would lie in the As Low As Reasonably Practicable (ALARP) region, within which it is appropriate to weigh nuclear safety together with the other effects of the proposed development.

1.10. For clarity, I have provided in Appendix A a summary of how nuclear safety is managed in the UK, with particular regard to aircraft crash, and how it can be decided what is 'safe enough'. The Appendix outlines:

- the duties of the power station operator and airport with regard to safety
- the roles and remits of the safety regulators
- the ALARP principle and
- how I have derived a tolerability criterion for aircraft crash.

Objectives and Scope

1.11. This rebuttal proof seeks to assist the Inquiry by setting out some points of rebuttal to evidence submitted by LAAG on the topic of nuclear safety. The evidence that I have reviewed falls into two main categories: that dealing with the aircraft crash risk to the Dungeness nuclear power stations, and that dealing with 'demographics'- the risk to persons at the airport from accidents at the power stations.

1.12. Sections 2 to 5 of this rebuttal cover, respectively, the following proofs relating to aircraft crash:

- LAAG/4/A. John Large. Review of the Risks and Hazards presented to the Nuclear Power Plants at Dungeness from the Proposed Development of

Lydd Airport (London Ashford Airport). Statement of John H Large. January 2011.

- LAAG/5/A. David Pitfield. Aircraft Accident Modelling for Lydd Airport, Kent. Revised, December 2010.
- LAAG/3/A. Trudy Auty. Proof of evidence of Trudy Auty, BSc, ARCS (Nuclear Safety Conflicts). Undated.
- LAAG/3/E and 3/F. Trudy Auty. Supplementary Proof of Evidence - ESR Technology Reports. 8th April 2011.

1.13. Section 6 of this rebuttal covers the proofs relating to demographics, as follows:

- LAAG/4/D. John Large. Consideration of Circular 04/00: Planning Controls of Hazardous Substances relating to the Proposed Development of Lydd Airport (London Ashford International Airport) to Dungeness Nuclear Power Stations. Statement of John H Large. 26 January 2011.
- LAAG/4/K. John Large. Application of the Demographic Siting Criteria and other related Site Issues to Dungeness A and B NPPs and applied to a Future Dungeness C NPP. Statement of John H Large. 12 February 2011.

1.14. In addition to the main proofs noted above, Mr Large and Mrs Auty present a number of summary proofs and appendices. Some of my rebuttal points apply equally to these additional documents but, to avoid unnecessary duplication, I have not referred to them except where specifically necessary.

1.15. This rebuttal proof, like the assessment in [1], considers the nuclear safety risks as predicted using generic data and models. I have not commented in detail on evidence presented by Mr Large, Dr Pitfield or Mrs Auty relating to the site-specific factors that have been identified as potentially important for LAA. These factors are explored in detail by others, the LAA evidence on these topics being principally that of Mr Deacon on bird hazard and Mr Maskens and Mr Roberts on airport/ aircraft operations.

1.16. This rebuttal proof is not intended to be exhaustive and only deals with selected points where it is considered necessary to respond. Where a specific point has not been dealt with, this does not necessarily mean that these points are accepted, and other points will be addressed at the Inquiry.

2. Review of LAAG/4/A – aircraft crash consequences (Large)

Introductory remarks – tolerability of aircraft crash risk

2.1. In comparison with his earlier report [2], Mr Large's evidence on aircraft crash in LAAG/4/A now concentrates on crash consequences, referring to Dr Pitfield's proof (LAAG/5/A) for information about crash frequencies.

2.2. Importantly, Mr Large no longer makes the incorrect claim, in the earlier report [2], that the risk would be unacceptable simply by virtue of the crash frequency being above the NII screening level of 1 in 10 million per year (10^{-7} per year). However, in drawing his conclusion (paras 80 and 185) that the risk is 'unacceptable', he relies on Dr Pitfield's proposed criterion, which, as I show in my paras 3.17 to 3.23, is inappropriate and incorrect.

2.3. Mr Large's overall contention is that an aircraft crash onto a nuclear power station could lead to major radiological consequences. Some of his statements give an overly pessimistic picture of the likelihood and severity of such consequences and I address these below.

Assessment basis – number of aircraft movements

2.4. At several points, Mr Large presents predictions for aircraft movements corresponding to 2 million passengers per annum. This figure is incorrect. The proposal before this inquiry is for a maximum of 500,000 passengers per annum. If LAA subsequently wishes to expand the airport further, to enable more than 500,000 passengers per annum, a new planning permission would be required.

Restrictions on aircraft movements while nuclear trains are passing

2.5. Mr Large points out, in his footnote 32, that the UK Aeronautical Information Publication (AIP) for LAA [3], states that the restriction on aircraft movements on runway 21, when a train carrying nuclear materials is passing on the railway line south of the airport, applies (only) to training take-offs that involve practice engine failure, and not to all landings on 03 and take-offs on 21, as had been stated in [1].

2.6. In fact, the AIP also states (within Section AD 2.10 – Aerodrome Obstacles) that *'ATC procedures will be applied to ensure deconfliction of aircraft movements and the very infrequent trains that utilise the NW-SE oriented railway track*

187m SW of Runway 03 threshold.' I understand from Mr Maskens that the restrictions applied in practice are more stringent than Mr Large states. The AIP, as a document for public information, does not need to contain a full description of air traffic procedures or other operational details.

2.7. Furthermore, the restrictions on aircraft movements and associated procedures should be subject to regular review under the airport safety management system, and can be adapted to changes such as, for example, the number and types of aircraft using the runways or the frequency of nuclear train movements. I note also that one of the proposed Section 106 conditions would additionally prevent landings on Runway 21 when a nuclear train is passing.

Risks during decommissioning

2.8. Paras 43, 47 and 48 of Mr Large's proof imply that the risk may rise during decommissioning, since (he claims) when the reactor containment is removed it will leave the irradiated core and supporting structures in place for a period with no protection against aircraft crash.

2.9. In reactor decommissioning projects, however, it is the practice to remove the containment only at the final stage, when virtually all radioactive material (i.e. the irradiated core and supporting structures as well as the fuel) has been removed. This is precisely to ensure that radioactive material is adequately contained and that the risks of exposure to radioactivity can be kept below intolerable limits and ALARP.

2.10. Furthermore, the power station licensee has a duty to prepare a satisfactory Safety Case for the decommissioning operations and submit it to the NII for consideration before decommissioning can commence. This Decommissioning Safety Case would need to take account of external hazards, such as aircraft crash, and demonstrate how they will be adequately managed. In my view it is difficult to see how an adequate Safety Case could be made for removing the outer containment before all significant quantities of radioactive material had been removed.

Site area used in frequency calculation

2.11. Mr Large argues, in paras 83 – 86, that the crash frequency calculation should be based on the entire site area of the nuclear facilities, such that it includes, for example, the railhead, the overhead electricity transmission lines, transformer and switchgear, waste stores, access roads and other ancillary areas, on the basis that damage to such areas and facilities could affect safety.

2.12. The assessment in [1] predicted a crash frequency of 8.3×10^{-6} per year, below our derived tolerability criterion of 10^{-5} per year, for the whole site area of Dungeness B (it being argued that, as Dungeness A is already shut down and being defueled in preparation for decommissioning, it presents a lower risk).

2.13. It is conservative to apply this design basis criterion of 10^{-5} per year to the whole site. The NII's Technical Assessment Guide on External Hazards [4] that accompanies the SAPs indicates, for example, that design basis criteria can be relaxed by a factor of ten for facilities that cannot give rise to off-site doses greater than 100 milliSieverts. Based on AREVA RMC's experience of safety cases for other nuclear licensed sites, I am of the opinion that it is only crashes on the 'nuclear island' (comprising, principally, the reactor(s), the spent fuel ponds and the main control room) that could lead directly to doses above this level.

2.14. While a crash onto areas outside the nuclear island could reduce the margin of safety, or lead to lower doses (for example in the event of a crash onto effluent treatment plant) I am of the opinion that it would not lead to off-site doses greater than 100 mSv unless other failures occurred. For example, it is possible that an aircraft crash could disable one of the essential power supplies to a reactor, but no radiological release would occur unless backup power supplies failed. The frequency of release in such a case would need to be scaled down from the aircraft crash frequency, taking account of the number of barriers and safety systems remaining and their reliability.

2.15. I therefore maintain that the crash frequency onto the nuclear island is the most important parameter to consider. The assessment in [1] predicted that this frequency would be about 5.6×10^{-7} per year, well below our derived tolerability criterion of 10^{-5} per year.

Terrorism – ground-based attack

2.16. At para 92, Mr Large speculates that the proposed development, by increasing the number of large aircraft movements, would increase the opportunity for terrorists armed with an anti-aircraft missile to shoot down an aircraft from the ground, with the possibility that the damaged aircraft might then crash onto the Dungeness power stations.

2.17. Security is a matter for the OCNS or the DfT (for nuclear and airport issues respectively), not for the NII or the station operators' Safety Cases. (Paragraph 216 of the NII SAPs [5] states that malicious acts are to be dealt with separately from the crash frequency calculations within the safety case.) AREVA RMC has no access to information on the likelihood of such an attack, or how the acceptability of the risk would be judged. However, I would expect that, in line with the risk-based approach to security that airports are required to take [6], vigilance in and around the airport should be proportionate to the level of aircraft activity. So, I see no clear causal link between the number of movements at an airport and the inclination or ability of persons to attempt such an attack, nor has Mr. Large offered any evidence for the existence of such a link.

Terrorism – deliberate aircraft crash

2.18. Mr Large discusses, in paras 93 to 98, the possibility of an aircraft being intentionally crashed into a power station. As in my para 2.16 above, security is not a safety case matter and AREVA RMC has no access to information on the likelihood of such an attack, or criteria for judging the acceptability of the risk. However, I note that Mr Large does not offer any convincing reasons as to why a deliberate crash should be any more likely with the proposed development than without it.

2.19. As for a ground-based attack (my para 2.16) I would expect that, in line with the risk-based approach to security, increasing movements will necessitate greater safeguards at the airport itself. Furthermore, I do not see any clear causal link between increased movements at an airport close to a potential target and the inclination or ability of persons to attempt such an attack – it could equally well be attempted using an aircraft taking off from or bound for other airports.

3. Review of LAAG/5/A – aircraft crash frequency (Pitfield)

Introductory remarks

3.1. Dr Pitfield's evidence presents a review of the Byrne methodology used by AREVA RMC and HSE to estimate aircraft crash frequencies, in the light of, inter alia, alternative approaches developed at Loughborough University.

Assessment basis – numbers of aircraft movements

3.2. At several points, Dr Pitfield, like Mr Large, presents predictions for aircraft movements corresponding to 2 million passengers per annum. As in my para 2.4 commenting on Mr Large's use of the higher number, the present applications are for facilities that would enable a throughput of 500,000 passengers per annum. If LAA subsequently wishes to expand the airport further, to enable more than 500,000 passengers per annum, a new planning permission would be required.

Sparse accident data

3.3. One of Dr Pitfield's criticisms of the Byrne [7] model is that the crash rates per movement are based on a 'sample' (para 2.1) or 'database' (para 4.4) of small numbers of accidents. This gives the misleading impression that only a very small number of events have been considered, and hence that the crash rates derived are very unreliable. In fact, the crash rates were derived by looking at the (very large) number of aircraft movements that occurred in the UK over the time period of several years. The small number of accidents that occurred in that sample is evidence of a low crash rate.

Movement types and directions assessed

3.4. In para 2.1, Dr Pitfield states that AREVA RMC's 2009 report [1] should have modelled three movement types and directions (landing on runway 03, taking off on runway 21 and landing on runway 21), not only the first two of these. However, the AREVA RMC assessment in [1] did apply the Byrne model correctly, as outlined in my paras 3.4 and 3.5 following.

3.5. For landings, the x co-ordinate in Byrne's crash location function (equation 7 of [7]) is measured from the arrival end of the runway, with positive x in the direction opposite to that of the aircraft's travel. Byrne states that this equation is not valid for x less than - 3.275 km, the value of the function being zero for any larger negative value of x. In effect, Byrne's model indicates that such large overshoots or overruns are so unlikely that the airport-related crash frequency at such locations is indistinguishable from the background level. The location of the Dungeness power stations relative to the airport is such that it falls outside this limit for landing on runway 21, and the crash frequency predicted by Byrne's model is therefore zero.

3.6. For take-offs, the x co-ordinate in Byrne's crash location function (equation 8 of [7]) is measured from the departure end of the runway, with positive x in the direction of travel of the aircraft. (see again Figure 13 of [7]). Byrne states that this equation is not valid for x less than - 0.6 km, the value of the function being zero for any larger negative value of x. In effect, Byrne's model indicates that crashes further away in the direction opposite to that of the take-off are so unlikely that the airport-related crash frequency is indistinguishable from the background level. The location of the Dungeness power stations relative to the airport is such that it falls outside this limit for take-off on runway 03, and the crash frequency predicted by Byrne's model is therefore zero.

Application of the Byrne model co-ordinate system

3.7. In para 5.5, Dr Pitfield's own use of Byrne's co-ordinate system is flawed. He states that, for runway 21, x = 4.348 km. As explained in my para 3.4 above, Byrne's co-ordinate system is such that the x co-ordinate of the Dungeness power stations for landings on runway 21 should be negative. For this reason, he erroneously calculates non-zero crash frequencies for landings on runway 21.

3.8. Also in para 5.5, Dr Pitfield uses the same x co-ordinates for landings and take offs on each runway. Landing and take off co-ordinates should in fact be different, being measured from the arrival and departure ends of the runway respectively.

3.9. These fundamental errors mean that the location factors, and hence the crash frequencies, that Dr Pitfield calculates, are incorrect.

Runway split

3.10. In para 2.2, Dr Pitfield states that, due to the restrictions necessary when the Lydd military range south of the airport is active, the split between runway directions would not be 30% and 70% (30/70), for runways 03 and 21 respectively as had been assumed, in accordance with prevailing wind directions, in the AREVA RMC 2009 report [1]. In para 5.4 and Table 4 of his evidence, Dr Pitfield presents his assumed runway splits: these are 5/95 for landing and 40/60 for take-off.

3.11. The factors affecting runway split are discussed in detail by others, the LAA evidence on this subject being principally that of Mr Maskens. I do not, therefore, propose to comment on what would be a realistic split as an issue in itself. However, in terms of the implications for nuclear safety, I note that Dr Pitfield's assumed runway splits would *reduce* the predicted crash frequency compared to that for our assumed 30/70 split. This arises because he proposes higher percentages of landings on runway 21 and take-offs on runway 03, both of which – according to Byrne's model - give a zero crash frequency at the Dungeness nuclear power stations.

3.12. The fact that Dr Pitfield's assumed runway splits would give *lower* crash frequencies estimates than the runway splits assumed in [1] provides reassurance that the assessment was conservative in this respect.

Site-specific factors

3.13. Dr Pitfield correctly points out (para 2.2) that the Byrne model does not take account of all site-specific factors that may affect crash rates or locations at an airport. The Byrne model takes account of only the runway location and the numbers of movements, divided between broad categories of aircraft. The models developed at Loughborough University (paras 3.1 – 3.3) are rather more sophisticated, taking account of additional factors.

3.14. As noted in my para 1.15, the main site-specific issues that have been raised as potentially important to risks at LAA (bird hazard and airport/ aircraft operations) are discussed in other proofs and rebuttals. Assuming that the airport will be operated and regulated in accordance with UK standards and good practice in relation to these factors, and given that the predicted frequency of a crash onto the nuclear island in [1] was 5.6×10^{-7} per year: a factor of about 18 times lower than our derived tolerability criterion, it is unlikely that such site-specific factors could lead to an intolerable risk.

3.15. I note here that the operational practices adopted by airport and aircraft operators, and the approach taken by the safety regulator, the CAA, do compensate, at least in part, for variations in site-specific factors. For example, an airport with a basic level of approach and landing aids will not be able to allow aircraft to approach in such poor weather as one that has advanced systems.

Whether crash rates are accurate and up-to-date

3.16. In para 4.4,and Figure 1, Dr Pitfield presents crash rate estimates derived from more recent data than those used by Byrne. Using these data, the average crash rate for LAA would rise from 1.52 per million movements as predicted using Byrne's model, to 2.6 per million movements – an increase by a factor of about 1.7. However, the predicted frequency of a crash onto the nuclear island in [1] is about 5.6×10^{-7} per year - a factor of about 18 times lower than our derived tolerability criterion of 10^{-5} per year. An increase in crash rate of 1.7 times would therefore not lead to a crash frequency above this criterion.

3.17. I also note that a recent (unpublished) review of Byrne's data, for the HSE, led to crash rates that are broadly similar to those in Byrne. These new data are available in Ref [8]. Some crash rates increased, other decreased, but by carrying out a sensitivity test incorporating these new data in the calculations reported in [1]. I conclude that there would be no significant effect on overall crash frequency at the Dungeness nuclear power stations.

Tolerability criterion

3.18. When Dr Pitfield's introduces his proposed criterion of '1 in 10 million', as the 'target level of safety' (para 3.4), he justifies it as being 'common in aviation' and, more specifically, as being the same as that adopted by Eddowes *et al* [9] in a study for the Norwegian CAA.

3.19. However, the criterion proposed in [9] was intended as a benchmark for certain broad categories of airport-related accidents associated with aerodrome design rules (such as overruns and taxiway deviations), not for crashes onto nuclear facilities. Dr Pitfield does not explain why the target for the hazard of aircraft crash onto specific nuclear facilities should be numerically the same as that for hazards related to aerodrome design rules. These hazards differ in type and in breadth of definition, and present risks to different groups of people. Ref [9] was concerned principally with the risk to aircraft occupants, while the present Inquiry topic is concerned with risks to the surrounding population. The application of the criterion from Ref [9] to aircraft crash onto the Dungeness nuclear power stations is therefore unjustified and misconceived.

3.20. The only regulatory risk criteria intended for application to aircraft crashes onto nuclear facilities in the UK are those used by the NII in their SAPs [5]. The NII screening criterion of 1 in 10 million per year happens to be numerically the same as Dr Pitfield's criterion. However, as explained in [1], the NII screening criterion is the level below which they would not devote regulatory effort to further scrutiny. It is not a limit of tolerability.

3.21. I also note that in [9] the '1 in 10 million' criterion is per movement and not, as Dr Pitfield, states, per annum. My paras 3.21 and 3.22 following expand on Dr Pitfield's inconsistent use of units.

Risk units

3.22. The units (metrics) in which the risk criterion, and predictions of risk, are stated are not consistent in Dr Pitfield's proof. When the '1 in 10 million' criterion is introduced, in para 3.4, it is stated to be 'per annum'. As this text follows on from quantitative predictions of 'accidents' on specific runways at La Guardia airport, it appears that the reader is being invited to compare the predictions against the criterion. If this is the intention, it would be necessary for both prediction and criterion to have the same units. However, it is not stated what types of 'accidents' are included in these predictions, or even what their units are.

3.23. Further inconsistency arises in para 5.7, where the 'one in 10 million' criterion is stated to be per 'occurrence' (without defining what type of occurrence is intended). Dr Pitfield then goes on to apply this criterion to determine the acceptability of accident frequencies, which, in the text are stated to be 'per km^2 per year', but in Tables 6 and 7 are presented simply as 'frequencies', without any units being stated.

3.24. It is, therefore, unclear how Dr Pitfield's proposed risk criterion, or his risk predictions, relate to the frequency of crash onto the Dungeness nuclear power stations.

Allowance for birdstrike and additional go-arounds

3.25. Tables 6 and 7 of Dr Pitfield's proof show the effects of increasing the influence of go-arounds and bird strikes on the predicted accident frequencies (and see also my paras 3.21 to 3.23 above regarding the lack of clarity in the meaning of this 'frequency'). No substantiation is given for choosing these percentages as appropriate to the particular conditions at LAA – they appear to be simply 'what-if' tests.

3.26. It is not clear how the effects of any higher levels of bird strike and go-around rates on accident frequencies have been calculated. For birdstrikes, the effect on risk seems to be in direct proportion to the increase in their 'influence' - a 10% increase to account for additional birdstrikes, for example, leading to a 10% increase in accident frequency. By contrast, a 10% increase to account for go-arounds leads to an increase of only about 1.4% in accident frequency.

4. Review of LAAG/3/A – aircraft crash (Auty)

Introductory remarks

4.1. Mrs Auty's evidence in LAAG/3/A deals with a variety of technical and regulatory matters associated with the assessment of aircraft crash risk. For the present purpose, I have grouped my rebuttal points under subject headings that largely reflect Mrs Auty's headings but that in some cases span more than one of them.

Step change in risk

4.2. In paras 26 to 28 of LAAG/3/A, Mrs Auty states that, by enabling more commercial aircraft movements, the proposed developments will lead to a step change in the risk of a major nuclear accident, it being only these larger aircraft that can cause sufficient damage to the nuclear power stations. This does not, however, affect the main conclusion in [1], which was that the absolute level of risk would remain below the intolerable limit.

Site-specific factors

4.3. The essence of Mrs Auty's claim in paras 31 to 34 is that the NII's risk assessments place too much reliance on a generic crash model (the Byrne model) which, being based on data from crashes of various types and at various locations, does not adequately account for site-specific operational and environment factors at LAA.

4.4. As I explain in my rebuttal of Dr Pitfield's evidence (my paras 3.12 to 3.14), I agree that the Byrne model does not take account of all the site-specific factors that may affect crash rates or locations at any particular airport. As noted in my para 1.15, the main site-specific issues that have been raised as potentially important to risks at LAA (bird hazard and airport/ aircraft operations) are discussed in other proofs and rebuttals. Assuming that the airport will be operated and regulated in accordance with UK standards and good practice in relation to these factors, and given that the predicted frequency of a crash onto the nuclear island in [1] was a factor of about 18 times lower than our tolerability criterion, it is unlikely that such site-specific factors could lead to an intolerable risk.

4.5. In para 33, Mrs Auty states that for a '*complex production line*' (*sic* - I assume that this means some hazardous industrial process or installation, for which a similarly rigorous safety case and detailed risk assessments would be required to that for a nuclear power station) '*the Health and Safety Executive (HSE) would never accept such comparisons (…* with historic data *….) as the definitive risk assessment …. . It would demand that a rigorous study be made of all of the possible failure mechanisms of that particular installation together with the proposed mitigating actions before determining whether the resulting system* *was safe to use*'. In fact, the HSE place great stress on operational experience as a means of validating reliability statistics – there are many examples in the field of predictive science where the best guide to the future is the past.

4.6. In systems such as aviation that involve a high degree of interaction between people, machines and the environment, it is rarely possible to assess failure mechanisms and their potential development into accidents in the comprehensive, reductive way that Mrs Auty suggests is necessary. However, in considering this and other criticisms of the NII's crash modelling, it is essential to remember that risk assessment is only part of the safety management process. Generic risk assessment models, such as the Byrne crash model, are used to give an indication of the overall level of risk, and this, together with an awareness of the limitations of the model, then informs decisions about tolerability, and the extent to which further risk-reduction measures may be needed. Safety is then assured in practice by designing the system and its operation to take account of site-specific factors and their interactions. An example of this would be the design of instrument approach procedures.

4.7. With regard to Mrs Auty's criticism of the use of historic data, it should also be noted that, even a reductive study of 'all failure mechanisms' for a relatively simple, system such as the 'production line', would typically rely on data about component reliabilities and human error rates that are derived largely from historic experience.

Screening criteria for assessment

4.8. At para 35, Mrs Auty states that, because the proposed future operations at LAA would exceed the screening criteria suggested in the Byrne methodology [7], this 'immediately puts into question the wisdom of supporting these plans'. This assertion over-states the significance of Byrne's screening criteria, which are only intended as guidelines to help determine the need or otherwise for an assessment of airport-related crash risk. A decision about the tolerability of risk should be informed by the results of any such assessment, but the mere fact that assessment is required does not imply that the risk is unacceptable.

Severity of outcome and numerical targets

4.9. In paras 36 to 40, Mrs Auty claims that the NII have not, but should have, assessed the consequences of a crash. She further states that (on her assumption that very large consequences could occur) the limits and targets on frequency of occurrence should have been reviewed. While no details of assessment data, models have been provided in the redacted information provided by NII, it is my understanding that they have considered radiological consequences in their assessment. This point is considered further in my paras 5.12 to 5.16.

Assessment basis – numbers of aircraft movements

4.10. In paras 41 to 43, Mrs Auty argues that aircraft movements corresponding to 2 million passengers per annum should be considered. This is incorrect for the reasons I have already given in my rebuttal of Mr Large and Dr Pitfield's evidence relating to this point (my paras 2.4 and 3.1).

4.11. From the NII letter in Appendix 1, Letter 3 to Mrs Auty's proof, it appears that the NII considered operations up to the level of 2 million passengers per annum in order to provide broader advice to the planning authority, going beyond commenting only on the specific planning applications that are the subject of this Inquiry. Also, as the NII letter explains, it is common practice in nuclear safety cases to assess the effects of levels of hazard greater than those which are actually expected, in order to check for any 'cliff-edge' effects: changes in hazard that would have a disproportionate effect on risk. This is one way in which assurance can be gained that uncertainties in models and data, such as those related to site-specific factors (see my paras 4.2 and 4.3), are taken into account. From the final sentence of this same letter – "*we currently have no intention to examine this issue further*" - it appears that the NII have satisfied themselves on this (and other) points.

Integrated risk

4.12. At para 45 Mrs Auty makes the point that interactions of hazards and operational conditions, across the whole system and its environment, need to be considered in risk assessment.

4.13. As explained in my para 4.5, it is rarely possible in risk assessments of aviation or other highly-interdependent systems to analyse such interactions comprehensively. Such considerations do indeed place limits on the value of risk assessments as a means of predicting the future. However, risk assessment is only one part of the safety management process. Generic assessment models are used to give an indication of the overall level of risk, and this, together with an awareness of the model limitations, then informs decisions about tolerability, and about the extent to which further risk-reduction measures may be needed. Safety is then assured in practice by designing the system and its operation to take account of site-specific factors and their interactions

4.14. Para 45 also, wrongly, implies that the Byrne model does not take account of the interacting factors that lead to accidents. The data that Byrne analysed will have included accidents that resulted from combinations of factors – indeed most aircraft accidents do result from combinations of factors rather than from one single failure or error.

4.15. Para 46 in effect repeats Mrs Auty's point about the need to consider site-specific factors. I have responded to this in my paras 4.3 to 4.5.

Comparison with overflying aircraft (background crash rate)

4.16. In para 48, Mrs Auty claims that the NII's 'primary' reason for non-objection is that the risk from aircraft using LAA would be small compared with the background risk posed by aircraft overflying the site. The NII letter referenced in Appendix 1, letter 3 to Mrs Auty's proof in support of this claim does not state that this comparison was their primary reason. Rather, it states that background risk provides a '*useful baseline'* against which to *'gain an appreciation of the net change*'.

4.17. My interpretation of the NII's statement in Appendix 1, letter 3 to Mrs Auty's proof is that they use comparison with background risk only to provide a more complete picture of the risk level and how it changes. There are indeed, as Mrs Auty acknowledges at para 50, no specific criteria for background risk. And, as the NII state in Appendix 1, letter 3 to Mrs Auty's proof, their concern is with '*aircraft impact, regardless of its origin'*. The NII's principal criterion is the comparison of total risk (both background and airport-related) against the limits and targets in their SAPs, as they state in Appendix 1, Letter 2.

4.18. Despite the reservations expressed in paras 48 to 50, Mrs Auty nevertheless acknowledges that comparisons with background risk can in principle be informative 'if the information under consideration had some substance' (para 51). In paras 52 to 54, she turns her attention to a criticism of this substance: the basis of the estimated background risk level in the Byrne model.

4.19. In para 52, Mrs Auty notes that Byrne derived the background crash rates for large and small transport aircraft from only 4 and 2 crashes respectively, and infers from these small numbers of accidents that no confidence can be placed in the resulting crash rates. As in my comment on Dr Pitfield's evidence (my para 3.2), Byrne actually looked at a very large sample of events (the number of aircraft movements). While there is inevitably statistical uncertainty in the crash rates derived, the small number of accidents occurring in this sample is evidence of a low crash rate.

4.20. Paras 53 (a) and 53(b) raise other points in relation to which Mrs Auty argues that the NII's comparison between airport-related and background crash rates is flawed. I respond to these below.

4.21. In para 53 (a) Mrs Auty notes that the Lockerbie crash was one of the 4 accidents included in Byrne's derivation of a background crash rate for large transport aircraft. She states that, by contrast, the airport-related crash rates excluded such malicious acts, and hence that any comparison between background and airport-related crashes is flawed, not being on a like-for-like basis.

4.22. From my reading of Byrne, it is not actually clear whether his airport-related data included or excluded crashes due to malicious acts (although I note that they are included in his list of causal factors in the data for crashes below airways). But whether or not malicious acts were included in the airport-related crash rate, the more important point is (as in my para 4.16) that the NII's principal tolerability criterion is a comparison of the *total* risk against limits and targets. In this respect, it would be conservative to include malicious acts in the data, for both background and airport-related crash rates.

4.23. Even if Byrne did omit malicious acts from his data for airport-related crash rates, the effect on the predicted risk level would be small. According to Byrne's data for crashes below airways, such acts account for only 6.1% of accidents. I would expect the percentage of crashes due to malicious acts to be even lower in airport-related crashes, because in en-route flight (background or on airways) there are fewer things to go wrong than during approach, landing and take-off. Crash frequencies are dominated by airport-related events.

4.24. If the Lockerbie incident was removed from the background crash data, the airport-related element of the total crash frequency would appear relatively larger. However, as explained in my para 4.16, that is a secondary consideration in the judgement about tolerability - the NII's principal criterion is the comparison of total risk (both background and airport-related) against the limits and targets in their SAPs.

4.25. For clarity, we should distinguish here between malicious acts in which the intent was to destroy the aircraft (as in the case of Lockerbie), and the deliberate use of a hijacked aircraft to attack a particular target. The former can with some justification be included in crash data for safety assessment, as the location of resulting crashes is effectively random. The latter, deliberately targeted, type of act should be considered primarily as a security concern rather than a safety matter.

4.26. Mrs Auty goes on to discuss the latter type of attack, claiming that the proposed development will increase the risk of a deliberate attack on the Dungeness nuclear power stations. As in my rebuttal of Mr Large's evidence on this point (my para 2.17), I see no clear causal link between increased aircraft movements and the risk of such an attack.

4.27. Regarding the overall validity of Byrne's data, I note (as in my para 3.16) that the reviewed and updated crash rates in the recent review of Byrne's data would not significantly change the predicted crash frequency at the Dungeness nuclear power stations.

Considerations for a Risk Assessment

4.28. The key point behind Mrs Auty's paras 66 and 67 appears to be that the Byrne method does not take account of specific flight 'scenarios' (i.e. flight paths and operational conditions), other than the proportions of landings and take-offs in either direction. Hence, Mrs Auty claims, it does not properly reflect the differing probabilities of a crash under each scenario. This is another example of site-specific factors, the safety management approach to which I have addressed in general terms in my paras 4.3 to 4.7.

4.29. Mrs Auty's paras 68 to 70 expand on the topic of flight scenarios, giving some details taken from Mr Spaven's evidence. I have not commented on these matters, as they are considered on behalf of LAA in Mr Maskens' evidence.

4.30. In paras 76 to 82, and the whole of Sections 3 and 4, Mrs Auty turns to the topics of birdstrike hazard and whether bird hazard can be effectively managed without conflict with conservation interests. Other than noting that bird hazard is another site-specific factor, which I have addressed in general terms in my paras 4.3 to 4.5, I have not commented on these topics, as they are considered on behalf of LAA in Mr Deacon's evidence and have already been dealt with at the Inquiry.

5. Review of LAAG/3/E/F – ESR Technology Reports (Auty)

Introductory remarks

5.1. In this evidence, Mrs Auty comments on the reports prepared for the HSE by ESR Technology [11, 12]. These reports, which were recently released (with redactions) by the HSE, assess aircraft crash frequencies and risks and review the data and models used, providing additional detail and discussion that was not available when LAAG/3/A was written.

5.2. For the purpose of this rebuttal, I have considered Mrs Auty's criticisms of the ESR Technology (ESRT) reports under three main areas:

- whether the crash rate data used in the assessment models were appropriate
- whether the mathematical models applied in the assessment are appropriate to the specific conditions at LAA
- how the tolerability of the resulting risk predictions is judged.

5.3. Where a point has already been raised and dealt with in my rebuttal of LAAG/3/A (Section 4) I have not repeated it in this section, although I have cross-referred to some points in Section 4 where these are relevant to new evidence in LAAG/3/E.

Crash rate data

5.4. A contention in LAAG/3/E is that the Byrne [7] crash rate data used by ESRT were inappropriate, overstating the risk from background aircraft traffic relative to that which is airport-related.

5.5. As noted in my para 3.16 the crash rate data were last reviewed by the HSE in 2008. The updated data, published in [8], were not significantly different from those in Byrne. The background crash rates for small and large transport aircraft (those of most concern as a hazard to the nuclear power stations) changed from 0.12 and 0.20 per km^2 per year respectively in Byrne to 0.11 and 0.26 per km^2 per year in the update.

5.6. Even if the background crash rate were overestimated, it would not have any material effect on the HSE's decision not to object since, as explained in my para 4.16 (and see also my para 5.17), the principal concern of the NII when assessing aircraft crash is with the total risk, not that from any particular component of the total. Indeed, overestimating the background crash rate would lead to a more conservative assessment.

Suitability of mathematical models

5.7. At several points, (paras 6, 21, 37, 40, 49) Mrs Auty claims that the Byrne model fails to represent landings on runway 21. The Byrne model does indeed give a zero crash rate for locations, such as Dungeness B, that are more than 3.275 km from the arrival end of the runway (as already explained in my para 3.4). However, this is not, as Mrs Auty's criticism implies, an arbitrary, 'artificial' (para 49) truncation of the model in which the crash rate is 'set to zero' (para 21). Rather, it results from Byrne's analysis showing that, at such large distances, the aircraft-related crash rate is not distinguishable from background.

5.8. In paras 64 and 65 Mrs Auty considers a case in which the possibility of an aircraft skidding by up to 550 m leads to an increase in crash risk by a factor of ten. Such an increase is in my opinion unrealistic, given that the power stations are surrounded by large expanses of shingle around the nuclear power stations, rather than a surface over which an aircraft or wreckage could kid freely, and the shielding of the nuclear island by other site buildings.

5.9. In paras 7, 8 and 22 to 61, Mrs Auty makes many detailed points in which she claims that the ESRT assessment fails to represent site-specific issues related to flight paths and birdstrike hazard.

5.10. As stated in my para 1.15, this rebuttal proof is not intended to give detailed comments on such site-specific factors. Nevertheless, as I note in para 4.5, it is essential to remember that risk assessment is only part of the safety management process. Risk assessment models, such as those used by ESRT, are used to give an indication of the overall level of risk, and this, together with an awareness of the limitations and uncertainties in the modelling, informs judgements about tolerability, and the extent to which further risk-reduction measures may be needed. Safety is then assured in practice by designing the system and its operation to take account of site-specific factors and their interactions. Analyses such as those of ESRT should not be 'pushed too far' to deliver meaningful conclusions on their own.

5.11. The legal duties on the operators of the power stations, the airport and the aircraft that use it which, together with the regulation of their activities by the HSE and CAA, are designed to ensure that measures will be taken to reduce the nuclear (and other) safety risks associated with aircraft crash to ALARP, as required by law. The key considerations for a planning Inquiry are therefore around the extent to which the necessary safety measures are compatible with other planning aims, rather than these detailed technical modelling issues.

Tolerability criteria

5.12. In para 1, Mrs Auty quotes HSE as stating that a large aircraft crash has the potential for causing a major nuclear accident resulting in more than 100 fatalities. In paras 18 and 19, Mrs Auty goes on to claim (following the guidance in the NII SAPs) that, as a result, the assessment criterion (in terms of crash frequency) should be made more stringent than the 10^{-7} per year which ESRT and HSE adopted as indicative of a 'broadly acceptable' risk.

5.13. In fact, the ESRT assessment estimates the frequency of a 'significant radiological release' and not, as Mrs Auty states in para 2 of her Introduction, a 'major nuclear accident'.

5.14. Because of the redactions in the ESRT reports, it is not possible to see exactly how ESRT assessed the frequencies and radiological consequences of the crashes that could occur, and our Freedom of Information enquiries to HSE [13] have shown that the 'significant radiological release' evaluated by ESRT was not defined in terms of quantitative dose levels or number of fatalities.

5.15. However, the HSE's response goes on to say that, given the conservatism in this analysis (which had predicted crash frequencies below 10^{-7} per year), the intention of SAP para 212, (which allows hazards with a frequency below 10^{-7} per year to be screened out) had been met.

5.16. This implies that the frequencies predicted by ESRT were for crashes leading to any 'significant' radiological release, rather than for accidents leading to more than 100 fatalities (or any other specific consequence definition). On this basis, I would expect the frequency of such major accidents to be significantly lower than 10^{-7} per year – by no means all 'significant' releases would be this large.

5.17. In paras 9 to 12 and 84 Mrs Auty implies that the change in risk (the 'step change' referred to in paras 13 to 15) that would result from changes in traffic type and numbers following development should be a primary criterion for assessing the tolerability of risk. However, as noted in my para 4.16, change in risk is not the principal criterion used by NII to assess tolerability. Rather, it is the comparison of total risk (both background and airport-related) against the limits and targets in their SAPs.

5.18. Para 9 states that 'it is important to establish the baseline for the comparison of increased risk', referencing Para 29 of the 'SAPs, ALARP guidance' (sic) in support. Assuming that this reference is to HSE's 'Principles and guidelines to assist HSE in its judgements that duty-holders have reduced risk as low as reasonably practicable' (http://www.hse.gov.uk/risk/theory/alarp1.htm), this does indeed state that 'In measuring the risk to be reduced, and the sacrifice involved in measures to achieve that reduction, the starting point should be the present situation'. However, this guidance is given in the context of ALARP assessments – i.e. testing whether or not the cost of potential additional risk reduction measures could be considered grossly disproportionate to their benefits. It is not intended to define a test of tolerability for the estimated risk associated with a given situation.

6. Review of LAAG/4/D/K – Demographics (Large)

Introductory remarks

6.1. For many years, government policy has been that nuclear installations should be sited only in areas where the population density does not exceed certain thresholds, and where the growth of that population can be monitored and controlled. The rationale for this policy is that, in the event of an accident, the greater the population (whether permanent or transient), the greater will be the number of people exposed to risk and the demands on the emergency services.

6.2. To ensure that potential population increases are given proper consideration from the perspective of nuclear safety, development in the vicinity of existing nuclear installations, such as the Dungeness power stations, is effected by means of land use planning policies that require local planning authorities (LPAs) to consider the impact of new developments within 'consultation zones' around each nuclear site. Responsibility for the implementation of this policy is vested in the NII.

6.3. The HSE has developed methods and criteria on which advice is provided to LPAs on the control of population distribution (demographics) around existing and proposed nuclear installations. Details of the policy context, and of NII's general approach, methods and criteria for providing advice on demographics nuclear sites are given in Ref [14].

6.4. The proposed developments at LAA are expected to lead to an increase in the numbers of passengers, air crew, airport company staff, other on-site workers in shops, restaurant facilities etc, and others such as visitors, bus and taxi drivers, and those meeting or dropping off passengers. It is therefore important to consider this increase in numbers of people at the airport relation to demographic criteria.

6.5. A contention within LAAG's evidence is that the demographic assessment process should have been explicitly addressed by the LPA (Shepway DC), the NII and the nuclear site licensees earlier on in the planning process. From the responses to FOI requests that LAAG received from Shepway DC and the HSE on 8th February 2011 (as referenced and annexed to LAAG/4/K), it appears that no demographic assessments had been carried out for the proposed developments at that time.

6.6. Following my own enquiries to NII, however, it is apparent that the issue has now been considered by the NII (see para 6.20) and that they do not wish to withdraw or alter their statement of non-objection [15]. The following rebuttal points therefore consider only substantive safety issues, not the extent to which any of the parties followed due process in the past.

Assessment basis - airport passenger throughput

6.7. In common with other LAAG proofs, LAAG/4/D refers to and presents estimates of impacts for a with-development case in which the passenger throughout is up to 2 million ppa. The applications before the Inquiry, however, are for only up to 500,000 ppa.

Comparisons with Cala Homes application

6.8. References to the HSE's evidence at the Public Inquiry into the recent Cala Homes application (LAAG 4/D, para 121 and LAAG/4/E para S28) present an erroneous picture of the percentage population increase, or absolute number of persons, that the HSE would consider unacceptable.

6.9. The Cala application, for additional housing close to the Atomic Weapons Establishment in Berkshire, was in an area where (as a result of HSE's admitted failure to object to earlier developments around the site) the population already exceeded the relevant criteria [16]. The HSE therefore strongly resisted *any* further increase in this case. The situation at Dungeness is wholly different.

Comparison against demographic criteria

6.10. Despite being erroneous in the respects described in my paras 6.7 to 6.9 above (and noting that there are other uncertainties in the data and methods, which Mr Large acknowledges), the calculations presented in Table 3 of LAAG/4/D do not show any cases in which the population at the airport would exceed HSE's demographic criteria for the Dungeness power stations1. For 500,000 ppa, it is no more than 27% of that for the relevant, 'remote' site classification (see para 6.20).

6.11. In paras 106 and 107 of LAAG/4/D, Mr Large states that development at the airport will 'stunt the potential for … growth' in other sectors, by using up some of the available margin between the existing population level and that which HSE would consider unacceptable.

6.12. This would be the case for any development in the Dungeness area that could lead to population growth, so it would be irrational to use this argument as a reason for refusing planning permission for the airport developments without a clear indication of what other developments may need to 'compete' for some of the remaining margin, and consideration of their relative planning merits.

Relevance of the remote railhead

6.13. Mr Large also presents demographic calculations for the railhead in Table 3, claiming that the population already just exceeds the 'remote' site criterion. The populations shown in this table do not begin to increase until the passenger throughput reaches (a hypothetical) 1 million ppa in Mr Large's 'log jam' case.

6.14. This lack of sensitivity to the airport development is presumably because the railhead is closer than the power stations to existing centres of population in Lydd Town or Lydd-on-Sea. The HSE methodology takes account of the maximum population in any sector around the nuclear installation, and the populations in one or both of these settlements are likely to constitute this maximum unless throughput at the airport rises substantially.

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1 The numbers presented in Table 3 are inconsistent with para 105 of LAAG/4/D, which states that *'if log jamming occurs and is accepted as a factor to be included in the demographic assessment, then this has the potential to exceed the remote limit with LAIA operating at 1million ppa'*. I assume this statement to be an error, as there is no claim that the airport would exceed the demographic criteria for the power stations in the Summary evidence (LAAG/4/E).

6.15. In any case, the HSE has stated that the railhead 'would not normally be factored into any demographic analysis' [4]. This is in my opinion reasonable, since the quantity of radioactive material at the railhead, even when a train carrying nuclear material is present, is much smaller than at the power stations, such that the potential hazard in the event of an accident is much lower.

HSE/ NII assessment and current view

6.16. The key points made by the HSE in their response [16] to my FOI request and in a subsequent telephone discussion [17] are noted in the following paragraphs

6.17. The consultation zones and assessments are driven by Dungeness A, because HSE consider the hazard to be greater from that station than from Dungeness B. Even though the 'A' station is no longer operating, there is still fuel on site, as there have been delays to the defueling/ decommissioning programme due to the limited capacity at Sellafield. HSE will review the consultation zones once Dungeness A is fully defueled.

6.18. In the consultation zone plans provided by the HSE, the airport lies in the Outer Zone for Dungeness A but outside any Zone for Dungeness B.

6.19. The threshold for consultation with HSE in the Outer Zone is any development that increases the population by 500 people or more. Mr Large estimates, as shown in Tables 1 and 2 of LAAG/4/D, that the increase could be greater than 500 at certain times. On the basis of LAA's own scoping estimates, and noting that the HSE methodology requires consideration of maximum, rather than time-averaged numbers, I do not dispute that the increase could be above 500 people, such that consultation with HSE was required.

6.20. Taking account of the hazard potential at Dungeness A, the criterion that HSE use for determining the acceptability of a development in these zones is that associated with a 'remote' site classification. (Because the assessment method takes account of existing populations at various distances and in different sectors, it is not possible to state the criterion as a simple number of people or population density at the site in question.)

6.21. HSE have now carried out a scoping assessment against the 'remote' classification criterion, and have concluded that they have no basis for objection provided that passenger throughput remains below the present application level of 500,000 ppa and that no additional development is being considered (e.g. to accommodate airport-related businesses) other than that proposed in the terminal application.

7. Summary and conclusions

7.1. The key findings of my review are as follows.

LAAG/4/A – Aircraft crash consequences)

7.2. Mr Large gives an overly pessimistic picture of the likelihood and severity of radiological consequences in the event of an aircraft crash onto a nuclear power station.

7.3. Mr Large no longer makes the incorrect claim in his earlier report [2] that risk is unacceptable simply by virtue of the crash frequency being above the NII's screening level (10^{-7} per year).

7.4. However, in drawing his conclusion (paras 80 and 185) that the risk is 'unacceptable', Mr Large relies on Dr Pitfield's proposed criterion, which, as I have shown, is inappropriate.

LAAG/5/A – Aircraft crash frequency (Pitfield)

7.5. Dr Pitfield claims that the level of safety is unacceptable. It is very difficult to follow the logic, methods and data he has used to predict accident frequencies but, most importantly, he bases this claim on a comparison of the predicted frequencies against a criterion whose units are not consistently defined, and which is not substantiated by reference to any applicable regulatory requirements or guidance, or industry practice

7.6. Dr Pitfield correctly points out that there are uncertainties and limitations in aircraft crash frequency and location modelling, especially with regard to the limited ability to take account of site-specific factors. The differences that he highlights between his data, assumptions, models and results and those in the AREVA RMC 2009 report [1] illustrate how the latter may, in some respects, underestimate risks. However, because the predicted crash frequency onto the nuclear island in [1] was well below our tolerability criterion, and assuming that the airport will be operated and regulated in accordance with UK standards and good practice in relation to these factors, the degree of potential underestimation that he points to is not sufficient to imply that the true crash frequency could be intolerable.

LAAG/3/A – aircraft crash (Auty)

7.7. Mrs Auty states that there are uncertainties and limitations in aircraft crash frequency and location modelling, especially with regard to the limited ability to take account of site-specific factors. As in my assessment of Dr Pitfield's proof, however, because the predictions of crash frequency onto the nuclear island are well below our tolerability criterion, and assuming that the airport will be operated and regulated in accordance with UK standards and good practice in relation to these factors, the true frequency is likely to remain below the intolerable limit, despite these uncertainties and limitations.

LAAG/3/E/F – ESR Technology reports (Auty)

7.8. This evidence provides a more detailed critique than that in LAAG/3/A of the data, models and criteria used in the HSE assessments, based on review of the ESRT reports that have recently been made available. However, there is no fundamentally new evidence here to question the validity of HSE's conclusion.

LAAG 4/D/K – Demographics (Large)

7.9. The evidence presented in LAAG/4/D and LAAG/4/K gives an overly pessimistic interpretation of the demographics. Notwithstanding this, the calculations presented in LAAG/4/D do not show any cases in which the population at the airport would exceed HSE's demographic criteria for the Dungeness power stations.

7.10. The HSE has now carried out a scoping assessment against the 'remote' classification criterion and has concluded that they have no basis for objection, for the population increase associated with the present applications.

Conclusions

7.11. With regard to aircraft crash, the evidence presented by Mr Large, Dr Pitfield and Mrs Auty does not invalidate the findings of AREVA RMC's 2009 assessment [1]. This assessment indicated that, for the forecast aircraft traffic corresponding to 500,000 ppa, the aircraft crash frequency would not be above the derived intolerable limit, and so should not in itself represent a basis for refusing planning permission.

7.12. With regard to demographic nuclear safety, I conclude that the population increase associated with the application developments should not be a barrier to granting planning permission for them.

7.13. The existing duties on the operators of the power stations, the airport and the aircraft that use it, and the regulation of these activities by the HSE and CAA, are designed to ensure that, if planning permission is granted, measures will be taken in design and operation to reduce the nuclear (and other) safety risks to ALARP, as required by law. No evidence has been presented by Mr Large, Dr Pitfield or Mrs Auty from which it should be concluded that this reduction to ALARP will not be achieved.

7.14. The key nuclear safety issues to consider at the present planning stage are therefore how far the safety measures likely to be necessary to ensure ALARP are compatible with other planning aims, and how the risk (as it will be when reduced ALARP) weighs together with other effects of the proposed developments.

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