

Q16. What is the rationale for exclusion of Vapour Cloud Explosions from the QRA? What are the implications of the Buncefield incident experience for the QRA?

The HSE's PCAG Chapter 6N, para. 8 states:

"For evaporating pools of saturated hydrocarbons (such LNG and LPG), the probability of a VCE can be effectively discounted except in highly congested plant areas. The volume of such areas is generally low and scoping calculations indicate no significant off-site hazard."

In the case of the proposed Shannon LNG Terminal consideration of the plant layout indicates that the plant is relatively open and the degree of congestion is low. The potential for a vapour cloud explosion (VCE) on site was therefore judged to be insignificant.

In December 2006 an explosion and major fire occurred at the Hertfordshire Oil Storage Limited petroleum storage depot near Buncefield in the UK. The explosion caused extensive damage to nearby buildings; the subsequent fires involved over 20 large storage tanks containing petroleum products.

The incident involved prolonged overflow of a storage tank that was being filled with petroleum at relatively high rates from a pipeline. The overflowing liquid cascaded down the side of the tank, causing the liquid to break into droplets and evaporate. The resulting vapour formed a dense, low-lying cloud that spread off-site and eventually ignited. Upon ignition an explosion occurred, with greater strength than would have been predicted by the current methods available for modelling vapour cloud explosions.

The investigation into the incident has produced a series of reports (available at [www.buncefieldinvestigation.gov.uk](http://www.buncefieldinvestigation.gov.uk)), from which two key points for the Shannon LNG project can be identified:

- level control in large-scale flammable product storage; and,
- strength of vapour cloud explosions.

In relation to the first point, the systems for level management and control in LNG tanks tend to be of a higher technical standard than those in conventional petroleum storage tanks. Furthermore, in the case of full containment tanks like those proposed, an overflow of the inner tank would be contained by the outer tank, so that the mechanism of vapour generation observed at Buncefield is not applicable.

With regard to the second point, the mechanism of the explosion at Buncefield is not yet sufficiently understood. Initial reports <sup>(1)</sup> have suggested possible mechanisms to explain the observations, but no definitive conclusions have been made. More research is required before a definitive answer can be provided. Although this may have implications for the understanding of other explosion hazards, including those from LNG releases, no conclusions can be made at present.

(1) Buncefield Major Incident Investigation Board (2007). *Explosion Mechanism Advisory Group report*.