

Benefits

Option 1 – No change to PSR

1. It is not expected that there will be any benefits associated with this option as this is the baseline case.

Option two – Amend PSR to include gasoline as a dangerous fluid

2. By classifying gasoline as a dangerous fluid, the additional duties under part 3 of PSR for major accident hazard pipelines will apply to gasoline. These additional duties include provisions regarding emergency shut down valves, notification before construction and use of pipelines, production of a major accident prevention document and emergency procedures and emergency plans.
3. Such duties are designed to reduce the risk of a catastrophic event and therefore reduce the expected costs¹ over time of incidents resulting from gasoline pipelines. The costs of an incident include any health and safety impacts (loss of life, injury and/or ill health) and any economic costs including damage to assets, loss of gasoline stock, emergency response costs and environmental consequences.
4. As a result of classifying gasoline as a dangerous fluid under the Pipeline Safety Regulations 1996, under Schedule 10 of the Town and Country Planning Act, local authorities are obliged to consult HSE on any development they are aware of which is within the consultation distance around these pipelines, as set by HSE. It is proposed that this area will be 80m² on either side of the pipeline rather than the 3m easement strip, which applies under the general duties of PSR. HSE will provide safety advice on these planning applications in it's capacity as statutory consultee,
5. HSE only provides safety *advice* on planning applications and so even if HSE advises against a development it may still go ahead, on the balance of the benefits from it proceeding versus the possible risk and costs of this. However, if Local Authorities follow the safety advice, then it will probably result in fewer developments over time than without the advice. This would probably mean lower populations located in the consultation distance around these gasoline pipelines than without the advice and so possibly reduced health and safety consequences in the event of an incident.

¹ Expected costs being the cost adjusted for the probability of it happening.

² 80m is the most up to date CD for the exemplar pipelines used so far. Please note this is the maximum CD we have calculated and that CDs for smaller pipelines and pipelines in rural areas are smaller than this.

6. Each of these possible beneficial impacts is looked at in more detail below.

Pipeline Failure Risk

7. The Health and Safety Executive (HSE) have provided estimates of the risk of pipeline failure. These estimates are based on historical failure data collected by CONCAWE (Conservation of Clean Air and Water in Europe) and UKOPA (United Kingdom Onshore Pipeline operator's association). The estimates use over 35 years of performance data for Western European cross country oil and gas pipelines and are based on the ratio of the number of observed failures to the overall population of pipelines. For third party interference events, a fracture mechanics based predictive model is used. These estimates suggest that an average failure rate across all diameters of pipeline of 0.715 events per 1000 km per year is used for rural pipelines and 1.4 events per 1000 km per year is used for suburban pipelines.
8. The average failure rate is thought to be sufficient here instead of failure rates by different diameters of pipeline. This is because it is not clear that the incident consequences are dependent on the diameter of pipeline. The only distinction made between pipelines for this analysis is between urban and rural pipelines.
9. The probability of an incident being an ignition event in urban areas is estimated by HSE to be 5% while in rural areas it is estimated to be 3%. The total length of pipeline in the UK is estimated as 2,147km and it is calculated that 10% of this gasoline pipeline is in urban areas and 90% in rural areas (HSL). Based on this data, the following incident risk has been estimated:
 10. **Urban risk:** The expected number of incidents per year in urban areas is estimated to be 0.015 on average for all urban gasoline pipelines.
 11. **Rural risk:** The expected number of incidents per year in rural areas is estimated to be 0.04 on average for all rural gasoline pipelines.

Health and safety benefits

12. With the estimated risk of an incident, there is an associated risk of death and injury to the public as well as to pipeline workers.
13. Population estimates from the Health and Safety Laboratory show that the night time population around gasoline pipelines in the UK is expected to be 45,913 in urban areas, and 8,506 in rural areas.

14. Based on the current estimated risk of an incident for gasoline pipelines in urban and rural areas, it is estimated that the individual risk for urban pipelines is 2.5 chances per million (cpm) and for rural areas is 1cpm.
15. Multiplying the calculated individual risk by the population within proximity of gasoline pipelines for both urban and rural areas gives an estimation of the expected number of fatalities per year. For urban areas the expected number of fatalities per annum is 0.1, while in rural areas the expected number of fatalities is 0.01 per annum, covering all gasoline pipelines in the UK.
16. HSE estimate the value of preventing a fatality (VPF) to be £1.5m³, (which is based on a survey of the willingness of society to pay to reduce risk, and is a technique commonly used across Government to value life). Using this value, the expected cost of fatalities due to gasoline incidents in urban areas is estimated to be £170,000 per annum and the expected cost of fatalities in rural areas is estimated to be £13,000 per annum.
17. HSE analysis of past incidents also indicates that for each fatality there might be expected to be on average four major injuries. HSE estimate the value of a major injury to be £40,500, on the same basis as the value of preventing a fatality. Thus, it is estimated that there would be 0.5 major injuries per annum in urban areas, and 0,03 major injuries in rural areas. The expected cost of these injuries in urban areas would be almost £20,000 and just over £1,000 per annum in rural areas.
18. The total expected current costs associated with gasoline pipeline incidents per annum is estimated to be almost £200,000 in urban areas and £14,000 in rural areas. Over a ten year period, the estimate of current health and safety costs of incidents is almost £2m for all gasoline pipelines in the UK.
19. It should be noted that these estimates are based on night-time residential populations. The actual population could be different to this if the incident occurred during the daytime, depending on the type of development. For example, housing would have a maximum population during the night time, but retail developments and schools would have their maximum population during the day.
20. To look at what effect the population assumption might have on the estimates, some sensitivity analysis can be performed. If it is assumed that population is 20% greater than the night time population (for instance if there were a lot of workplaces in the area) then the expected costs per annum would also be 20% more, i.e. £245,000 per annum in total for all gasoline pipelines in the UK. Over a ten year appraisal period, the expected cost of all injuries and fatalities would be £2.3m. Equally, if the population was 20% lower than the night time population (for instance if the incidents happened in the day while people were out of the house)

³ See HSE appraisal values at: www.hse.gov.uk/economics/eauappraisal.htm

then the total expected cost per annum would be £165,000 and the total current expected cost over 10 years would be £1.5m for all gasoline pipelines in the UK.

21. The proposed intervention to classify gasoline as dangerous under PSR will mean that operators are required to implement additional duties for gasoline pipelines as explained in paragraph 2. Some of these duties are around reducing risk (such as emergency shut down valves) while some are more around mitigating consequences (such as emergency plans and land use planning). Due to the infrequency of accidents and the complex causality between interventions and outcomes, it is not possible to quantify by how much the risk of an incident might decrease as a result of these additional duties. Therefore, it is not possible to quantify the reduction in expected numbers of fatalities / injuries per year that might result from the intervention.
22. Equally, the additional duties are designed to mitigate the consequences of incidents associated with gasoline pipelines. Some part of this will be achieved by land use planning controls. In the cost section of this IA it has been estimated that future development will be reduced by x% over the next 10 years. So while the population might continue to grow, this could be at a lower growth rate than might otherwise be the case if land use planning did not take safety into account. However, it is not possible to estimate robustly the future population growth around gasoline pipelines and how this might change due to land use planning, as our research (described in the cost section) has focussed on the development value lost only.

Other benefits

Business Interruption and clean up costs

23. Following an ignition incident there will be business interruption costs and clean up costs. As well as the significant cost to human life and health, major accidents due to pipelines can be very costly to the economy as a whole. These costs are borne by the operators of the pipelines in terms of compensation to be paid, loss of gasoline, damage and repair costs; to society in terms of the costs of evacuation, road closures and disruption of supply; and to the taxpayer in terms of emergency responses and medical costs.
24. Due to the low frequency of major incidents around pipelines, there is limited data on what such incidents cost. So in the absence of alternative information, the Buncefield Incident of 11th December 2005 has been used to illustrate the potential costs of such a large scale incident.⁴ While

⁴ See chapter 3 of the Buncefield Incident 11 December 2005: The final report of the Major Incident Investigation Board. Available at: <http://www.buncefieldinvestigation.gov.uk/reports/volume1.pdf>

Buncefield is an oil storage depot, rather than a pipeline, the incident does illustrate the potential damage and costs associated with large scale incidents. The total costs were estimated to be around £894m, which includes the site operators' compensation claims, aviation costs, Competent Authority and Government response costs, emergency response costs and environmental impact.

25. Whilst the explosion at Buncefield was extremely significant and is likely to be one of the more costly type of incidents, it does illustrate that incidents can have huge consequences to workers and their families, to the operators, to the public and to government and the environment.
26. Due to the fact the reduction in risk associated with the proposed intervention cannot be quantified (as described in paragraph 21), it is not possible to estimate any expected reduction in costs over time. However, if the intervention was to reduce the number of incidents that occurred over time, there would be cost savings associated. If the incidents were significant then these cost savings could be significant.

Improved awareness of gasoline pipelines

27. It is possible that by classifying gasoline as a dangerous fluid under PSR, the public will have an increased awareness of the risks associated with such pipelines and take more care when working in the vicinity of these pipelines. This might in turn reduce the amount of third party damage to pipelines, saving costs to operators and reducing the risk of large scale incidents
28. However, it is not possible to quantify by how much this extra awareness might reduce the risk of damage and how this in turn might reduce the risk of incidents and so the expected costs to society over time.
29. It is possible that by classifying gasoline as dangerous, concerns will be raised about those pipelines which already exist and which the public were not previously aware of. This could lead to increase societal concerns over the pipelines in close proximity to housing, and so to increased queries from the public. This will create a cost to operators from resolving any queries and potentially to a misallocation of resources if the public's perceptions of risk are not aligned to the most recently available evidence. This potential cost is covered in more detail in the cost section below. .

Monitoring benefits to operators

30. The existence of land use planning will probably mean that less development takes place around gasoline pipelines. While this has a cost to society which is covered below, there could also be a benefit to the pipeline operators. If planning controls are not put in place around these pipelines, and highly populated, possibly sensitive developments are built

within the consultation distance, then the operators will have to ensure that residents do not damage the pipelines. Equally, trying to get access to these pipelines to ensure this damage is not happening could prove to be more difficult if development only takes account of the 3m easement strip. Thus, it could be possible that having land use planning controls in place will make monitoring of the integrity of the pipelines more straightforward and so less costly.

Conclusion

31. It is possible that by classifying gasoline as dangerous under the pipeline safety regulations, this will mean that the risk and consequence of incidents will decrease. This will lead to reduced expected costs of incidents, including the costs of fatalities and injuries (currently expected to cost about £2m over 10 years) as well as the costs of the damage to society (incidents like Buncefield could cost almost £1billion). The proposal could also raise awareness of the potential risks and so encourage people to take more care when working in these areas and land use planning could in fact assist the operators with their monitoring procedures.
32. However, due to the complex causality and infrequent nature of incidents, it is very difficult to predict by how much risk and consequence might reduce as a result of this proposed intervention. Thus, it is not possible to quantify further the benefits of this proposal.