

**Major hazards Strategic Programme  
2<sup>nd</sup> Quarter Report 2003/04**

**Annex C1**

**To have a sustained reduction in the occurrence of precursor incidents in key major hazard industries regulated by the Health and Safety Executive over the period of the target 2004 - 2006.**

**How the target is measured**

HSE plays an important role in the regulation of major hazard activities, i.e. those industries where control failures can lead to a “catastrophic” effect including rail, nuclear, offshore oil and gas and onshore chemical industries, and in ensuring the safe management of these industries. The target aims to reflect how well major hazard industries militate against failures in major hazard control systems within these industries.

The detail of how progress in each industry will be tracked is still under development. The degree of reduction necessary/achievable and the types of precursors to be monitored will be different for each major hazard industry. Arrangements for the delivery of this target will be described in the Business Plan for 2003/04 and linked Directorate operating plans for 2003/04.

**Delivery strategy to achieve objectives**

Enforcement of the safety case regime, or in the case of the nuclear industry the licensing regime, will be used as the starting point for HSE to deliver this target. Each major hazard industry operates on the basis of a safety case or licence under which the activities take place. HSE carries out inspection programmes that ensure the provisions in the safety case or license are being adhered to.

<b>“Major Hazard” industries target – Key Requirements for achieving this target are:</b>					
<b>Responsibility</b>	<b>Requirement</b>	<b>Target/assumptions for 2005/6</b>	<b>Assumed impact on overall target by 2005/6</b>	<b>Status</b>	
				<b>Last Q</b>	<b>This Q</b>
<b>Rail</b> Target: Reduce the incidence of 5 indicators including signals passed at danger (SPADS), and track compromised (broken rail, landslip), derailments, vandalism and level crossing incidents  2001/02 Baselines 172/627/63/921/182 respectively	Delivery of Directorate operating plan	% reduction for these indicators still under development. Discussions are still being held with key players in the rail industry, including OGDs, to ensure the targets align with their existing and proposed targets	During the shadow running period we are treating each major hazard industry as having separate targets		

<b>Onshore</b> Target: Reduce the incidence of relevant RIDDOR-reportable Dangerous Occurrences including failure of pressure system and unintentional explosions  2001/02 baseline of 179 dangerous occurrences	Delivery of Directorate operating plan	6% target reduction for these indicators	During the shadow running period we are treating each major hazard industry as having separate targets		
<b>Offshore</b> Target: To reduce the number of Hydrocarbon releases off-shore  2001/02 baseline of 113 major and significant releases	Delivery of Directorate operating plan	40% target reduction for these indicators	During the shadow running period we are treating each major hazard industry as having separate targets		
<b>Nuclear</b> Target reports made to HSE by licence holders which indicate a challenge to nuclear safety  2001/02 Baseline 143	Delivery of Directorate operating plan	% target reduction for these indicators - under development, likely to be zero i.e. no rise above baseline	During the shadow running period we are treating each major hazard industry as having separate targets		

### Key assumptions

Success in the other major areas of HSE work ensures that resource is not diverted from delivery of this target into more urgent work.

Industry is a significant player and provider of the information and continues to be fully engaged and sympathetic to HSE's approach to regulation and to this target to deliver their contribution.

The socio-economic environment does not change in such a way as to introduce significant new risks to health and safety in Major Hazard industries, or to make comparisons over time difficult. For example, if the economic activity increases dramatically (e.g. oil and gas production levels but the number of hydrocarbon releases remains static) this could be considered an improvement.

### Progress towards target

3 Delivering Major Hazards Target	Base Year		2003/04			
	2001/02	2002/03	Quarter 1	Quarter 2	Quarter 3	Quarter 4
<b>Rail indicators</b>						
Signals passed at danger	172	143	36	36		
Track compromised	627	577	62	62		
derailments	63	56	17	15		
Acts of vandalism	921	741	113	72		
Level crossing incidents	182	176	50	77		
<b>TOTAL</b>	<b>1965</b>	<b>1693</b>	<b>278</b>	<b>262</b>		
<b>Nuclear indicators</b>						
Reports made to HSE by licence holders which indicate a challenge to nuclear safety	143	156	22	24		
<b>Offshore indicators</b>						
Major and significant hydrocarbon releases	113	85	24	17		
<b>Onshore indicators (COMAH)</b>						
Relevant RIDDOR reportable dangerous occurrences, e.g. unintentional explosions, failure of pressure systems	179	155	35	37		

## **Narrative**

1) Rail - (a) baseline data revised following further analysis; (b) the Q2 data for "track compromised" has been transposed from Q1 as the data series has been discontinued.

Proposals for a risk-weighted and combined index to replace the current 5 indicators for rail is set out below.

2) Offshore - the Q1 figure has increased from 12 to 24 because the reporting scheme agreed with duty holders gives them up to 1 month to report an incident so each quarter may see an increase in the previous quarter's reported figures

3) Onshore (COMAH) - the baseline figure for 2001/02 has been updated from 156 to 177 following further data validation work

## **Risks to delivery of the Major Hazards target**

Industry acceptance and engagement is a key element of this target. Much work will be required to establish baselines, targets and gain confidence particularly with industry sectors that may need different approaches and for which HSE might be relying on cooperation to measure progress.

HSE works with other regulators eg the Environment Agency (EA) and the Scottish Environment Protection Agency (SEPA) to ensure consistency of approach on policy and operational issues involving environmental legislation. Coordination of activities will be necessary to ensure the development of the target does not undermine this collaboration.

## **Note on Railways indicator**

Development of a new approach, in consultation with the rail industry, for establishing a baseline and target for Rail using a risk model based on the frequency and consequences of different types of precursor (More information on the approach is contained at [Annex \\*\\*](#)). N.B. Adoption of the model, which uses data supplied by the industry, will result in a reporting lag of approximately one quarter because of the complexity of the data collation and analysis process.

As a result of this work the baseline for Rail would become 100 in 01/02 with a target of a 10% year on year reduction leading to a target of 65 by the end of 05/06 - we propose to introduce this new approach with effect from the next quarterly report.

## RAIL TARGET BASED ON A SAFETY RISK MODEL

1. The target will be linked to the Railway Group's target of achieving an overall 10% reduction of the 2001/02 level (on a yearly basis), in risk from precursors that can lead to a catastrophic event. The 2001/02 data provides the baseline of 100 with a projected performance target for March 2006 of 65.
2. The Rail Safety & Standards Board (RSSB) is responsible for monitoring the rail industry's safety performance and to do this they developed the Safety Risk Model (SRM) to provide a structured representation of the causes and consequences of potential accidents arising from railway operations and maintenance. The SRM consists of a series of fault tree and event tree models representing 122 hazardous events which, collectively, define the overall level of risk on the mainline railway. The SRM has been designed to take full account of the high frequency, low consequence type events (events occurring routinely for which there is a significant quantity of recorded data) and the low frequency, high consequence events (events occurring rarely for which there is little recorded data). The results for each hazardous event are presented in terms of the frequency of occurrence (number of events per year) and the risk (number of equivalent fatalities per year).
3. The SRM is based on the quantification of the risk resulting from hazardous events occurring on the mainline railway that have the potential to lead to fatalities, major injuries or minor injuries to passengers, staff or members of the public. In the context of the SRM a 'hazardous event' is taken to mean an event that has the potential to lead directly to death or injury. For example, a derailment would be considered to be a hazardous event as it can lead directly to injuries, whereas a broken rail would be classified as a 'cause precursor', because without the occurrence of a subsequent derailment, no injury would occur. For each hazardous event there could be a single precursor or a combination of precursors (system failures, sub-system failures, component failures, human errors or physical effects) that could result in the occurrence of the hazardous event. The SRM hazardous events adopt the incident categories defined by HMRI (*ie* train accidents (HET), movement accidents (HEM) and non-movement accidents (HEN)) relevant to the operation and maintenance of the mainline railway.
4. As part of this process, RSSB monitor the trend of precursor events or groups of events which could lead to major incidents with the potential for multiple fatality outcomes. The major incidents monitored (all of which are train accidents) are:
  - Collision between trains;
  - Collision between a train and a buffer stop;
  - Collision between a train and a vehicle at a level crossing;
  - Train derailment; and
  - Train fire.
5. The monitoring is done by use of a Precursor Indicator Model (PIM), which is integrally linked to the SRM. The PIM records over time (a) the change in number of precursor events occurring and (b) the potential change in the safety risk associated with the occurrence of the precursors. Underlying these precursors, there are over 1400 events which would indicate a system failure, sub-system failure, component failure, human error or operational condition which could individually or in combination with other cause precursors result in the occurrence of a hazardous event *eg* broken rail, signal passed at danger (SPAD) or dragging brakes are precursors to the hazardous events derailment, collision and fire respectively. The precursors monitored are:
  - Total SPADs

- Level crossing misuse
  - Irregular working
  - Track faults
  - Rolling stock failures
  - Structural failures
  - Land slip
  - Vandalism
  - Broken rails
  - Wrong-side signaling failures
  - Level crossing incidents (weather)
  - Non-rail vehicles on the line
  - Hot axle box
  - Animals on the line
  - Obstructions blown on to the line
  - Train speeding
  - Buckled rails
  - Adhesion
  - Level crossing failures
  - Irregular loading of freight trains
  - Flooding
6. For each of these precursors, the number of events per quarter are weighted by their contribution to train accident risk (as assessed by the SRM). They are then incorporated into one of eight groups and for each group, the equivalent fatalities, and the overall risk, expressed as a proportion of the total, are calculated. The groups are:
- Public
  - SPAD
  - Track quality
  - Workforce
  - Trains/rolling stock
  - Environmental factors
  - Infrastructure failures
  - Other (eg other derailment, animals on the line)
7. The risk-weighted variations in each of the eight precursor groups are plotted, over time, to reflect changes in train accident risk and show how they combine together to produce overall changes in the model. The chart uses the data at the end of 2001/02 as the baseline level. Thus, the value that each precursor has at that point, matches the proportions in the table above, and the total of the values at that point is 100.