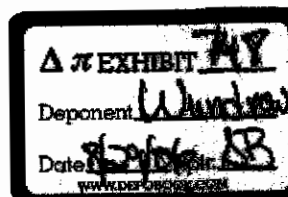


GROUP HSE STANDARD
Major Accident Risk
Awareness Training

October 17, 2002



BPISOM00308857

Agenda for the Awareness Course

Safety Moment & Introductions

BP Group Standard & Background Information

Overview of the Syndicate Exercise

Break (10 minutes)

Hazard Identification

Consequence Assessment

Break (10 minutes)

Frequency Assessment

Risk & Tolerability

Risk Matrix Tool

12:00 Lunch/Path Forward Discussion

Adjourn

*Bob Mancini
Johnny Wright
Milton Vogel*

1. BP Group Standard

Cost benefit analysis



<u>House</u>	<u>Vulnerability</u>	<u>Expectation</u> <u>value of loss</u>	<u>Cost of House</u>	<u>Cost +</u> <u>Expectation</u> <u>Value</u>
Straw	0.9	\$900 <small>.9 x 1000 =</small>	\$10	\$910
Sticks	0.8	\$800	\$20	\$820
Brick	0.1	\$100	\$100	\$200
Blast Resistant	0.01	\$10	\$1000	\$1010

optimal ↙

Cost benefit analysis of three little pigs



- **Frequency – the big bad wolf blows with a frequency of once per piggy lifetime.**
- **Consequence – If the wolf blows down the house, the piggy is gobbled.**
- **Maximum justifiable spend (MJS) – A piggy considers it's worth \$1000 to save its bacon.**
- **1.0/piggy lifetime * \$1000/piggy life = \$1000.**
- **Which type house should the piggy build ?**



Cost Benefit Analysis



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- **To do such an analysis, the costs and benefits must be expressed in the same units, typically dollars.**
 - **At a minimum, the costs and benefits should be equal. (Some companies have stated that the benefits should be ~1.4 x costs)**
 - **This requires monetary evaluations of societal risks, statistical fatalities avoided, and loss of Brand reputation.**
 - **The corporate guidelines provide the framework for these.**

Evaluating Risk Reduction Measures



no. 10.12.2005

The corporate guideline is clear that unacceptable risks must be reduced to acceptable by the end of 2005.

doable

- All facilities must demonstrate continuous improvement.
- One method of showing improvement is to reduce risks to a level "As low as reasonably practical (ALARP)". ALARP implies that a cost benefit analysis is needed.



BP Group Guidelines for Maximum Individual Risk

	Employees and Contractors	Non-BP workers within the same industrial complex	Public
Intolerable limit for existing facilities	1×10^{-3} /yr	1×10^{-4} /yr	1×10^{-5} /yr
Target value for existing facilities	5×10^{-4} /yr	5×10^{-5} /yr	1×10^{-6} /yr
Intolerable limit for new facilities	5×10^{-4} /yr	5×10^{-5} /yr	1×10^{-6} /yr

BP Guidelines for Maximum Individual Risk



Risk to an individual expressed on an annualized basis (e.g., 10^{-4})/yr

Only part of an individual's total risk is attributable to "major" accidents

If a facility wishes to apply an individual risk criterion, or is required to do so by regulations, recommended guidelines for BP facilities have been developed.

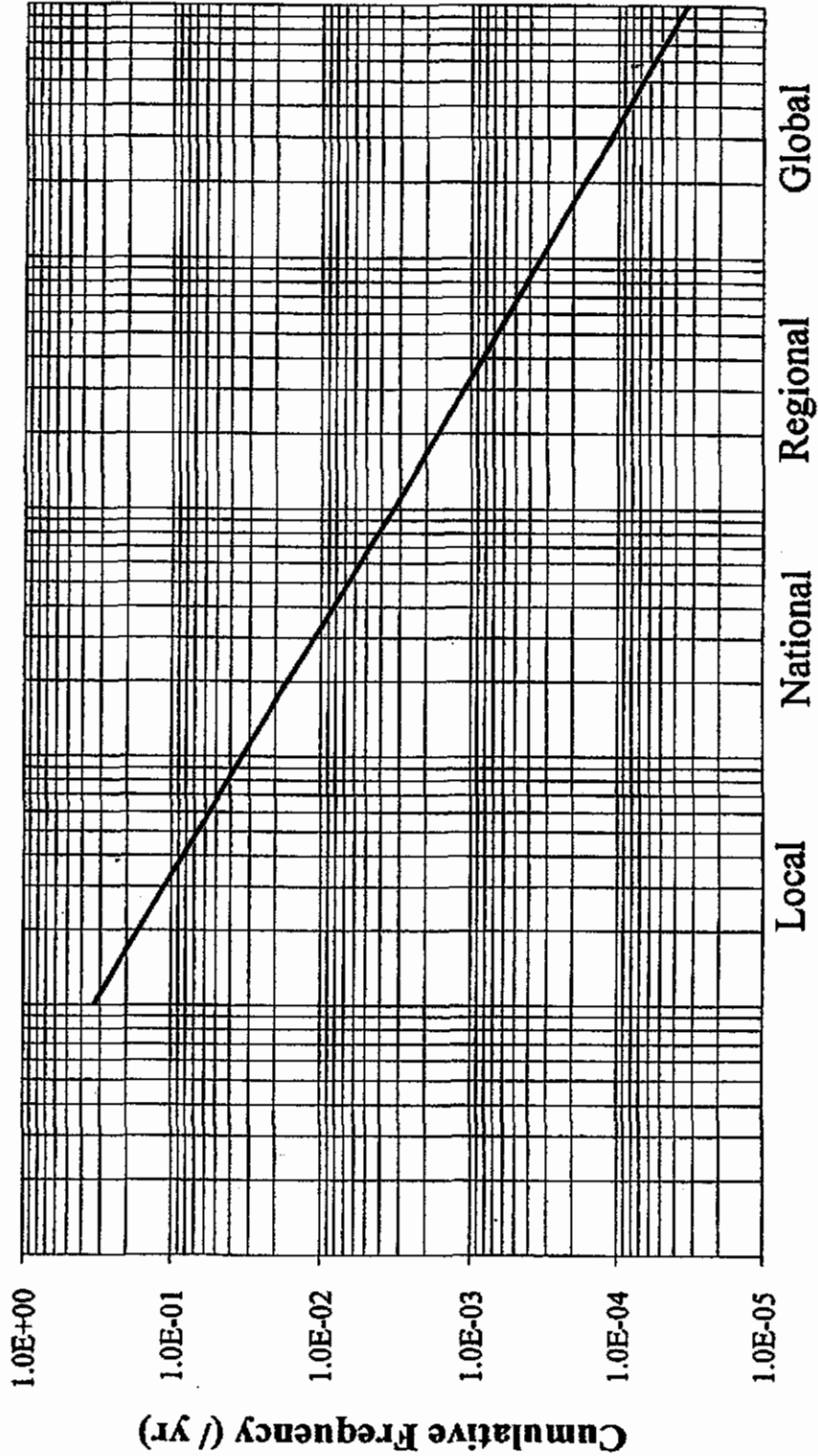
BP Group Standard on Major Accident Risk



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- **All Business Unit Leaders and Works General Managers must assure the Group that they are not operating in the zone of intolerability by the end of 2005**
 - **All Project Managers must assure the Group that the facilities they are designing will not operate in the zone of intolerability**
 - **Ongoing implementation of this policy should be acknowledged in the 2002 HSE Assurance Report**

BP Group Standard on Major Accident Risk bp

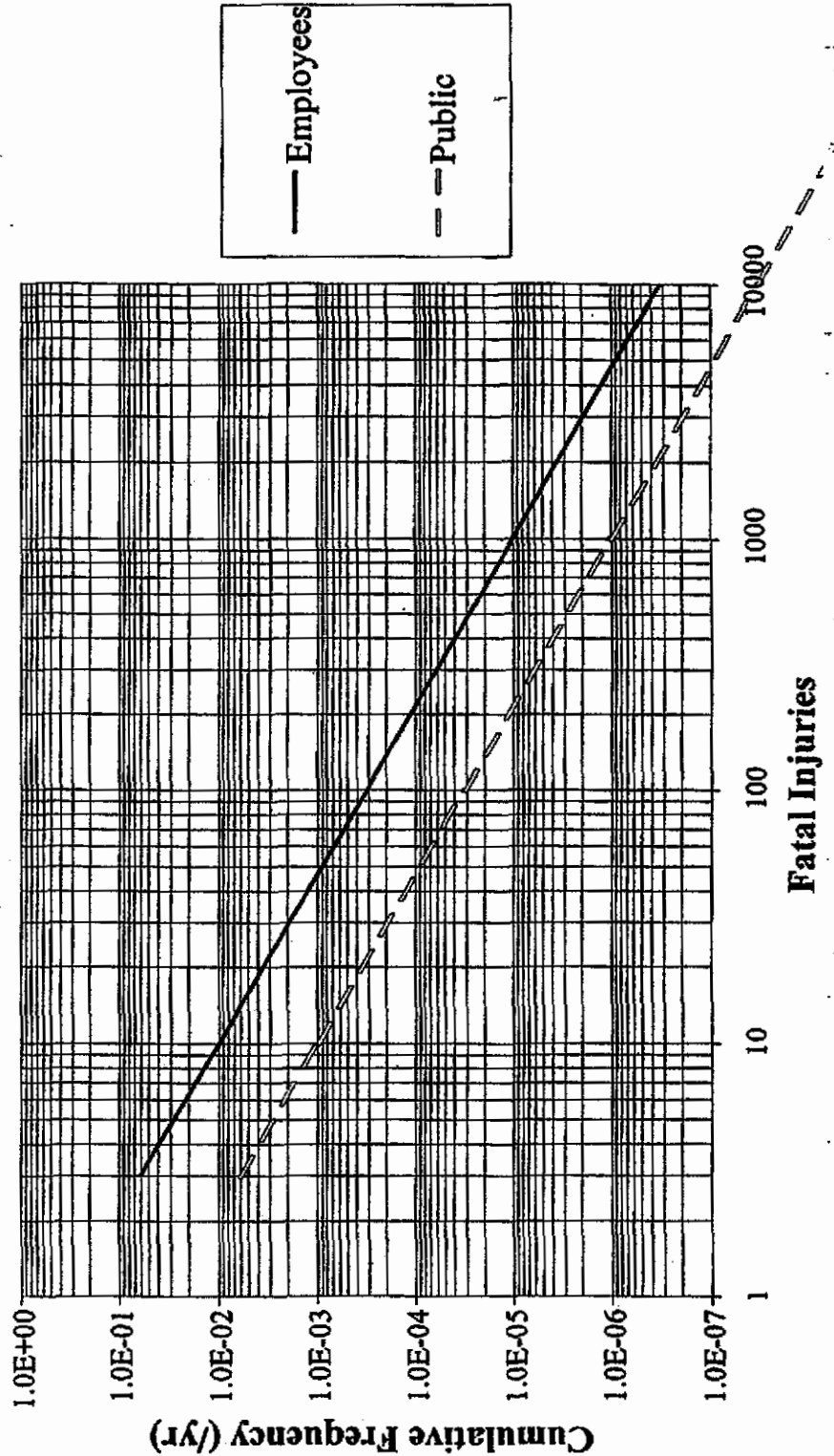
Intolerable Environmental Risk for a Major Operation



BP Group Standard on Major Accident Risk bp

Limits shown on graph are for an asset of \$1bn – move down the frequency by a factor of 10 for an asset of \$100m

Intolerable Societal Risk for a Major Operation



BP Group Standard on Major Accident Risk



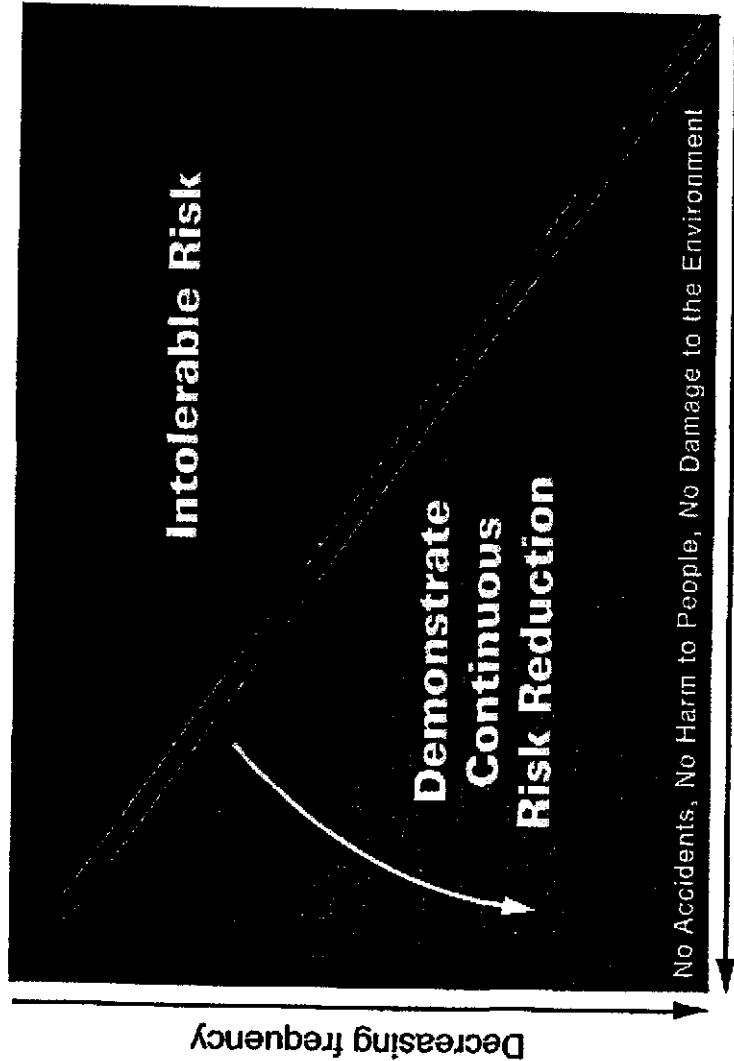
For any operation, the two zones are defined for three discrete types of risk

- *The societal risk associated with major accidents involving BP employees and contractors***
- *The societal risk associated with major accidents involving the public***
- *The environmental risk associated with damage to the environment***

Societal risks framed in predicted number of fatalities

Environment risks framed in public outrage

BP Group Standard on Major Accident Risk



Intolerable – Operations in this zone must reduce the risks to below the limit of intolerability

Below the limit of intolerability continuous improvement must be demonstrated

All actions to be prioritised in relation to overall risk reduction benefit

What does it provide?



- The standard provides quantitative criteria against which major accident risks can be judged
- It supports and provides performance expectations for Element 2 of getting HSE right
- It defines what is meant by “manage the risks to acceptable levels”

New Standard on Major Accident Risk



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- **New Group Standard developed during 2001/2**
 - **It considers the risk of multiple fatality events and major pollution/public outrage incidents**
 - **Its function is to manage the risk of major accidents in the BP Group which would involve severe loss of reputation**