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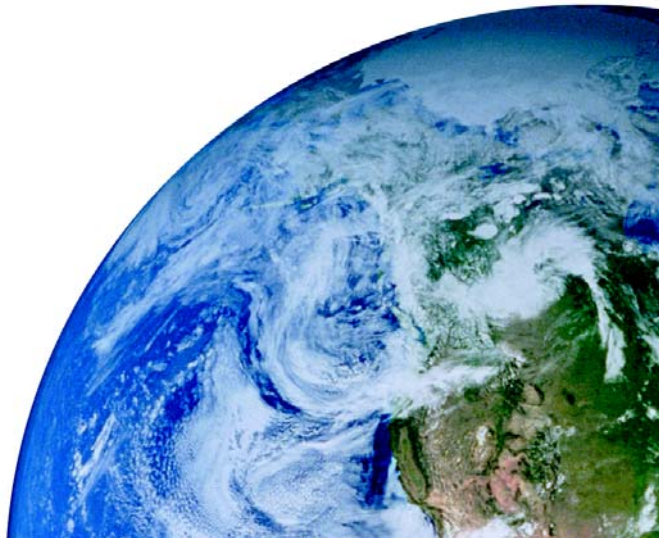
Reviewing the impact of the revised INES Manual on transport activities
PATRAM 2010

Garry Owen



Purpose of INES for transport

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- A numerical scale to define the safety significance of radioactive transport events.
- Communication tool for all stakeholders.

INES Scale

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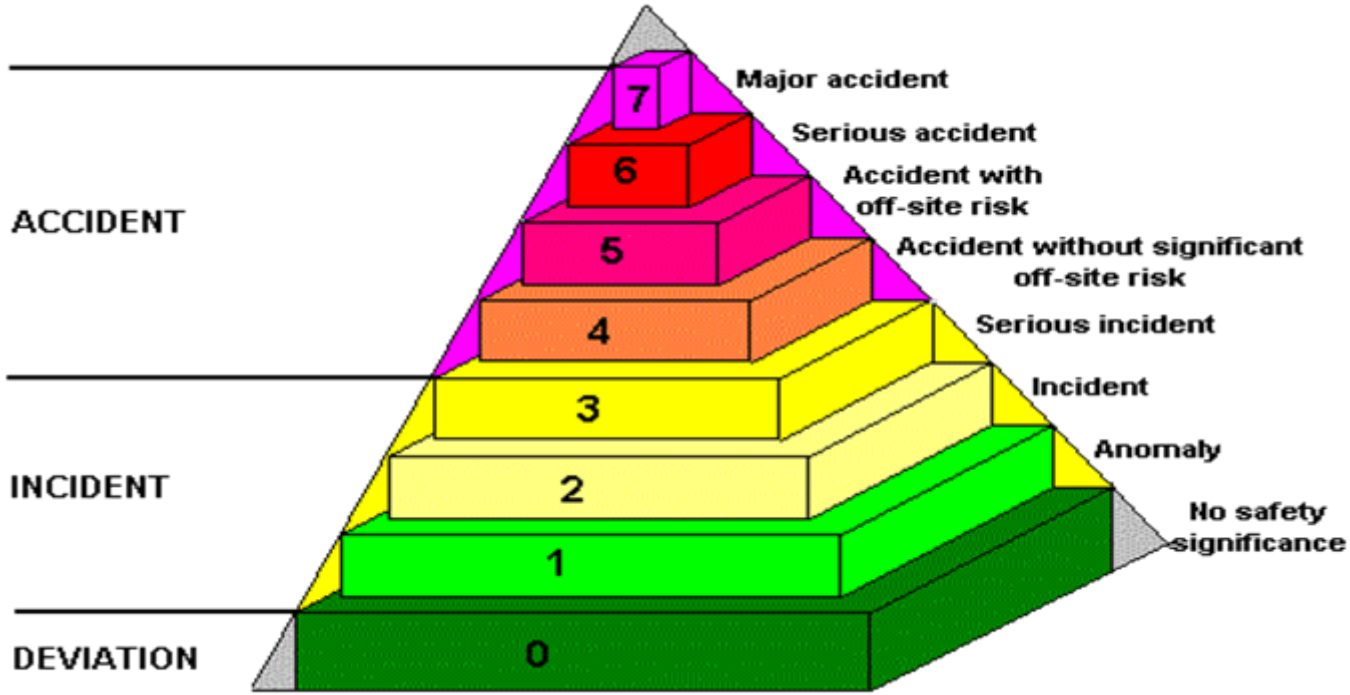
- Seven levels, 4-7 Accidents, 1-3 Incidents,
- Below scale/level 0, Anomaly, No significance.



Key elements for transport

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- People and the environment – radiological impact
- Defence in depth – failure of safety provision

INES for Transport –Achieving the balance

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- How we measure the safety significance of transport events has wide ranging consequences.
- An ‘over sensitive’ measure, could trigger multiple INES activations for low hazard materials.
- A ‘coarse’ measure, could rarely trigger an event
- Balance is needed

What's new for transport!

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- 'A values' are dropped!
- 'D values' are used to measure the significance of transport events.
- Radioactive material is equated to a 'source category'
- The 'D value' is a dangerous level of activity with a potential to cause severe harm.
  - D1 uncontrolled but encapsulated source (more restrictive)
  - D2 uncontrolled but dispersed source (less restrictive)
- Use 'D2 values' for radiological release for transport.

Concerns for Transport

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- ‘D Values’ are foreign to our usual transport controls.
- Confidence in safe transport could be damaged.
- They convert radioactive materials into equivalent source categories.

D_1 value Concept

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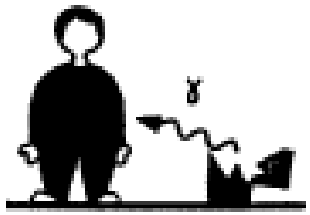
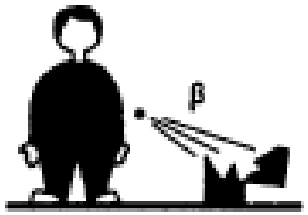
10 Hours carried in hand or pocket

100 hours in room or work place

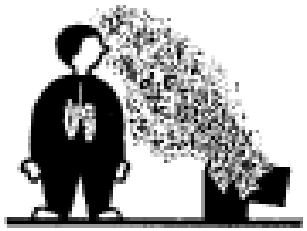
Basis of Q System (A_1 & A_2's)



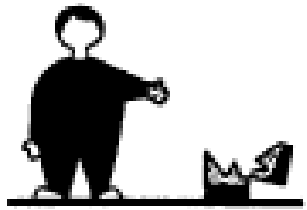
Gamma



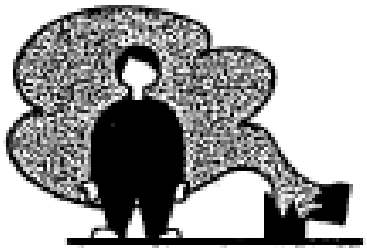
Beta



Inhalation



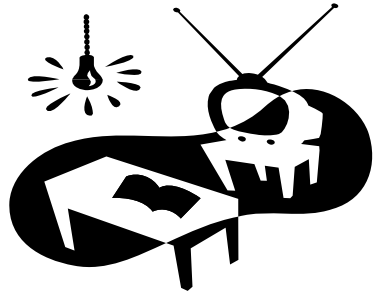
Contamination



Immersion

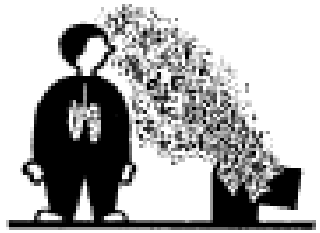
Basis of D System

Hand

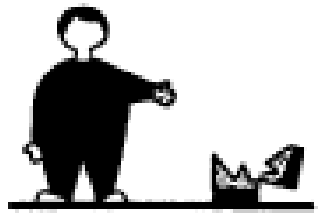


Room

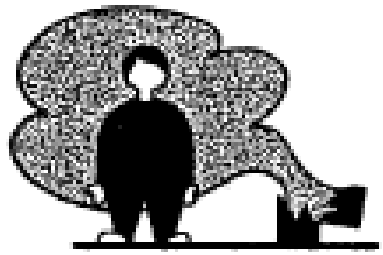
D1



Inhalation



Contamination



Immersion

D2

The Differences

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- **D value** - Quantity which could result in death or permanent injury.
- **A value** – Quantity which if released would not cause significant harm.
- On average there are approximately 80 x A_2's in a D_2.
- Several nuclides differ enormously.

Uncontrolled Source Vs Transport Package

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Using D Values is the worst case scenario :

Uncontrolled Source

- Unsupervised
- Anonymous
- Collectable
- Easily Handled
- Concentrated Activity

Transport Package

- ➔ Supervised
- ➔ Physical Protection
- ➔ Visual Warnings
- ➔ Bulk Quantities
- ➔ Credit for LSA

Typical Activations

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- Shipping documents, labels or placards incorrect or missing.
- Missing transport package.
- Found transport package.
- Misdelivered transport package.
- Minor damage to a transport package.
- Faulty packaging or tie-downs.
- Exceeding a dose constraint

Which Sector – Level 2 Events and above

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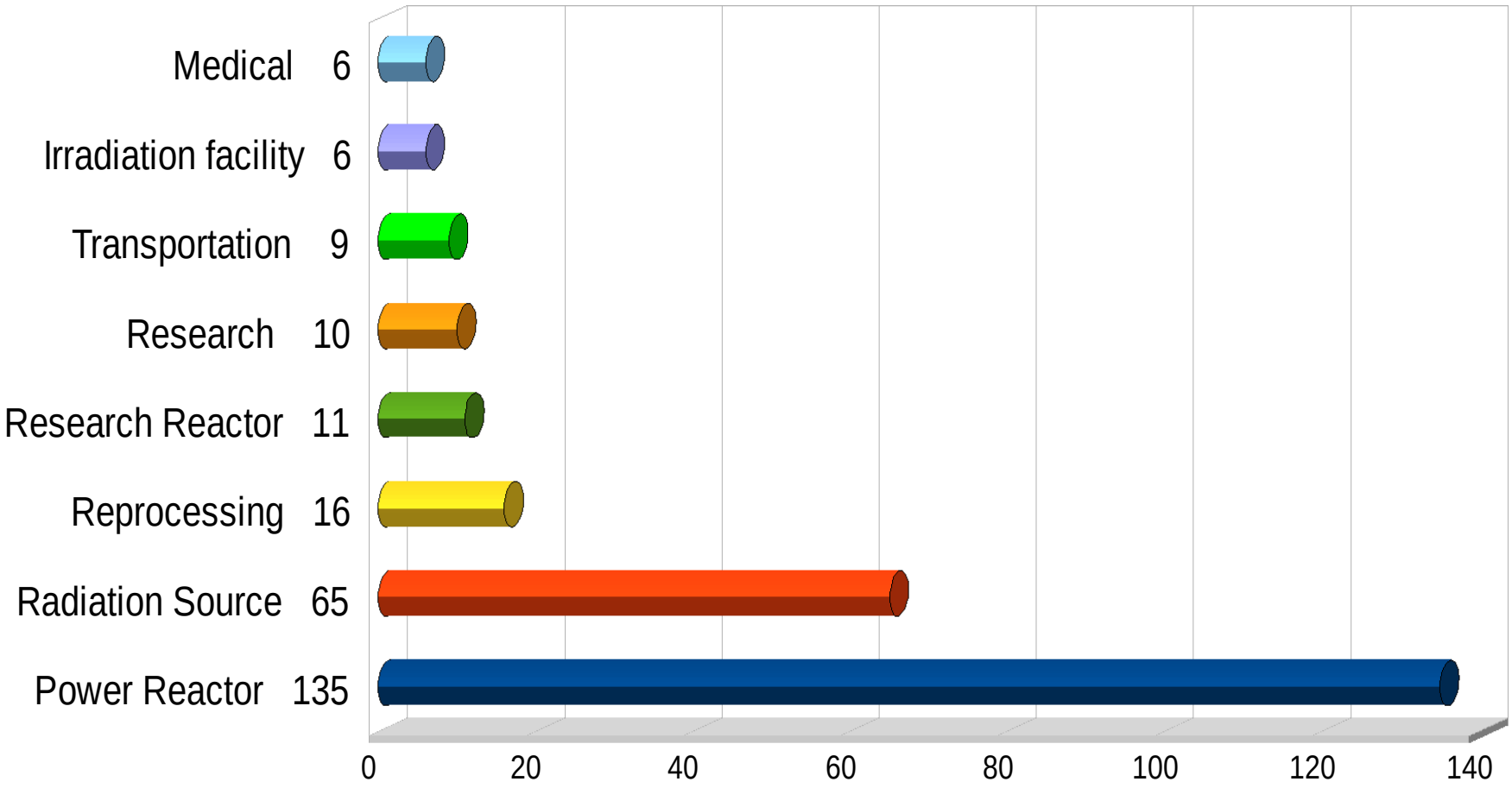

'Recorded' INES Historical events - Level 2 and above

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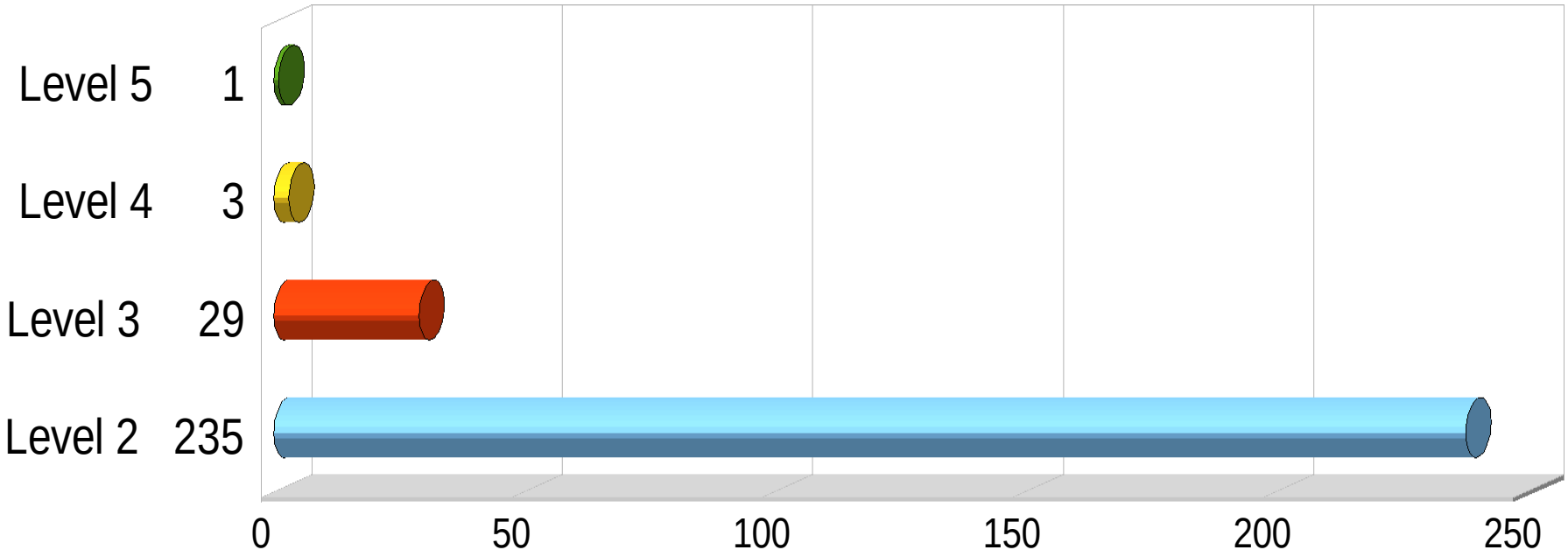
Level 0 is below scale & Level 1's are subjective and inconsistently reported hence, offer limited value.

In 20 years around 275 events 'Level 2' and above.



Transportation 9 events

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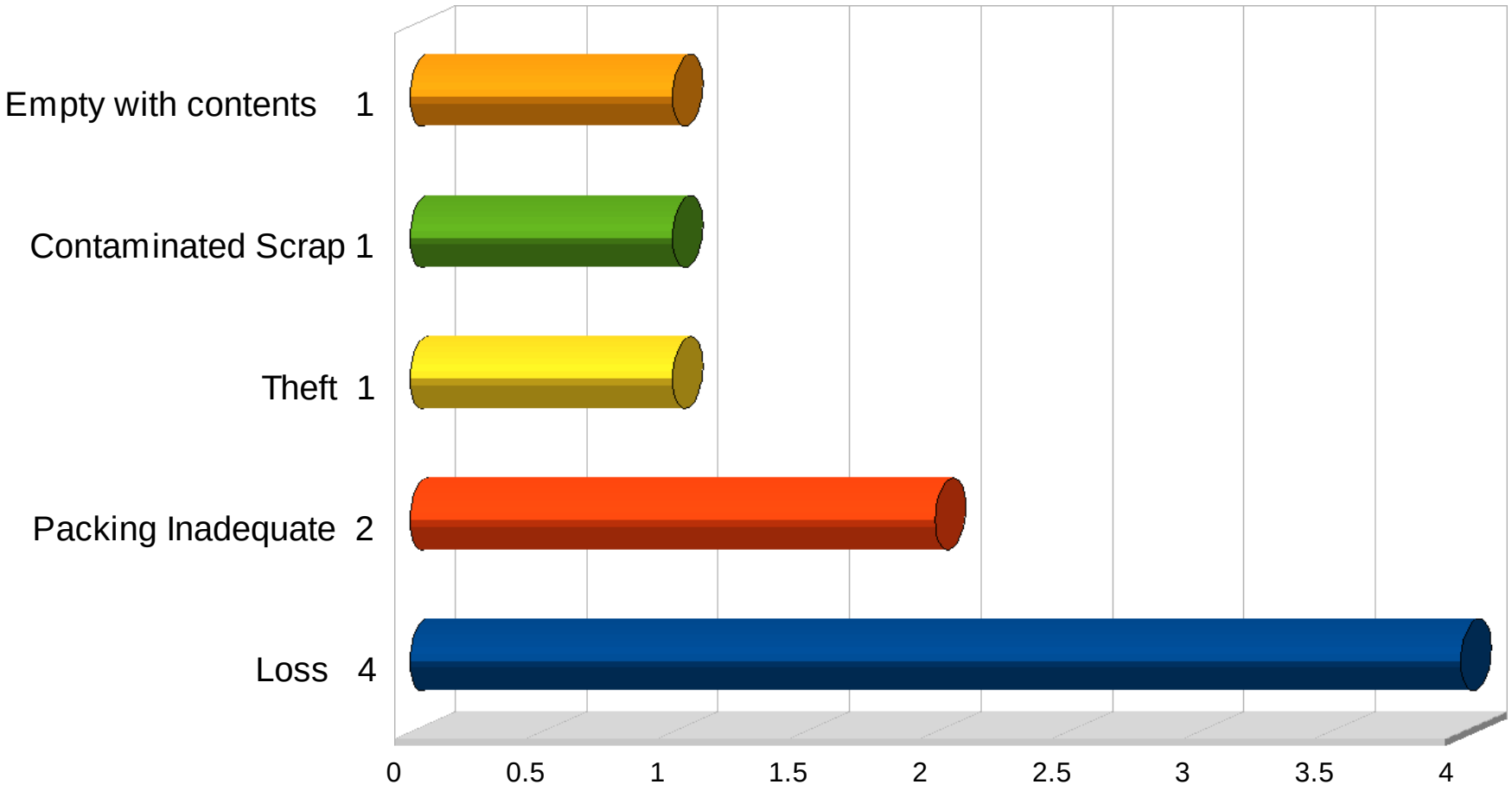

'Likely' Maximum INES Levels

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- Excepted packages 'generally' fall out of scope.
- Industrial packages and Type A packages
  - ‘2’ for complete failure of all safety provisions
  - ‘1’ for a ‘defense in depth’ failure
- For Type B and fissile packages:
  - ‘5’ for complete failure of all safety provisions
  - ‘3’ for multiple ‘defense in depth’ failures

Other Industrial Activities?

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Date	Location	Substance	Details	Equivalent INES Level
15/03/2010	Taichung, Taiwan	Toluene	Tank truck fire, driver dead	Level 4
16/03/2010	Salang, Afganistan	LPG	Gas canisters exploded during transport, 32 killed, 6 injured	Level 5
22/03/2010	Bangalore, India	Explosive, Gel	Explosives detonated during transport, 2 dead	Level 4
24/03/2010	Punjab, India	Oil	Oil tanker overturned and caught fire, 2 dead, 9 injured	Level 4

INES - Final View

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Advantages

- Enables the effective sharing of information with the public and for other stakeholders 'learning from experience'
- Adopts a relatively simple 'source based' hazard rating system for transport.
- When presented without bias and kept in perspective, its clear transport has an enviable safety record.
- Transport events generating an INES of ‘5’ are unlikely, multiple deaths through failure of all safety systems of ‘Type B’ or ‘fissile packages’.

INES - Final View

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Other Issues

- International publication of minor incidents, does it 'reassure' the public or 'over sensitise' them?
- Other dangerous goods transports have significantly more impact on public safety, why do we focus on radioactive transports?
- Using D values works well for 'uncontrolled sources' but may over-emphasis the hazard for other RAM
- INES incorporated into National legislation without consideration of other classes may be unbalanced in terms of overall transport safety.

- Good news – Significant INES events for transport are very rare.

Thanks for Listening

Thanks to WNTI and its members