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IAEA
International Atomic Energy Agency

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Public Communications: communicating the safety significance of events - INES

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Public Communications:

Communicating the safety significance of Events

- INES -

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Objectives

- Explain why to use INES
- Present what is INES
  - History, developments, scope, purpose, main features, terminology
- Present the key criteria for rating events
  - "People and Environment"
  - "Radiological Barriers and Controls"
  - Explain the general approach to "Defence in depth"
- Present key issues in communications using INES

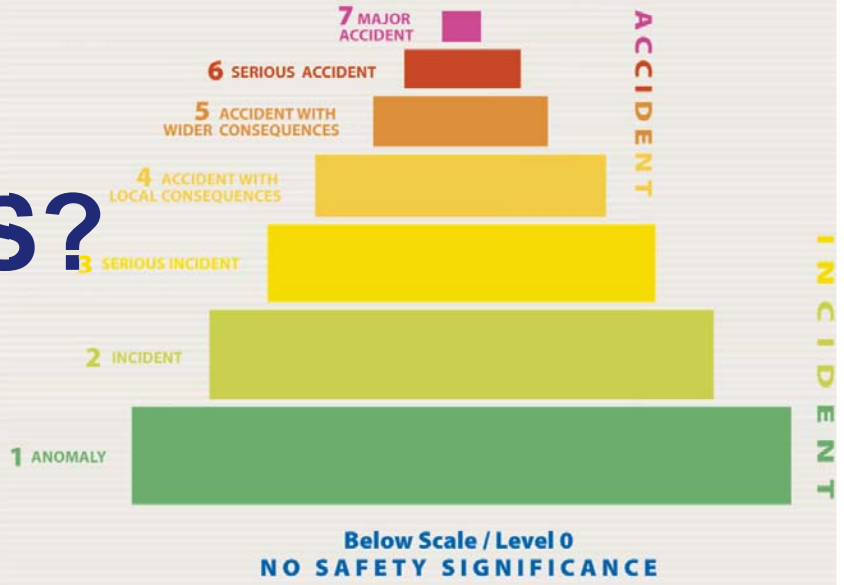
Public Communications:
Communicating the safety Significance of Events - INES

Part 1 (30 min)	How the scale was developed Practical exercise Why to use INES • A scenario • Movies
Part 2 (30 min)	INES: Purpose, history, scope, main features, terminology
Part 3 (30 min)	Overview of Rating Criteria Key issues in communicating using INES

(See part 2)

PRACTICAL EXERCISE

WHY TO USE INES?



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Consider a scenario - 1

Earthquake **scale Richter!**

Consider a scenario: 2

Fire at nuclear power plant !

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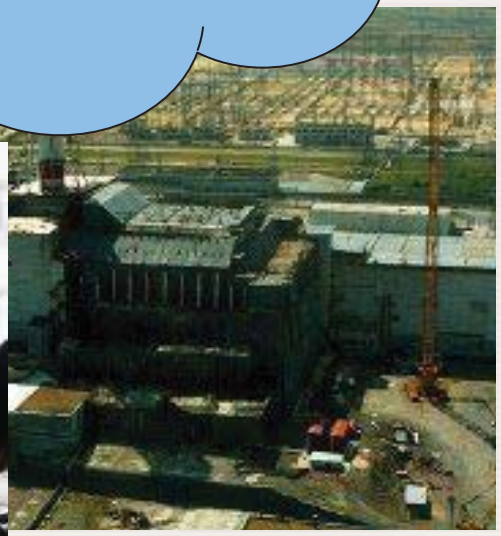
‘What has happened?’

‘Am I and my family safe?’

‘What is the safe level?’



Fire at transformer

Fire extinguished

NPP decreased power

No safety systems affected

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Movie

OVERVIEW OF INES

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Overview of INES

- Purpose
- History
- Scope and main features
- Terminology
- Criteria

Communication is good for you

"Timely and accurate responses

to media and public concerns

avoid confusion and rumour"

"Proactive communication

Builds Trust"

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“Make everything as simple as possible, but not simpler.”

A. Einstein

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Scales are inherent forms of measurement used in daily life

Celsius or Fahrenheit scales for temperature

Richter scale for earthquakes

Beaufort wind scale

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Why a Scale?

- **Aftermath of Chernobyl**
  - Growth in Public concern about nuclear events
  - Same information was not the same from one country to another
- **Initiatives in several countries**
  - Better informing the public about nuclear events
  - Development of severity scales to communicate to the public, in particular in France and Japan (1988)

➢ **Cooperation between IAEA and NEA to develop a scale**

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What is INES?

The international event rating scale aiming to communicate the safety significance of nuclear and radiological events to the public, the media and the technical community

Jointly developed by the IAEA and OECD/NEA in 1990

Used at national and international level by 70 Member States

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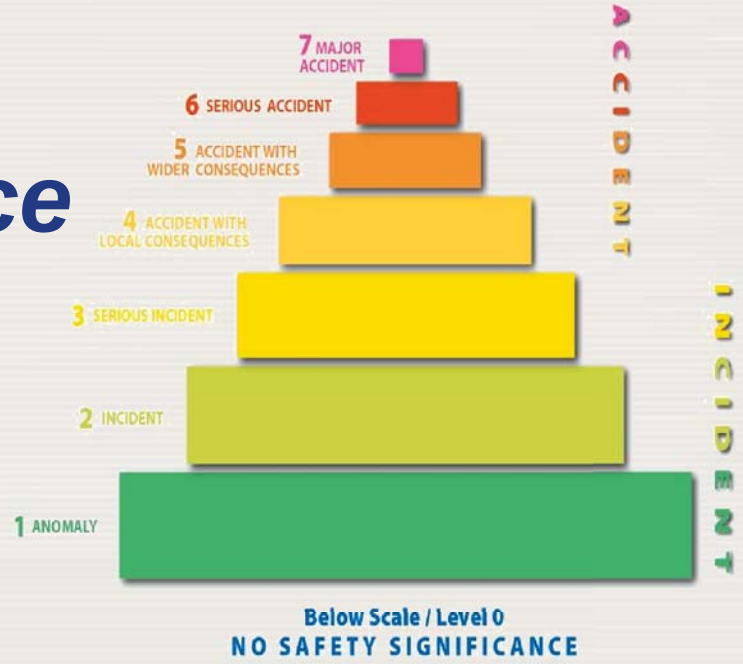
Criteria for rating any event associated with the transport, storage and use of radioactive material

The INES Scale

One tool to help communicate the right message at the right time

the safety significance of events



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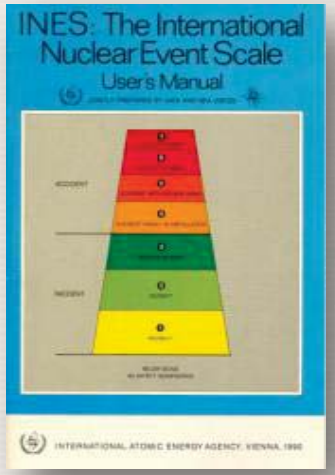
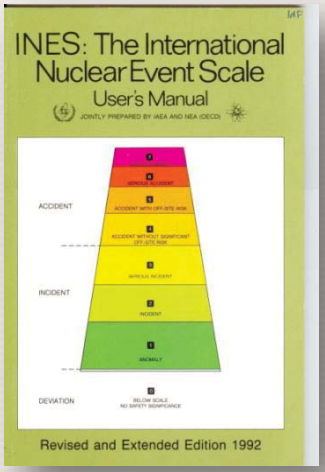
INES Developments

Nuclear power plants



1990

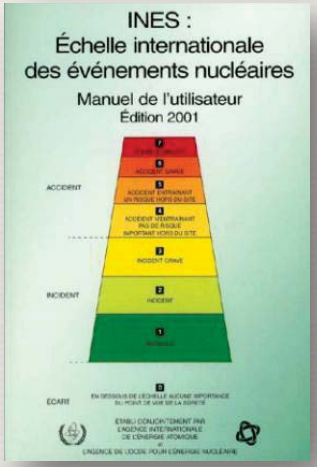
Nuclear Facilities



1992

1996 Additional Clarifications issued

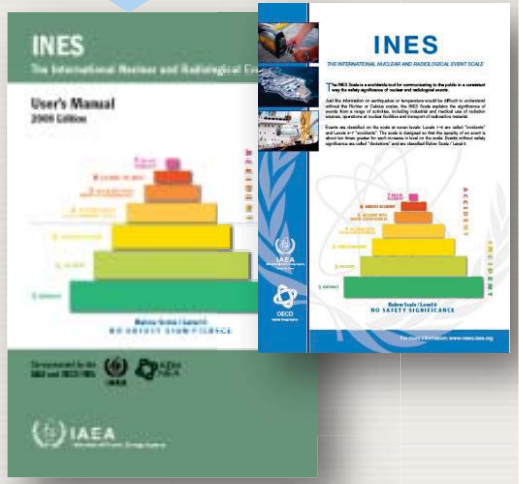
Nuclear Facilities/ transportation and exposures



2001

2006 Additional guidance for radiation sources & transport

Any event involving radiation sources and transport of radioactive material



2008

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INES management process and players

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coordinates developments and administrates NEWS
(co-sponsored by OECD/NEA)

INES Advisory Committee: nine experts, IAEA INES Coordinator, NEA officer

Identify areas where additional guidance/clarification is required	Analyse the feedback on the effectiveness of INES	Propose lines of action to the TM

Biennial Technical Meeting of INES (TM) : INES National Officers (over 70)

Review INES use and developments	Recommend actions	Endorse documents for use

When needed: **Working groups with INES AC members**

Analyse issues	Prepare proposals	Develop guidance

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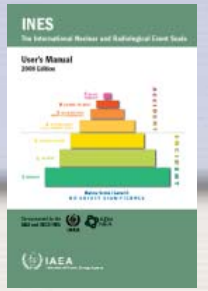
Key for success



- **Simple and easy to understand**
- **Solid technical basis**

- ✓ **Support**
- ✓ **Coordination**
- ✓ **Commitment**

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Support of Member States

General Conference Resolutions

- 2005, 2006, 2007
- 2008: "welcomed the new INES User's Manual…"
- 2009
  - "Recognizes the efforts of the Secretariat and Member States in implementing the International Nuclear and Radiological Events Scale (INES)"
- 2010
  - "Urges Member States to designate International Nuclear and Radiological Events Scale (INES) national officers and utilize the scale"

Coordination & Commitment

- **IAEA and OECD-NEA**
- **70 Member States**
  - **Over 90 INES National Officers**
  - **INES Advisory Committee**

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Production of the 2008 Manual

- Managed by IAEA and OECD/NEA
- Wide involvement of experts from ALL areas
  - Nuclear facilities
  - Radiation safety
  - Transport
- Reviewed by INES national officers
  - 63 countries; over 330 comments

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Scope of INES

Any event associated with the transport, storage and use of radioactive material

Radiation sources

Transport

Nuclear Facilities

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INES essentials

- Applicable to any event associated with radioactive material
- Classification of events on a scale from 1 to 7
- Prompt communication
- Consistency in terms of safety significance

- Putting the event into PROPER safety significance perspective
- Contributing to COMMON understanding of incidents and accidents
- Bringing TRANSPARENCY
- Bringing UNIFORM terminology
- Increasing CREDIBILITY and REASSURANCE
- Building TRUST

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What it is ….

- PROPER safety significance perspective
- COMMON understanding of incidents and accidents
- TRANSPARENCY
- UNIFORM terminology
- CREDIBILITY and REASSURANCE

What it is not

- It does NOT REPLACE the existing national criteria for reporting of events
- It can NOT be used to COMPARE safety or regulatory programmes between countries

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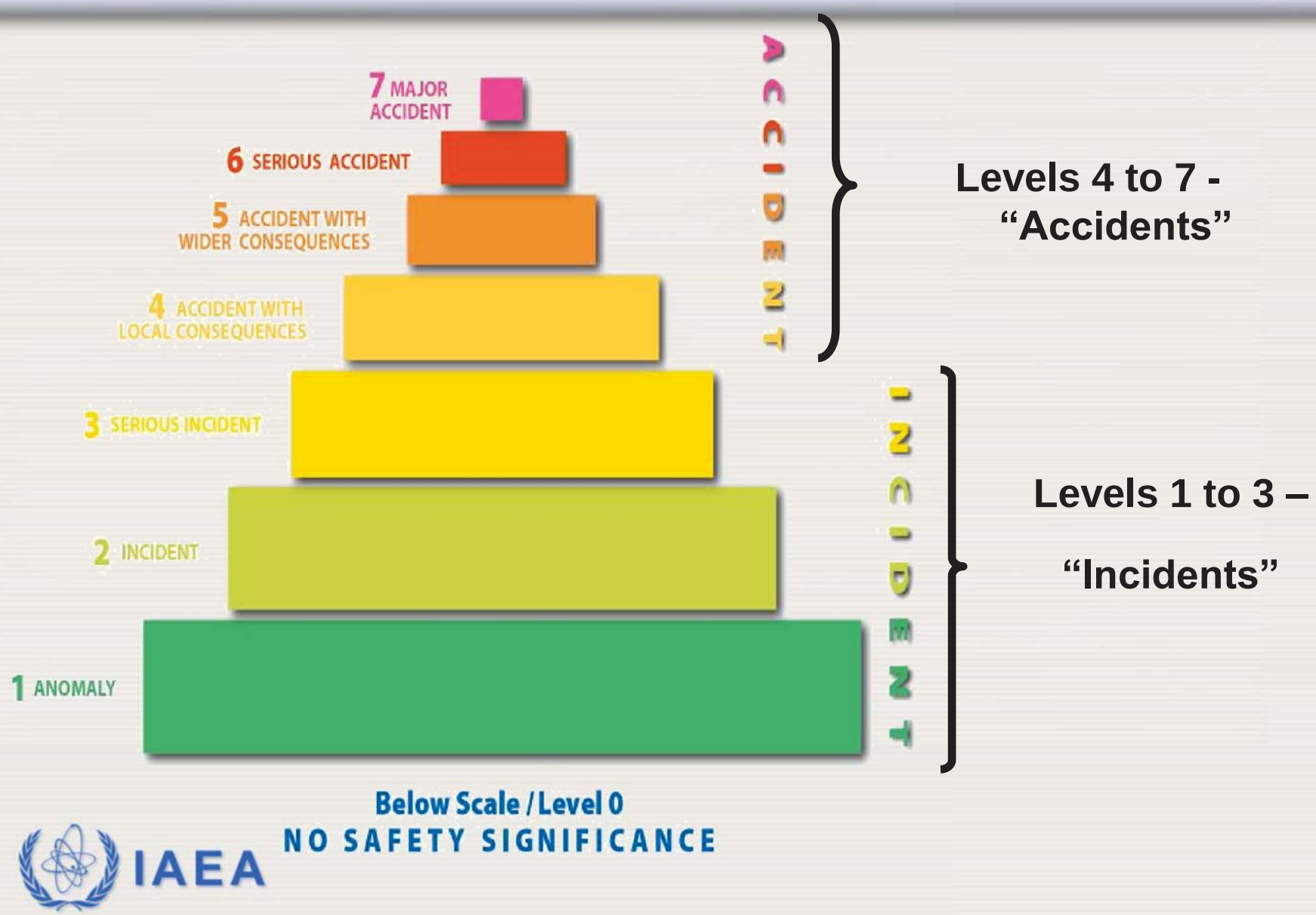
Terminology



Levels 4 to 7 - "Accidents"

Levels 1 to 3 – "Incidents"

Criteria – 3 major areas

1. **Impact to people and environment (replaces off-site impact)**
   - Dose received or activity released
2. **Impact to radiological barriers and controls (replaces on-site impact)**
   - The severity of the event inside the site of a facility and the potential harm to the public
3. ***Degradation in "Defence in Depth"***
   - Looking at failures in safety provisions to determine how close the event was to causing actual consequences

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1. Impact on People and Environment

It considers the actual radiological impact to workers and members of public and to the environment

- Assessment based on:
  - **Amount of radioactive material released**
  - **Doses** (measured or estimated) and the number of people involved (who received dose)

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1. Impact to people and environment
Activity Release Criteria

Activity release

criteria for widespread major accidents

- Covers people and environmental effects
- Independent of weather, time of year, population density
- Independent of success of protective actions taken
- Highest INES levels can only occur from major nuclear facilities but need to cover major transport and source accidents

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What should highest level look like?

Chernobyl

- Release of large fraction of the inventory of a power reactor (including long lived radionuclides)
- Stochastic health effects over a wide area
- Involving more than one country
- Possibility of deterministic effects
- Long term environmental consequences
- Likely protective measures

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Unplanned Airborne Release of Activity
Criteria for facilities

7	Radiologically equivalent to order of more than tens of thousands of TBq I-131 (> 50,000 TBq I-131)	*Chernobyl*
6	Radiologically equivalent to order of thousands to tens of thousands of TBq I-131 (> 5,000 TBq I-131)	*Kyshtym*
5	Radiologically equivalent to order of hundreds to thousands of TBq I-131 **(> 500 TBq I-131)**	*Windscale*
4	Radiologically equivalent to order of Tens to hundreds of TBq I-131 **(> 50 TBq I-131)**	

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Level of Exposure	Minimum Rating	Number of Individuals	Actual Rating
The occurrence or likely occurrence of a lethal deterministic effect	4	Few tens or more	6*
		Between several and a few tens	5
		Less than Several	4
Whole body exposure leading to an absorbed dose of the order of a few Gy	4	More than one hundred	6*
		More than 10	5
		Ten or less	4
The occurrence or likely occurrence of a non-lethal deterministic effect	3	Few tens or more	5
		Between several and a few tens	4
		Less than Several	3
Exposure leading to an effective dose of the order of a few hundred mSv or whole body exposure leading to an absorbed dose of a few hundred mSy-Eq	3	More than one hundred	5
		More than 10	4
		Ten or less	3
Exposure of a worker in excess of statutory annual limits OR Exposure of a member of the public leading to an effective dose in excess of 10 mSv	2	More than one hundred	4
		More than 10	3
		Ten or less	2
Exposure of a worker in excess of dose constraints OR Exposure of a member of the public in excess of statutory annual limits	1	More than one hundred	3
		More than 10	2
		Ten or less	1

*Level 6 is not considered credible for any event involving radiation sources

2. Damage to radiological barriers and controls

Applicable to events within authorized facilities:

- with a site boundary defined as part of their licensing

and

- where there is the potential for a release of radioactive material at INES level 5

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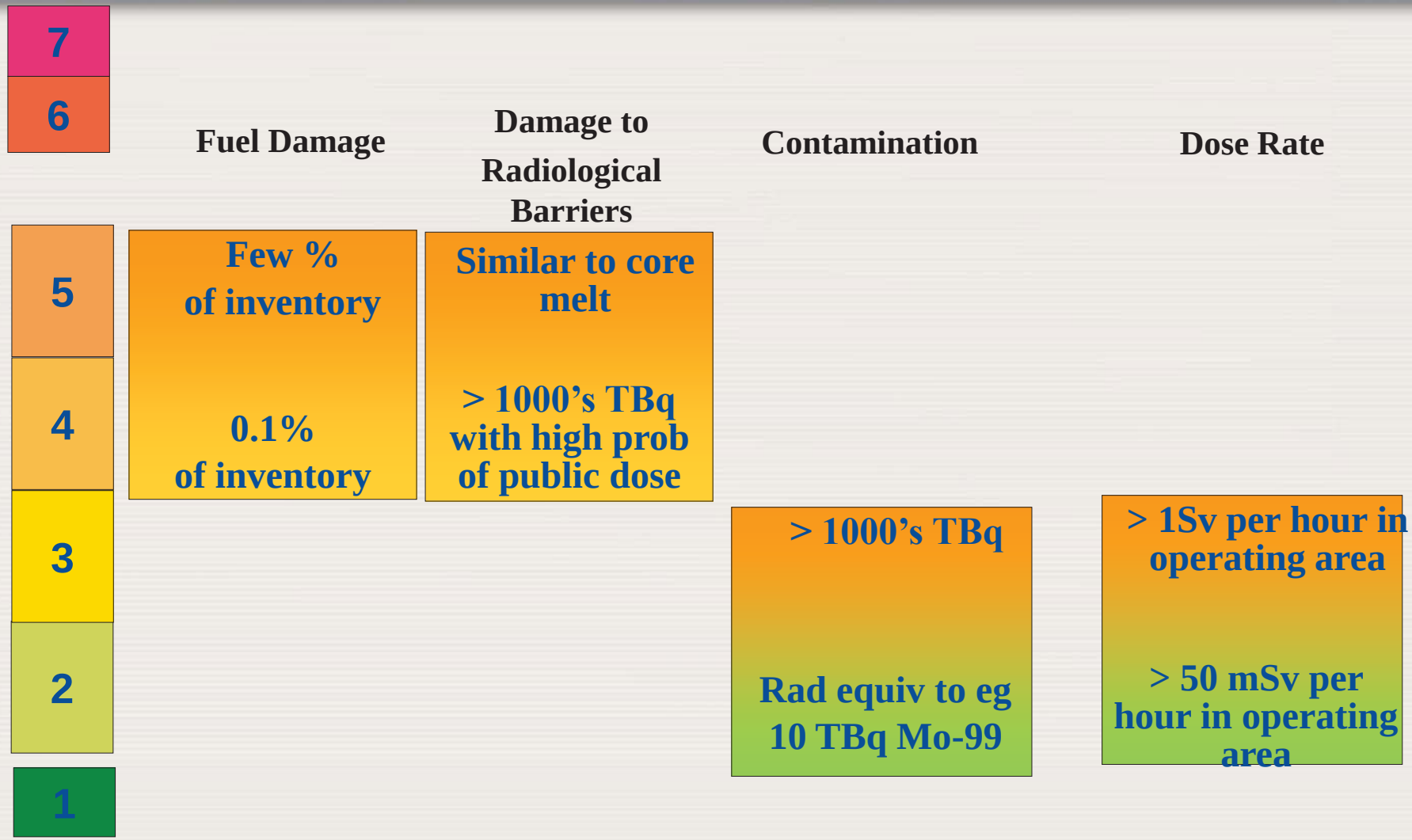
Radiological Barriers and controls



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3. Degradation of Safety Provisions (DID)

Three sets of guidance

- **Reactors at power**

- **Major facilities**

- **Transport and Radiation Sources**

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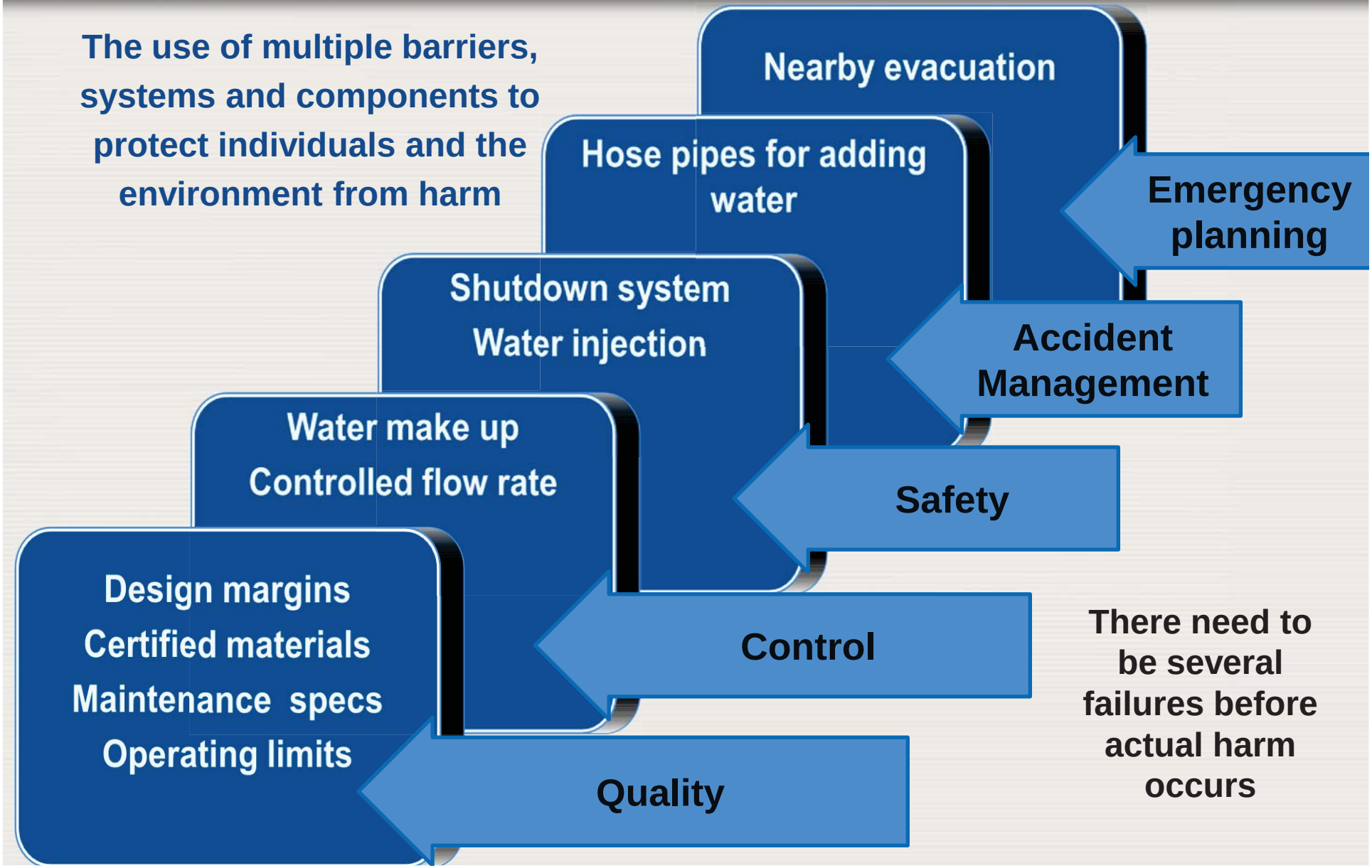
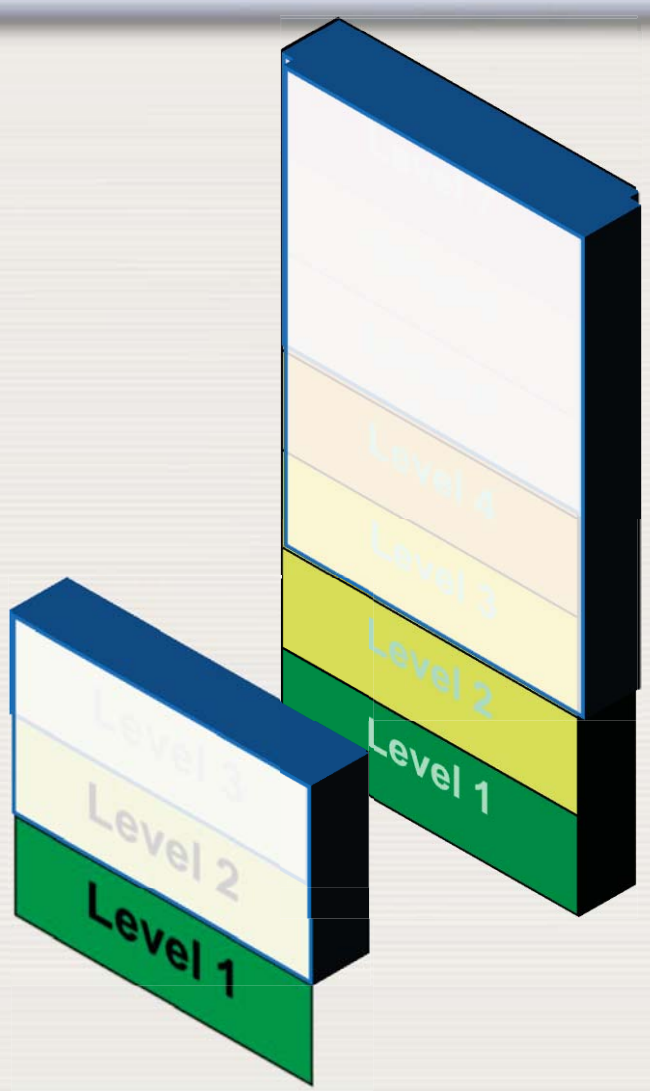
3. Defence in depth

The use of multiple barriers, systems and components to protect individuals and the environment from harm



There need to be several failures before actual harm occurs

The Upper Limit of DID



Summary:
Levels covered by each area of impact

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Summary:
Levels covered by each area of impact

	People and Environment	Radiological Barriers and Control	Defence-in-Depth
7	• Major release of radioactive material with widespread health and environmental effects requiring implementation of planned and extended countermeasures.		
6	• Significant release of radioactive material likely to require implementation of planned countermeasures.		
5	• Limited release of radioactive material likely to require implementation of some planned countermeasures. • Several deaths from radiation.	• Severe damage to reactor core. • Release of large quantities of radioactive material within an installation with a high probability of significant public exposure. This could arise from a major criticality accident or fire.	
4	• Minor release of radioactive material unlikely to result in implementation of planned countermeasures other than local food controls. • At least one death from radiation.	• Fuel melt or damage to fuel resulting in more than 0.1% release of core inventory. • Release of significant quantities of radioactive material within an installation with a high probability of significant public exposure.	
3	• Exposure in excess of ten times the statutory annual limit for workers. • Non-lethal deterministic health effect (e.g., burns) from radiation.	• Exposure rates of more than 1 Sv/h in an operating area. • Severe contamination in an area not expected by design, with a low probability of significant public exposure.	• Near accident at a nuclear power plant with no safety provisions remaining. • Lost or stolen highly radioactive sealed source. • Misdelivered highly radioactive sealed source without adequate procedures in place to handle it.
2	• Exposure of a member of the public in excess of 10 mSv. • Exposure of a worker in excess of the statutory annual limits.	• Radiation levels in an operating area of more than 50 mSv/h. • Significant contamination within the facility into an area not expected by design.	• Significant failures in safety provisions but with no actual consequences. • Found highly radioactive sealed orphan source, device or transport package with safety provisions intact. • Inadequate packaging of a highly radioactive sealed source.
1			• Overexposure of a member of the public in excess of statutory annual limits. • Minor problems with safety components with significant defence-in-depth remaining. • Low activity lost or stolen radioactive source, device or transport package.

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Example of events

Chernobyl (1986)	7
Kyshtym (1957)	6
Goiania (1987)	5
Three mile island (1979)	5
Tokaimura (1999)	4
Fleurus (2006)	4
Vandellos (1989) / Sellafield (1992)	3
Oil refinery Gdansk (2009)	3
Industrial radiographer overexposure	2
Loss of radiation source	2

References

- INES User's Manual, 2008 edition

  http://www-pub.iaea.org/mtcd/publications/pdf/ines-2009_web.pdf

- INES Facsheet:

  http://www.iaea.org/Publications/Factsheets/English/ines.pdf

- INES at iaea.org:

  http://www.iaea.org/newscenter/pressreleases/2010/prn201012.html

  http://www.iaea.org/newscenter/news/2007/ines.html

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  http://www.iaea.org/newscenter/news/2011/fukushima120411.html

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The International Nuclear and Radiological Event Scale

INES

20th anniversary 1990-2010

a worldwide tool for communicating to the public in a consistent way the safety significance of nuclear and radiological events

http://www-news.iaea.org/news/

Any questions?