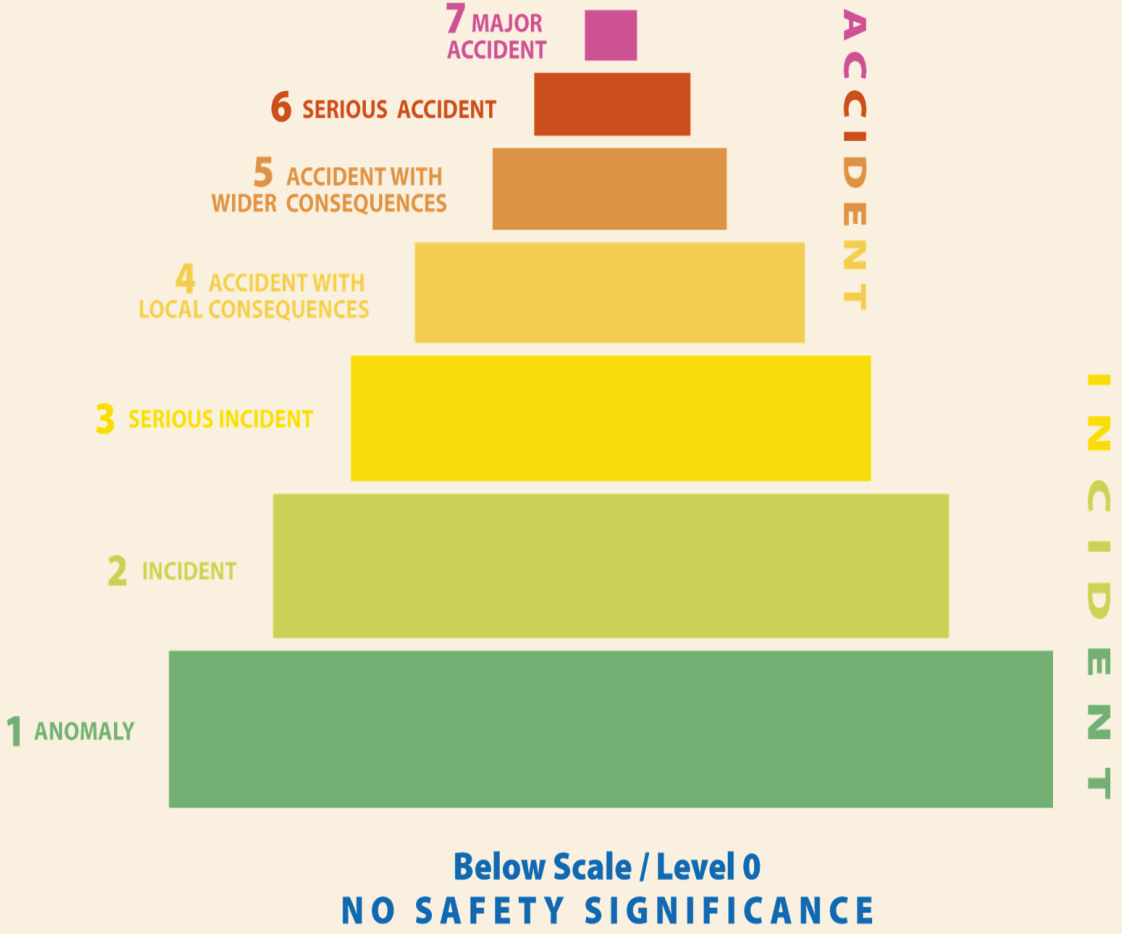
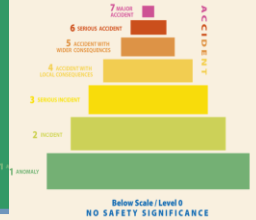
# INES

## The International Nuclear and Radiological Event Scale

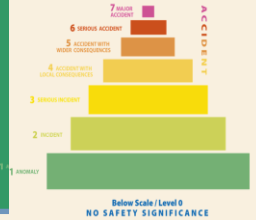


# BACKGROUND




- Developed in 1989/1990 by IAEA and the OECD/NEA
- Accidents that attracted international media attention e.g. Chernobyl accident
- To communicate safety significance of events at nuclear installations
- Communicate to the public, in a consistent manner

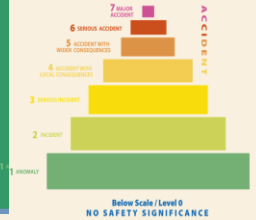
IAEA




*INES is an international tool for communicating the right message, the safety significance of events at the right time*

IAEA

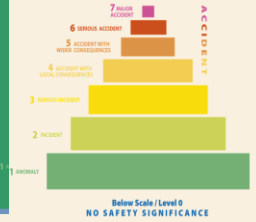
# INES DOCUMENTATION




- 1992 - INES User's Manual including guidance for events at all nuclear facilities
- 1996 - Additional Clarifications issued
- 2001 - INES User's Manual incorporating guidance on radiation and transport events
- 2004 - Additional guidance for radiation source and transport events issued for pilot use
- 2006 - Additional guidance for radiation source and transport events endorsed/approved by INES National Officers
- 2009 - Publication of New INES User's Manual

IAEA

# INES MILESTONES




## The 1990's

1990 — NPPs

1992 — All facilities

1996 — Clarifications

## The new millennium

2001 — Manual

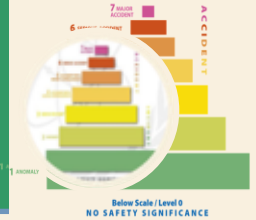
2006 — Add Guidance

2008 — 2008 INES User's Manual

2010 — 1990-2010: 20 years

IAEA

# SCOPE OF INES




***Any event associated with the transport, storage and use of radioactive material at facilities or practices***




**Radiation sources**



**Transport of RAM**



**Nuclear Facilities**

IAEA

# INES MAIN FEATURES

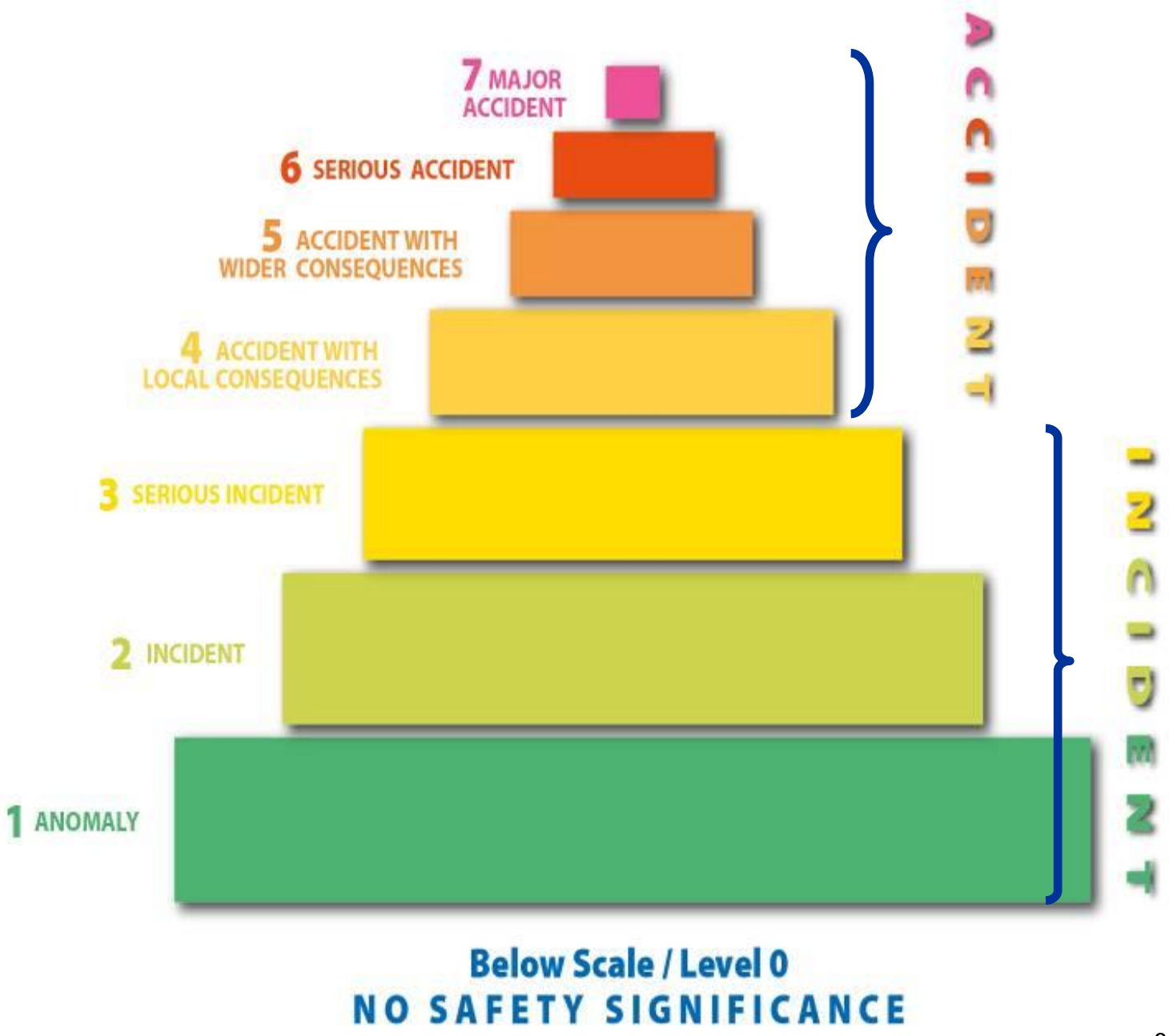



- PROMPT communication to the public
- Applied to ANY EVENT associated with radioactive material
- Put the event into PROPER safety significance perspective
- Contribute to COMMON understanding of incidents and accidents
- Bring TRANSPARENCY, and UNIFORM terminology
- COOPERATION and SUPPORT in case of regional, transboundary events

IAEA

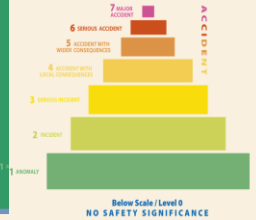
**Levels 4 to 7**
**"Accidents"**

**Levels 1 to 3**
**"Incidents"**




IAEA

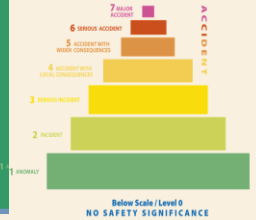
# CRITERIA – 3 MAJOR AREAS




1. **Impact to people and environment**
   - Dose received or activity released
2. **Impact to radiological barriers and controls**
   - 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

IAEA

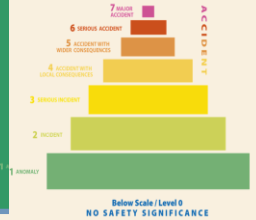
# 2008 REVISION OF INES MANUAL




- Coordinated again by the 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

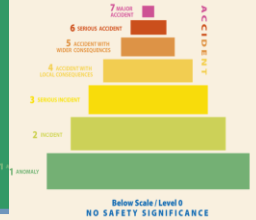
IAEA

# WHAT ARE THE CHANGES




- Scope? Not really.
- Criteria better clarified
- Consistency of terminology across the different areas improved
- Ambiguous interpretation eliminated
- More examples (about 50)

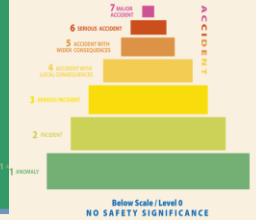
# 1. IMPACT ON PUBLIC AND ENVIRONMENT




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 no. of people involved (who received dose)

# 2. DAMAGE TO RADIOLOGICAL BARRIERS AND CONTROLS




Applicable to events within authorized facilities:

- with a site boundary defined as part of their licensing

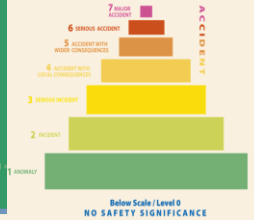
and

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



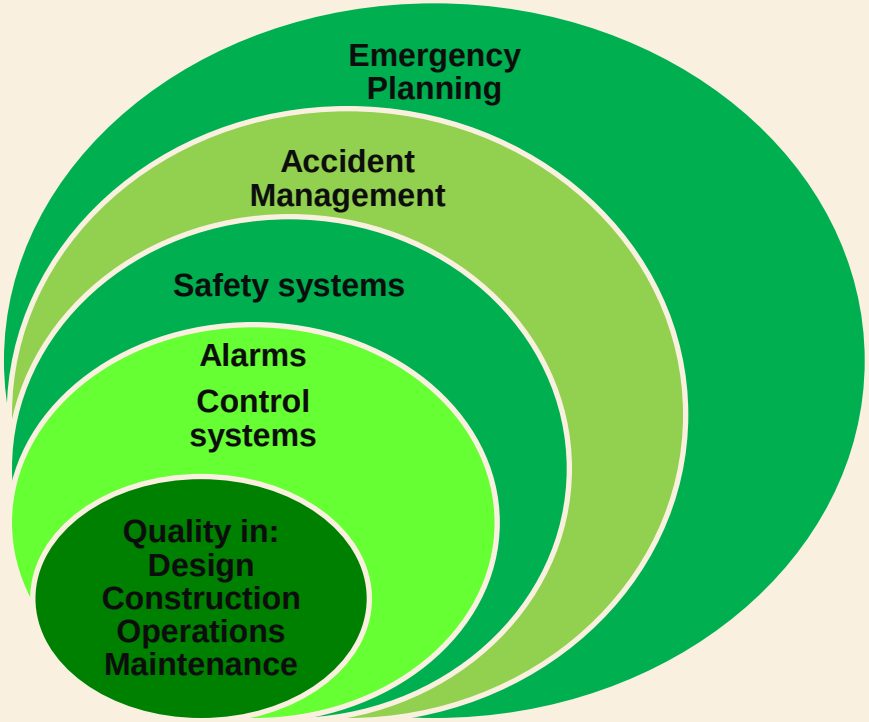


# 3. DEFENCE IN DEPTH CRITERIA

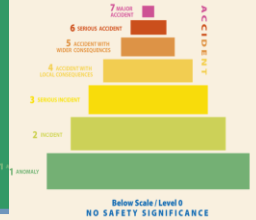



The concept is related to the use of multiple barriers, systems and components to protect individuals and the environment from harm. There needs to be several failures before actual harm occurs

**INES:**
**Degradation of Safety Provisions**



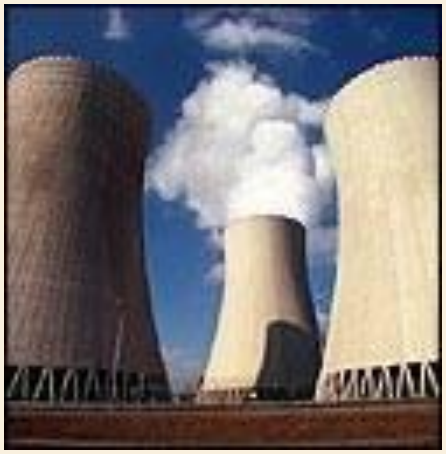
# DEGRADATION OF SAFETY PROVISIONS




## Three sets of guidance

- Reactors at power
- Major facilities
- Transport and Radiation Sources

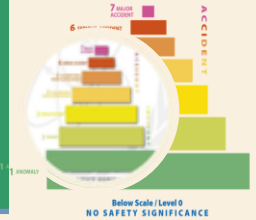







IAEA

# PAST EVENTS




**Chernobyl (1986)**

**Fukushima (2011)**

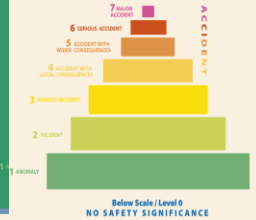
**Goiania (1987)**

**Three mile island (1979)**

**Tokaimura (1999)**

IAEA

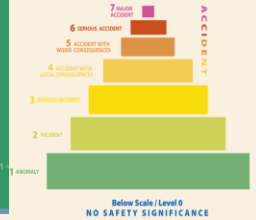
# FUKUSHIMA EVENT




- March11, 2011, at 14:46, a massive earthquake, of magnitude 9.0 occurred.
- At the Fukushima-Daiichi NPS, Unit 1 to 3 were in power operation, Unit 4 was in shutdown with all the fuel assembly unloaded and Unit 5 and 6 were in shutdown.
- The Earthquake motion at the station was somewhat higher than the response acceleration calculated for the design basis earthquake.
- The tsunami height was much higher than the design basis one.

IAEA

# FUKUSHIMA RATINGS




## 1st provisional rating (March 12, around 0:30)

- Level 3 for Unit 1 and 2 due to loss of heat removal

## 2nd provisional rating (March 12, evening)

- **Level 4 for Unit 1 due to high radiation level at the site** boundary

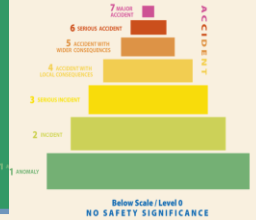
## 3rd provisional rating (March 18)

- Level 5 for Units 1, 2 and 3 since core melt was believed to have occurred with high credibility.
- Level 3 for Unit 4 due to loss of heat removal

## 4th provisional rating (April 12)

- Level 7 for Fukushima-Daiich site since the estimated equivalent release was believed to be more than several tens of thousands of terabecquerels of $^{131}$I

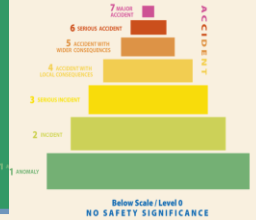
# FUKUSHIMA CRITICISMS




- The level 5 rating was one week after the accident and the level 7 rating was one month after the accident.
- Why the ratings were so late, while the objectives of INES is prompt notification to the public?
- Why the rating result became higher at every rating? Was there an intention to underestimate the accident?
- Why the result of the final ($4^{th}$) provisional rating was same as that for Chernobyl
- The radioactive material released to the environment during this accident was about one order lower than that in Chernobyl?

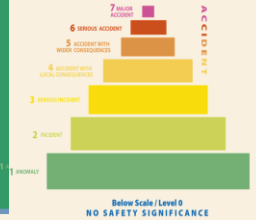
IAEA

# INES POST FUKUSHIMA ISSUES




- Two major issues in improving INES, reflecting the difficulties and criticisms in the Fukushima accident:
  - One is to consider whether the current structure, consisting of seven levels, may need modification.
  - The other is to consider how we can rate the event and inform the rated result promptly to the public, under the condition with large uncertainties.

# INES AFTER FUKUSHIMA




- Confirming the appropriateness of the criteria for rating events
- Developing guidelines that will enhance the use of INES as part of communications during an emergency
- Giving guidance on how to rate events at multiple sites or a site with multiple facilities
- Explaining how two Level 7 events can have very different consequences

# IAEA INE SPOST FUKUSHIMA ACTIVITIES

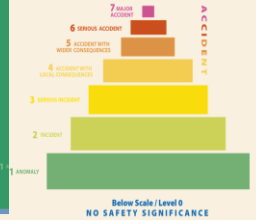



- Following the approval of the IAEA Post-Fukushima Plan of Action by the IAEA General Conference, the AC refocused its activities to concentrate on the action related to INES

  "*The IAEA Secretariat and Member States, in consultation with the OECD/NEA and the IAEA International Nuclear and Radiological Event Scale (INES) Advisory Committee to review the application of the INES scale as a communication tool.*"

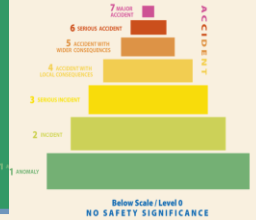
- Action list developed (at the October 2011 ad hoc meeting/ Train-the-Trainers session)
  - Actions to directly address the IAEA Action Plan
  - Other actions not directly related to the IAEA Action Plan

# IAEA INE SPOST FUKUSHIMA ACTIVITIES




- Primary action was the development of the draft "*Guidance on the Use of INES in Evolving Severe Accident Situations*"
- Draft Guidance was circulated the for comment
- Will be presented at this Biennial Technical Meeting
- The Advisory Committee recommendation:
  - Update the draft Guidance, taking into account the comments of the INES National Officers
  - Include the updated Guidance as an Annex in the document "*The Use of INES in an Event Communication Process: Principles and Good Practices*"
  - IAEA Secretariat reports the progress to the General Conference

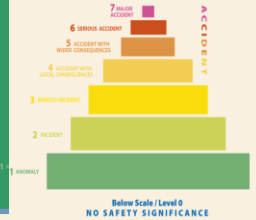
# INES PARTICIPATION




- INES covers a wide spectrum of practices, including industrial use such as radiography, use of radiation sources in hospitals, operations at nuclear facilities and transport of radioactive material
- Participation is open to all IAEA Member States Participation in the INES system is voluntary
- Designated INES National Officers participate in discussions and decisions on the application of the Scale

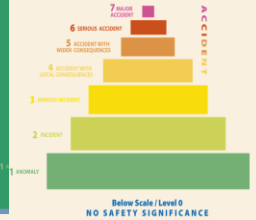
IAEA

# PARTICIPATION IN INES




- Membership of INES
  - ~70 of the 141 IAEA Member States have implemented INES
  - Africa 7 Member States
  - South Africa, Zimbabwe, Nigeria, Egypt, Algeria, Kenya, DRC
  - Target" IAEA MS who have signed the Convention on Nuclear Safety, Joint Convention on Spent Fuel and Radwaste and Code of Practice for Radioactive Sources

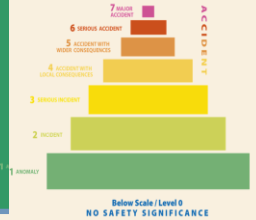
# INES ADVISORY COMMITTEE




- Co-chairs from South Africa and Belgium
- Members Japan, France, Spain, Bulgaria, UK, Canada, India, Poland, Brazil
- Interact with IAEA Secretariat
- INES decision-making processes
- Mandate from National Officers

IAEA

# INES ADVISORY COMMITTEE




- Standing body of senior experts with high professional competence and long-term experience in assessment and rating of nuclear and radiological events on INES

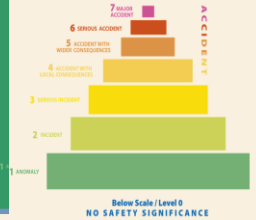
- The INES “system” is administered by the IAEA, through the infrastructure of the IAEA Incident and Emergency Centre (IEC)

- The IEC provides the Secretariat for the INES AC

- Strengthen and sustain the application of INES as a tool to facilitate communication and understanding between the technical community, the media and the public

IAEA

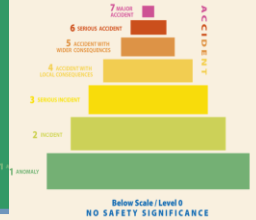
# INES ADVISORY COMMITTEE




- Clarification of the rating procedures/guidance in the Manual
- Develop, provide inputs into revisions of relevant INES documents, training materials and other associated materials
- Analyse the feedback on the effectiveness of INES
- Development of additional guidance, based on the review of event ratings and/or on identified difficulties in ratings
- Advice on National guidance and explanatory material, consistency of the rating of an event within the guidance
- Review the events rated within INES with the purpose to identify areas where additional guidance or clarification is required
- Advise the IAEA IEC in any significant technical discussions that relate or potentially relate to INES
- Mandate from National Officers

IAEA

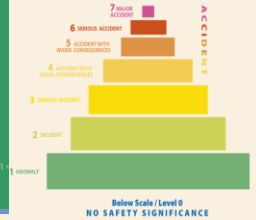
# INES ADVISORY COMMITTEE WORK




- Role of the INES Advisory Committee in emergency situations
- Communication and Awareness-building Material
  - Update and enhance the modules on communications
  - Update and enhance the concise material for briefing of senior executives
  - New training modules developed for distance learning

IAEA

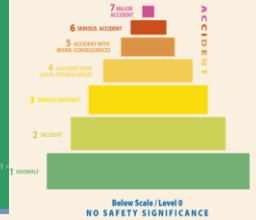
# INES ADVISORY COMMITTEE WORK




- INES “Toolkit”
- National INES Rating decision-making processes
- Rating of Aquatic releases
- Development of a separate document: “Additional Guidance on the application of INES as a communication tool during severe accidents in particular, and emergency situations in general”
  - sent to INES National Officers for comment

IAEA

# INES ADVISORY COMMITTEE WORK




- The use of INES to rate events involving medical patients
  - report prepared by the special Working Group
  - discussion at 2012 Biennial Meeting of INES National Officers
  - Draft guidance circulated for review

# SOUTH AFRICA INES

- National INES Committee established Aug'09
- Terms of Reference, 2 meetings annually
- Involvement of main nuclear and radiation safety stakeholders
- Oversight role
  - Legislative/regulatory frameworks
  - Interpretation and application of the new INES User's Manual
  - Establishment of rating, reporting and communications mechanisms
- Identification and implementation of training and development initiatives
- Dissemination, awareness of INES to public/media
- Review of IAEA standards/guidelines

# COMMITTEE MILESTONES

- 5 meetings of the National Committee
- Regulators decides/provides final rating
- Report events rated Level 2 and those attracting national and international interest
- Linkage to Advisory Committee activities
- Attendance of IAEA train-the-trainers seminar (2009, 2011, 2012)
- Proposal for regional training programmes
- Inclusion in FNRBA Working Group

# COMMITTEE MILESTONES

- Adoption of 2008 INES Users Manual, implementation 1 Oct'10 (nuclear installations)
- Implementation and rating process for medical events, mining and minerals
- Establishment of organisational rating committees
- Draft national procedure for communication, rating, reporting (included in new draft regulations)
- 3 national training courses conducted for technical experts (Jul'10, May'11, Jul'12)
- Draft INES public/media awareness strategy

# SHORT TERM ACTIVITIES

- Applying INES to NORM
- Rolling out of technical training for NORM
- Rolling out public/media INES awareness strategy
- More training for technical experts
- Rating and communication exercises