LEM/TEK/35 Sem.1
20 September 2018

PANDUAN TEKNIKAL

PANDUAN PENENTUAN SKALA KEJADIAN NUKLEAR DAN RADIOLOGIKAL ANTARABANGSA (INES)

KEMENTERIAN TENAGA, SAINS, TEKNOLOGI, ALAM SEKITAR DAN PERUBAHAN IKLIM

AELB ATOMIC ENERGY LICENSING BOARD

Lembaga Perlesenan Tenaga Atom
Kementerian Tenaga, Sains, Teknologi, Alam Sekitar dan Perubahan Iklim
Batu 24, Jalan Dengkil, 43800 Dengkil Selangor Darul Ehsan

Tel: 03-8922 5888
Fax: 03-8922 3685
Laman Web: http://www.aelb.gov.my

TUJUAN

1. Panduan ini disediakan bertujuan untuk memberi panduan penentuan Skala Kejadian Nuklear dan Radiologikal Antarabangsa (*International Nuclear and Radiological Event Scale*, INES).

SKOP

2. Panduan ini adalah terpakai kepada pemegang lesen, orang awam dan pihak media sebagai rujukan berhubung penentuan skala berkaitan kejadian nuklear dan radiologi yang digunapakai di peringkat antarabangsa.

SINGKATAN

3. (i) INES – Skala Kejadian Nuklear dan Radiologikal Antarabangsa
   (ii) IAEA - Agensi Tenaga Atom Antarabangsa

LATAR BELAKANG

4. Skala Kejadian Nuklear Antarabangsa (INES) diwujudkan bertujuan untuk menyampaikan kepada orang awam dengan segera mengenai keselamatan berkaitan nuklear dan radiologikal apabila sesuatu kejadian itu dilaporkan dalam tafsiran yang bersesuaian. Dengan meletakkan sesuatu kejadian itu kepada gambaran yang betul berdasarkan skala, INES dapat memudahkan pemahaman yang sama di antara golongan teknikal, media dan orang awam.

5. Skala INES boleh digunapakai bagi kejadian yang berlaku sama ada di dalam atau di luar sesuatu kemudahan. Skala ini juga meliputi kejadian kehilangan atau kecurian punca radioaktif, bungkusan bahan radioaktif dan penemuan punca piatu di premis besi lusuh. Di samping itu, skala ini juga boleh digunakan untuk kejadian yang melibatkan dedahan tidak terancang. Walau bagaimanapun, skala ini hanya terpakai untuk tujuan kegunaan sivil yang berhubung dengan aspek keselamatan suatu kejadian nuklear dan

radiologikal. Skala ini tidak boleh digunakan untuk menilai kejadian nuklear sekuriti atau perbuatan berniat jahat yang sengaja mendedahkan sinaran kepada orang awam.

6. Skala INES ini adalah telah diterimapakai di Malaysia. Sekiranya sesuatu kejadian berlaku di Malaysia, pemegang lesen, orang awam dan pihak media boleh merujuk kepada Lembaga Perlesenan Tenaga Atom (AELB) bagi mengetahui aras skala INES semasa melalui Seksyen Pengurusan Tindakbalas Nuklear (SPTN) di bawah Bahagian Kawalselia Sinaran (BKS) di talian Hotline Kecemasan AELB iaitu 1 800 88 7999 atau melalui emel di MNR-customer@aelb.gov.my.

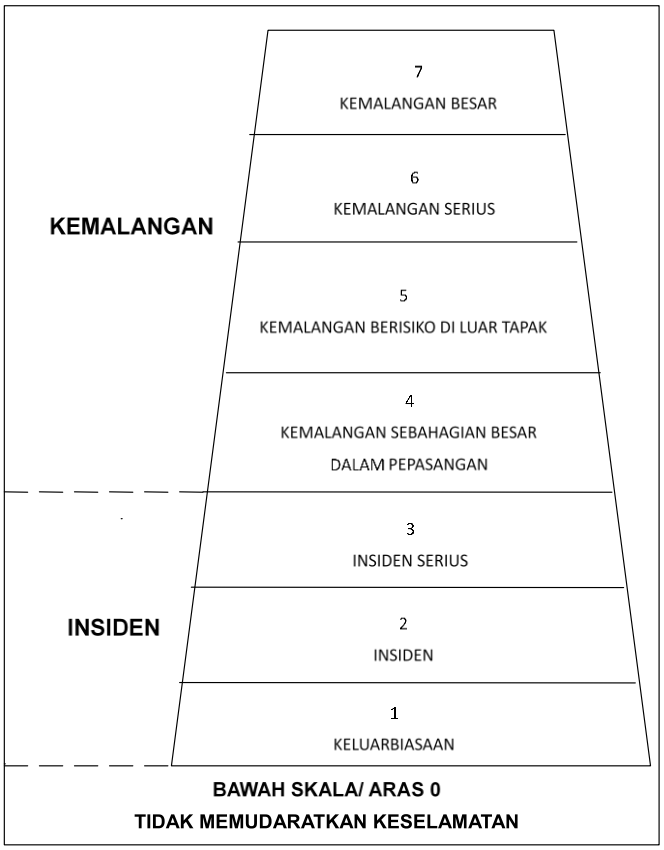
Penerangan INES

7. Kejadian yang diklasifikasikan di dalam INES hanya berkaitan keselamatan nuklear atau radiologikal dan dikelaskan kepada tujuh (7) aras sebagaimana yang ditunjukkan dalam **Gambarajah 1**. Aras 1 hingga 3 ditafsirkan sebagai insiden, manakala aras 4 hingga 7 ditafsirkan sebagai kemalangan. Kejadian yang tidak memudaratkan keselamatan dari segi sinaran atau keselamatan nuklear diklasifikasi sebagai Bawah Skala/Aras Kosong (Aras 0).

8. Skala bagi suatu kejadian nuklear dan radiologikal ditentukan berdasarkan kepada tiga jenis kesan yang berbeza seperti berikut:

i. kesan terhadap orang dan alam sekitar
ii. kesan terhadap sawar dan kawalan radiologikal di tapak kemudahan
iii. kesan terhadap *defence in depth* (sistem keselamatan)

9. IAEA telah menyediakan brosur bagi menerangkan kriteria setiap aras INES dan contoh kejadian nuklear dan radiologikal seperti **Lampiran 1**. Maklumat lanjut dan terperinci berkaitan INES boleh dirujuk di laman web IAEA di https://iec.iaea.org/inesrilt/two-approaches.



Gambarajah 1: Skala Kejadian Nuklear Antarabangsa (INES)

PENUTUP

10. Panduan ini boleh dirujuk agar pemegang lesen, orang awam dan pihak media mempunyai pemahaman yang sama bagi terhadap skala sesuatu kejadian nuklear atau radiologikal yang berlaku.

11. Sekiranya terdapat sebarang pertanyaan mengenai panduan ini, sila hubungi AELB di alamat berikut:

Lembaga Perlesenan Tenaga Atom
Batu 24, Jalan Dengkil, 43800 Dengkil, Selangor
Telefon : 03-89225888 Faks: 03-89223685
Email: mnr-customer@aelb.gov.my

PEMBATALAN

12. Panduan ini diterimapakai untuk menggantikan panduan LEM/TEK/35 bertarikh .

RUJUKAN

(i) International Atomic Energy Agency and OECD/Nuclear Energy Agency, INES The International Nuclear and Radiological Event Scale User Manual 2008 Edition

REKOD DOKUMEN

Tarikh Terimapakai	Status semakan	Penyedia
	0	AELB
20 September 2018	1	Pn Lim Ai Phing

Which events are rated on INES?

INES covers events at nuclear facilities, events involving sources in industry and medicine, events during transport of radioactive material, events when radioactive sources or packages are lost or stolen, discovery of orphan sources (such as radioactive sources being found in scrap metal) and events involving the unplanned exposure of individuals in other regulated practices (such as processing of minerals).

When is it not appropriate to use INES?

It is not appropriate to use INES to:

- Assess or compare safety performance between facilities, organizations or countries
- Initiate protective actions to a nuclear or radiological emergency
- Classify emergencies for the purpose of triggering emergency response actions

Do countries have to use INES and who decides on the INES rating?

Participation in the INES is voluntary. INES is regularly used by around 80 countries worldwide. These countries have officially designated an INES National Officer who is responsible for communicating the rating to the IAEA and Member States.

The rating of a particular event is decided by the country where the event occurred and each country designates who has the authority to provide it.

Can the INES rating be changed after it has been communicated to the public?

Yes. Events are dynamic; they start, develop and terminate. Experience has shown that in the early phase of an event, its nature and potential consequences may not be known. If an INES rating is provided during this phase, it might be changed afterward. A provisional rating may be up- or down-rated when the final outcome of the event is fully understood.

What is NEWS?

NEWS stands for 'Nuclear Events Web-based System' and is an IAEA supported communication channel that provides authoritative information about nuclear or radiological events as reported by INES National Officers. It can be accessed at http://www-news.iaea.org. NEWS aims to keep the public informed about the occurrence and safety significance of events rated at Level 2 and above, and those attracting international public interest. The IAEA hosts and administers the system, but event reports are filed and updated by INES National Officers in participating countries, who are responsible for all related content.

More information on INES:

Website:
http://www-ns.iaea.org/tech-areas/emergency/ines.asp

INES Contact Point: INES.Contact-Point@iaea.org

NEWS Contact Point: NEWS.Contact-Point@iaea.org

IAEA

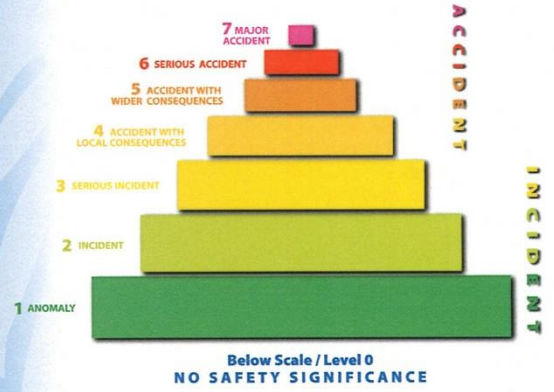
IEC
Incident and Emergency Centre

16-26111

THE INTERNATIONAL NUCLEAR AND RADIOLOGICAL EVENT SCALE

What is INES?

The International Nuclear and Radiological Event Scale (INES) is a scale used for communicating the safety significance of events associated with sources of radiation to the public.



General description of the scale

Events are rated on seven levels.

Levels 1–3 are called 'incidents', Levels 4–7 'accidents'. In order of increasing severity, the levels are:

- Level 1: anomaly
- Level 2: incident
- Level 3: serious incident
- Level 4: accident with local consequences
- Level 5: accident with wider consequences
- Level 6: serious accident
- Level 7: major accident

Events without safety significance are rated as "Below Scale/Level 0".

Events not related to radiation or nuclear safety (e.g. injury of a worker in a nuclear power plant by an electrical shock) are not rated on the scale.

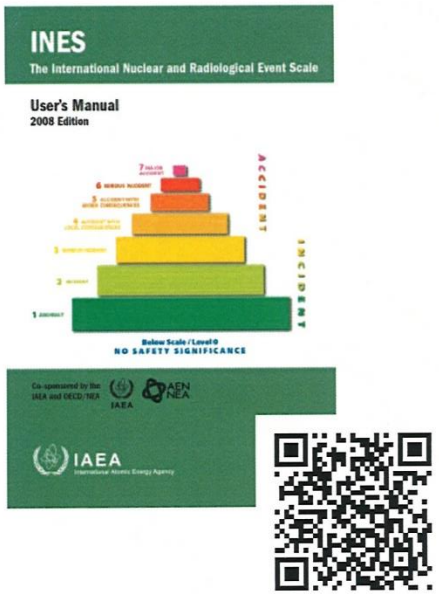
How is the INES rating determined?

Events are rated on INES using a methodology that is described in detail in the IAEA INES User's Manual (http://www-pub.iaea.org/MTCD/Publications/PDF/INES2013web.pdf).

Each event is considered in terms of its impact on three different areas.

- The impact on people and the environment considers the doses to people or the amount of radioactive material released to the environment.
- The impact on the systems designed to prevent the spread of contamination (radiological barriers and controls) considers the severity of the event at the site of a facility, as well as potential harm to the public.
- The impact on safety systems (defence in depth) considers events where the measures put in place to prevent accidents did not operate as intended, providing an indication of how close the event was to causing actual consequences.

The INES rating is the one that corresponds to the highest of the three.



What do the different INES ratings mean?

- Below Scale/Level 0 is for events that have no radiation safety significance.
- Level 1 means that there is only degradation of the safety systems designed to prevent the occurrence of events.
- Levels 2 and 3 mean that there are more serious degradations of the safety systems or some, though not severe, consequences for people and the environment.
- Levels 4 to 7 mean there is at least one death from radiation and/or a release of radioactive material that requires, or could require, the implementation of countermeasures.

Examples of INES ratings

Below Scale/ Level 0:
- Discovery of damaged fuel rods during core unloading and fuel inspections, NPP Krsko, Slovenia, 2013
- Discovery of consumer goods contaminated with ^{60}Co, Colombo, Sri Lanka, 2012

Level 1 (anomaly):
- Fast stop of the main circulation pumps and simultaneous loss of their fly wheel systems during reactor scram, NPP Olkiluoto-1 Finland, 2008
- Exposure of two workers in the nuclear power plant beyond the dose constraints, NPP Rajasthan-5, India, 2012

Level 2 (incident):
- Reactor trip due to high pressure in the reactor pressure vessel, NPP Laguna Verde-2, Mexico, 2011
- Overexposure of a practitioner in interventional radiology exceeding the annual limit, Paris, France, 2013

Level 3 (serious incident):
- Release of ^{131}I into the environment from the radioelements production facility, Fleurus, Belgium, 2008
- Severe overexposure of a radiographer, Lima, Peru, 2012

Level 4 (accident with local consequences):
- Radioactive material in scrap metal facility resulted in acute exposure of scrap dealer, New Delhi, India, 2010
- Overexposure of four workers at an irradiation facility, Stamboliysky, Bulgaria, 2011

Level 5 (accident with wider consequences):
- Severe damage to the reactor core, NPP Three Mile Island, USA, 1979
- Four people died after being overexposed from an abandoned and ruptured high activity source, Goiania, Brazil, 1987

Level 6 (serious accident):
- Significant release of radioactive material to the environment after the explosion of a high activity waste tank Kyshtym, Russian Federation, 1957

Level 7 (major accident):
- Significant release of the radioactive material to the environment resulting in widespread health and environmental effects, Chernobyl, Ukraine, 1986
- Significant release of the radioactive material to the environment resulting in widespread environmental effects, Fukushima, Japan, 2011