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Case Study --Rating events using INES

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Case study:

Rating events without knowing INES

DEVELOPING A SCALE

Example 1

"A pressure build-up led to the explosion of a large steel vessel buried in a concrete bunker of a plutonium reprocessing facility.

The vessel contained a mixture of concentrated nitric acid, uranium (8757 kg), plutonium (449 g) along with a mixture of radioactive and organic waste.

The explosion blew a large hole in the roof of the building, releasing a cloud of Pu-239 and various other radionuclides into the environment.

The contamination plume extended 20 km beyond the facility property. No fatalities, illnesses or injuries were reported.

The accident exposed 160 on-site workers and almost two thousand cleanup workers to total doses of up to 50 mSv"

IAEA

Example 2

"Used nuclear fuel rods undergoing cleaning in a tank of heavy water ruptured and spilled fuel pellets. Boric acid had to be added to the tank to prevent the loose fuel pellets from achieving criticality. Ammonia and hydrazine were also added to absorb iodine-131. The discharge of radioactive gases through the stack continued for several days after the incident, although the authorities determined that the radiation levels adjacent to the plant were only about 10% above normal. The reactor remained out of service for over a year."

IAEA

Example 3

“The plant experienced what is arguably its largest incident to date. Out of the 60 control rods in the reactor, 22 did not appear to be functioning. Some people said that this meant that in the case of an emergency shutdown with loss of cooling water, it would not have been possible to stop the reactor quickly, which could have led to a meltdown.”

IAEA

Example 4

Opposition groups said:

"*This incident underscores the vulnerability inherent in the process of producing nuclear energy. Experts say the accident won't be the last of its kind*

"The flaw in nuclear power plants is their complexity."

"The culprit was as simple as it was troubling: a short-circuit. But that short-circuit caused an electricity failure that nearly led to catastrophe.

Nearly two weeks ago, a power outage occurred, throwing the plant's control room into a state of chaos. As the power failed, so did two of the plant's four emergency backup generators. The numbers on the controls started to go berserk, and it took a full 23 minutes before the workers, who for a time had no idea what was happening inside the reactor, were able to bring the reactor back under control."

IAEA

Example 5

"*A leak at a nuclear reprocessing plant was not spotted for three months, an investigation has revealed. More than 20 tonnes of uranium and 160kg of plutonium spewed onto a floor when a pipe fractured at the complex. The leak occurred when a pipe - just a few centimetres wide - fractured, sending nitric acid onto the floor of the concrete-lined cell.*"

IAEA

Example 6

"*Leaking plutonium at a nuclear reprocessing plant went unnoticed and nearly led to a criticality accident.*

According to a local reporter, staff said it was only luck that the growing stalagmite of plutonium was spotted before it went critical. Had it done so, the consequences would have been devastating."

Example 7

“At a reactor site, a large volume of water was found to be leaking onto the floor by a laundry operator carrying out routine work in the vicinity.

The source of the leak was found to be a breach in the fuel storage pond cooling system.

The water level had dropped over a foot with over 180 cubic metres of water spilt. Several alarms should have alerted operators to the leak but they did not work.

Approximately 135 cubic metres have been recovered and 45 cubic metres is estimated to have been discharged through the Site storm drains. There was no significant dose to the public.”

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Example 8

“A local journalist has suggested that a nuclear power station came close to a meltdown as a result of safety lapses. The utility admitted breaking safety laws during the trial and pleaded guilty to four charges under the Health and Safety Act.

During routine refuelling of one of the reactors, part of a crane - known as a grab - broke and fell into the reactor itself. The grab was jammed in a refuelling channel causing a blockage.

The regulator now claims that it was purely a matter of luck that a meltdown did not occur during that period. The Chief Inspector of Nuclear Installations told the court in a statement that it was potentially the most serious incident he had come across during his career.”

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Example 9

"This accident was the worst disaster in the country, and seriously degraded public confidence in nuclear energy development."

At a reprocessing site:

- Residents within 350 m of the site were evacuated
- More than 300,000 people were recommended to stay indoors.
- In total 76,256 people were surveyed.
- Transportation was stopped.
- Schools and other cultural facilities temporarily closed their activities as well as private companies.
- Three workers received significant external neutron and gamma ray doses.
- Laws related to nuclear activities were changed.

Example 10

According to media reports:

"*An experienced physicist has been rushed for immediate specialist treatment, after a major accident at a nuclear research facility. We understand that it is unlikely that he will survive.*

The facility is still out of control after an experiment went very wrong leaving material critical with no-one knowing how to stop the radiation.

An expert from the plant said: "The point of criticality was exceeded, there was a flash of light and a wave of heat"."

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