Strengthening Defence in Depth in Emergency Preparedness and Response by Pre-establishing Tools and Criteria for the Effective Protection of the Public During a Severe Reactor Emergency

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TUESDAY - 22 OCTOBER 2013

TOPICAL SESSION 3: 17:05 - 17:30

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Key IAEA publications

GSG-2 Safety Guide

2011

- Dose warranting action (Generic criteria)
- Plant conditions warranting action - Emergency classification system (EALs)
- Off site measurements (OILs) warranting action

EPR-NPP Public Protective Actions

2013

- Latest guidance on Public Protective Actions
- Considered Fukushima lessons

The public protective action strategy is driven by 3 main objectives:

1. To prevent injuries or deaths (severe deterministic effects)
2. To reasonably reduce the risk of cancers (stochastic effects)
3. To prevent the public from doing more harm than good – actions taken in the belief they are protecting themselves (e.g. not treating injured)

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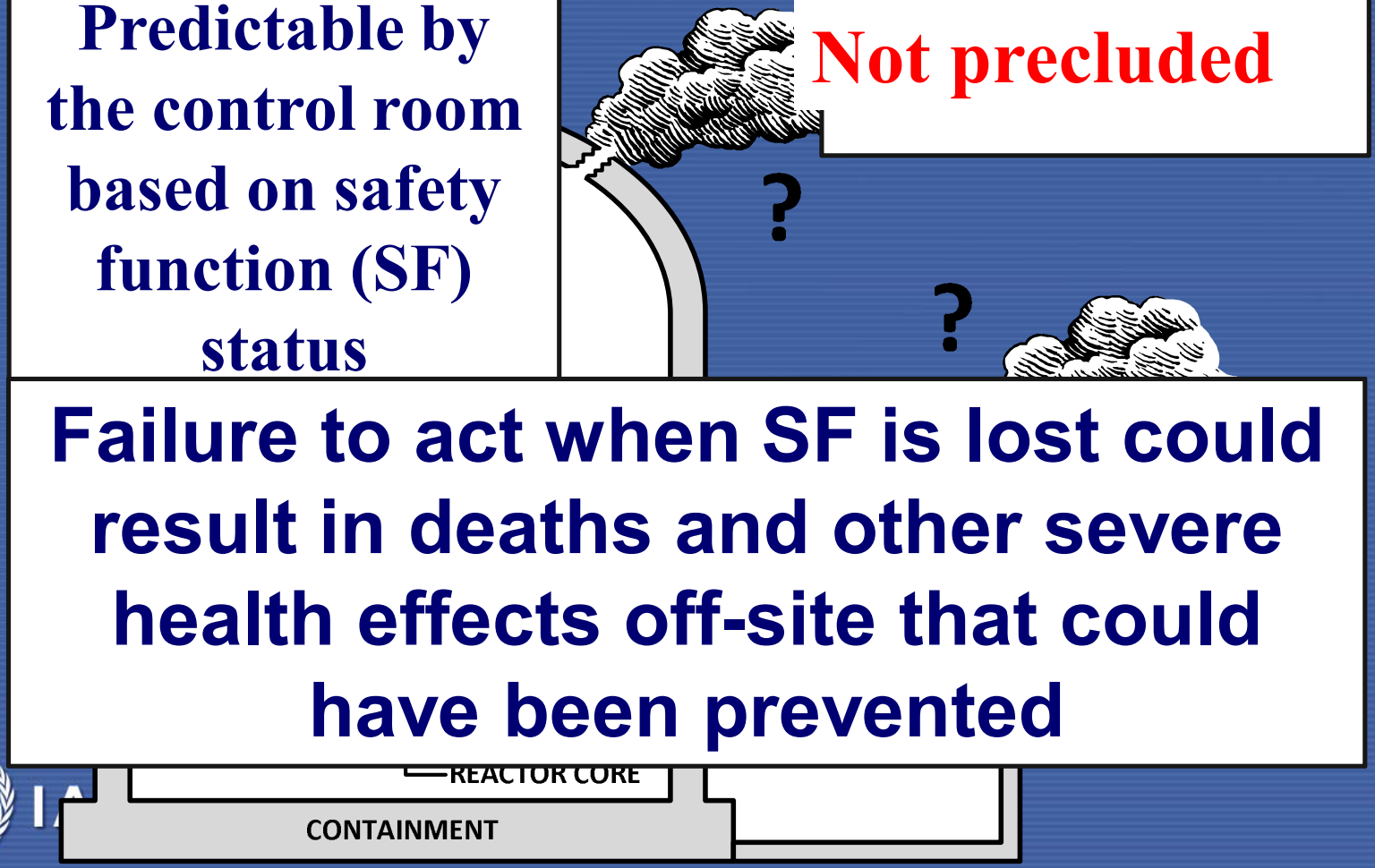
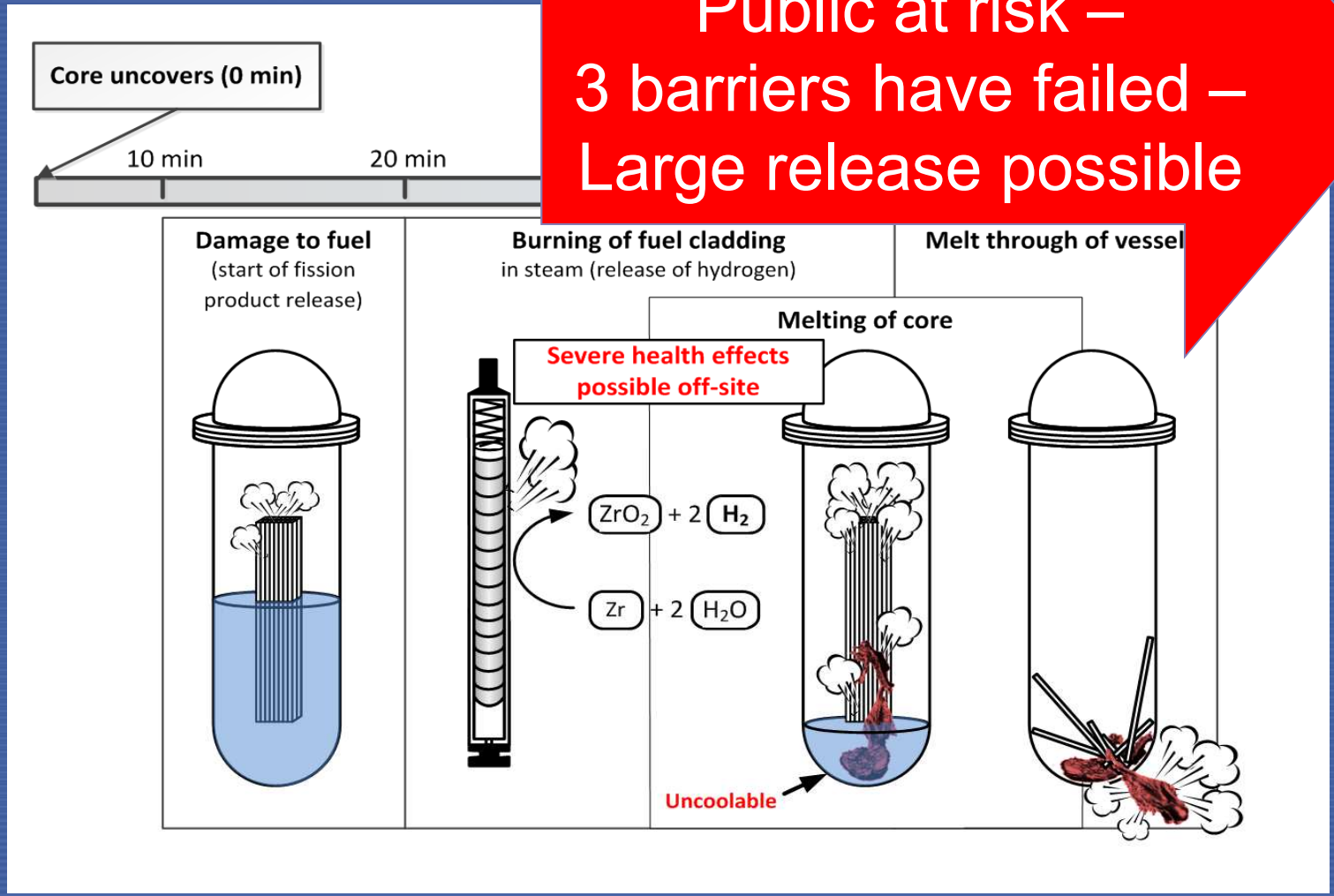
Severe health effects off-site require:

Fuel damage	+	Major release
Predictable by the control room based on safety function (SF) status		Not precluded



Failure to act when SF is lost could result in deaths and other severe health effects off-site that could have been prevented

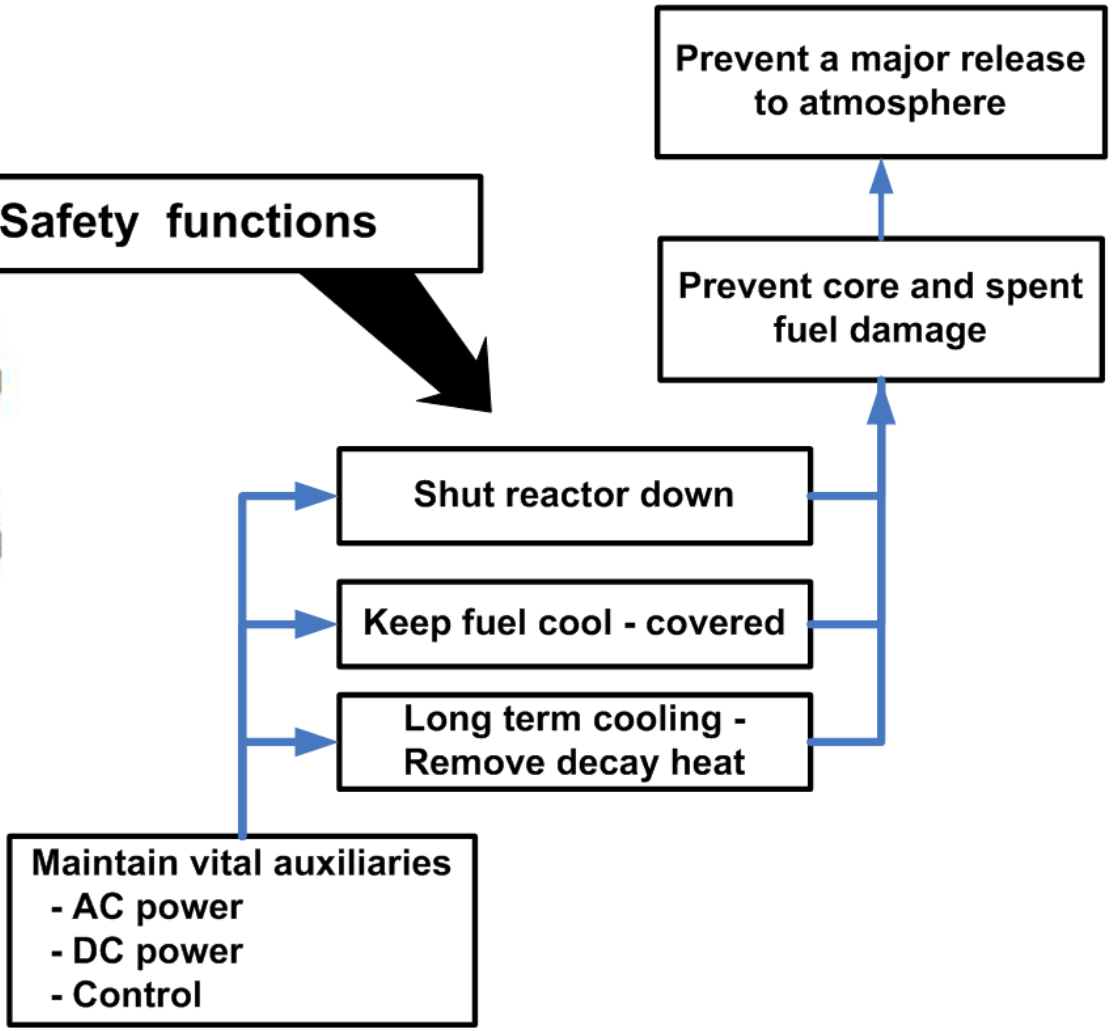
Public is at risk shortly after uncovering core



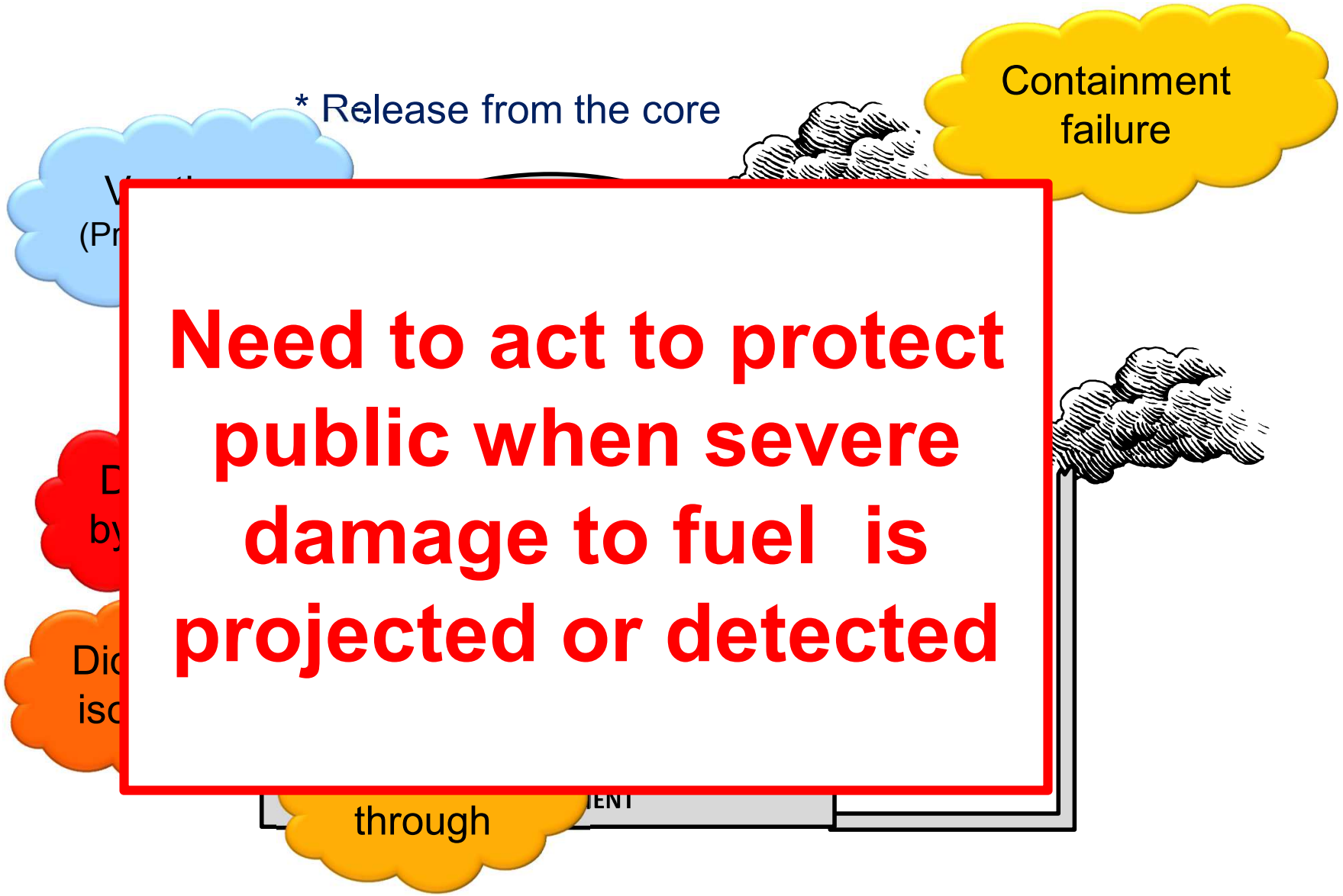
Core heats up at 1 C/s after shutdown if not covered with water

Control room staff can project fuel damage
(based on status of SFs needed to protect the fuel in the core)

Status known to control room



Operator cannot predict containment failure (most release pathways are unpredictable)



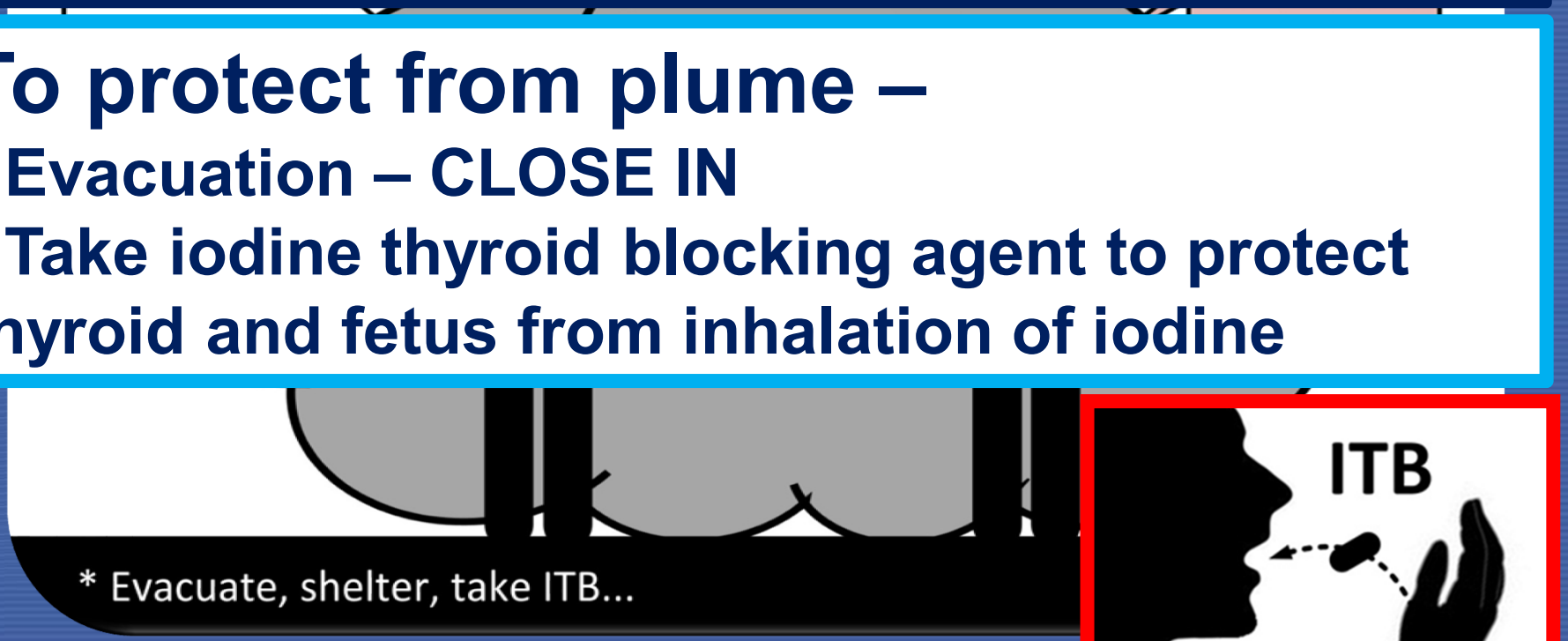
Need to act to protect public when severe damage to fuel is projected or detected

To be effective some protective action must be taken before a release - Can not wait for monitoring

When you measure the plume off site – people are already being exposed

To protect from plume –

- **Evacuation – CLOSE IN**
- **Take iodine thyroid blocking agent to protect thyroid and fetus from inhalation of iodine**



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Emergency classification system

Triggers fast and coordinated response (without meetings), based on emergency action levels

Class	Plant conditions	Protective actions off site
General emergency	• **Projected or actual severe damage to fuel** • **Loss of control**	**Immediate urgent protective action**
Site area emergency	**If additional failures → severe damage to fuel**	• **Alert officials and public to prepare** • **Off-site monitoring**
Facility emergency	On site risk only	None
Alert	Degraded or uncertain conditions - no known danger to fuel	None

Classification based on emergency action levels (EALs)

- Predetermined observable thresholds
- Operator classifies within 15 minutes of being exceeded and notifies off-site within 30 minutes
- Example for a General Emergency:

  Projected loss of AC and DC for a site-specific time that leads to fuel damage

  (e.g. 40 min)

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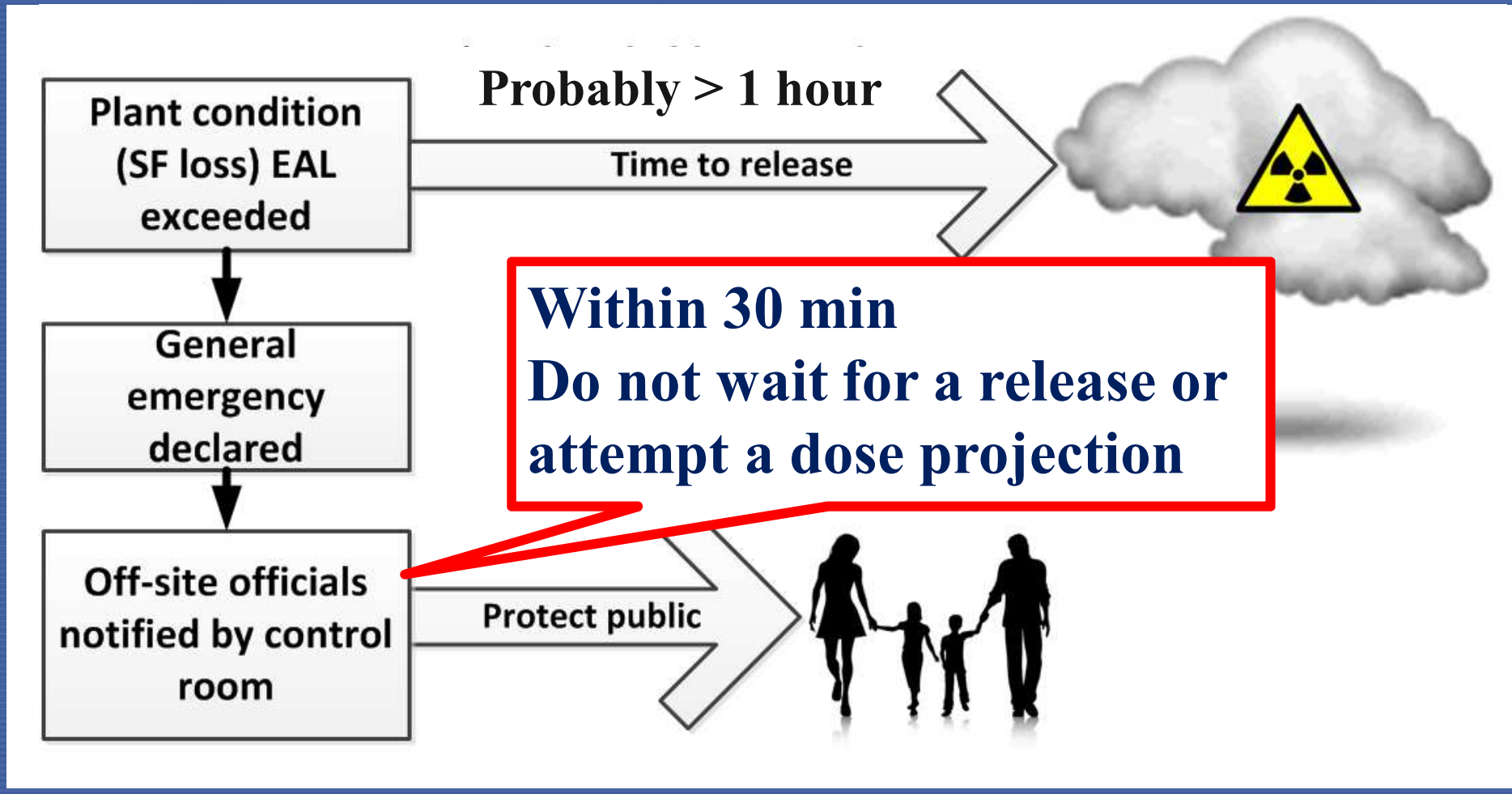
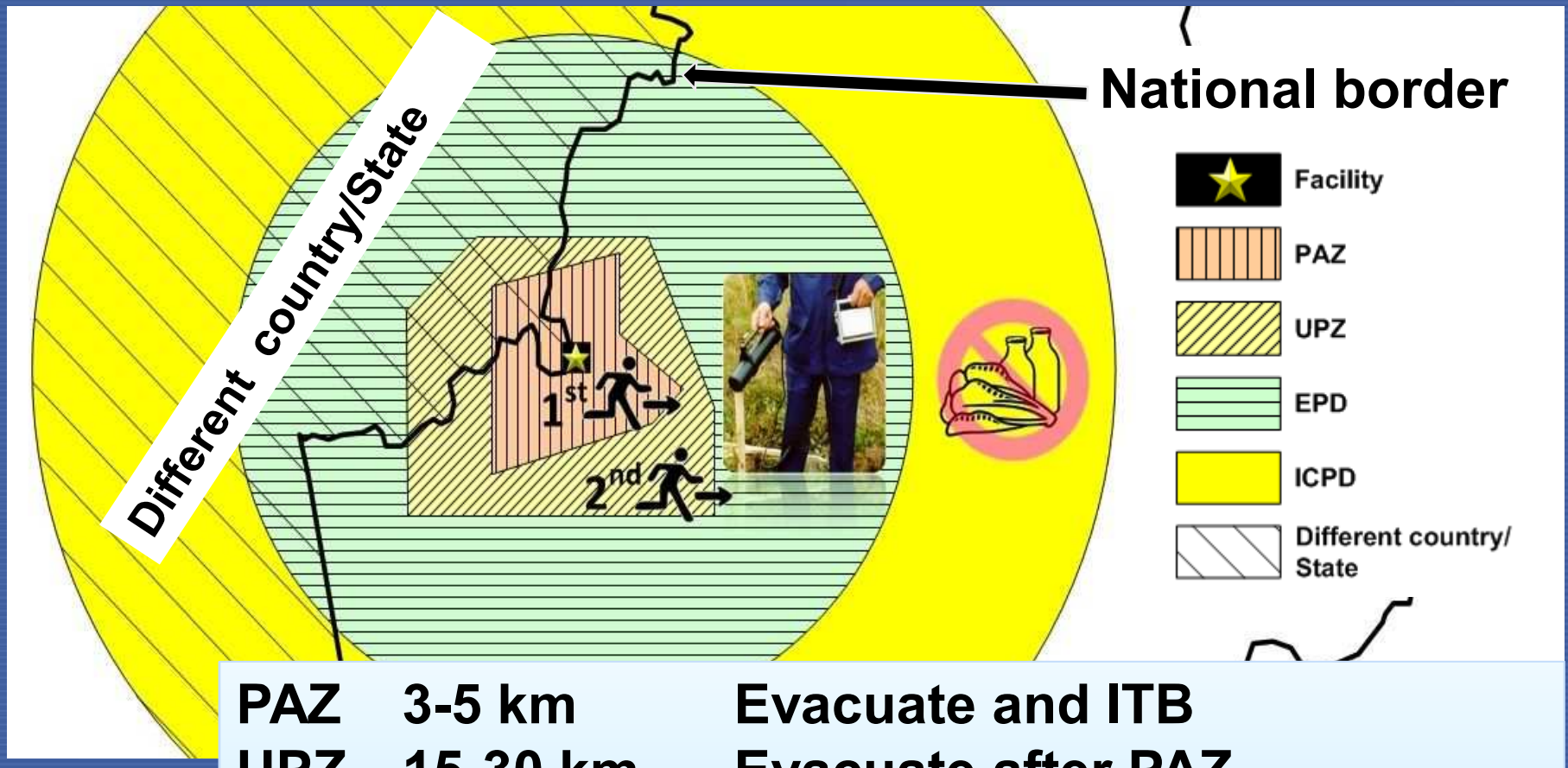
Act to protect public when severe damage to fuel is projected or detected



> 1 hour

General Emergency → public starts to take action (in all directions)



PAZ	3-5 km	Evacuate and ITB
UPZ	15-30 km	Evacuate after PAZ
EPD	50-100	Prepare - monitoring
ICPD	100-300	Restrict food and commodities

GENERIC CRITERIA (GSG-2)

Protective actions and other response actions justified in general

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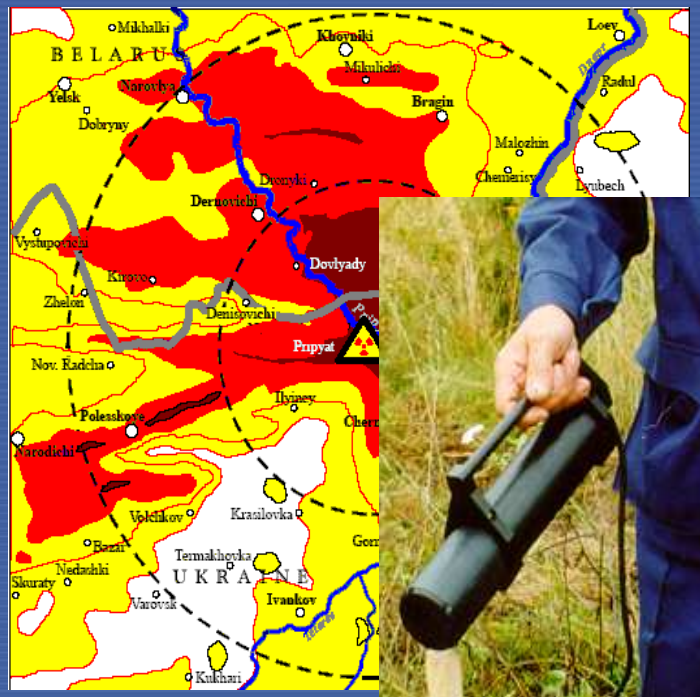
After a release →
Adjust actions based on monitoring

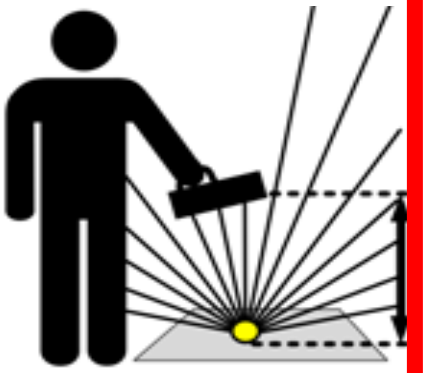
Predetermined operational intervention levels (OILs) – value exceeded

Immediate action

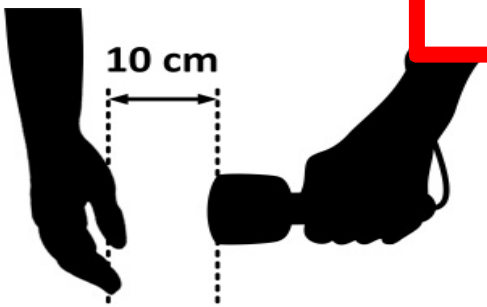


Default OILs are provided for:
[Section 6, EPR-NPP PPA]

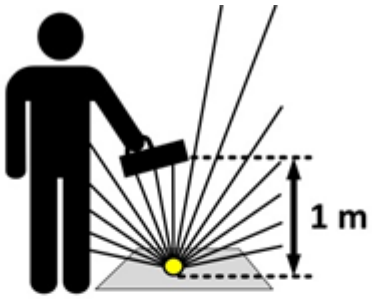
Dose rate



Dose rate from skin contaminatio



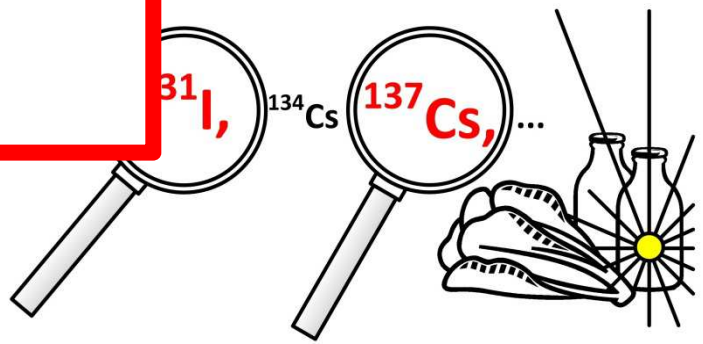
Example



> 10 days after shutdown of the reactor relocate at 25 µSv/h

Dose rate from the thyroid

Cs-137 and I-131 concentrations



Importance of plain language explanations

Bq

Sv

Dose

I-131 Bq/kg

Contaminated

cps

µSv/h

Risk

High doses

Not clearly answering this question has resulted in:

- **Voluntary abortions**
- **Unsafe evacuation of patients (deaths)**
- **Refusal to treat patients**
- **Stigma**
- **Economic impact**
- **Psychological distress**
- **etc.**

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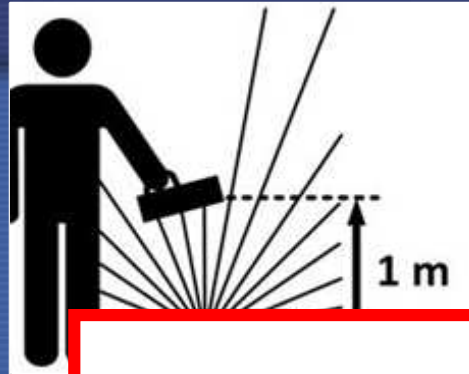
Perspective charts are provided to answer:

[Chart1, page 59, ERP-NPP RPA]



LIVING IN THE AFFECTED AREA
CHART 1

- For a release of radioactive material from a LWR or RBMK
- For all members of the public (including children and pregnant women)
- Based on the dose rate at 1m above ground level

100 µSv/h Read footnote * for measurements between 25 and 100 µSv/h	FOR 7 DAYS, PROVIDING ACTIONS ARE TAKEN TO REDUCE INGESTION OF RADIOACTIVE MATERIAL	PROVISIONALLY SAFE** FOR 1 MONTH, PROVIDING ACTIONS ARE TAKEN TO REDUCE INGESTION OF RADIOACTIVE MATERIAL	HEALTH CONCERNS (check OIL1 and OIL2)
25 µSv/h			
10 µSv/h	SAFE** FOR EVERYONE, PROVIDING FOOD, MILK AND DRINKING WATER ARE SAFE		
1 µSv/h			
NATURAL BACKGROUND DOSE RATE			

* Areas showing a dose rate of 25 to 100 µSv/h during the first 10 days after the release are safe (according to international safety standards), providing food, milk and drinking water are safe.

** Safe according to international safety standards **- For further information read the back of this chart**

EXPLANATION

Summary of response time objectives

Event leading to core damage occurs	00:00
Classified as a General Emergency by NPP	00:15
Off site decision maker notified	00:30
Public notified to act	00:45
Public starts to act, food and commodities restricted	01:00
Media briefing – plain language explanations Centers for monitoring evacuees	Hours
Monitoring – actions modified based on OILs	Days

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