Global nuclear industry views:

Challenges arising from the evolution of the Optimization principle in radiological protection

Session on dose constrains and reference levels

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Outline

RP for emergency and post-emergency exposures

- RP review/upgrade measures for plants
- International policies & standards

RP for planned exposures

- Normal radioactive discharges associated with nuclear new-build

Nuclear Industry Views:

RP for Emergency and Post-Emergency Exposures

RP for emergency/post-emergency

First priority (measures for plants):

Industry/regulators are reviewing/upgrading measures for plants against severe accidents

Example of topics:

- **Source terms and impacts, evacuation, sheltering, protective and monitoring equipment, etc.**

National agendas are top of the priority list

RP for emergency/post-emergency

First priority (measures for plants):

Intervention for severe accidents

- **Ensure capacity for on-site**
  - **Upgrade immediate readiness**
  - **Study and define upgraded preparedness**
- **Ensure capacity off-site**
  - **Study and define upgraded preparedness**

RP for emergency/post-emergency

A secondary priority (policies & standards):

International policies and standards will eventually need to be upgraded as appropriate

Fukushima has shown that an accident can be much more than the evacuation of people for 24-48 h after which they can return to their homes

RP for emergency/post-emergency

A secondary priority (policies & standards):

ICRP new policies have been the only 'show in town' in terms of some genuine evolution

- **Tendency by most was to keep things unchanged**

One of the industry regrets is not to have flagged earlier the insufficiency of the IAEA BSS revision

Re-centring RP on where it counts the most

WNA report to IAEA RASSC (June 2010) contextual to the BSS revision (int'l RP policies):

"Refocusing RP on real safety gains

1) RP for workers, especially the most exposed

– Typically addressed via RP measures

2) Risk of public exposures from major accidental releases

– Typically addressed via nuclear safety measures (against core melt down and loss of containment) and emergency preparedness

RP for emergency/post-emergency

A secondary priority (policies & standards):

Analysis of Fukushima will provide an opportunity to seriously test the ICRP new approach

Industry is committed to deploy effort recognizing though that this is a secondary task

RP for emergency/post-emergency

A secondary priority (policies & standards):

We recommend a reasonable pace of development that would benefit from the analysis of Fukushima

This should serve as a basis to improve/refine international policies & standards afterward

RP for emergency/post-emergency

International Policies: New ICRP recommendations

– Tutorial in style but not road tested for severe accident:

- **Optimization**
- **Voluntary responders? Subtleties between 100-500 mSv**
- **Transition between emergency and post-emergency**
- **Implications: Evacuation, sheltering & post-emergency**
- **Reference levels: Are the genuine generic values fit?**
  - Dose ranges (1, 20 and 100 mSv) and their practical applicability: public health & rehabilitation realities

RP for emergency/post-emergency

National/company choices of RP measures for large scale events will likely vary significantly

International dialogue (ICRP , IAEA, etc.) will be key to develop a supporting rationale for choices

RP for emergency/post-emergency

In-depth understanding of nuclear technologies and of their implementation is key for sound improvements in RP policies/standards

Otherwise, it is not self-evident for policy-makers to really improve policies/standards

Systematic input from nuclear industry leaders should be the norm

Nuclear Industry Views:

RP for Planned Exposures, Normal radioactive discharges associated with nuclear new-build

New-build and normal rad discharges

High performance was achieved over decades through Optimization as a driving principle

- Precedes the new emphasis put on Dose Constraint (DC)

Margins for improvements are now much smaller. The smaller is the dose, the greater is the effort

There is a risk of challenging nuclear technologies and operations beyond safety reasons

New-build and normal rad discharges

By design, protection basics for the public and the environment are that:

- **The most hazardous radionuclides are contained: eg. alpha emitters**
- **The most benign radionuclides are discharged eg. beta emitters**

What are the options for discharges?

- **Liquid, air & waste effluents**

Can real extra safety gain be made?

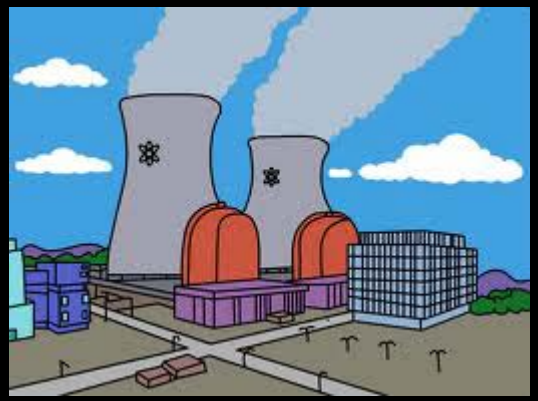
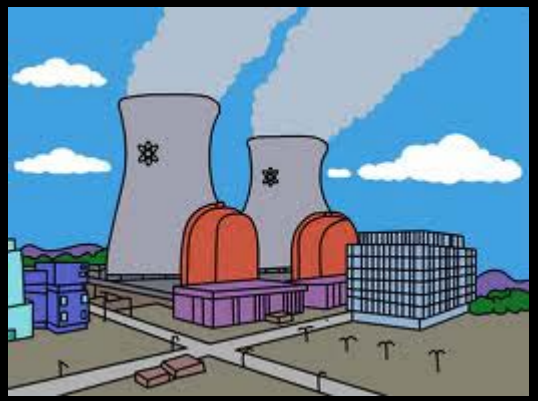
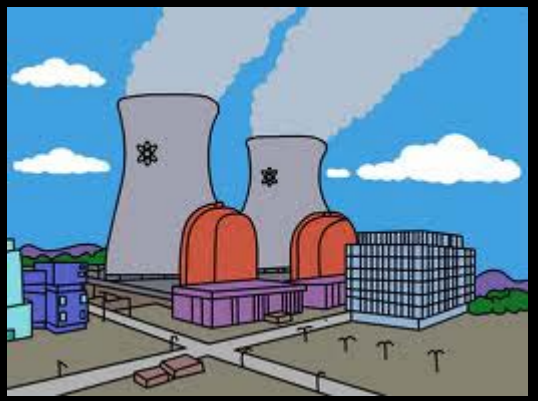
New-build and normal rad discharges

Resulting doses are tiny - Much lower than any level that would pose a real health concern for the public and the environment

Should Optimization of such low-impact radioactive discharges be primarily on doses in such a case?

New-build and normal rad discharges

An increasing number of countries need to address the following change:

From an existing site with nuclear reactor units that is subject to a site dose constraint (DC)

To the addition of extra nuclear reactor units at such a site

New-build and normal rad discharges

Basic design (BD) and the related dose constraints (DCs) should not be confused with, the much lower actual discharges

If DCs are lowered to match actual discharges, it would hinder Optimization of nuc op. efficiency

DCs should account for the necessary flexibility to operate nuc op. efficiently

New-build and normal rad discharges

Optimization of nuclear power efficiency?

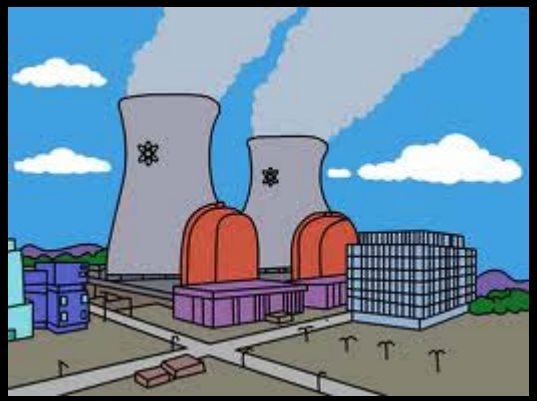
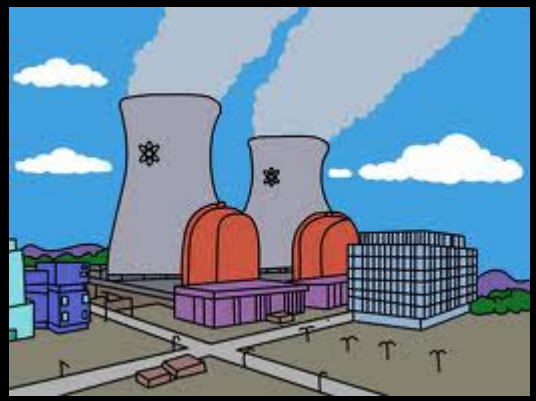
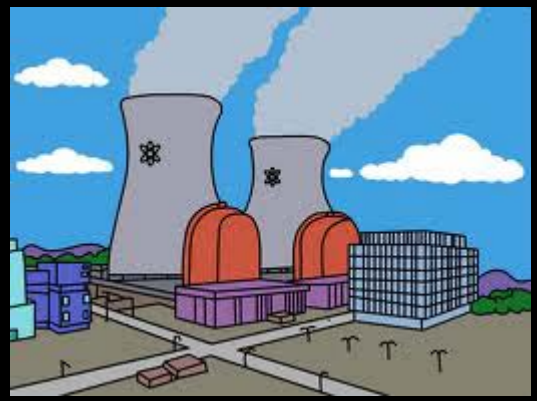
- **Some key operational parameters:**

  Power rate, fuel cycle time, fuel burn-up, primary circuit decontamination, margins for handling minor fuel damages

- **When normal operations are already very safe, it can be argued that it is far more important to Optimize such parameters than tiny doses**

New-build and normal rad discharges

Towards a more reasonable approach

Site DC (basic design)+much lower actual discharges

For compliance, the total impact from actual discharges of all units is compared to the site DC

If a site DC is divided by the number of reactor units, it would be overly restrictive

On Reference Levels and Dose Constraints

Above all, we have to bear in mind that the RP system is generally based on the risk of cancer and hereditary diseases

In addition, the protection against deterministic effects (-> tissue reactions and non-cancer effects) is also included

Tissue reactions and non-cancer effects

Continued scientific developments on the health effects of ionizing radiation are important

We understand ICRP interest in re-examining deterministic effects (tissue reactions and non-cancer effects)

Tissue reactions and non-cancer effects

In seeking such refinements in protection, we invite ICRP to pay increased attention to the fact that the matter is not just about protection

We emphasize that a continued balance must be struck between beneficial activities which cause exposures, and protection

In summary

On RP for emergency/post-emergency, RP upgrades are getting deployed at plants (top priority for both industry and regulators)

Post-Fukushima, international policies & standards will need improvements later on

Industry input will be key and we are prepared to fulfil this key role gradually over time

In summary

On RP for planned exposure (nuclear new-build and normal rad discharges), a more reasonable approach is needed

The Optimization of nuclear reactors' key operating parameters is far more important

Countries actively involved in deploying nuclear new-build should cooperate accordingly

In summary

On RP refinements (e.g. tissue reactions and non-cancer effects)

We emphasize that a continued balance must be struck between beneficial activities which cause exposures, and protection

Thank you for your attention

Questions?

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