Action Levels for Reporting Environmental Releases

Raphael McCalla, Director - Environment Health & Safety, | August 2023

ONTARIO POWER GENERATION | Where a brighter tomorrow begins.

Agenda

1 | What Are Action Levels
2 | Historical Methodology Used
3 | Reason For Changing Methodology
4 | New Methodology
5 | Application At OPG Facilities
6 | Meaning Of Action Level Exceedances

What are Action Levels?

Action Levels are **precautionary limits** which are put in place to **ensure** that **regulatory limits** associated with airborne emissions and liquid releases are **not exceeded.**

Function of Action Levels

- **Identify** quantity or concentration **deviations from normal** range of releases.
- Provide process **control feedback** to return to normal operation.
- **Report** to the CNSC with investigation results and actions to **ensure no Loss of Control** takes place.
- **Re-evaluate** Action Levels and controls as determined.

Identify

Act

Notify

Feedback

Historical methodology used

- **Exposure-based** release limits are **set below levels** required **to protect human health** and the environment.
- Exceeding a limit **does not** necessarily **imply** that either the **health of the public** or of an ecosystem is **at risk.**

Derived Release Limit (DRL): Releases limited to less than the public dose limit of **1 mSv/year** to a "**representative person**".

(Old) Action Level: Ratio of **~10% of the DRL used** as a suitable exposure-based criterion for the **Action Levels**.

Reason for changing methodology

Structured, Consistent, Transparent

- Replaces **older, inconsistent** approaches by Licencees
- Provides **transparency** and **structure** with a standard **statistical approach** based on predicted or operating history

Expanded Mandate

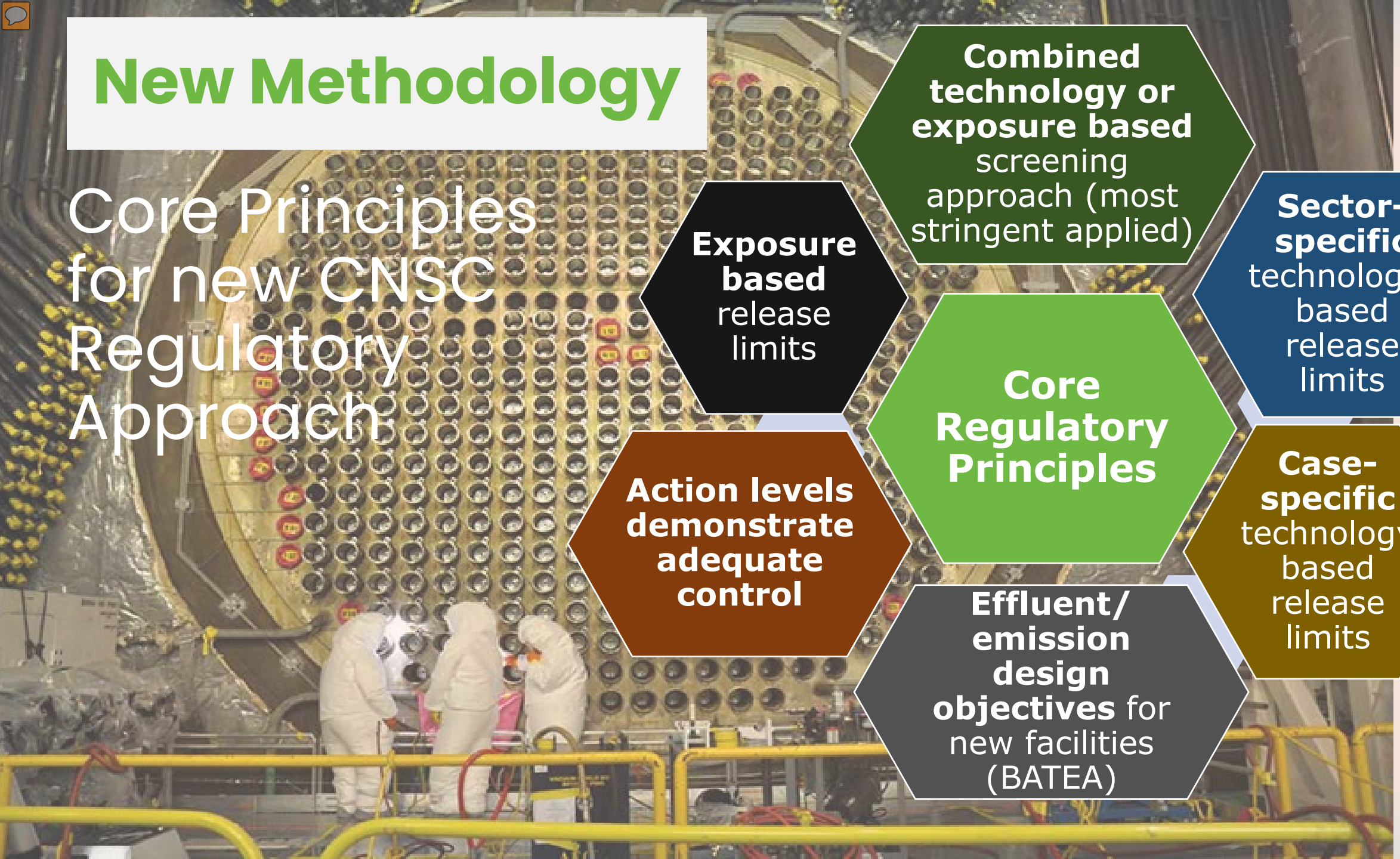
- Was focused on the protection of **humans** from **radiation**
- Now includes **protection** of the **environment** from **both** nuclear and **hazardous substances**

Regulatory Framework

- Included under broader changes to **Nuclear Safety and Control Act** (year 2000)
- Regulatory framework now includes regulatory guides, policies and standards, including the **CSA N288** series

New Methodology

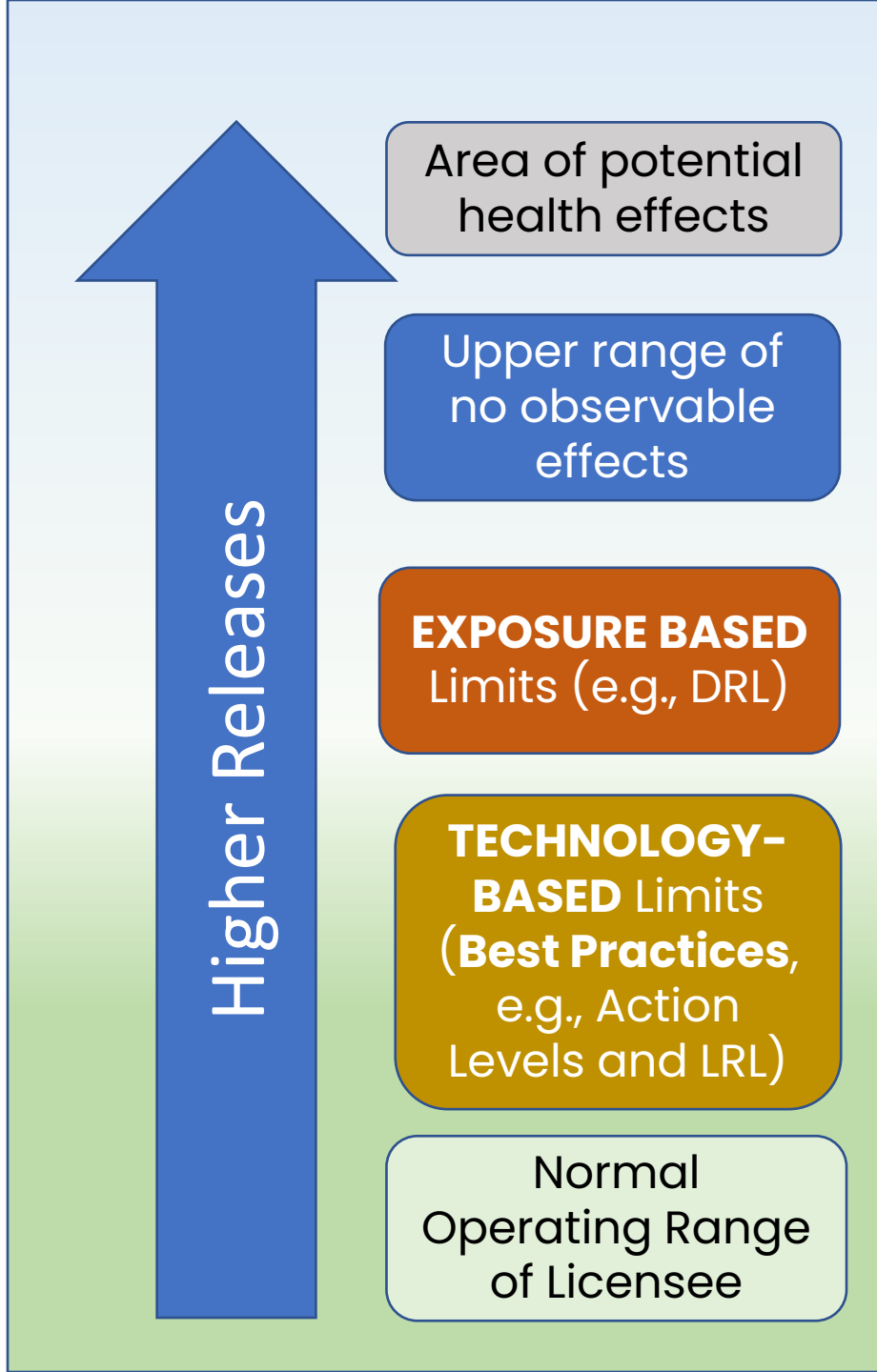
Core Principles for new CNSC Regulatory Approach



New methodology

Technology-based Release Limits

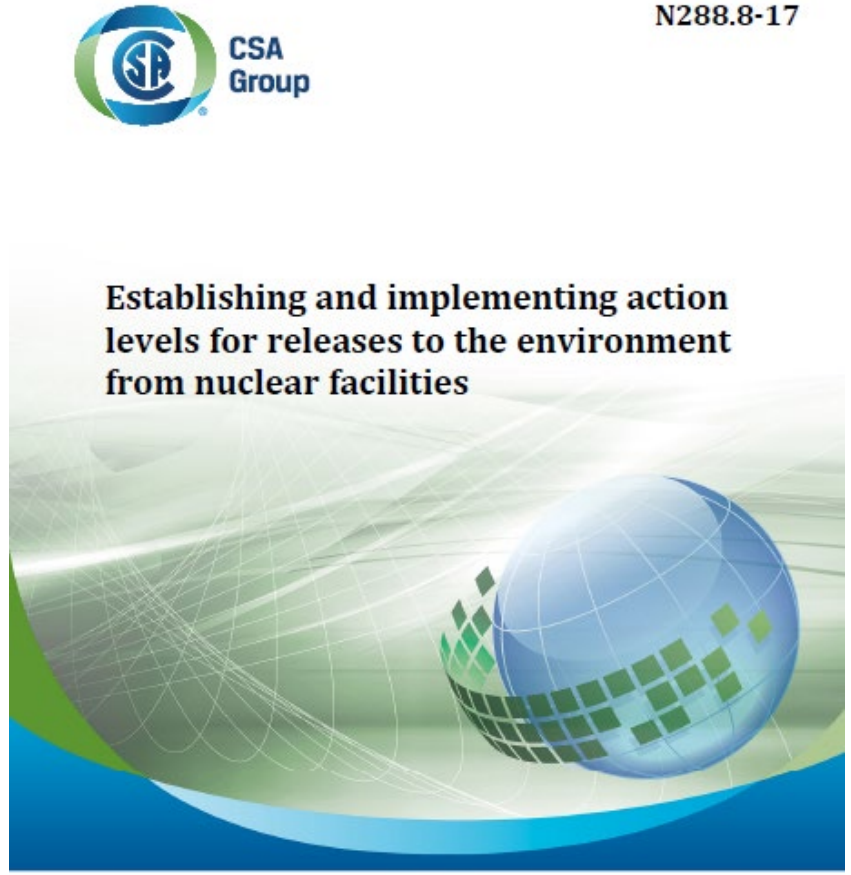
- New **Action Levels** (and planned **Licence Release Limits**) are **based on** the **control technology** in place and are **not exposure** (dose) based.
- These limits do not inherently consider environmental constraints (which are otherwise considered) but assume that the **application of "best practices"** offers some level of protection.
- Action Levels are **set below** levels protecting human health and the environment.
- For this reason, exceeding a limit does **NOT necessarily imply** that either the **health** of the public or of an ecosystem is **at risk**.



Application at OPG facilities

Action Levels are developed for DN and PN operations.

- ALs are to be **reviewed periodically** based on installation and optimization of new control technology or after implementation of **major process changes.**
- ALs may be **adjusted** (at least every **5 years**) **to reflect the actual performance,** if the facility continues to operate below licence limits.
- **Temporary ALs** are possible typically for some exceptional, planned outage conditions.



Meaning of Action Level exceedances

Note: Exceeding an AL is by no means a violation of the licence or regulations. The demonstration of appropriately responding to ALs is itself a demonstration of responsible operation and oversight.

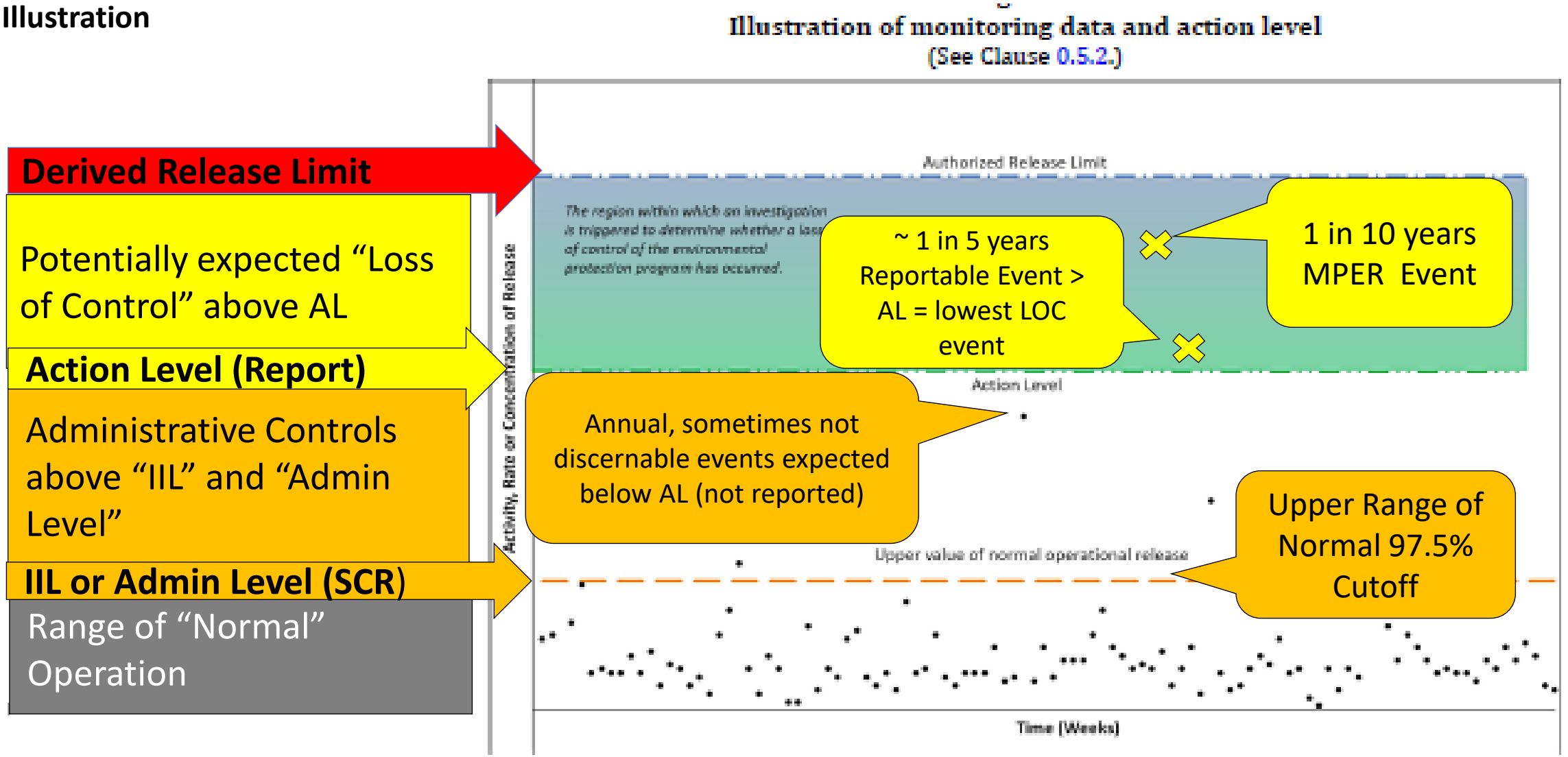
An AL serves as an **early warning system** to indicate when releases may be deviating from the norm. It is meant to **result in action** by the licensee **to determine if** there is a risk of **"loss of control"** in the licensee's radiation or environmental protection program.

Should an AL be exceeded, OPG will:

- **determine if** there has been a **"loss of control"** by implementing an investigation,
- **identify the cause** of the exceedance, and
- **take action to restore** the effectiveness of the radiation and environmental protection program.

Action Levels and “Loss of Control”

Reference: CSA N288.8-17
Illustration



Action Levels for Pickering

Type	Radionuclide	New AL[1]	2019 AL[1]	New/2019 AL (%)
Airborne Emission	HTO	7.01E+02	5.49E+03	12.8%
	C-14	8.93E+00	1.45E+02	6.16%
	Iodine	1.85E-04	1.53E-01	0.12%
	Noble Gas	2.70E+02	1.44E+03	18.8%
	Particulate	1.59E-04	2.32E-02	0.69%
Waterborne Emission	HTO	3.81E+03	1.70E+05	2.24%
	Gross Beta-Gamma	6.74E-01	4.03E-01	167%
	C-14	Not required	8.11E+00	N/A

Units:
- All airborne effluents, except for noble gases: Ci/week
- Noble gases effluents: Ci-MeV/week
- All waterborne effluents: Ci/month

Result Summary

Action Levels for Darlington

Type	Radionuclide	New AL[1]	2019 AL[1]	New/2019 AL (%)
Airborne Emission	HTO	4.01E+02	2.67E+03	15%
	HT	1.03E+03	4.45E+04	2.3%
	C-14	2.92E+00	6.55E+01	4.5%
	Iodine	1.65E-04	9.55E-02	0.2%
	Noble Gas	8.91E+01	2.05E+03	4.3%
	Particulate	1.22E-04	3.28E-02	0.4%
Waterborne Emission	HTO	3.16E+03	1.39E+06	0.2%
	Gross Beta-Gamma	2.16E-01	7.55E+00	2.9%
	C-14	Not required	1.51E+02	N/A

Units
- All airborne effluents, except for noble gases: Ci/week
- Noble gases effluents: Ci-MeV/week
- All waterborne effluents: Ci/month

Action Levels for WWMF

All airborne releases at WWMF have MPERs < 0.1% DRL

- Analysis indicates a negligible risk for environmental releases.
- Airborne ALs are, therefore, “not warranted” and Internal Limits (i.e., IILs) will still be in place for the facility.

WWMF waterborne releases:

- The Environmental Risk Assessment confirmed no radiological adverse effects to the environment.
- Sub-surface drainage monitoring will continue to be covered under the Groundwater Monitoring program.

ONTARIO POWER GENERATION

Where a brighter tomorrow begins.