

A FRAMEWORK FOR SELECTING ASSESSMENT AND MEASUREMENT ENDPOINTS FOR ECOLOGICAL RISK ASSESSMENT OF CANADIAN NUCLEAR POWER STATIONS

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Federal agencies in Canada have chosen ecological risk assessment (ERA) methodology as a basis for evaluating the probability of potential effects on ecosystems as a result of exposure to ionizing radiation. ERA methodology was developed for toxic chemicals. Environment Canada's Priority Substances List II (PSL2) assessment of 25 substances, to determine if any are toxic under the Canadian Environmental Protection Act (CEPA), includes radionuclide releases from nuclear facilities (non-human effects) .

The ERA recognizes that knowledge of the receiving ecosystem processes, function and structure are critical to assessment of ecological risks. It also recognizes the ecological risks are likely to involve indirect effects and changes in habitats as well as the direct toxic effects from released radionuclides.

The focus of ERA is continually changing as scientific and public understanding of ecological principles has evolved. The ERA can evaluate risk to a single species individuals and populations, as well as to natural communities and whole ecosystems. Stressors can be single or multiple chemicals, biological agents, or physical disturbance including associated resource use (e.g. hunting, fishing). A risk assessment process may be initiated because of the existence of a particular stressor (e.g., a radionuclide) or source of stressors (e.g., a nuclear waste site/power generating station), or by some observed ecological effects (e.g., change in fish population), or by a valued eco-resource that seems to be in danger of deteriorating.

The potential complexities of the ERA demand careful planning for its design. Many of the complexities differ from those of human health assessments and include exercising judgement to decide what species, populations, ecosystems, or functions are most relevant; species interactions, and indirect effects; and the significance of non-radiological stressors. The assessment process outlined in the ERA provides a way to develop a logical, sequential approach to solving this complex problem. The parts of the ERA process most relevant to this presentation are to set specific objectives for the program and establish assessment and measurement endpoints. They are systematic planning steps that identify the major factors to be considered in a particular assessment, and they are linked to the regulatory and policy context of the assessment.

It is necessary to develop *scientifically defensible* criteria and a process acceptable to interested parties for choosing assessment and measurement endpoints for CANDU nuclear power stations. Endpoints for radioecological impacts are needed to determine whether there is a likelihood that ecological effects (if observed) are caused by exposure to radionuclides, or to predict whether adverse effects might occur in future. To establish these endpoints, it has been suggested by federal regulatory bodies that an acceptable overall criterion is to evaluate impact on the most relevant radiosensitive species at the most sensitive life-cycle stage. This seemingly pragmatic approach, however, is limited and may not provide comprehensive enough information for defensible ecosystem protection and public acceptance.

This paper will explore the relationship between risk assessment and the ecological entity to be protected, and will provide a basis for evaluating which assessment and measurement endpoints are practical in providing effective, comprehensive ecological protection over the long-term from radionuclide releases from CANDU stations.

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