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MODELLING FOR EMERGENCY RESPONSE AT NUCLEAR INDUSTRY SITES

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This paper will indicate some aspects of accidental releases at nuclear sites, the ways in which people could be exposed to radiation following an accidental release and the countermeasures that could be imposed to reduce that exposure. Radioactive material can be detected very easily and the response to an accident would be based on a combination of modelling and interpretation of monitoring results. The paper will also describe the type of model that is used in emergency response. Accidents are generally assumed to release material to atmosphere over a period of up to several hours. They would release radioisotopes of many different elements, which behave differently in the environment. The relative importance of the different exposure pathways would depend on the amounts of different radioisotopes released in the particular accident. The countermeasures required could include sheltering, evacuation or taking stable iodine tablets within a few kilometres of the site; such actions may need to be initiated rapidly after the start of the release or as a precautionary measure. Countermeasures could also include food restrictions over a much wider area; these might need to be initiated within hours of the start of the release. Clean-up measures might be needed following deposition in inhabited areas; these would be initiated over a longer timescales following the accident. Concentration of material in the air and deposition to the ground close to the site would be estimated by using monitoring data to establish the actual level of concentration or deposition, together with simple Gaussian plume models to express their variation with distance. Other models, such as the Met Office NAME model, would be used to predict the path of the plume over longer distances. Again, monitoring data would be used to establish the actual levels in the environment. Models have been developed to calculate the contamination of a variety of different types of food following a deposition of radioactive material. Results from such models would be used to identify areas in which food restrictions would be needed. Models are also available to describe the movement of material following its deposition in inhabited areas, the dose rates from the deposited material and the impact of actions that could be taken to reduce the dose rates. These models would be used in the longer term, together with monitoring data, to plan the remediation strategies in the affected areas.