ANALYTICAL REVEIW OF HISTORICAL DISCHARGE DATA

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Several candidate reactor designs have been considered for analytical study focusing on their liquid and airbourne discharge. The candidate reactors considered are Westinghouse AP1000, EDF/Areva EPR, GE-Hitachi ESBWR and AECL ACR-1000. The discharge groups being considered are: Liquid tritium, Liquid others, Airborne tritium, Airborne noble gases, Airborne I^{131}, Airborne particulates and Airborne C^{14} with values of 1.06E-02, 1.32E-07, 1.56E-02, 1.47E-02, 8.59E-08, 0.00E+00, 1.80E-02 GBq/GWeh respectively, as the best performing predecessor reactors by discharge. From the data available, there is no simple, clear or easily explainable relationship between the candidate reactors being considered and the radionuclide discharge considered. It can however be assumed that an increase in the power output of a reactor, would result in an increase in discharges into the environment. However, this is not always the case. Instead, the majority of candidate reactors considered display a mix of characteristics including proportional and abnormal events. The methodology used has shown that a large standard deviation indicates that the data points fluctuate significantly about the mean. A small standard deviation indicates that the data points are clustered more closely around the mean.

The ACR-1000 predecessors provide the highest total liquid and airborne averages and highest standard deviations; ESBWR predecessors give the lowest total liquid and airborne averages and the lowest standard deviations; EPR and AP1000 predecessors both show small variation in total liquid and airborne averages, when compared with the ACR-1000 and ESBWR predecessors. It is expected that the radiological impacts of the reactor predecessor discharges would serve to support future research with the conclusions drawn. This radiological impact assessment and its analysis would aid in the investigation of areas and environmental surroundings in proximity and with reference distance from reactor sites. The annual discharge data and the levels reported are subject to variation due to local, climatic and other effects. Thus, these discharges may be clustered around specific periods of the year for a particular reason. The GALE code has been used by experts to predict discharges for candidate reactor designs. The predicted discharges from each of the four proposed candidate reactor designs indicate that the ESBWR and the EPR designs are the most ambitious for liquid and airborne discharges respectively. The GALE code has been used to predict 3.82, 3.58, 0.382 and 12.6 GBq/GWeh for AP1000, EPR, ESBWR and ACR-1000 for liquid discharge respectively and 43.1, 0.13, 11.4 and 6.97 GBq/GWeh for AP1000, EPR, ESBWR and ACR-1000 respectively for airbourne dicharge.