The development of the Bulgarian Emergency Response System (BERS) for short term forecast in case of accidental radioactive release to the atmosphere has been started in the mid 1990's [1]. BERS comprises of two main parts - operational and accidental, for two regions “Bulgarian” and “Northern Hemisphere”. The operational part runs automatically since 2001 using the 72 hours meteorological forecast from DWD global model, resolution in space of 3.5° and in time - 12 Hours. For specified Nuclear Power Plants (NPPs), 3 days trajectories are calculated and presented on NIMH’s web-site [http://info.meteo.bg/ews/]. The accidental part is applied when radioactive releases are reported or in case of emergency exercises. BERS is based on numerical weather forecast information and lagrange dispersion model accounting for the transport, dispersion, and radioactive transformations of pollutants. The core of the accidental part of the system is the Ensimael 3D dispersion model EMAAP calculating concentration and deposition fields [2].

The system is upgraded with a “dose calculation module” for estimation of the prognostic dose fields of 31 important radioactive gases and aerosol particles. The prognostic doses significant for the early stage of a nuclear accident as calculated are the effective doses from external irradiation (air submersion + ground shining) effective dose from inhalation, committed effective dose and absorbed thyroid dose [3]. The output is given as 12, 24, 36, 48, and 72 hours prognostic dose fields according the atmospheric conditions.

The BERS was upgraded to simulate the dispersion of nuclear materials from Fukushima NPP [4], and results were presented in NIMH web-site. In addition BERS took part in the respective ENSEMBLE exercises to model 1971 and 1975 in Fukushima source term. In case of governmental request for expert BERS was applied for environmental impact assessment of hypothetical accidental transboundary radioactive pollution. The consequences were estimated based on the worst emission scenario for the existing basic reactor type, selection of real meteorological forecast conditions, favoring the direct transport of the contaminated air masses to the territory of the country in consideration. In the present work BERS is used to estimate the worst case accidental scenario impact from a possible new site of a new Nuclear Power Plant in Hungary, over the territory of Bulgaria.

BERS Description

BERS comprises of 2 parts - operational and accidental, for two regions “European” and “Northern Hemisphere”. Ensimael 3D dispersion model EMAAP is a core of the accidental part of BERS.

BERS validation - ETEX, RTMOD, ENSEMBLE

The most important doses during the early stages of accident calculated from BERS:

- Absorbed dose in thyroid gland denoted as At
- Effective dose by inhalation of radioactive substance, excluding Rn
- Effective dose by external exposure to the radioactive plume (by submergence, and ground shining – and )

Accidental scenario – test cases with BERS

The scenarios for accidental release of mixture of radionuclides to the atmosphere is based on the largest accident scenario with worst meteorological forecast conditions (from WAMR (WAMR-400)). The scenario is one of the typical scenarios of ROGAM system. In our case for BERS the 31 radionuclides are reduced to 31 main radiologically important radionuclides incorporated in BERS.

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References

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