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Estimation of uranium mining peak

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1. In this work the dynamics of uranium mining is shown for five countries –leaders in terms of uranium mining and uranium resources –Canada, Australia, Kazakhstan, Russia, the USA, and the world (as a whole). Forecasts are constructed on the basis of our 'relaxation balance model'. Time dependence of annual uranium mining is described by a symmetric bell-shaped curve (similar to Gauss's distribution) and normalized on the mass of uranium extracted. The model allows determining the correlation between the maximum of annual mining (mining peak) and the time of mining peak whereas the volume of metal ores resources and the rate of resource development are known values.
2. Using the formulas it is convenient to run annual monitoring of the forecast and its correction taking into account a new data of input parameters (latest G0, the value of annual mining, M the refined data on uranium resources as of the beginning of forecast period, GM the expected mining peak value or k0 the rate of mining volume change).
3. Calculations of the world's uranium mining dynamics and in particular countries show that long before the end of the current century the resources of natural uranium at the prime cost of mining less than 130USD/kg will be almost exhausted. The peak of uranium mining in these countries for various scenarios is reached in 2020-2050. During the second half of the XXI century uranium mining in the world will be essentially reduced whereas existing fields and mining technologies remain unchanged.
4. The forecasts of complete exhaustion of natural uranium resources by the middle of our century show that fast neutrons breeders may increase the resource base of nuclear power by 140-300 times due to inclusion in a fuel cycle of isotopes uranium-238 and thorium-232 could become a basis of long-term development of nuclear power. Commercially acceptable and safe reactors on fast neutrons should be widely used in power engineering no later than the middle of the century, while natural uranium resources are sufficient for their running. As, moreover, M.King Habbert noted the uranium in the closed fuel cycle is similar to a renewable resource.

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