Title (en)

METHOD AND APPARATUS FOR FINAL STORAGE AND SAFE OPERATION OF NUCLEAR POWER STATIONS

Title (de)

VERFAHREN UND VORRICHTUNG ZUR ENDLAGERUNG UND SICHEREN BETREIBUNG VON KERNKRAFTWERKEN

Title (fr)

PROCÉDÉ ET DISPOSITIF DE STOCKAGE DÉFINITIF ET D'EXPLOITATION SÛRE DE CENTRALES NUCLÉAIRES

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Abstract (en)

[origin: DE102006013836A1] The creation of a final geological repository in the base region of super-deep bore shaft (10) by magnetically glided, directional melt drilling with cast metal encapsulation (2) for disposing highly radioactive waste material, includes subcritically disposing highly-radioactive material into the borehole shaft. The borehole shaft separates itself from the rest of the shaft after filling by producing the residual heat of the material and/or geo-pressure and/or the self-weight under gravity and/or the molten rock formation from the hot deep-seated rock migrates towards the geocentre. The creation of a final geological repository in the base region of super-deep bore shaft (10) by magnetically glided, directional melt drilling with cast metal encapsulation (2) for disposing highly radioactive waste material, includes subcritically disposing highly-radioactive material into the borehole shaft. The borehole shaft separates itself from the rest of the shaft after filling by producing the residual heat of the material and/or geo-pressure and/or the self-weight under gravity and/or the molten rock formation from the hot deep-seated rock migrates towards the geocentre. The metal encapsulation is a lower cone-shaped shaft segment, which is intended to final repository and whose wall thickness increases downwards from the top. The lateral pressure forces of the deep-seated rock cumulate themselves on the metal encapsulation of the separated cone-shaped final repository segment to downwardly directed pressure forces on the tip of the segment. The super-deep drilling shafts are bored for final disposal of wastes through self-propelled sinking directly at the nuclear power plants, intermediate storage sites and other nuclear-technology based plants. Ingot molds and nuclear fuel rods are stacked one above the other with heat-conducting intermediate spacers to be safely disposed in pressure-resistant carrier units in the borehole shaft by a magnetically-driven gliding system. Liquid lead is filled into the free spaces between the stored materials for reducing the frictional load of the carriers and serves as a heat transfer fluid and moderator for fast neutrons for increasing the heat production. A filled up drill hole section is intended to be closed with a pressure-tight lid (5). The produced residual heat from the subterraneously stored, highly radioactive material leads to an evenly distributed heating in the metal encapsulation of the shaft segment on account of the convection of heat transfer medium (9). The cast metal encapsulation of the borehole shaft above the pressure-tight closed, lower borehole segment is melted over a suitable length to form molten metal by a directional melt drilling method using a magnetically driven gliding vehicle and is separated from the rest of the shaft. The molten metal serves as additional pressure sealing of repository segment (6). On the account of the residual heat production, the own heat of the deep-seated rocks, lateral pressure of the rocks and effect of gravity on the separated final repository segment with a 2 to 3-fold higher mass density than the surrounding rock, a partial melt formation results between the surrounding geological strata and the metal encapsulation of the final repository segment. The formed partial melts act as a guided gliding system between the hot deep-seated rocks and the metal encapsulation and exhibit an accelerated migration towards the geo-center as a consequence of lateral geological pressure effect of gravity on the separated final repository segment. The formation of partial melts is intensified under the supercritical conditions of the fluid in hot deep-seated rocks by the injection of the liquid lead or weak-radioactive into the region of the final repository segment. The liquid lead dissolved in the partial melt follows or overtakes the hot final repository segment during its migration into hotter regions of the center of the earth. The melted-up drill shaft region is filled up with a suitable material. The rest portion of the drill shaft is provided with a suitable metal melt shaft segment tip. The filling of further final repository segments is restarted for a self-propelled sinking prevails. Not only the final disposal of the highly radioactive stock of a nuclear power plant but also its dismantling with direct disposal of the resulting material has to be accomplished at the same site of the super-deep drilling shaft borehole shaft, in such a manner that a bomb-proof connection has to be built from the reactor building and/or reactor, and/or intermediate storage sites to the final repository shaft acting as the disposal site, hermetically separated from the biosphere. The free spaces between the disposed medium and weak-radioactive material is filled with a material, by means of which a corrosion of the final repository segment from the inside is hindered. The top region of the super-deep borehole shaft is filled up in an air and watertight manner. A tunnel that is lined with carbon panels runs from the reactor to a deep-lying basin, which is occupied by high active waste carbon ingot molds with overflow devices and which lies in the decay region of the reactor or the intermediate storage site, so that in the event of a reactor melt, the highly-radioactive melt runs into the ingot molds and has to be disposed by the automated transport system of the final repository device, directly into the medium-filled final repository segment. An independent claim is included for a device for creating a final geological repository in the base region of super-deep bore shafts by magnetically glided, directional melt drilling.

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