Intshayelelo

i-Koeberg Nuclear Power Station (KNPS) kungokunje sikwinkqubo yokwandisa ixesha lezicelo zelayisenisi yeYunithi yesibini. I-layisenisi yesikhulilo esiphehla amandla i-Koeberg imiselwe iminyaka engamashumi amane, kwaye kufuneka isivumelwano esiphunyezwe liqumrhu likazwelonke le nyuk'liya i-National Nuclear Regulator (NNR) ukuze esi sikhululo samandla siqhubeleke nokusebenza phantsi kwemiqathango ekhuselekileyo nangaphaya kwamashumi amane eminyaka (40). Esiqwengana sale ncwadi yamabali injongo yayo kukucacisa gabalala inyaniso nge KNPS nokuba luluqilima kangakanani ukhuseleko kwisiza se KNPS. Inkcukacha ezithe vetshe zivulelekile kwaye ziyafumaneka kuwonke-wonke, umzekelo UmguluOnenkcukachazikawonke-wonke. Ezihloko zilandelayo ngeKoeberg zishukuxwa ngokupheleleyo kule ncwadi yamabali.

- Ukhuseleko nge Koeberg,
- Ukuthintela iimpazamo zomntu,
- Isithintelo esigqibeleleyo,
- Uvavanyo ngobungozi bonyikimo,
- Ulawulo lokulahlwa kwenkunkuma kusetyenziswa ubugcisa benzululwazi (Radioactive),
- Inkunkuma yerhasi namanzi kusetyenziswa ubugcisa nenzululwazi (Radioactive) (kuquka ithrithiyam).

1. Ikhuseleke kangakanani iKoeberg?

I-Koeberg ikhuselekile kuba iyilwe kakuhle, yalungiselelwa ukusebenza, kwaye ivavanyiwe. Kunanamhla oku izibambile iinkqubo neemfundiso ezifunde kwiziganeko ezifana ne Chernobly ne Fukushima kananjalo ithe gqolo ukwenza uphononongo, kwaye ifunda nakwamanye amazwe jikelele (phesheya kwelwandle) phantsi kombutho ozimeleyo kwihlabathi nolawulo lwe Nyuk'liya Jikelele [National Nuclear Regulator-(NNR)].

Ngokungqamene nemiqathango yezokhuseleko kwelicandelo nokuzuza ukhuseleko ngeyona ndlela, isikhululo samandla seNyuk'liya eKoeberg sisebenzisa **inyathelo 'lokhuselo olunzulu'** Imiba engundoqo kulamanyathelo nantsi:

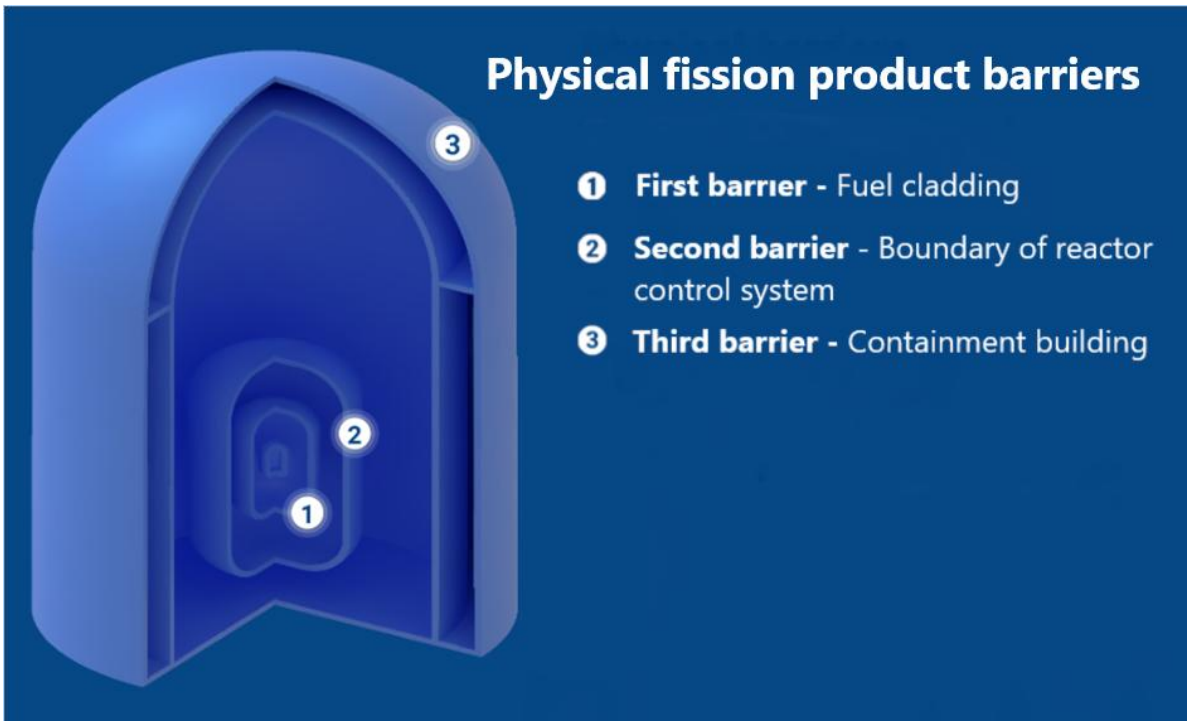
- Umgangatho ophezulu wokuyila nokwakhiwa.
- Izixhobo ezichasene neempazamo ezingenziwa ngabantu okanye ezifuna ungenelelo lwabantu.
- Ukubekwa esweni rhoqo kunye nokuvavanywa kwezixhobo ukuze kubhaqwe ezingxaki okanye ezinokuthi zisilele ukwenza umsebenzi kwangethuba.
- Iinkqubo embaxa yokugcina nokukhusela umonakalo wamafutha enyuk'liya nokukhutshwa kokhuselo lobugcisa kwezenzululwazi (radioactive).
- Imiqobo embaxa evala ukukhutshwa kwempahla zokusebenza kobugcisa nenzululwazi.
- Ukucutha iintshukumo (izicwangciso zenkonzo ezingxamisekileyo) zeziganeko xa kunokuthi kwenzeke ukukhutshwa okungacwangcwisanga kwenkqubo yokusebenza yobugcisa nenzululwazi.Uthotho lobonelelo lokhuseleko kwimiqobo engenziwa ngabantu (ekwabizwa ngemiqobo kwimveliso eziqhekekayo (fission products) kuba ziqulethe okanye zithintela ukukhutshwa kwemveliso eziqhekekayo) phakathi kwamafutha enyuk'liya nokusingqongileyo namalungiselelo aphinda-phindeneyo enkqubo zokhuseleko. Imiqobo kwiinqubo zoqhekeko eKoeberg nazi:
- Amafutha aqinileyo ohlobo lwe ceramic pellets, agcinwe ngaphakathi kwimibhobho etywiniweyo nge zirconium ukwenza amafutha abizwa fuel rods (**Umqobo wokuqala kwimveliso eziqhekekayo**).
- La mafutha (fuel rods) adityaniswe ndawonye kwinto ebizwa (fuel assemblies) avalelwe ngaphakathi kweyona yakhe yankulu intsimbi ephehla nelawula ukusebenza kwemibhobho. Iindonga eziyintsimbi zokulawulwa kwalemibhobho ziyi 200mm ubungqindilili zongezwa nge 7.5mm wobungqindilili bentsimbi yokogquma (**umqobo wesibini wemveliso eziqekekayo**).
- Konke oku ekugqibeleni kuvalelwe ngaphakathi kwesakhiwo esiluqilima esinendonga ezingqalileyo ezinobungqindilili bomlinganiselo we 900mm (**umqobo wesithathu wemveliso eziqhekekayo**).

Oku kulinganiswa nemiqobo emithathu yeemveliso eziqhekekayo engqonge amafutha enyuk'liya, kwaye intembeko yalemiqobo ibekwa esweni rhoqo. Ukogqunywa kwamafutha kuqwalaselwa ngokomlinganiselo womthamo wokuphola kwamanzi kusetyenziswa ubugcisa

benzululwazi (radioactivity). Ukuphehlwa ngamandla kwamanzi ngeqondo eliphezulu kuqwalaselwa ngomlinganiselo wokuvuza kwamazi aphuma kulenkqubo.

Uxinzelelo lokwakhiwa kwesithintelo nokunyityilikiswa ziqwalaselwa rhoqo ngekota kuquka nokuvavanywa kweqondo lokuvuza, okungakoku, ukufaka uxinzelelo lokungeniswa komoya kwizakhiwo nokuqwalasela umlinganiselo wokuphuma komoya kwizakhiwo phantsi kwamanqanaba amane oxinzelelo, la manyathelo enziwa rhoqo kwiminyaka elishumi (10).

Le miqobo yezinkqubo zemveliso ziqhekekayo ezibonakalayo zibonisiwe ku Mfanekiso 1.



Umfanekiso 1: Umqobo obonakalayo wemveliso eziqhekekayo

I-Chernobly - Ifilosofi eyohlukileyo yokhuseleko: ezilawula neziyilwe tanci zohlobo lwe Soviet

Ngomhla we 26 kuTshazimpuzi ngo1986, igumbi lesine ekulawulwa kulo ukuhamba kwe nyuk'liya kwisiza samandla eChernobly, kwindawo eyayifudula iyi Soviet Union, imvavanyo zamandla asebenza kancinane zaphuncukana nolawulo ntoleyo yaqandusela kugqabhuko dubulo emva kokufeda kweemvavanyo kwindawo yamandla asezantsi olwatshabalalisa isakhiwo ekulawulwa nekukhutshwa kuso umthamo omkhulu womoya. Nanjengoko yayityeshelwe imilinganiselo yokhuseleko, amafutha e-uranium abanobushushu obugqithisileyo anyibilika agqobhozela ngaphaya kwemiqobo ekhuselayo. Le ntlekele yenzeka kwisikhululo samandla senyuk'liya iChernobly eUkraine yabaziziqhamo zokunqaba kokuyilwa kwendawo ezilawula inyuk'liya eRBMK (Reactor Bolshoy Moshchnosty Kanalny),

ukunyhashwa kweenkqubo ezisebenzayo nokungabikho kwesithethe sokukhuselwa ngolawulo oluphucukileyo kwenyuk'liya. Olunye uphawu olungaqhelekanga kuyilo lwe RBMK kukuba yayinesithuba esivulekileyo nesihle esiphindiweyo nesinokusetyenziswa. Oku kwathetha ukuba ngokuya kuvuleka izithuba ezininzi (amaqamza) kwindawo ekulawulwa kuyo inyuk'liya, amandla abanofunqu, kuqandusele kubushushu obugqithisileyo kwaye ezithuba zininzi kulendawo ziyayipholisa. Kananjalo yayingenaso isakhiwo esomeleleyo.

I-Koeberg, njengezinye efana nazo, eziyilwe ngokwendlela yalemihla yohlukile kakhulu kwi Chernobly. I-Koeberg ayinazo izithuba ezivulekileyo lonto iyenze ikhuseleke nangakumbi. Inesakhiwo esiluqilima kananjalo. Okubaluleke kakhulu, iKoeberg inesithethe sokhuseleko oluphucukileyo kwaye iphononongwa rhoqo yimibutho yangaphandle, nezimeleyo equka i-World Association of Nuclear Operators (WANO) ne International Atomic Energy Agency (IAEA).

Isithethe sokhuseleko oluluqilima luboniswa ngemifanekiso kuMfanekiso 2 ngezantsi (ngezibele ze IAEA):

Umfanekiso 2: IAEA isondela kwisithethe esikhuselekileyo senyuk'liya

Intlekele yase Chernobly yabasisiganeko esohlukileyo ezimbalini zorhwebo ngamandla enyuk'liya nalapho kwalahleka imiphefumlo. Ezona ziphumo zincomekayo ngalentlekele kwelicandelo yaba kukusekwa kwe World Association of Nuclear Operators (WANO), nelala ngengubo enye noEskom.

I-Fukushima Daiichi

Ngomhla we 11 Kweyokwindla ngo2011, eJapana kwabanenyikima ebukhulu bulinganiselwa kwisithoba (9) eyalandelwa kukulatyuza kwamaza (tsunami) okwakuphakame kangangeemitha ezilishumi (10). Zazilishumi elinanye (11) iiyunithsi kwindawo elawula ukuhanjiswa kwenyuk'liya ezachaphazelekayo kulengingqi yaye zonke ngokuzenzekela zavalwa. Inyikima yokuqala nelandelayo ayizange idale monakalo ungakanani ukonakalisa iiyunithsi kwindawo elawula ukuhanjiswa kwenyuk'liya, kodwa zabangamaxhoba etsunami kamva.

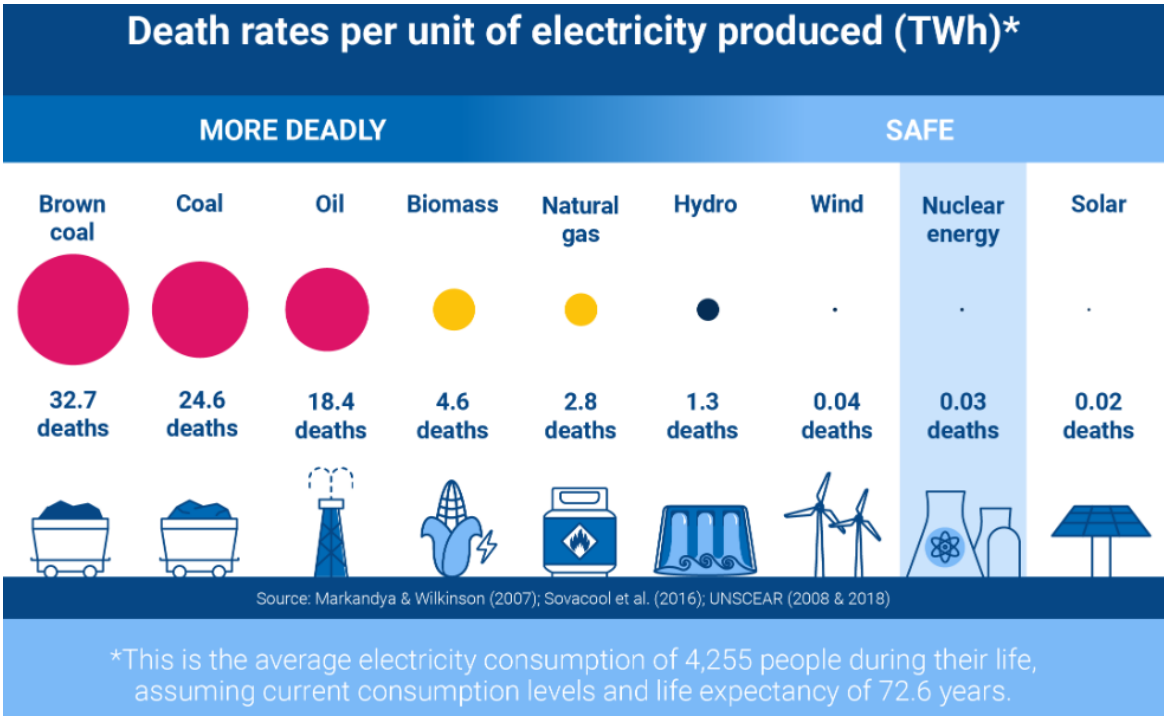
Amandla egridi okanye izincedisi zoomatshini abaphehla umbane (backup generators) ayekhona ukunikezela ngamandla ombane ukuze kuphole iimpompo zamanzi kwezisibhozo zeshumi elinanye iiyunithsi kwindawo elawula ukuhanjiswa kwenyuk'liya yaye zonke zavalwa ngokukhuselekileyo. Iiyunithsi ezintathu kwindawo elawula ukuhanjiswa kwenyuk'liya eFukushima Daiichi yabanobushushu obugqithisileyo ngenxa yokuswela amandla ombane opholisayo yaye amafutha enyuk'liya anyibilika, ekhuphela amandla okuhamba kwenyuk'liya kokusingqongileyo.

Indayo yase Koeberg yindawo enenyikima kancinci xa kuthelekiswa nendawo ekuzinze kuyo isikhululo sase-Fukushima Daiichi. Nangona kunjalo, ahlala engundoqo amalungiselelo okuchophela unyikimo. I-Koeberg iyilelwe ubukhulu obulinganiselwa kwisixhenxe sonyikimo kuqwalaselwe umgama wekhilomitha ezisibhozo ukusuka eKoeberg. Inomgangatho wethala okwimitha ezisibhozo ngaphezu kolwandle ukukhusela iitsunami.

Isiganeko sase Fukushima saphawula ukuba izixhobo ezongezelelweyo zombane ezilungele ukusebenza naninina ezingenakuchatshazelwa yitsunami ziphakathi kwezixhobo ezibalulekileyo ezidingekayo ukunqanda umonakalo kwindawo elawula ukuhanjiswa kwenyuk'liya. Eminye imiba eyongezelelweyo kwizixhobo zokupholisa amanzi, sisakhono sokususa i-hydrogen kwindawo elawula ukuhanjiswa kwenyuk'liya, nesicwangciso esisebenzayo kwiinkonzo ezingxamisekileyo, phakathi kwezinye.

Emva isifundo sase Fukushima, iKoeberg ithenge izixhobo zombane ezilungele ukusebenza nanini eziphathekayo ukuxhobisa inkqubo yayo yokhuseleko yaye ihlaziye nesicwangciso sayo senkonzo ezingxamisekileyo. IKoeberg kananjalo inezihlanganisi ze-hydrogen ezingenzi nto kwisakhiwo sendawo elawula ukuhanjiswa kwenyuk'liya ukunqanda uqhushumbo lwe-hydrogen. Ukongeza, isixhobo esilindele ukusebenza nanini sokupholisa amanzi sikhona nezinye ezimbini, kwakhiwe namatanki omeleleyo okuhambisa amanzi ngexesha lenyikima.

Umfanekiso 3 ngezantsi (ngabakwa IAEA) uthelekisa iqondo lokhuseleko lwamandla enyuk'liya neminye imithombo yamandla ombane. Ukhuseleko lwamandla enyuk'liya linokuthelekiswa nomoya kunye namandla ombane ophehlwa lilanga (solar energy)



Umfanekiso 3: Uthelekiso phakathi kwamandla enyuk'liya namandla eminye imithombo yamandla

Ukuqukumbela, iKoeberg sisikhululo esikhuselekileyo kuba siyilwe kakuhle, salungiselwa ukusebenza, sigciniwe yaye savavanywa. Kunanamhla oku sigcinwe ngezenzo zalemihla ngenxa yezifundo ezifunde kwiziganeko ezifana nezase Chernobly nase Fukushima yaye ngokuzimeleyo siphantsi kwemibutho ezimeleyo kwihlabathi nakwi NNR. Oku kuqaqanjiswa yiminyaka engamashumi amane (40) yokhuseleko, nokusebenza okuthembekileyo okungenzaziganeko.

2. Yenza ntoni iKoeberg ukucutha iimpazamo ezenziwa ngabantu?

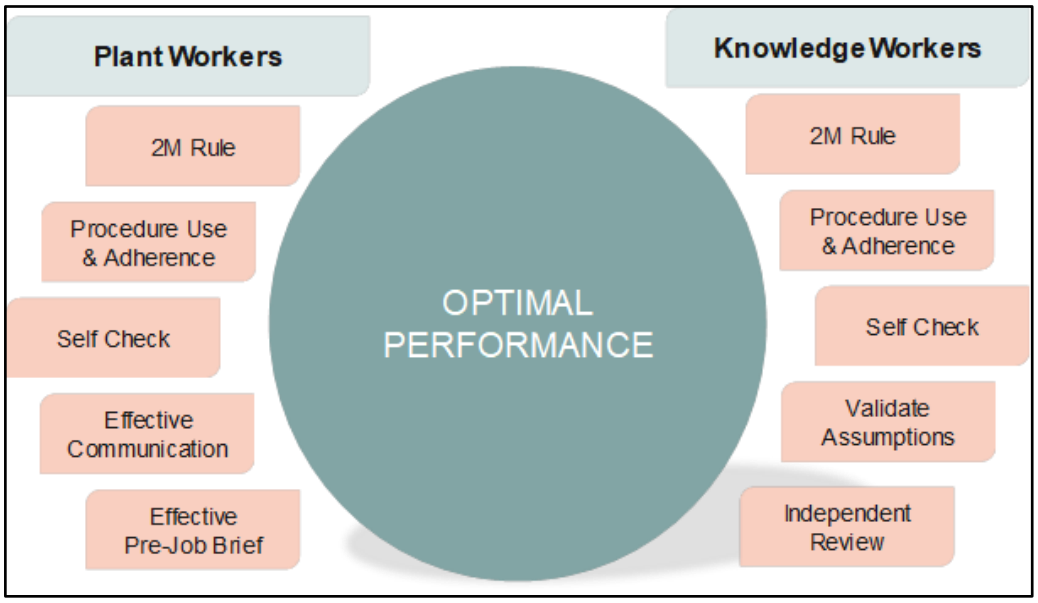
Imibutho yethu eyongamele ulawulo kwicandelo le nyuk'iya (IAEA, WANO njalo-njalo) idinga zonke iinkonzo zorhwebo ngenyuk'liya zibenenkqubo ezisebenzayo ukunciphisa iimpazamo zoluntu iHuman Perfomance ngolwamangesi (HP), kwaye iKoeberg ayikho ngaphesheya koku.

Bonke abasebenzi eKoeberg, kuquka abasebenzi abasisigxina kunye nabo bexesha elifutshane bahamba uqeqesho oluquka iiseshoni ezingezilumnkiso njengenxalenye yenyathelo lokuqala xa bengena kwisikhululo sase Koeberg. Oku kukwazisa kubo iindlela nezixhobo zokucutha iimpazamo xa besenza umsebenzi wabo nokubanceda basebenze ngokukhuselekileyo. Bonke abasebenzi baphindwa uvavanyo yaye bagunyaziswe kwakhona ngokusebenza kwezixhobo zeHP rhoqo emva kweminyaka emibini elinyathelo lilawulwa yinkqubo eqwalasela ukulungela umsebenzi ngokwasemzimbeni iFitness for Duty Programme (FFD).

Ezi zixhobo zilungiselelwe ukucutha iimpazamo kwaye zikwalungiselelwe ukucutha iimpazamo ezingababeka abasebenzi emngciphekweni. I-Koeberg ivelise inkqubo yokuqwalasela umgangatho wabasebenzi (Human Perfomance) ezingagxilanga kuphela kwiimpazamo nokutyibilika kubasebenzi kwisikhululo abasebenza kuso. Ikwaqwalasela izinto zenkampani ezinempembelelo kwindlela abasebenzi abaziphatha ngayo ezingadala iimpazamo maxa wambi. Zimbini iinkqubo zenkxaso zezi, yinkqubo yokulungisa indlela ekusetyenzwa ngayo (Corrective Action Programme) -[CAP] nenkqubo enika ingqwalasela.

I-CAP kulapho bonke abasebenzi (bomzi mveliso u-Eskom kunye nabasebenzi bexeshana nabakhi) bangafaka khona ingxelo ngemiba abahlangabezana nayo emsebenzini. Le miba iyahlolwa, ivavanywe, iphawulwe ngendlela ekudidi oluthile ibekwe phantsi kophando olululo kuba kuqinisekiwe ngayo kwenziwe uphando olukwizinga eliphezulu.Inkqubo enika ingqwalasela ivumela iinkokheli nogxa bazo ukuba ziqwalasele indlela yokuziphatha kwabasebenzi ngexesha lomsebenzi (ngexesha elililo), ukuba bawenza njani umsebenzi abawunikiweyo, bayayilandela imiqathango nokulindelelekileyo, nokuba bayakwazi ukugqala imiqobo abahlangabezana nayo.

Umgangatho wabasebenzi lelinye inqanaba kwisithethe sokhuseleko. I-Koeberg iphuhlise isithethe esiluqilima sokhuseleko lwenyuk'liya (NSC) ilandela umgangatho wehlabathi. Inyathelo elisempilweni le NSC livumela umgangatho wokusebenza kwabantu kwaye lityale umgangatho okhuselekileyo, lithintela kambe iimpazamo ezenziwa ngabantu . Ukongeza kwezinkqubo zimbini zikhankanyiweyo ngasentla, iinjingalazwi zenyuk'liya eKoeberg zimilisela ezixhobo zikumgangatho wokusebenza kwabantu zilandelayo (Umfanekiso 4) ukusingatha ukhuseleko lwabasebenzi nentembeko :



Umfanekiso 4: Izixhobo ezingomgangatho wokusebenza kwabantu

Isishwankathelo, iKoeberg imiselwe kakuhle ngenkqubo ye HP equka inkqubo yokhuseleko oluthe gabalala nolujolise ekucutheni iimpazamo ezenziwa ngabantu kwaye iphucule ukhuseleko.

3. Izakhiwo zezithintelo eKoeberg

Njengoko kuchaziwe apha ngasentla, undoqo kukugcina kwindawo ekhuselekileyo nenesithintelo esiluqilima amandla erhasi ye-nyuk'liya (radioactive reactor). Ngezantsi apha, zizinto ezinxulunyaniswe nezakhiwo ezigqibeleleyo zesakhiwo sesithinteli senyuk'liya.

Yintoni umsebenzi wesakhiwo sokuthintela?

Izakhiwo zesithintelo zigcina amandla oxinzelelo lokuhanjiswa kwamandla enyuk'liya neenkqubo ezoyamene nokupholisa i-reactor iinkqubo zomatshini bokuphehla umbane (generators), namanye amacandelo abalulekileyo adingekayo okuvelisa umophu xa kuveliswa umbane. Umsebenzi wayo ugcina ukukhupha isixhobo sendawo elawula ukuhanjiswa kwe nyuk'liya kwiziganeko ezingenakwenzeka kwintlekele zenyuk'liya. Ukuze konke oku kubeyimpumelelo, uyilo lwayo luquka ubungqindilili, nokomelela kakhulu nenendonga ezitywinwe nge khonkrithi (iyinika amandla) kwaye nentsimbi yangaphakathi eyomeleleyo (evala ukuvuza).

Umfanekiso 5: Isakhiwo sokuthintela sase Koeberg

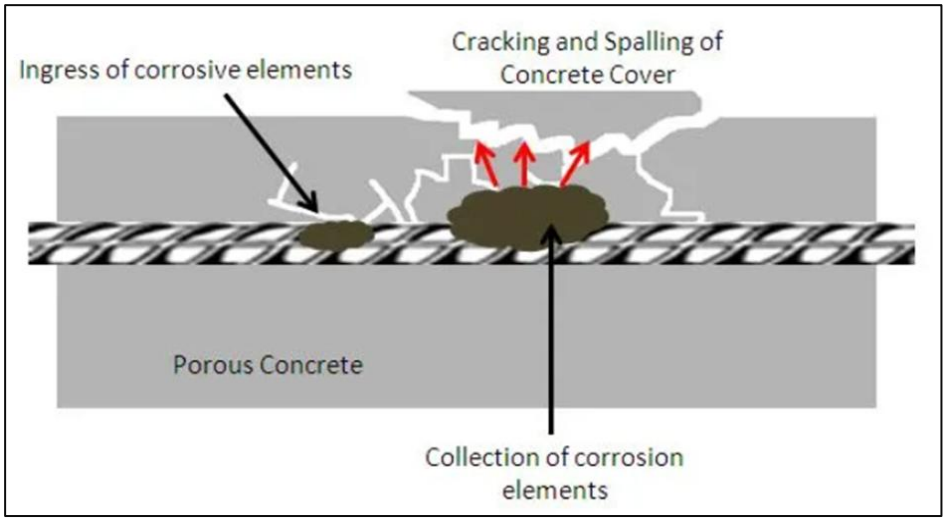
Zintoni iinkxalabo eziphakanyisiweyo malunga nesakhiwo sokuthintela sase Koeberg?

Zimbini iinkxalabo eziphakanyisiweyo. Okokuqala, izakhiwo zokuthintela zakhiwe kufutshane nolwandle, ngoko ke zisemngciphekweni ophezulu kwi-kloridzi (chlorides). Ezi k'loridzi (chlorides) zigqobhozela kumoleko wangaphandle kwikhokrithi kwaye ukuba ayilungiswa inganomhlwa (corrosion) kwiintsimbi zokhuseleko lokuqinisa isakhiwo. Oku kungaqandusela kuqhekeko (ukuhlukana komoleko) lwekhonkrithi. Okwesibini, iintanda kwizakhiwo zokuthntela, zakhiwe zabhaqwa kwiminyaka eliqela egqithileyo.

Ingakanani indawo echatshazelwa luqhekeko kwisakhiwo sokuthintela?

Indawo ezingaphandle ezijonge ngaselwandle zizo ezichaphazeleka kakhulu. Imalunga ne700m^2 kwisakhiwo ngasinye indawo echaphazelekileyo. Indawo esele ilungisiwe imalunga ne500m^2 kwisakhiwo ngasinye. Ngoko ke, ilingana nesine ekhulwini (4%) kwisakhiwo ngasinye indawo esadinga ukulungiswa neyinxalenye yesicwangciso esiqhubelekayo solungiso.

Inkqubo yeentanda ibonisiwe kumfanekiso 6.

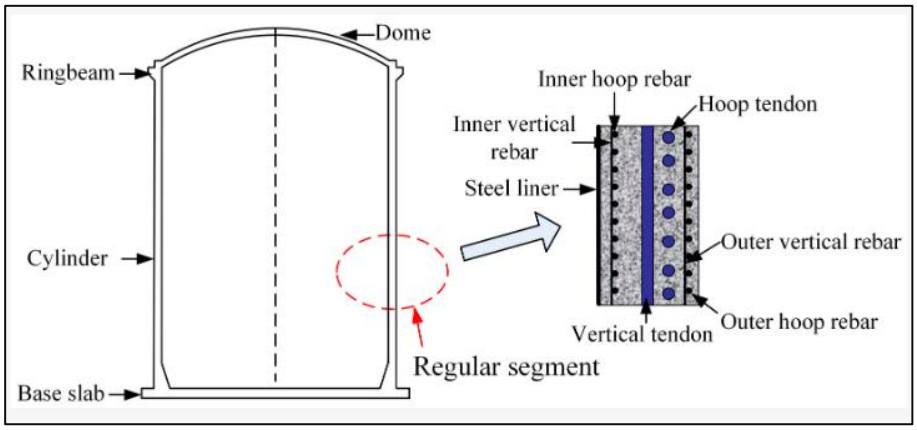


Umfanekiso 6: Indawo engaphandle enentanda (eqhekekayo)

Kuchaphazeleka njani luqhekeko ukomelela kwesakhiwo sesithintelo?

Uqhekeko alukuchaphazeli ukomelela kwesakhiwo sesithinteli kuba uqhekeko luchaphazela kuphela umoleko wangaphandle kwi khonkrithi. Udonga lwe khonkrithi liluqilima kangange 900mm, kwaye ukuqhekeka kuchaphazela kuphela kangange 80mm (ngaphantsi komyinge weshumi ekhulwini (10%) ubunzulu).

Indawo olunqumla kuyo udonga lwesithinteli kubonisiwe kumfanekiso 7.



Umfanekiso 7: Isakhiwo sesithinteli nendawo ekunqumla kuyo udonga

Lulawulwa njani uqhekeko kwindawo yekhonk'rithi ukuqinisekisa ukuba ukomelela kolwakhiwo lwesakhiwo akuchaphazeleki?

Ntlandlolo, ukulungiswa kweziqwengana kwiindawo eziqhekekileyo bekusenziwa ngokugrunjwa kwendawo ezimoshakeleyo, kufakwe iintsimbi ezomeleleyo njengoko kudingeka kuphinde kugcwaliswe iindawo ezigrunjiweyo ngekhonk'rithi. Ukuhlolwa kwizinto ezibonakalayo bekusenziwa ukuze kuqwalaselwe ukuba zikhona kusinina iindawo ezintsha eziqhekekileyo, nokubeka esweni amanqanaba ek'loridzi (chlorides) nobunzulu bek'loride kwikhonk'rithi. Xa kukho imfuneko, olunye ulungiso luyacetywa.

Kusetyenziswe ubuchule bokufunda ngeziphumo zonke nokuqukumbela ngokomelela kwesakhiwo kwahlala kuyinto eyamnkelekileyo.

Siyintoni isicwangciso sexesha elide sokuthetha ngeziphumo zomonakalo we k'lorayidi (chloride)?

Igqiza leengcali licebise u-Eskom ukuba afake eyalamaxesha inkqubo yokukhusela iintsimbi ukuba zingafunyanwa ngumhlwa ebizwa Impressed Current Cathodic Protection (ICCP) lenkqubo ikhusela ukomelela kweentsimbi nokulwa ithombe (rust) okanye umhlwa (corrosion). Iinkqubo ze-ICCP zisetyenziswa ukukhusela ukomelela kweentsimbi kwi khonk'rithi eselubala kwindawo ezinomhlwa (ezifana neebhulorho namadama). Inkqubo ye ICCP ikwinqanaba eliphambili ngophuhliso nokufakelwa kwayo kulindelekile kuleminyaka imbalwa ezayo. Ebufana nayo le nkqubo sele yakhiwe yavavanywa.

Kuchaphazeleka njani ukomelela kwesakhiwo sesithinteli kuthanda olukungqameko lwesakhiwo?

Uthanda olukungqameko lwesakhiwo sesithinteli asikuchaphazeli ukomelela kwesakhiwo lwesithinteli. Nangona lubude bulinganiselwa umyinge okwi 110m ithanda kwindawo ejikeleze ungqameko, lubekwe esweni ngokutywinwa nokupeyintwa. Luyafana nqwa neentanda eziqatshelweyo kwizakhiwo zezithinteli zamanye amazwe. Akuyonto ingaqhelekanga into yokuba ikhonk'rithi ibenothanda kwaye iikhowudi zokuyila zivumele ikhonk'rithi ukuba ibenentanda. Oluthanda lubekwe esweni ngokukhethekileyo ngexesha kuvavanywa isakhiwo sesithinteli kwaye sivavanywe ziingcali zehlabathi. Oluthanda alukhulanga nangona isakhiwo besiphantsi koxinzelelo lweemvavanyo kwaye akuxhalabisi ukuba lungachaphazela ukomelela kolwakhiwo lwesakhiwo sesithinteli.

Umfanekiso 8: Lutywiniwe uthanda kungqameko lwesithinteli lwaqatywa

Singaqinisekisa njani ukuba isakhiwo sesithinteli singawenza ngokufanelekileyo umsebenzi xa siye sadingeka?

Isakhiwo sesithinteli siphantsi kweentlobo ngentlobo ezohlukeneyo zohlolo, imvavanyo, nohlalutyo njenge nxalenye yemiqathango yelayisenisi yase Koeberg. Iziphumo zonke zolatha ngokuthe vetshe ukuba isakhiwo sesithinteli sikulungele ukusetyenziswa kwaye singaqhuba nokwenza umsebenzi waso ngokukhuselekileyo kwiminyaka engama 20 eyongezelelweyo yokusebenza. Ezinye zezimvavanyo, kukubekwa esweni, ukuhlolwa nokuhlalutywa ziquka:

Ukusebenza kwe khonk'rithi kuhlolwa rhoqo ngekota kwaye iziphumo azibonisi nkxalabo ngokugqibelela kwesithinteli.

- Uxinzelelo lwentambo ezicinezelekileyo zekhonk'rithi zibekwe esweni rhoqo ngekota (kusetyenziswa isixhobo esikala umlinganiselo wamandla aphumayo [dynamometer] esifakwe kwiisampuli zezintambo) kwaye azolathi nkxalabo ngokugqibelela kwesithinteli.

- Ukuhlolwa kwembonakalo yekhonk'rithi kwenziwa rhoqo xa kucinywe oomatshini bokuphehla umbane (kwisithuba seenyanga ezilishumi elinesibhozo 18). Nangona zibekhona iindawo ezongezelelekileyo ezinoqhekeko, azixhalabisi ngokugqibelela kolwakhiwo oluqwalaselwe ngethuba kusenziwa uhlolo.

- Uvavanyo lweminyaka elishumi lwenziwe kuzo zombini izakhiwo zesithintelo ngonyaka u2015 kwaye yaziphumelela ezomvavanyo. Olunye uvavanyo luzokwenziwa xa kucinywa kwakhona kwi yunithi nganye kwaye iziphumo zizovavanywa ziingcali zehlabathi.
- Uhlalutyo ngoxinzelelo lwe khonk'rithi nesixhobo esikala umlinganiselo wokuphuma kwamandla (dynamometer) zibonisa ukuba isakhiwo sesithinteli sikhuselekile kwaye sizoqhubeleka nokusebenza eminye iminyaka engamashumi amabini (20), nemvamvanyo kunye nokuhlolwa okuqhubekayo..

Ingaba izinto ezingcolisekileyo yinyuk'liya zingavuza kwiintanda ezikwi khonk'rithi?

- Hayi, izinto ezingcolisekileyo yinyuk'liya azisoze zivuze kwiintanda ezikwi khon'rithi. Okokuqala, izivingci-kuvuza zibonelela ngeentsimbi ezingqindilili ezilinganiselwa kwi 6mm ngaphakathi kwikhonk'rithi ekwisakhiwo sesithinteli hayi kwi khonk'rithi. Okwesibini, ezintanda nokuqhekeka zichaphazela kuphela indawo engaphandle kubungqindilili be 900mm, kwiindonga ezomeleziweyo zekhonk'rithi. Ungqameko lubungqindilili obukumlinganiselo oyi 800mm.

Ingaba inkqubo eqwalasela ukusebenza kolwakhiwo lwesithinteli kubuyiswe ngokupheleleyo njengokucebisa kwe IAEA?

Ukusebenza okupheleleyo kubuyiselwe. Izixhobo idynamometers zilinganisiwe kwaye nokulungiswa kwengcingo ezibizwa invar ne pendulums kuqukunjelwe. Ukubekwa esweni kwesakhiwo sesithinteli kuyaqhuba kusetyenziswa izixhobo zokuhlola. Ezizixhobo zokuhlola zinika izimvo /ubume besithinteli ngokupheleleyo.

Ngaphandle kwenkqubo yokuhlola esebenza ngokupheleleyo, ukuhlolwa kolwakhiwo lwesakhiwo sesithinteli kungaqhubeka kubekwa esweni?

Ewe, ukubeka esweni inkqubo yokuhlola isakhiwo sesithinteli kungaqhuba kusetyenziswa izixhobo zokuhlola ezikhoyo. Ukwaphuka nokufeda kulindelekile ngamaxesha athile kwaye inkqubo yokuhlola ulwakhiwo iquka iinkqubo eziliqela ezihambelanayo.

Uvavanyo olumandla kwisakhiwo sesithinteli, lwenziwa ngeizixhobo zexeshana zokuhlola ukongeza kwizixhobo zokuhlola ebezikho ngaphambili. Makwaziwe ukuba ezizixhobo zokuhlola isakhiwo sesithinteli ziyezalungiswa zonke, ngoku ziyasetyenziswa ukuhlola isakhiwo eso.

Sithini isicwangciso sexesha elide sokubeka esweni inkqubo yesithinteli?

Iinkqubo ezikhoyo zokuhlola isithinteli ziqwalaselwa njengezoneleyo kwaye ulungiso luzokwenziwa xa kukho ezaphukileyo. Nangona kunjalo, isicwangciso esiguquliweyo sokufakwa kwezixhobo ezintsha kwixesha eliphakathi ukuya kwelide sizovumela ukuphucuka kokuhlolwa kolwakhiwo lwesakhiwo sesithinteli kuyinxalenye yenzame zophuculo eziqhutywayo ngu Eskom.

Lungenza njani uluntu ukuqinisekisa ukuba isakhiwo sesithinteli sisebenza ngokukhuselekileyo ngexesha lokusebenza ixesha elide (long-term operation LTO)?

Uhlalutyo ngokuguga kolwakhiwo lwesakhiwo sesithinteli luqukunjelwe ngaxeshanye kumanqwanqwa ehlabathi nolubonise ukukhuseleka kwesakhiwo sesithinteli isithuba seminyaka engamashumi amabini (20) eyongezelelweyo.

Ukuvavanya, ukubekwa esweni nokuhlola kuzoqhuba ngexesha le LTO kwaye ezimvavanyo zibizwa (license-binding surveillances) zibalulekile kwi NNR kumcimbi welayisenisi yenyuk'liya. Oku kukuthi, zenziwa phantsi kwemiqathango yephepha-mvume lokusebenza (license) ekhutshwe yiNational Nuclear Regulator (NNR) kwaye yonganyelwa kwangabo.

Oluhlolo nemvamvanyo ezimandla zeminyaka elishumi nezizokwenziwa xa kucinyiwe omatshini bokuphahla umbane ngamandla enyuk'liya kwixa elilandelayo kwi yunithi 1 ne yunithi 2, luzoboniswa kwinkqubo eqhubayo ngalo lonke ixesha elishiyekileyo lokuyilwa kwenkqubo yokhuseleko kwisakhiwo sesithinteli.

4. Iimvavanyo zonyikimo olunobungozi eKoeberg

Njengaso nasiphi isikhululo esiphehla umbane ngamandla enyuk'liya, indawo ekuyo iKoeberg yachongwa ngokuphelelyo nangenkathalo, kuqwalaselwe izinto eziliqela ezimiselwe yimiqathango ehambelana neemfuno ezikhoyo ngexesha lokuchongwa kwesiza (site).

Inkqubo yokuchonga yokuqala kukuqinisekisa ngokugqibelelyo ukuba akukho mngcipheko ungafanelekanga kwimpilo nokhuseleko lwabantu ngenxa yokusebenza kwe Koeberg. Enye yezinto ezihlolwayo ngexesha lokuchongwa kwesiza yinzululwazi ngonyikimo-isifundo ngenyikima engachaphazela iKoeberg. Izifundo zokuqala ngokuchongwa kwesiza esifanelekileyo seKoeberg sakhutshwa ngonyaka ka1960 no1970 eyakhokhelela ukuba iDuynefontyn ibeyiyona ikhethwayo njengesiza seKoeberg.

Intshona Koloni iphawulwa njengendawo enamaqondo asezantsi onyikimo xa kuthelekiswa namanye amazwe enezikhululo eziphehla umbane ngamandla enyuk'liya, umzekelo, iJapan ne California. Oku kuthetha ukuba ambalwa amathuba okuba inyikima ingadala umonakalo onobuzaza eKoeberg. Nangona kunjalo, kubalulekile ukuba iKoeberg ihlale ixhobile kwaye ilungiselele intlekele yenyikima.

I-Koeberg iyilwe yalungiselelwa ukuba imelane nenyikima ebukhulu busisixhenxe igxile ngomgama we 8km ukusuka eKoeberg. Ingxelo / uvavanyo ebhalwe nguDames no Moore uhlalutyo lwenyikima olwalusingathwe ngonyaka ka 1973 ukuya ku 1981. (IDames ne Moore yayingovulindlela kwicandelo leenjineli zokwakha ezizinze eUSA).

Ukususela ngoko, uEskom ugunyazise ezinye iimvavanyo zobungozi benyikima eDuynefoyntyn, kwisiza seKoeberg. Ezimvavanyo zonyikimo olunobungozi zibonisiwe apha ngezantsi:

- Ibhunga Lenzululwazi kwizifundo ngomhlaba (Council for Geoscience) (ngo 1999 kwakhona ngo 2005)
- Abahlobo bakwa Rizzo (Rizzo Associates (2008)
- Uhlolo lwenyikima lwangaphakathi (Interim Seismic Evaluation) (2022)
- Ibhunga lenzululwazi ngezifundo ngomhlaba nemvavanyo zobungozi bonyikimo ekufundwe ngazo gabalala (Council for Geoscience Probabilistic Seismic Hazard Assessment (PSHA) (ngo2021 ukuya ku2024)

Izifundo zakutsha nje, PHSA(24), zigunyaziswe ngenxa yemida eye yasilela kancinci kwiingcombolo zeDames nase Moore nangemvavanyo zangaphambili, ukuze kufakwe isicelo samvanje sedatha, ubuchule, imigangatho nokungqamana nemiqathango yolawulo.

I-PSHA isebenzisa iindlela eziphuculiweyo nemigangatho ekwinqwanqwa lehlabathi ukuqinisekisa ukuba iimvavanyo zobungozi benyikima eKoeberg zikudidi oluphezulu ehlabathini. Kutyunjwe igqiza lehlabathi liBhunga Lenzululwazi ngezifundo ngomhlaba (Council for Geoscience) elenze izifundo iminyaka.

Uhlolo lwangaphakathi ngenyikima (Interim Seismic Evaluation 2022) lwenziwe ukuze luqinisekise ukomelela kwe Koeberg ngakwiziganeko zenyikima kwaye zincedise ukuphuhlisa ukusebenza kwexesha elide (LTO) logama iPHSA isaqukunjelwa.

Isakhono seKoeberg sokumelana neenyikima ezinkulu kungenxa yokomelela koyilo lwayo.. Ukongeza, isiqithi senyuk'liya (esiquka isakhiwo sesithinteli nezinye izakhiwo ezibalulekileyo) sakhiwe nge 1829 zentsimbi ezidlala indima yokucutha iziphumo zomonakalo odalwe yinyikima kwimeko ezingaqhelekanga ezingenzeka ukuvumela ukucima kokhuseleko kwisikhululo samandla.

Ziqukunjelwe kungokunje izifundo nge PSHA kwaye zibonisa gabalala ukuqhuba kakuhle kakhulu, ngovavanyo lobume bobugcisa ngemeko yenyikima kwisiza saseKoeberg. Zonke ezaziwayo, nezingaziwayo iimpazamo noqikelelo kunye negalelo zinikwe ingqwalasela ebanzi kwesi sifundo. Ukomelela kwesiza ngakwiziphumo zePSHA (oku kuthetha ukuba inyikima ibhaqwe kwesi sifundo) ifukanywe Luhlolo lwangaphakathi Ngenyikima olwenziwe yiLTO. Ngoko ke, Uhlolo lwenyikima oluqhutywa ngaphakathi lunika isiqinisekiso sokuba isikhululo sase Koeberg siluqilima kakhulu xa kuthelekiswa neentlekele zenyikima.

5. Ukulawulwa kwenkunkuma yerhasi enamandla asebenzayo (radioactive)

Ukhuseleko lwenkunkuma yohlobo oluthile lwerhasi enamandla (radioactive)

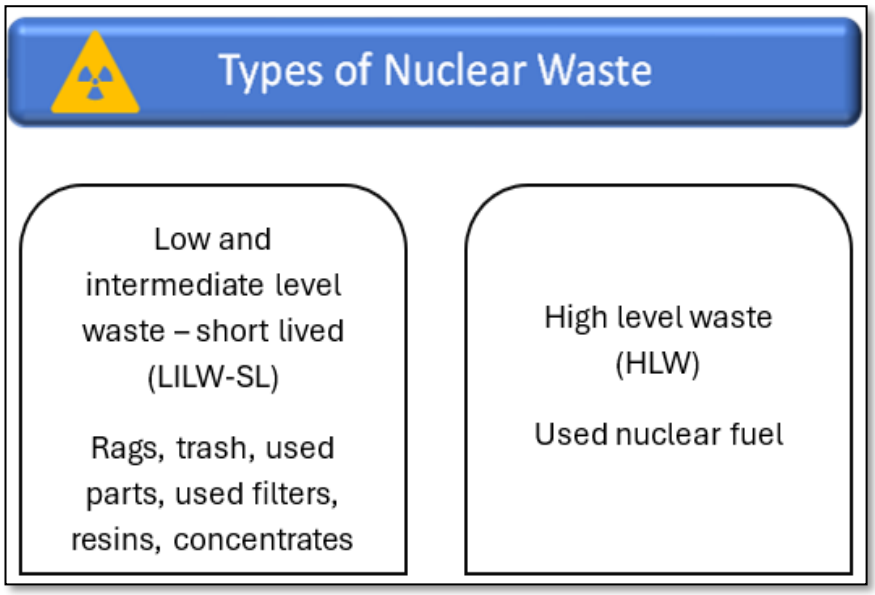
Indawo egcina irhasi enamandla esebenzayo kwa Eskom neenkqubo zokuyilahla ziphantsi kwemiqathango neemfuno ezikumgangatho wehlabathi. Indawo ekumgangatho osezantsi egcina inkunkuma eqinileyo imiselwe ngokukhuselekileyo. Inkunkuma yona uqobo lwayo ineqondo eliphantsi lerhasi enamandla esetyenziswayo kwaye igcinwa ngokukhuselekileyo.

Indlela efanayo ekwinqanaba elisezantsi nephakathi yokulahlwa kwenkunkuma isetyenziswa ngokukhuselekileyo kumazwe amaninzi aquka iFrance, USA nase UK. Indawo egcina amafutha asetyenzisiweyo kumaqula amafutha nendawo ezigcina iifatyi ezomileyo zenziwe ngokukhuselekileyo iminyaka eKoeberg nakawamanye amazwe amaninzi. Ilinge elisetyenziswe ngu Eskom lokugcina amafutha asetyenzisiweyo enyuk'liya liyasetyenziswa eUSA nase Europe.

Into ebalulekileyo ngokhuseleko lokulawulwa kwenkunkuma eqinileyo kukuyilwa kwezigcini nkunkuma leyo (imigqomo yekhonk'rithi, imigqomo yentsimbi neefatyi ezomileyo zokugcina inkunkuma) neenkqubo zamaqula okupholisa amafutha asetyenzisiweyo ephatsi kolawulo olungqingqwa.

Iintlobo zenkunkuma eziveliswe ngamandla erhasi esebenzayo (radioactive)

Njengenxalenye yenkqubo zesiqhelo ezisebenzayo ukulungiswa kuyaqhuba, iKoeberg ivelisa inkunkuma yerhasi, engamanzi neqinileyo yohlobo lwerhasi esebenzayo (radioactive). Inkunkuma yerhasi namanzi ithatyathwa ilahlwe kuphela xa kukhuselekile ukwenza oko yaye kulawulwa ziimeko eziphantsi kwemiqathango yokhuseleko, imida evumayo negunyaziswa yimfuneko yoko. Ukulawulwa kwenkunkuma yerhasi, amanzi ivelisa eqinileyo, esezantsi nekwiqondo eliphakathi elitywinwe ngeentsimbi nemigqomo ye khonkr'ithi (kuxhomekeka kuhlobo lwenkunkuma). Imigqomo yenkunkuma (iyila, ivavanye indlela yokuyithutha) ilawulwa yimiqathango engqingqwa ekwimfuneko ezikwinqwanqwa lehlabathi ukuqinisekisa ukuba inkunkuma eqinileyo izogcinwa ngokukhuselekileyo. Inkunkuma ekumgangatho ophezulu (esetyenzisiweyo / namafutha asetyenzisiweyo) igcinwa kuqala kwiqula lamafutha asetyenzisiweyo phambi kokuba igqithiselwe kwindawo ezigcina inkunkuma eyomileyo kwisiza sase Koeberg.



Umfanekiso *9*: Imizekelo eyahlukeneyo ngeentlobo ngentlobo zenkunkuma yenyuk'liya

Ngenkcukacha ezithe vetshe, vula le linki inoMqulu Wenkcukacha Zoluntu zexesha elide elisebenzayo eKoeberg:

https://www.eskom.co.za/wp-content/uploads/2025/05/240-165294677-Rev-4-PID-for-LTO-Xhosa.pdf

Umgangatho osezantsi nophakathi wenkunkuma yerhasi enamandla esebenzayo (LILW - SL)

Umgangatho osezantsi nophakathi wenkunkuma idibanisa malunga nomyinge wamashumi aluthoba nesixhenxe ekhulwini (97%) wenkunkuma eveliswayo. Umgangatho osezantsi wenkunkuma (LILW-SL) ugcina iqondo elisezantsi lerhasi esebenzayo kwaye ukuvuza kwemigqomo engachaphazela okusingqongileyo kukwiqondo elisezantsi. Imigqomo ye LILW-SL yentsimbi neyekhonk'rith yenzelwe ukugcina izixhobo zenkunkuma ngokukhuselekileyo yaye zinqande ukuvuza. Le nkunkuma ihlohlwe yatywinelwa kumgqomo uphawulwe ngokucacileyo wagcinwa kwesi siza kwade kwafika ixesha lokuyithuthela kwisiza esikhethiwe ekulahlwa kuso **eVaalputs** kwiphondo loMntla Ntshona. Incindi (resin) ephuma kwirhasi esebenzayo ekumgangatho ophezulu nenyibilikileyo ephuma kwirhasi namanzi amdaka ziyabunjwa ngokudityaniswa nesamente zigalelwe kumgqomo wekhonk'rithi phambi kokuba zisiwe eVaalputs.

Iipakethe zenkunkuma ziphantsi kwemiqathango engqingqwa ngendlela eyamkelekileyo ukuqinisekisa ukuba inkunkuma ithuthwa kwaye ilahlwa ngokukhuselekileyo.

Indawo kazwelonke yokulahla inkunkuma yenzelwe ukukhusela impilo yoluntu nokusingqongileyo kwaye ineenkqubo zokuhlola ukunciphisa umngcipheko ongaphembeleleka kokusingqongile. Le ndawo ilawula **yiNuclear Energy Corporation of South Africa** phantsi kwe**National Radioactive Waste Disposal Insitute (NRWDI).** Ngumyinge omncinane okhoyo kwindawo ekugcinwa kuyo inkunkuma osele usetyenzisiwe.

Umfanekiso 10: Inkunkuma yerhasi esebenzayo kwimigqomo yentsimbi egcinwe Kwiziko Likazwelonke Lokulahla Inkunkuma (National Waste Disposal Facility) Vaalputs

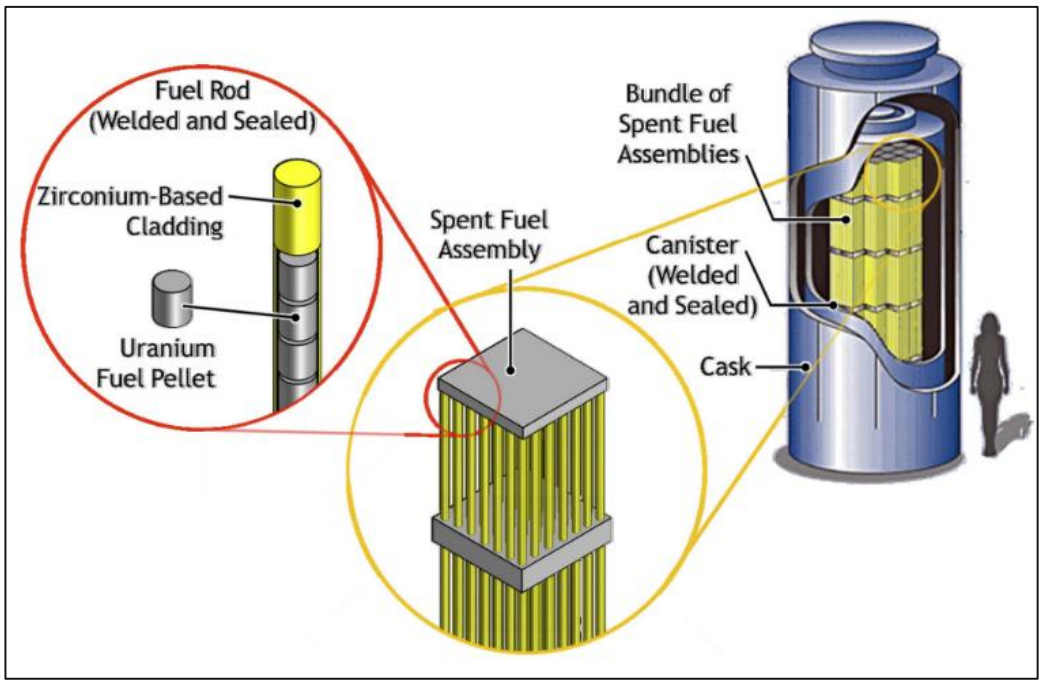
Umfanekiso 11: Inkunkuma yerhasi esebenzayo igcinwe kwimigqomo yekhonk'rithi Kwiziko Likazwelonke Lokulahla Inkunkuma (National Waste Disposal Facility) Vaalputs

Inkunkuma ekumgangatho ophezulu

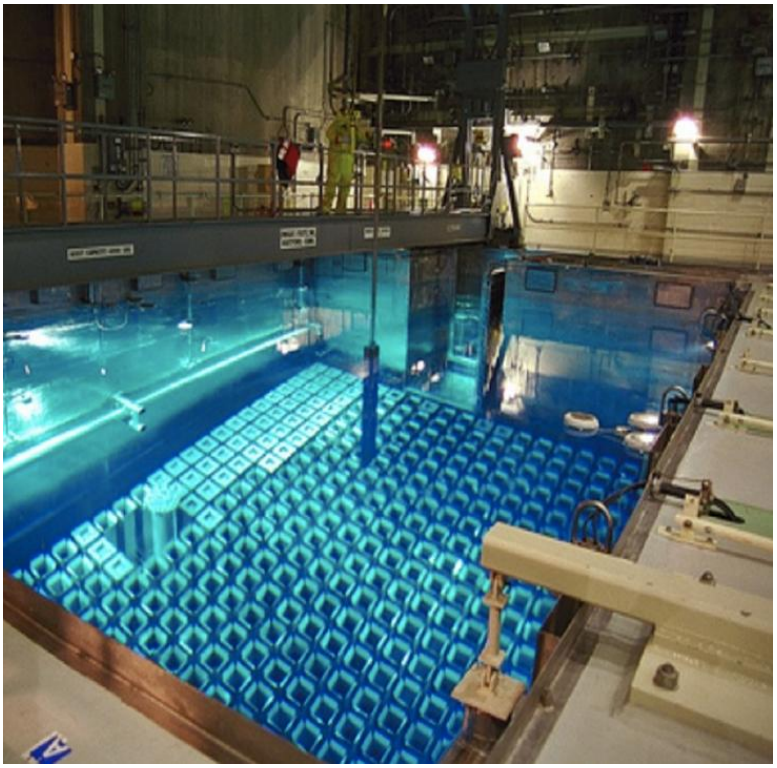
Inkunkuma ekumgangatho ophezulu (amafutha asetyenzisiweyo enyuk'liya ekugqibeleni afanele ukubizwa njalo) enza umyinge wesithathu ekhulwini (3%) wenkunkuma evelisiweyo. Iqulathe iintlalutye ezincinci ze uranium oxide ezipakishwe kumbhobho wamafutha (bona kumfanekiso 12). Amafutha adityanisiweyo kwimibhobho elungiselelwe ndawonye yenziwa yakumila njengombhoxo buxande(rectangular) njengokuba kubonisiwe.

Amafutha asetyenzisiweyo agcinwa kumaqula amafutha asetyenzisiweyo (bona kumfanekiso 13) kwiifatyi ezomileyo eKoeberg (bona kumfanekiso 14). Ubonelelo ngeefatyi ezongezelelweyo zokugcina amafutha kucwangcisiwe kwaye zizobakhona xa zidingeka. Amaqula agcina amafutha asebenzileyo neefatyi ezomileyo zikhuselekile kwaye zithembekile ukuba zingagcina amafutha asetyenzisiweyo.

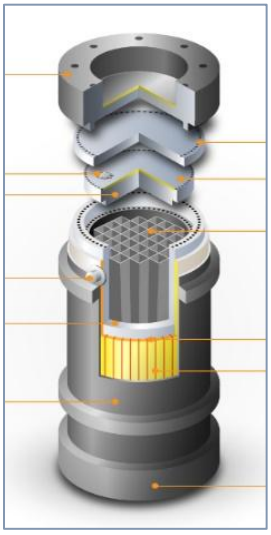
Elinyathelo lisetyenziswa kakhulu ngokoyame kwizenzo zamazwe ngamazwe.



Umfanekiso 12: Inkunkuma ekumgangatho ophezulu - amafutha asetyenzisiweyo enyuk'liya agcinwe ezifatyini (casks).



Umfanekiso 13: Iqula lamafutha asetyenzisiweyo

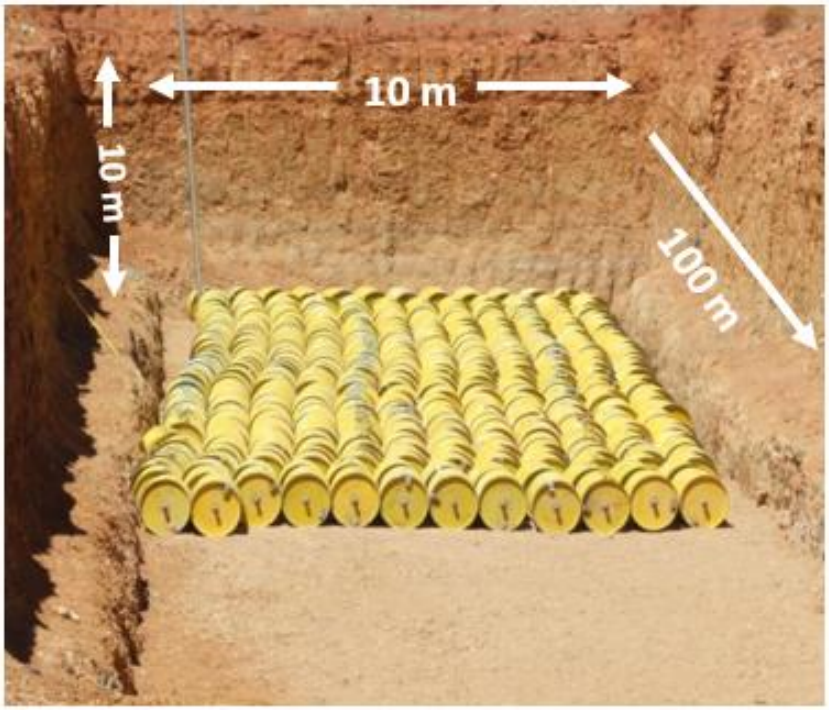


Umfanekiso 14: Ifatyi eyomileyo yokugcina amafutha enyuk'liya

Umthamo wenkunkuma yomgangatho ophezulu nosezantsi oveliswe kwiminyaka engamashumi amabini (20) eyongezelelweyo.

Uwonke umthamo wenkunkuma ekwiqondo elingezantsi oveliswe ngexesha leminyaka engamashumi amabini (20) uqikelelwa ngaphantsi kwe 10,000m^3. Lo mthamo uquka umthamo wenkunkuma epakishiweyo, oku kuthetha ukuba yimigqomo yekhonk'rithi neyentsimbi. Lidibene lilonke inani lamafutha asetyenzisiweyo enyuk'liya aveliswe kwiminyaka engamashumi amabini (20) eyandisiweyo liqikelelwa kwi1750.

Lengqokelela yamafutha ingagcinwa kwiifatyi ezomileyo ezingamashumi amathandathu (60) ezingathabatha indawo engange 600m^2.



Umfanekiso 15: Umthamo odingekayo wenkunkuma ekwiqondo elisezantsi eliveliswe kwiminyaka engamashumi amabini(20) eyandisiweyo

Umfanekiso 16: Umzekelo wefatyi eyomileyo kwindawo yokugcina amafutha enyuk'liya asetyenzisiweyo

Ikhuseleke kangakanani indlela uEskom aqubisana ngayo yokugcina nokulahla inkunkuma yerhasi enamandla esebenzayo?

Ukhuseleko lwenkunkuma yerhasi enamandla esebenzayo

Indlela ka Eskom yokugcina nenkqubo elungiselelwe ukulahlwa kwenkunkuma kwindawo yase Vaalputs ichankcatha phantsi kweemfuno zemiqathango ezikumgangatho wehlabathi iNNR. Indawo yokugcina inkunkuma yenyuk'liya i-LILW-SL eyakhiwe kwimisele kwaye ikhuselekile. Ukugcinwa kwenkunkuma kukodwa kukumgangatho osezantsi werhasi enamandla esebenzayo kwaye yomelele iimigqomo yokugcina inkunkuma. Imigqomo yokugcina inkunkuma nayo ikhokhobe phantsi kwemiqathango engqingqwa yenkunkuma.

Indlela efanayo yomthetho wokulahla inkunkuma ekumgangatho osezantsi nophakathi isetyenziswa ngokukhuselekileyo kumazwe amaninzi aquka iFrance, iUSA ne UK. Ukugcinwa kwamafutha asetyenzisiweyo kumaqula amafutha asetyenzisiweyo nakwiifatyi ezomileyo kwenziwe ngokhuseleko iminyaka eKoeberg nakwamanye amazwe amaninzi. Ilinge elisetyenziswe ngu Eskom lokugcina amafutha asetyenzisiweyo enyuk'liya liyasetyenziswa eUSA nase Europe.

Into ebalulekileyo ngokhuseleko lokulawulwa kwenkunkuma kukuyilwa kwezigcini nkunkuma leyo (imigqomo yekhonk'rithi, imigqomo yentsimbi neefatyi ezommileyo zokugcina inkunkuma) neenkqubo zamaqula okupholisa amafutha asetyenzisiweyo ziphatsi kolawulo olungqingqwa nolukhuselekileyo maxa onke.

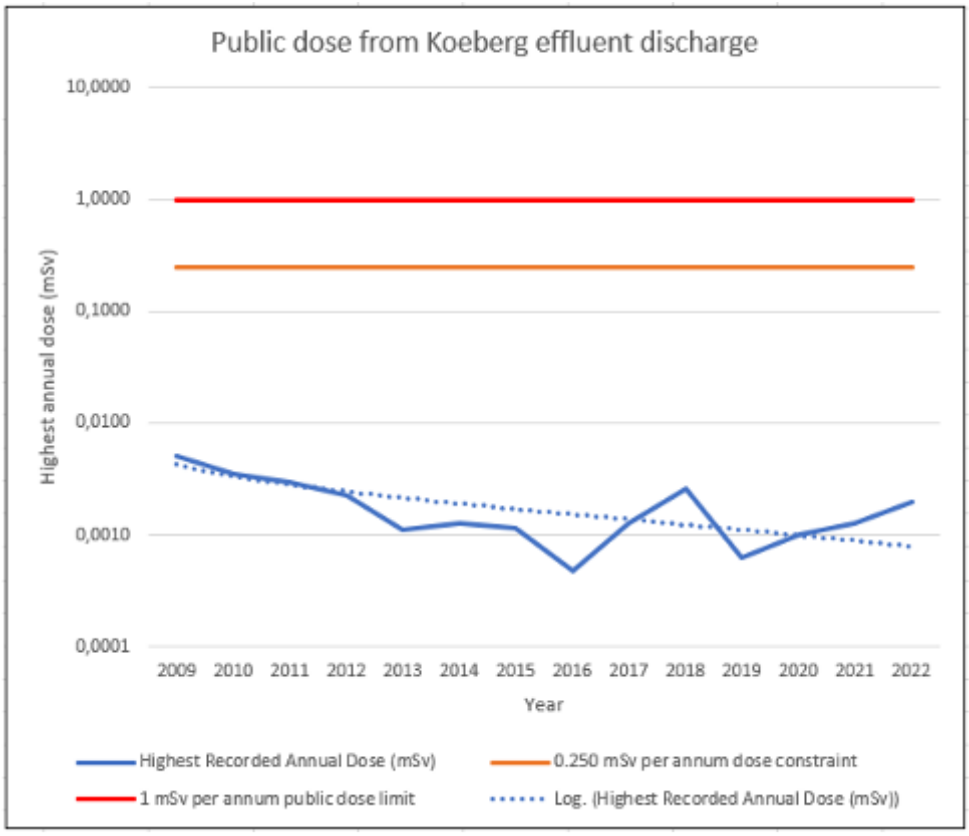
6. Inkunkuma engamanzi nerhasi yerhasi enamandla esebenzayo (Radioactive) (equka i-tritium)

Ngexesha lenkqubo zesiqhelo zokusebenza kwisiza samandla senyuk'liya, amanye amanzi amdaka erhasi esebenzayo (kuquka i-tritium) akhutshwa phantsi kolawulo yimiqathango evumelekileyo, esetyenziswa yinkqubo yokuhlola yase Koeberg.

Iirhasi ze radioactive namanzi zilawulwa ziinkqubo ezilawula inkunkuma eKoeberg kwaye ezinkqubo zicutha amandla erhasi ekwimida phambi kokuba zikhutshelwe kokusingqongileyo. Amanzi amdaka akutshwayo aquka i-tritium engamanzi nerhasi. I-Tritium ikhona ngokwendalo kokusingqongileyo kodwa ikwaveliswa nayinyuk'liya eyenziwa ngabantu efana nesikhulilo samandla senyuk'liya.

Ukukhutshelwa kokusingqongileyo kwamanzi amdaka nerhasi kucuthiwe ngomthamo okumlinganiselo ophezulu omiselwe ngumthetho. Umthamo osebenzayo umiselwe ngumthetho kumalungu oluntu ngeziphumo zawo onke amanyathelo agunyaziswe yi 1mSV rhoqo ngonyaka, logama umthamo wesinye osetyenziswa eKoeberg ngokumela umntu omnye uyi 0,25mSV rhoqo ngonyaka. Oku kusezantsi kakhulu kwisininzi semvelaphi yomgangatho wamandla asebenzayo amalunga ne 2,4mSV ngonyaka.

Ingqokelela yomthamo yomntu ngamnye ngonyaka ohlala kufutshane neKoeberg ungaphezulu ngexesha elilinganiselwa kwikhulu (100) kwimvelaphi yendawo yamandla asebenzayo. Ngoko ke, ukwenzeka kweziphumo ngezempilo ngenxa yokusebenza kwe Koeberg kusezantsi kakhulu. I-Tritium ayinakhemikhali inetyhefu emzimbeni womntu ngaphandle kerhasi enamandla esebenzayo (radioactivity). Nangona kunjalo, njengokuba kubonisiwe kulomfanekiso ungezantsi, akhutshiwe amanzi amdaka erhasi enamandla esebenzayo (kuquka i-tritium) kwaye ihambelana neemfuno zomthetho yaye iyancipha.



Umfanekiso 17: Inyathelo lomthamo woluntu ngenxa yokukhutshwa kwamanzi amdaka eKoeberg (kuquka i-tritium)

E-Koeberg i-tritium ibekwe esweni kumatshini wokupholisa amanzi, ngaphakathi kwisithinteli esinomoya zonke iirhasi namanzi zikhutshiwe. Ubuninzi bokungakhuseleki ngonyaka kungaphantsi kwe 0,002mSv, ntoleyo ingaphantsi ngekhulu (100) kwixesha lobuninzi bokungakhuseleki okuvumelekileyo ngonyaka.