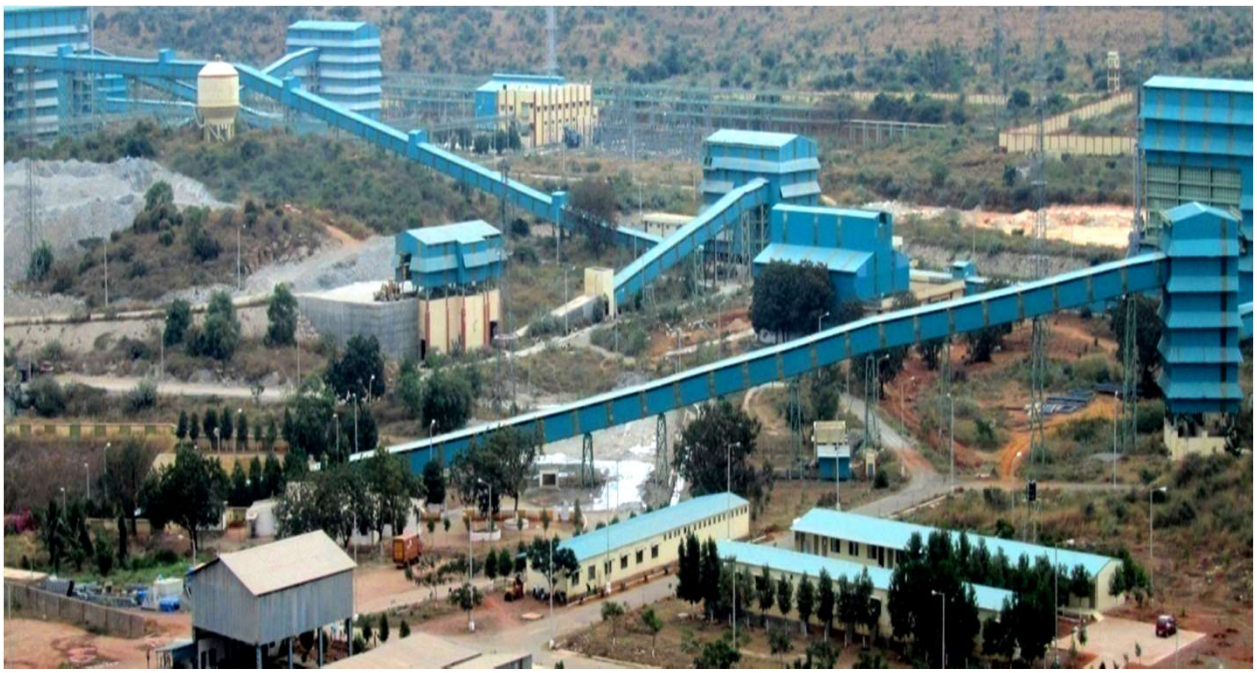
ENVIRONMENT IMPACT ASSESSMENT REPORT

FOR

EXPANSION OF TUMMALAPALLE URANIUM PROJECT FROM 9.0 LAKH TPA TO 13.5 LAKH TPA AT YSR (KADAPA) DISTRICT, AP

EXECUTIVE SUMMARY



MEC/01/S2/Q7JK/EIA-EMP/R-1 ***SEP* - 2020**

URANIUM CORPORATION OF INDIA LTD.
(A Govt. of India Enterprise)
An ISO 9001:2008,
ISO 14001:2004 & OHSAS 18001:2007 Company
P.O.- Jaduguda Mines, Dist.- East Singhbhum,
JHARKHAND – 832102

Project Proponent

MECON LIMITED
(A Govt. of India Enterprise)
Bangalore, Karnataka.

CERTIFICATE NO: NABET/EIA/1619/RA0068

Environmental Consultant

Executive Summary

General

Uranium Corporation of India Limited is empowered to mine and process uranium ore in the country. In order to meet the increased demand of natural uranium in our nuclear power plants, UCIL planned to increase the production capacity of Tummalapalle mine and processing plant from its 9 lakh TPA to 13.5 lakh TPA to bridge the gap between demand and supply of uranium.

UCIL has planned to approach MoEF&CC to obtain Environmental Clearance (EC) for expansion of mines and ore processing plant. As per schedule of EIA notification 2006 MOEF&CC, the proposed mines and ore processing plant falls under Sl. No. 1(a) and 2(b) i.e. Mining of minerals and Mineral beneficiation under category "A". Hence, UCIL has entrusted MECON Limited, which is an accredited consultant organization by QCI/NABET for preparation of EIA/EMP report for the expansion project.

The MoEF&CC, EAC Committee prescribed the TOR for undertaking detailed EIA study vide their letter No. J-11015/226/2016-IA.II (M) dated 19.01.2017. The validity of TOR was extended vide MoEF&CC letter No. J-110115/226/2016-IA.II (M) dt. 25.11.2019 with the validity period upto 18.01.2021.

This EIA/EMP report has been prepared on the basis of one full season baseline environmental data generated during summer season covering three months (March-April-May) of year 2017 in core and buffer zone of 10 km radius. In view of extension of TOR, the baseline data have been revalidated by carrying out baseline monitoring, for additional one month during March 2020. Radiological baseline data was collected by Health Physics Unit, of BARC Tummalapalle.

Project Description

The project and town ship is spread over in an area of 973.412 ha. The mine and associated ore processing plant covers an area of about 813.412 ha.which falls in Tummalapalle, Mabbuchintapalle, Bumayigaripalle and Rachakuntapalle villages.. The project site is linked to Pulivendula by a metal road which is leading to State Highway No.18, and connects Kadapa with Pulivendula. The nearest railway station is Muddanuru on South Central Railway's Hyderabad – Chennai BG Line, which is about 50 km towards the north-east with respect to site.

The proposed expansion units will be accommodated in the existing plant and mines. The mining lease was granted to UCIL on 19.12.2007 for a period of 30 years by Government of Andhra Pradesh and production of uranium ore commenced in the year 2008 – 2009 after obtaining environmental clearance in 21st Feb,2007.

The project doesn't require any approval/clearance under the Forest (Conservation) Act, 1980 as there is no forest land involved in the project. The project is not located in the vicinity of any environmental sensitive area. Further, there is no litigation, directions or any order passed by any Court of Law or pending against the project.

Tummalapalle uranium deposit is located in the middle of the south-western margin of Cuddapah basin. Vempalle carbonate rock formation is the host rock, uranium mineralization forms in the upper part of Papaghni group of rocks and underlained by Gulcheru quartzite. The life of mine has been estimated as 13 years at the proposed expanded capacity of 13.5 lakh TPA

Mining Methodology

Existing Method of Work & Design Parameters

Already, three declines (5m x 3m along an apparent dip of 9° due NE), namely, west, central, east are existing. As on date, the mine has reached a depth of about 225.63m RL below the decline portal. The lowest level to be mined out is limited at 275 mRL.

Mine design parameters

The main declines of three (3) nos. at 9^{o} parallels to each other at 15m distance in apparent dip direction are of 5 x 3m size. The additional decline portal of 6X4m in western side is planned for expansion. The ventilation shafts of four (4) nos. 3.5m dia. Will be located at surface up to a depth of 35m.

Drilling & Blasting, Ventilation and mine drainage

A magazine of 20t explosive and 44,000 nos. of detonator storage capacity is in use in the Tummalapalle mine. The same magazine will be sufficient to cater the enhanced ore production of 13.5 lakh TPA. The safety measures inline with guidelines issued by DGMS for handling and storage of explosives is in practice.

Presently the mine is ventilated through 2 nos. of VF-3000 ventilation fans installed at ventilation shafts of 3.5m dia at exhaust end. An additional ventilation shaft will be opened in the west to meet the expansion requirements.

The present average water inflow from mine drainage is about 890 m3/day The water will be pumped to mine water pond after settling the slush in the mines. The mine water from the sumps will then be pumped to ETP located inside the processing plant for treatment radon and uranium content present in the water.

Mineral processing plant

The mineral processing plant at Tummalapalle was designed to process 3000 tpd of uranium ore. Additional material handling, crushing and milling and processing facilities will be added within the existing plant to process additional 1500 tpd of uranium ore.

Raw Material Requirement

The raw material required for uranium processing is uranium ore, lime, flocculant, barium hydroxide, sodium carbonate, barium hydroxide, liquid oxygen, ferric chloride, LDO, caustic soda lye, ferric alum, sulphuric acid, hydrogen peroxide and ammonium hydroxide. The raw material requirement will be fulfilled from indigenous sources. The mine shall consume about 1350t/yr of explosives considering expansion. The

mine will also consume about 1350 kl/yr of HSD. The estimated LDO requirement for the expanded plant is about 12,000 kl/yr.

Process Technology

Since, the host rock for uranium mineralization is basic in nature, only alkaline leaching route is viable for the recovery of uranium values.The ore processing plant, treats dolomite limestone based uraniferous ore from mine. The ore is transported by covered conveyors from mine site to plant. The same will be continued for expansion. Hydro-metallurgical route is employed for processing uranium ore for production of concentrate. Soluble uranyl-tri-carbonate anion $UO_2(CO_3)_3^{-4}$ is formed by alkali carbonate salts showing nearly selective dissolution. The overall process comprises three basic steps viz. i) Leaching or dissolution ii) Precipitation iii) Reagents recovery.

Power Requirement

The present power consumption is about 20 MVA, The estimated maximum power demand for the expanded mine, ore processing plant and township have been estimated to be 7 MVA, 21 MVA and 2.0 MVA respectively (i.e. total 30 MVA). Power will be drawn from the Pulivendula sub-station of Southern Power Distribution Company of Andhra Pradesh Ltd.

Water Requirement, Availability and Source

The fresh water requirement from Chitravathi water supply system after expansion is estimated as 4826 m^3/day. UCIL has permission to draw 6000 m^3/day of water from Chitravati reservoir by the Principal Secretary to Govt., Irrigation and CAD Department, Govt. of Andhra Pradesh. About 440 m^3/day of potable water is supplied to nearby communities.

Man Power Requirement

The estimated additional manpower requirement for expansion is 291. Presently 550 persons are employed at mines and 384 at the plant. The total man power after expansion will be 1225 out of which, 650 persons are planned to be deployed in the mine and about 575 persons in the ore processing plant.

Waste Generation and Management Plan

The wastes generated from mines is mainly rocks whereas tailings are generated as a result of ore processing. The rocks excavated during development of decline (and ventilation shaft is stacked at plant site in an area of about 4.4 ha. Additional waste expected is about 3.36 lakh tonnes and this will be dumped in the same area identified for waste dump.The waste generated from the process are tailings, calcium carbonate, ETP sludge and filter media of about 1350000, 30300, 450, and 36 t/yr respectively. The tailing will be sent to existing lined tailing pond for about three years and for remaining years the tailings will be converted in to filter cake and planned to be dumped in the designated mine lease area..

The liquids waste generated from the process plant are recirculated in the system**.** The mine water discharge and tailing pond decant water is treated in an effluent

treatment plant. The ion exchange technology is planned to be used for treating the mine and tailing pond water to remove radon and uranium. Virtually no effluent is discharged into environment.

The process plant will have some gaseous emission into the atmosphere generated from the process. There are eleven (8 for process and 3 for DG sets) stacks in the existing plant and will have additional nine (7 for process and 2 for DG) stacks to meet the expansion units requirements. The boiler stack is lifted to 54m height for better dispersion and the rest of stacks are in the range of 26 to 40 depending on the quantity of air to be cleaned. The auto clave stacks are equipped with water scrubber before venting into atmosphere. The product area stack is supported by three stage filtration and HEPA filter is one among them. Other stacks are provided with bag filters.

Project Schedule and Proposed Investment

The project cost for of the proposed expansion has been estimated as Rs. 720 Crore and planned to be implemented in four years of construction period from the date statutory approvals.

Description of Environment

The site is mainly characterised by undulating topography with hillocks and valleys. The presence of high drainage density creates a situation conducive for quick disposal of run-off down the channels. Wide fluctuation in groundwater table is observed in this region. The predominant land use in study area is scrub forest land which covers about 55% of study area followed by agricultural land which covers about 13%.

Baseline Data Generation

Micrometeorology

A micrometeorological station was installed in UCIL township to measure wind direction, wind speed, temperature and relative humidity. The observed data (overall) reveals that the predominant wind direction was from ESE (9.85%), followed by SE (9.75%), E (7.13%) and SSE (5.39%). Calm condition prevailed for 39.98% of the time.

Air Environment

Ambient air quality monitoring was carried out at eight locations covering upwind and downwind directions for the parameters such as PM_{10}, $PM_{2.5}$, SO_2, NO_X, and CO. All the recorded values with respect to AAQ and work zone air quality are well within the AAQ and work zone norms. Also, free Si and heavy metals of PM_{10} have also been analysed and found to be within permissible limits. On comparison of 2020 data with 2017 data, it is observed that air quality has improved which indicates satisfactory implementation air pollution controlling measures by UCIL. The observed ranges of AAQ are as follows:

PM_{10}= 49-79 µg/m^3
$PM_{2.5}$= 22-38 µg/m^3
SO_2 =4.2-7.8 µg/m^3

NO_x= 10-16.3 µg/m^3
CO= 98-1098 µg/m^3

Water Environment

One surface water and eight groundwater samples have analysed with respect to CPCB and IS:10500 parameters respectively. The surface water sample correspond to CPCB class-A, have been compared. The groundwater samples have shown higher concentration of Mg but within permissible limits. High Mg concentration (81 mg/l) is attributable to magnesium rich mineralisation in the region. Other parameters are observed to be well within the limits.

Noise Environment

The noise levels are measured at eight locations covering industrial, residential area and silence zone. All the measured results are within the permissible limits and have shown improvement as compared to 2017 results.

Soil Environment

The soil samples were collected from eight locations covering project site, agricultural land and barren land. The results indicate that the soil is suitable for green belt development and physical parameters are reveals that the soil is fully weathered and favour for all type of utilisation. The soil samples collected from agriculture and barren land indicate that the soil is in good condition and not affected by any type of pollutant too. The micro nutrients like Cu, Zn, Mn and Fe are observed to be on higher side. This may be attributable to geological formation and mineralisation.

Radiological Environment

The radiological monitoring has been carried out by Health Physics Unit of BARC. Radiological parameters have been measured for air, water, soil and vegetation samples collected from the site as per BARC norms for pre project and for during operation time of the project.

The natural background of the radiological parameters in this region are typical to those in mineralized terrains i.e., marginally elevated compared to low background areas. However, these values are much less compared to the naturally existing high background radiation area worldwide.

Biological Environment

Ecology of the area was studied by direct field studies/observations and collecting information from records of the State Forest Department. There is no national park, sanctuary, biosphere reserve or tiger reserve within 10 km radius of project site. Three reserved forests are present in study area i.e. Gorivikanuma R.F., Doringallu R.F and Kokkarajukonda R.F which has become a habitat for several species of wild animals, including some Schedule – I species like peacock, pangolin, indian python, monitor lizard and sloth bear.

Traffic Study

Traffic study was carried out for weekdays and weekends. It was observed that during weekdays the traffic density is more during wee hours. It was inferred that the overall traffic density is less in weekend as compared to weekday.

Socio Economics

The socio economic condition was studied by conducting equal sample allocation method in the study area. The population in study area is predominantly rural with a population of about 2.28 lakhs in 10 km radius based on 2011 census with district population density of 188/Sq.km which is lesser than national density. About 56% of population is literate which is lower than district average. However, the general awareness about education is increasing. The consumption behaviour and pattern of demand shows that the major portion of income is used to meet food demand. Overall social welfare amenities in the study area is observed to be good.

ANTICIPATED IMPACTS AND MITIGATION MEASURES

Impact Due to Construction and Its Mitigation

The site is already levelled and it is operating mine and plant. Hence, a minor rearrangement of material scattered in the plant are to be taken care. Whereas, in the mine a new decline and ventilation shafts are planned. It requires levelling works for the identified site for shaft and decline. The GLC of PM during peak construction will be 0.5 µg/m^3 over and above the ambient concentrations**.** The mitigation measures like road wetting, construction material covered by tarpaulin while transportation, erection of wind curtains, vehicle regulations etc**.**

Increase in run-off is another significant impact expected due to addition of plant foot prints by 80,000 m^2. The annual average runoff volume shows an increase of 34,266.75 (1.8%) in post construction scenario. Although, the increase is minor in nature and care like storm water networks rainwater harvesting and recharge structure have been suggested inside the plant.

Impact and Its Mitigation Measures During Operation

Alteration of surface topography due to mining will be minimum as this is underground mine. The surface and working level at present is 357 and 285 mRL i.e 72m below the surface and after expansion it is planned to be terminated at 275 mRL i.e 103m below surface level. Aesthetic look will remains unaltered. The area used for decline, waste dump and storage area will increase from the present status and finally at the end of mining it will be brought down to maximum possible to restore the landue. As a positive impact about 360 ha of land will be converted into plantation area with homestead species. Most of the waste dump will be used in to mining for stowing.

Land Reclamation and Progressive Mine Closure

On closure of Tummalapalle underground mine, all accesses to mine area are planned to be sealed as to prevent any access to the site. The areas earmarked for ore stack yard and other temporary stockyard are planned to be reclaimed. All

electrical installations including sub-stations, overhead wires will be dismantled. Civil constructions, other than those which may not be of use by local inhabitants/State Government, will be demolished.

Tailing pond

Considering initial & final level of present tailing pond from RL 342 to 380m, it is estimated that the tailing pond can store a volume of 5.2 million m^3. At present, the tailing pond is filled upto 360 mRL. Considering the available height of 20m only the estimated volume which can be accommodated in tailing pond is 2.25 Mm^3 which is sufficient for three years of operation at the production rate of 4500 TPD.

To avoid groundwater contamination the bottom of the existing tailing pond has been adequately compressed to reach the permeability of about 1 X 10^{-9} m/sec., and high pressure grouting has been carried out where ever joints/dykes are observed to be weak at the bottom to double ensure, no seepage of tailing pond water to ground water. Further in-house monitoring of ground water quality around the tailing pond is ensured at nine locations. The tailing pond decanted water and the rainfall impounded within the dam is discharged through a robust decantation pond for re use. To ensure the health of dam construction and its maintenance, monitoring instruments like piezometer, inclinometer & settlement gauge have been installed at the dam at various sections and levels.

Secured Disposal Facility

Once the tailings pond is full, it is planned to store the tailings in the form of dried filter cake at secure disposal facility. The height of the proposed site will be 5m below the ground and 13m above the ground. It can accommodate about 4.49 Mm^3 of tailings to meet the requirement of five years of operation. Similar model will be extended for next five years of operation within the lease area. The secure disposal facility of about 11.4 ha. will be lined with HDPE liner, geotextile and will have leachate collection system and finally on closure capped with greenery.

Water Environment

Surface water sources are not identified in study area, Hence management is not detailed further. Groundwater studies have been carried out in subwater shed of about 133 km and total annual replenishable recharge is estimated as 13.8 Mm^3/yr against a draft of 3.508 Mm^3/yr. The present grounwater development is 25%.

Effluent Treatment Plant

An ETP is envisaged to treat mine discharge water of about 890 m^3/day and tailing pond decant water of 1109 m^3/day. State- of – the- art ion exchange technology and further precipittaion with Barium hydroxide is used for removing uranium and radium.

Sewage Treatment Plant

The sewage generated from the plant shall be treated in a MBR based STP. It is estimated that about 100m^3/day of sewage will be generated on completion of expansion. The treated water will be used for dust suppression and green belt

development. At township, it is proposed to have a modular STP to treat the generated sewage and the treated water shall be used for plantation

Rain water harvesting

Roof top rainwater harvesting is planned in the plant and township to recharge about 3000 m^3 of water. A percolation tank is constructed in low lying area near RKPalle village to harvest the water in the catchment area of the valley during monsoon season. The total annual recharge from percolation tank is about 0.36 Mm^3.

Air Environment

The stacks as given in project description for proposed stacks are considered for air modelling as the existing stack emissions have been reflected in the background values. Maximum predicted GLCs for PM_{10}, $PM_{2.5}$, SO_2 and NOx emissions are obtained as 17.7 µg/m^3, 10.8 µg/m^3, 1.8 µg/m^3 & 2.5 µg/m^3 respectively during operation phase. These highest values are obtained within the lease boundary.

.

The predicted maximum concentrations and the nearest receptor's baseline data values are added together and the expected GLC due to the mine and plant are shown in the table and are well within the permissible limits.

Sl. No.	Scenario	PM $_{10}$ µg/m^3	$PM_{2.5}$ µg/m^3	SO_2 µg/m^3	NO_x µg/m^3
1	Baseline data (A2) nearest station Tummalapalle 1.6 km from ML boundary	75	37	7.0	13.3
2	Predicted/Future scenario after expansion due to proposed project	1.2	0.7	0.2	0.35
3	Future Max GLC	76.2	37.7	7.2	13.65

**Concentrations are in µg/m^3 and of 24 hours averaging time*

The mine is being ventilated @ 600 m3/s, which is at par with the international practice of ~0.1 m3/s per tonne of broken rock per day, to dilute radon and it's daughter nuclides and all fumes generated by diesel powered machinery and blasting. The plant is designed with various air pollution control equipment like PTFE bag filters, primary and secondary dust extraction system, three stage filters along with HEPA filters for product handling area and venturi scrubbers to clean the plant process gas.

Noise environment

The project is an underground mine, where most of the activities will take place several meters below the surface. The major noise generating activity at the surface is ventilation fans and vehicles transporting men and materials to and from the project site. It is expected the noise level will not be exceeding 90 dB(A). At the ore processing plant, major noise will be generated during unloading of ore, crushing and grinding of ore. All the envisaged equipment will adhere the norms to limit the noise

level. The nearest settlement will have an insignificant impact with an attenuation factor of green belt and acoustic enclosures are considered in the project.

PLANTATION PROGRAMME

Green belt development have been undertaken in consultation with state forest department. A patch of land have been identified in mining lease area to be handed over to forest department for growing plants of native species. Progressive plantation over 85 ha. has already been carried out. About 85,000 plants of local species *like Neem, Gulmohar, Teak, Red Sandal, Mango and custard apple etc.*have been planted in the project site. The selection of species for the green belt development have been done in consultation with DFO and as per the local climatic conditions.

Radiation Due to Mines

The airborne dust in mine contains long-lived radionuclides from ^{238}U series viz. ^{238}U, ^{234}U, ^{230}Th, ^{226}Ra, ^{210}Po and ^{210}Pb. For operating Indian uranium mines with grade mostly less than 0.05%, U_3O_8 and it can be termed as insignificant. Further, internal exposure due to ore dust, generally, contribute about 5% or even less than the limiting values. The effective control measures for siliceous dust in mines e.g., water spraying, ventilation, use of respirators etc., would be sufficient to minimize the impact potential.

Radiation Due to Processing Plant

The only possible route from where the uranium concentration can be dispersed into atmosphere and reach public is expected from fugitive silica dust generated from milling section during crushing and from junction and transfer points of the ores

The silica dust generated from these units will pass through bag filters provided with Poly Tetra Fluoro Ethylene (PTFE) membrane. In addition a dry fog type system is also introduced in crushing and grinding area.

Secondly, after crushing of ore the process enters into wet system and the wet system continues up to product drying and packing. Dried product from spray drier will be pneumatically lifted and extracted from cyclone and bag filter system. Cleaned air after bag filter will pass into a pre filter bank similar to product bag filter system and then the cleaned air will pass through High Efficiency Particulate Arrestor (HEPA) filter bank. The stack for the drying system is provided with radioactivity sensors.

Water Route

The project will not discharge any liquid effluent into the environment .Water based scrubbing system is provided for autoclaves emissions with interlocking system. Hence, during normal operation and accidental case uranium laden particles cannot escape into atmosphere through air route. However, the scrubbed liquid effluent will be sent to tailing pond. The tailing pond is constructed with lining and land fill area is constructed with leachate collection system. Hence, the particles getting into groundwater is considered as of very rare probability.

Analysis of alternatives

As the mining is site specific in nature, in the present context, alternative of site for mine is not applicable as the mines and plant are in operation and planned to be expanded. The technology envisaged for the project is proven tested by BARC with pilot plant studies and indigenously developed. The existing plant is running successfully since 2013 without any major failures

Environmental monitoring Program

A detailed environmental monitoring program is devised to meet the State and MOEF&CC RO office requirements. In addition, HPU of BARC monitors the radiological parameters continuously as per AERB guidelines and submit the annual report to the authority. Continuous AAQ monitoring system is envisaged for conventional pollutants like micrometerology, PM_{10}, $PM_{2.5}$, SO_2, NO_x, and CO. Similarly, ETP will be monitored continuously for radiological parameters. Groundwater level and quality at plant and tailing pond area will be collected and tested quarterly and half yearly respectively. Subsidence monitoring will be done continuously as per DGMS norms. Vibration is measured as per DGMS norms. Provisions for monitoring storm water discharge, green belt will be carried put as per need. Leachate collection and monitoring is also provided at landfill site for tailings.

Additional studies

From the socio economic study it is understood that about 70% of the sample drawn (65 samples) is in the favour of the project due to employment, infrastructure development and better business prospects. However about 30% people are having fear about pollution and health related problems. The samples are drawn by adopting equal allocation.

Pool fire accidental scenario is considered for LDO considering rupture of one tank and both the tanks of 200 and 400 m^3. It is evident that in case pool fires the heat radiation of 4 kW/m^2 will be occurring at a distance of 57m and 122m respectively in stability class 'F' which is well within the plant site.

In addition to the pool fire analysis, other probable risk analysis related to mine, processing plant and tailing pond and natural events have been investigated and adjudged the protection measures are in place.

Project benefits

The additional manpower of about 291 envisaged for the project would be benefiting the society. The royalty likely to be paid by UCIL would be benefiting the AP Govt. The CSR and CER activities would be benefiting the region. The nation would be immensely benefited, self-sufficient on nuclear fuel by reduction on import and thereby present burden on foreign exchange.
The CER earmarked for the project is about Five Crore thirty five lakhs rupees.

Environmental Cost benefit analysis.

The capital cost of the project is 720 Crore. About 270.2 Crore is provisioned for environmental protection measures like landfill for tailings, green belt development, ETP, environmental attributes monitoring etc.

Environmental Management plan

An Environmental Management Cell headed by GM is envisaged which will be responsible for all environment related issues. The cell will be working inline with environmental policy approved by the UCIL Board. The cell will be supported by HPU of Tummalapalle for continual improvement based on their findings related to radiological part.

Conclusion

It can be concluded that the proposed expansion is benign with the environment. On the other hand, the project is considered as of national importance as far as nuclear fuel is concerned. All the possible impacts have been identified and suitable mitigation measures have been envisaged.

The project is viable technically, environmentally empathetic and highly beneficial to the nation.