Evaluation of
The Rapid Environmental Impact Assessments

The Proposed Capacity Expansion of Bauxite Mines From 3.0 MTPA to 8.5 MTPA at Baphlimali Plateau Rayagada/Kalahandi District, Orissa

The Proposed Capacity Expansion of Utkal Refinery from 1.0 MTPA to 3.0 MTPA Doraguhra, Rayagada District, Orissa

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At the request of Nityanand Jayaraman, I evaluated the Rapid Environmental Impact Assessments (EIAs) submitted by Utkal Alumina International Limited (UAIL) for: 1) the Proposed Capacity Expansion of Bauxite Mines From 3.0 MTPA to 8.5 MTPA at Baphlimali Plateau Rayagada/Kalahandi District, Orissa; and 2) the Proposed Capacity Expansion of Utkal Refinery from 1.0 MTPA to 3.0 MTPA Doraguhra, Rayagada District, Orissa.

These EIAs contain the following critical attributes.

EIA for the Proposed Capacity Expansion of Bauxite Mines From 3.0 MTPA to 8.5 MTPA at Baphlimali Plateau Rayagada/Kalahandi District, Orissa

1. UAIL fails to identify where it would obtain topsoil necessary for reclamation of mined out areas

UAIL's land reclamation measures (see Section 5.7 of the EIA) seem adequate in theory but carry a high risk of failure in practice. The overburden that UAIL would excavate and return to the mined out areas as backfill lacks adequate nutrient levels to support the growth of vegetation. UAIL knows this; it is why UAIL proposes to retain the topsoil that presently covers the bauxite deposit in the mine lease area.

However, the topsoil that presently covers the bauxite deposit at Baphlimali Plateau isn't of sufficient quantity or quality for UAIL to revegetate the mined out areas. Page C5-9 of the EIA states:

"Baphlimali plateau is characterized by a thin soil profile, mostly clayey loam, which has not supported any significant growth of vegetation excepting bushes of Khajur (Phoneix acqualis)."

Furthermore, UAIL would not begin to revegetate the mined out areas until at least three years after the commencement of mining. Inevitably a substantial portion of the topsoil removed from Baphlimali plateau will be lost during transport and storage. Furthermore, we learn on page C5-9 pf the EIA:

"It is proposed to scrap out 0.3-m thick topsoil and transport to outside the lease area for utilization in parks and plantation zones in rehabilitation colonies, township areas etc.

Any topsoil from Baphlimali plateau that would be diverted in this manner would be unavailable for reclamation of the mined out areas. Therefore, if UAIL intends to revegetate the mined out areas, it would be required to excavate topsoil from somewhere else. Whatever location would serve as the source of this needed topsoil would suffer the environmental damage associated with this topsoil removal.

In summary, either UAIL would fail to reclaim the mined out areas because there isn't sufficient quantity and/or quality of topsoil to accopmplish the task, or UAIL would excavate topsoil from elsewhere, resulting in environmental impacts that it fails to assess in the EIA.

2. UAIL fails to present adequate erosion control measures

UAIL's mining proposal would generate more than 150 million metric tons of overburden, a category of mining waste. EIA at page C2-1. This waste is prone to erosion, especially in a location such as the project area that experiences heavy rainfall: an expected rainfall of 1500 mm per year, much of this concentrated during the monsoon months of June to September. Unless UAIL implements effective erosion control measures commensurate with these meteorological conditions, a substantial portion of the quantities of 150 million metric tons of overburden will erode into tributaries of the Indravati River, causing siltation of these streams and possibly of Indravati Reservoir.

UAIL's proposed plan for preventing erosion of overburden consists of a single paragraph in Chapter 5 of the EIA:

"The overburden storage areas need to be protected from soil erosion and washouts during heavy rains and avoid dust generation from these areas during dry season. Inactive areas are to be stabilised by topsoil and grass. Soil erosion as well as generation of dust from these areas is curtailed at the very source by turfing."

As discussed above, UAIL hasn't identified a source that can provide an adequate quantity of topsoil for revegetation of mined out areas. Unless UAIL can show where it would obtain the necessary topsoil and assess and address environmental impacts at the source site, its plans to prevent soil erosion from the overburden storage areas will suffer the same practical limitation as it's plans to revegetate mined out areas.

3. UAIL fails to discuss financial assurances for performance of reclamation measures

Commodity prices are prone to wide fluctuations. In the past few years, we have witnessed a sharp increase in the price of aluminum and other commodities. This price increase is a primary motivating factor for UAIL's proposed project. However, the sharp increase in the price of aluminum in recent years follows several years in which the price of aluminum declined.

A vital question arises: How would UAIL, a private company, insure that it would complete the reclamation measures it describes in the EIA if the price of aluminum declines? If UAIL lacks the funds to complete the reclamation measures, the task would fall to the government (that is, the people) of India.

In many countries, such as the U.S., a private company proposing a mining project would be required to provide financial assurances, usually in the form of a surety bond, irrevocable letter of credit, or trust fund, that the government would use in the event that the company runs out of funds to complete reclamation measures.[1]

[1] California Office of Mine Reclamation. "Financial Assurances" http://www.consrv.ca.gov/OMR/financial_assurances/index.htm

The EIA does not describe any financial assurances UAIL is providing to the government of India to insure that it would complete the reclamation measures described in the EIA. Without a description of these financial assurances, it is impossible to predict whether the reclamation measures described in the EIA would ever be completed.

EIA for the proposed Capacity Expansion of Utkal Refinery from 1.0 MTPA to 3.0 MTPA Doraguhra, Rayagada District, Orissa.

1. UAIL's proposed refinery would be a major source of air pollution

There is no escaping the conclusion that UAIL's proposed refinery would be a major source of air pollution in Rayadaga District.

By its own admission, UAIL estimates that the proposed refinery would emit 28.6 grams of particulate matter per second, which is equivalent to 900 metric tons (992 United States tons) of particulate matter per year. If UAIL's proposed refinery were to be located in the Pacific United States (comprising the States of California, Oregon and Washington), then it would be **the fourth** largest source of particulate matter emissions in the entire Pacific United States.[2]

By its own admission, UAIL estimates that the proposed refinery would emit 151 grams of sulfur dioxide (SO_2) per second, which is equivalent to 4,761 metric tons (5237 United States tons) of SO_2 per year. NOTE: As discussed below, this is likely a gross underestimate. However, assuming that this estimate is correct, if UAIL's proposed refinery were to be located in the Pacific United States (comprising the States of California, Oregon and Washington), then it would be **the fifth** largest source of SO_2 emissions in the entire Pacific United States.[3]

1.1 UAIL's proposed measure for controlling particulate matter emissions is subject to frequent malfunction

According to the EIA, UAIL will rely exclusively on the use of electrostatic precipitators (ESPs) to control particulate matter emissions from the proposed power boilers and calciners. Page C9-6 of the EIA.

The performance of ESPs to control emissions of particulate matter from coal-fired thermal power plants in India has been notoriously poor owing to the high ash content of Indian coal and other factors. According to a technical report of the Tata Energy Research Institute:

> "The problems faced in the operation of ESPs depend on many factors—operating parameters such as gas volume, particle size distribution and gas temperature, mechanical conditions, electrical behaviour, proper maintenance, and so on. Indian coals have very high ash content and the fly-ash characteristics also affect the ESP performance significantly

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[2] http://www.scorecard.org/env-releases/cap/rank-facilities.tcl?how_many=25&pollutant=pm10&fips_state_code=06; http://www.scorecard.org/env-releases/cap/rank-facilities.tcl?how_many=25&pollutant=pm10&fips_state_code=41; http://www.scorecard.org/env-releases/cap/rank-facilities.tcl?how_many=25&pollutant=pm10&fips_state_code=53

[3] http://www.scorecard.org/env-releases/cap/rank-facilities.tcl?how_many=25&pollutant=so2&fips_state_code=06; http://www.scorecard.org/env-releases/cap/rank-facilities.tcl?how_many=25&pollutant=so2&fips_state_code=41; http://www.scorecard.org/env-releases/cap/rank-facilities.tcl?how_many=25&pollutant=so2&fips_state_code=53

which include chemical composition, electrical resistivity, and particle size distribution. Higher resistivity dust can cause excessive spark rates or back corona and force operation at lower than average current densities and voltage resulting degraded performance. Wear and tear on coal mills can change particle size distribution. It can also increase carbon loss of the boiler resulting in carbon rich fly ash particles. The chemical composition of both ash and flue gas constituents can affect the fly ash resistivity. …"

"The characteristics of ash depend to a large extent on the quality of coal used. The major problems with Indian coal is their high ash content and low volatile matter. With the increase in opencast mechanized mining, the quality of coal has considerably deteriorated over the years. The average calorific value of 5200 kcal/kg and specific coal consumption of 0.63 kg/kWh in 1970 have deteriorated to 4200 kCal/kg and 0.72 kg/kWh, respectively. The percentage of ash content in coal during this period has gone up from 30–35 to 40–45 per cent and even more in certain cases. A striking factor of our coal is low sulphur content giving extremely low sulphur/ash ratio. Very low content of sulphur has to condition enormous quantity of ash. While normally, sulphur/ash ratio ranges within an order of 1:10, it is 1:100 and sometimes even more in Indian coal, which leads to a very high resistivity of the order $1–5\times10^{13}$ ohm cm. This value is improved by a satisfactorily high moisture content and also by the fact that low content of volatile matter and low calorific value of coal require operation of boiler with high excess air which reduces the resistivity by decrease in temperature of the combustion chamber as well as by higher transformation rate of SO_2 to SO_3."

"Operational problems in ESPs arise due to many reasons either at the beginning or after a long period of operation. In the first case, the possible reasons may include variation of design parameters at inlet of precipitator like gas flow, temperature, moisture, etc., and in the second case, reasons are attributed to maintenance and other mechanical aspects. Some of the important operational problems include voltage fluctuations not matching with ESP current, periodically repeated heavy sparks, falling of hopper baffle plates, dust blockage in hoppers, dust build-up in collecting electrodes, etc. The problems faced by industries using ESPs are summarized in Table 5."

Accompanied by GD Aggarwal, former Member Secretary of the Central Pollution Control Board, I have toured the coal-fired power plants operated by the National Thermal Power Corporation in the Singrauli area of Uttar Pradesh. Dr. Aggarwal explained that these plants were emitting copious quantities of particulate matter at the time because of the factors described above that limit the performance of ESPs. The EIA fails to discuss these factors that would greatly impair the performance of ESPs to control particulate matter emissions from UAIL's proposed coal-fired thermal power plants.

1.2. UAIL underestimates the amount of SO_2 that the proposed refinery would emit

By its own admission, UAIL would emit more SO_2 from calciners at the proposed refinery (106.5 grams per second), which would rely of combustion of heavy fuel oil, than from the proposed coal-fired power plants (44.4 grams per second).

Annexure VIII of the EIA provides the basis only for UAIL's estimate of SO_2 emissions from the proposed coal-fired power plants.

Closer inspection of other data in the EIA reveals that UAIL is grossly underestimating emissions from the calciners at the proposed refinery. The EIA reveals that UAIL would consume 225,000 metric tons of heavy fuel oil per year, almost all of which would be used by the proposed calciners. Heavy fuel oil has a high sulfur content, averaging 2.0%.[4] If the calciners consume 225,000 metric tons per year of heavy fuel oil, than these units would emit not 106.5 grams of SO_2 per second, but 285 grams of SO_2 per second. Emission of only 106.5 grams of SO2 per second, as UAIL assumes, would imply a heavy fuel oil sulfur content of only 0.7%, which is utterly unrealistic. If the calciners were to emit 285 grams of SO_2 per second, a far more reasonable estimate, than the entire proposed refinery would emit 329 kg of SO_2 per second, which is equivalent to 10,386 metric tons (11,424 United States tons) of SO_2 per year. As such, it would be **the third** largest source of SO_2 emissions in the entire Pacific United States.[5]

1.3. UAIL's proposes no measures for controlling SO_2 emissions from calciners

Despite the fact that the proposed calciners would the largest source of SO_2 emissions at the proposed facility, UAIL proposes no measures for controlling these emissions.

1.4 UAIL fails to account for mercury emissions

Consumption of coal is a major source of mercury emissions in India and throughout the world.[6]

UAIL proposes to consume 1,400,500 metric tons of coal per year. Assuming that this coal has an average mercury content of 0.25 parts per million, then this coal would contain 350 kilograms of mercury per year. Use of recirculating beds with lime injection and electrostatic precipitators – the only air pollution control technologies UAIL is proposing to use – do not control mercury emissions. At least 90%, 315 kilograms of mercury per year, would be emitted into the atmosphere. As such, UAIL's proposed refinery would among the **top 20** sources of mercury emissions in the **entire United States.**[7]

The release of this much mercury from UAIL's proposed refinery could have far-reaching public health consequences for the people of Rayagada District and in the State of Orissa. Mercury is a potent neurological toxin that bioaccumulates in the food chain. Despite the fact that UAIL's proposed facility would be a major source of mercury emissions, the EIA for UAIL's proposed refinery makes no mention of mercury.

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[5] http://www.scorecard.org/env-releases/cap/rank-facilities.tcl?how_many=25&pollutant=so2&fips_state_code=06; http://www.scorecard.org/env-releases/cap/rank-facilities.tcl?how_many=25&pollutant=so2&fips_state_code=41; http://www.scorecard.org/env-releases/cap/rank-facilities.tcl?how_many=25&pollutant=so2&fips_state_code=53

[6]

[7] http://www.scorecard.org/chemical-profiles/rank-facilities.tcl?edf_chem_name=MERCURY&edf_substance_id=7439-97-6&how_many=100&drop_down_name=Air+releases&fips_state_code=Entire+United+States&sic_2=All+reporting+sectors

1.5 UAIL fails to consider using natural gas at its proposed facility – a choice that would avoid emissions of particulate matter, SO_2 and mercury

Most other alumina refineries in the world avoid emissions of particulate matter, SO2 and mercury by using natural gas, rather than heavy fuel oil or coal, to provide energy to their facilities.

UAIL's proposed facility would be 45% owned by Alcan Aluminium of Canada (Alcan). Alcan's current principal alumina refinery is the Alcan Gove facility in Australia. In early 2007, Alcan will switch from the use of fuel oil to the use of natural gas at its Gove aluminum refinery so as to reduce emissions of air pollutants, principally particulate matter, SO_2, and mercury.[8] It is duplicitous for Alcan to propose engaging in a practice in India – using dirty fuels to provide energy to an alumina refinery – that it is ending elsewhere.

Natural gas supplies exist in Orissa.[9] UAIL has a responsibility to explore every option for using local natural gas supplies to provide energy for its proposed alumina refinery as an alternative to using dirty fuels, such as high-sulfur fuel oil and high ash coal.

2. UAIL fails to present measures necessary to protect groundwater and soil contamination from the disposal of red mud and power plant ash

UAIL's proposed facility would generate copious quantities of solid wastes: 1) more than 3,000,000 metric tons of caustic red mud per year; and 2) more than 500,000 metric tons of ash laden with heavy metals. UAIL proposes to dispose of these solid wastes in ponds containing a geo-textile liner.

This proposed management measure does not go far enough. Use of a geo-textile liner for a red mud and ash disposal pond is a necessary practice, but it does not protect groundwater and soil from contamination when the liner develops a leak. It is therefore also necessary that UAIL install a leachate collection and removal system along with the geo-textile liner to prevent groundwater and soil contamination. Use of a leachate collection and removal system is required by law in India for municipal waste landfills.[10] The kinds of wastes – red mud and power plant ash – that UAIL would generate at its proposed facility are generally more toxic than municipal waste. Therefore, it is even more necessary for UAIL to use a leachate collection and removal system at its proposed red mud and ash disposal pond.

After installation of a leachate collection and removal system, a disposal facility will generate a wastewater that will require treatment prior to discharge. The discharge of untreated leachate from a red mud and ash disposal pond can have serious environmental consequences.

In the EIA, UAIL does not mention, let alone discuss, the issue of leachate collection, removal, treatment and discharge.

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[8] Alcan Gove Alumina Refinery Expansion Project Draft Environmental Impact Statement. http://www.lpe.nt.gov.au/enviro/eiareg/alcangove/download.htm

[9] Asian Times (July 20, 2005) "RIL strikes fresh gas in Mahanadi river basin."

[10] Municipal Solid Wastes (Management and Handling) Rules, 1999.