GMR Energy Limited

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December, 28, 2007
GEL/AHEP/MOEF/280/07

The Secretary
Ministry of Environment and Forest (**MoEF**)
Government of India,
Paryavaran Bhavan, C.G.O Complex,
Lodhi Road,
New Delhi-110 003

KIND ATTENTION: Dr. S. Bhowmick, Additional Director, MOEF

Sub: **Submission of Application for the Appraisal of the Alaknanda Hydroelectric Project (300 MW) in district Chamoli, Uttarakhand for Environmental Clearance.**

Ref: Notification S.O. 1533(E) dated 14.09.2006 of Ministry of Environment and Forest.

Dear Sir,

GMR Energy Limited (**GEL**) has been allotted the Alaknanda Hydroelectric Project by the Government of Uttarakhand vide their letter no. 2116/I/2005-04(8)-12/2003 dated. 07.05.2005 and subsequently the Project Development Agreement was executed on 22.10.2005 between the Govt. of Uttarakhand and GMR Energy Limited (**GEL**).

MoEF accorded its site clearance for investigations and survey vides its letter no. J-12011/72/2005-IA.I dated 05.05.2006. **GEL** has prepared the Detailed Project Report (**DPR**) and submitted the same to Government of Uttarakhand. Simultaneously the DPR was submitted to Central Electricity Authority for concurrence.

GEL had also applied for clearance to the State Pollution Control Board of Uttarakhand, subsequent to which a Public Consultation was conducted at the Project Site on 05.11.2007. Minutes of the Public Hearing has been forwarded to the MoEF by the Member Secretary, Uttarakhand Environment Protection and Pollution Control Board vide their letter no. UEPPC/HO/NOC-RP-8/07/1545-5611 dated 18.11.2007.

In accordance with para 7 and Appendix – V of Notification S.O. 1533(E) dated 14.09.2006 of Ministry of Environment and Forest, we are submitting herewith the following documents for the Appraisal of the Project for Environmental Clearance:

i. The Questionnaire for Environmental Appraisal (For River Valley and Hydroelectric Projects) along with the necessary enclosures.

ii. Final Environment Impact Assessment Report - (20 copies) :

- Executive summary
- Environment Impact Assessment Report (**EIA**)
- Environmental Management Plan (**EMP**)

iii. A copy of CD of the Public Hearing proceedings

iv. A copy of final layout plan (20 copies)

v. A copy of the project feasibility report – Detailed Project Report (1 copy)

Thanking you

Yours faithfully,
For GMR Energy Limited

28/12/2007

J Henry Robertson
Associate Vice President

Enclosures: As Above

SCHEDULE II
[See Sub-para I(a) of Para 2]

APPLICATION FORM

1. (a) Name and Address of the project proposed:
Alaknanda Hydro Electric Project
Tehsil Joshimath, district Chamoli
Uttarakhand, India

(b) Location of the project
Name of the place:
District, Tehsil - **Tehsil : Joshimath, District - Chamoli, State- Uttarakhand:**
Latitude/Longitude : **Barrage/ intake - 79^0 29.7' E, 30^0 43.4' N**
Power Station - 79^0 30.3' E, 30^0 41.2' N.
Nearest Airport/Railway Station: **Dehradun/Rishikesh**

(c) Alternate site examined and the reason for selecting the proposed site:

A site was examined upstream of the present barrage site, which was later abandoned as it would have lead to the touching the Badrinath town area by the tail of the reservoir.

Another scheme was examined to construct 60 m high dam with large submergence area prone to frequent avalanches. It was shelved also due to geo-technical grounds as the proposed area was covered with deposits of moraines, and as well as on techno-economic grounds.

The project has been envisaged as run-of the river scheme and the barrage has been proposed as the diversion structure which causes very nominal area of 2.27 ha only as impounded area. This will have very little adverse effect on the environment or forests.

1) **Apprehension of avalanches hitting the reservoir and causing damage to the barrage is minimized to a great extent.**
2) **No submergence of forest cover and cultivable land.**

(d) Does the site conform to stipulated land use as per local land use plan:

The land required for the Project is mostly forest and Government land. Since the Project has been primarily identified and awarded by the Government of Uttarakhand the proposed site is expected to conform to the stipulated land use as per local land use plan if any.

2. Objectives of the project:

The proposed Alaknanda Hydroelectric Project (AHEP) of 300MW capacity envisages harnessing the potential of the river Alaknanda upstream of the Barrage of Vishnuprayag Hydroelectric Project and generate Electrical Energy thus contributing towards energy need of the Country .

3. (a) Land Requirement:

Agriculture Land: **4.394 Ha**.(Private Land)
Forest Land and Density of vegetation: **49.648 Ha.** (density yet to be assessed)
Other (specify): **29.858 Ha.** (Government Land)

(b) (i) Land use in the Catchment / within 10 Kms. Radius of the proposed site:

There are no dense and open forests in the catchment of Alaknanda river basin. More than 81.59% of the catchment area up to the proposed barrage site is covered with snow and glaciers. Of the total catchment area, 2.15% area (48,079.80 ha) is comprised of scrub while barren/ rockyland cover 11.04% of the area up to the barrage site. About 4,210.15 ha (4.14%) of the catchment area is under moraines. The human settlements comprise of about 44.33 ha.

(Please refer chapter 8 of EIA Report)

(ii) Topography of the area indicating gradient, aspects and altitude:

Alaknanda river has two major tributaries, the Saraswati draining the Arwa valley and Dhauliganga coming from Niti Pass. Alaknanda river originates at the water divide between Satopanth and Bhagirath glaciers (near Vashundhara Falls), flows eastward and joins Saraswati river at Mana and then flows in a SE direction up to Joshimath where it meets Dhauliganga. After this confluence, it takes a swerve and starts flowing in the SW direction to meet Bhagirathi river at Devprayag. The drainage network of the Alaknanda watershed up to the proposed barrage site is shown in Figure 5. River Sarswati is a major tributary of Alaknanda, which receives Arwa Nala, Nagthuni Gad and Anadeb Gad from left bank. In the downstream of Saraswati confluence, the river Alaknanda is joined by Kanchan Ganga at 2970 m from left bank. The first right bank tributary is Rishi Ganga. It flows eastward and confluences with Alaknanda river on its right bank near Badrinath at 2,960 m near Bamni village. Two streams from Dhamling Dhar region joined Alaknanda at 3,020 and 2,950 m respectively on the right bank. The important large tributaries with substantial water discharge joining the Alaknanda river on left and right bank at 3.36 km and 4.7 km downstream of barrage axis are Ghrit Ganga and Khirao Ganga, respectively. Before confluencing with river Bhagirathi

at Deoprayag, river Alaknanda is joined by major tributaries like rivers Birahi, Nandakini, Pindar (left bank tributaries), Balkila and Mandakini (right bank tributaries). The gradient of the river channel up to power house is 1:10. The gradient of entire course (31 km) of Saraswati river is 1:17. The tributaries joining the Saraswati river on its left bank have high gradient of the order of 1:3.5. The right bank tributaries have low gradient (1:16). The profile of the Rishi Ganga joining Alaknanda on its right bank has high gradient (1:5.8).

In the catchment region of Alaknanda H.E. Project, very steep (50-70%) slope category covers only 2% of the entire catchment. Moderately steep slope (15-20%) category covers about 42% of the total catchment followed by steep slope (30-50%) category covering 29% (Fig. 6). Strongly sloping (8-15%) category has a substantial coverage of 16%. Moderately sloping (2-8%) and gently sloping categories together cover about 11% of the catchment. The gently sloping (0-2%) areas cover 5.3% of the catchment.

The climate of the project area results from its high altitude and location in the monsoon belt in northern India. The barrage is located at an elevation of 2,940 m and the power station is at 2,395 m at the confluence of Alaknanda river with Khirao Ganga.

(Please Refer Chapter 3 of EIA Report)

(iii) Erodibility classification of the proposed land:

Different types of erosion that occurs in the catchment of Alaknanda river are, i) sheet erosion, ii) gully erosion is the aggravated form of rill erosion and iii) stream bank erosion. Water is the single most important agent of erosion. Whenever water moves it erodes the boundaries alongside. Rainfall, streams and rivers all scour soil with their action. Drainage and slopes are important factors, induce soil erosion.
(Please Refer Chapter 2 of EMP Report)

(c) Pollution source existing in 10 km radius and their impact on quality of air, water and land:

The proposed Alaknanda H.E. project on Alaknanda river does not come in the category of air polluting projects and whatever impacts will be there, those will be at the time of construction phase. The air environment of the region is also very clean. The total human population beyond Pandukeshar up to Mana (last village in the region) is less than 4401 living in six villages and in Badrinath town. National Highway 58 is the only metalled road connecting all these villages. Traffic flow on this road remains only for three to four months from May to August mainly due to famous religious and tourist destinations like Badrinath, Hemkund and Valley of Flower. During winters only local vehicles ply, which are also few in number. There is no industry in the region. Most of the people are

engaged in agriculture and animal rearing. Kitchen fuel for the households could be only source for gaseous pollution like nitrogen dioxide, sulphur dioxide and carbon monoxide. The SPM in the region could be due to loose soil lying along the road due to slides and slips, open agricultural fields and less forest or vegetation cover. The instrument, High Volume Air Sampler (APM 460 BL), was run at Pandukeshar and Lambagar to assess the levels of SPM, NO_2 and SO_2 in the ambient air of the region during monsoon and non-monsoon season. Among the air quality parameters the level of the SPM ranged from a minimum of 38.3 $\mu g/m^3$ to 191.1 $\mu g/m^3$ at project sites. The average NOx in the project area was nearly negligible when compared to the standard levels of CPCB.
(Please Refer Chapter 15 of EIA Report)

(d) Distance of the nearest National Park / Sanctuary / Biosphere Reserve / Monuments / Heritage site / Reserve Forest:

The proposed hydroelectric project is in the buffer zone of Nanda Devi Biosphere Reserve (NDBR). It comprised of two core zones - Nanda Devi National Park and Valley of Flower National park. Valley of flower is well known for its unique high altitude floral and faunal diversity; many of them are nationally and globally threatened. The Nanda Devi National Park is a 'World Heritage Site' with the total area of 2236.79 Km ft was established in 1988. The other core zone is the Valley of Flowers National Park (VONP) covers an area of 3623.69 sq km it is also declared a World Heritage. The total area of Nanda Devi Biosphere Reserve is 5,860.69 sq km. The area covered under buffer zone is 5148.57 sq km. The biosphere reserve is situated between 30^0 16' to 30^0 41' N latitude and 79^0 40' to 80^0 05' E longitude.

(e) Rehabilitation Plan for quarries/borrow areas:

The rock quarry site is proposed on the right bank of Khirao Ganga. Removal of rocks from the quarry site for different construction works will result in the formation of depression and or crater. These will required to be filled up by the dumping materials consisting of boulders, rock, gravel and soil from near by sites and materials excavated from tunnel. Hence proper care will be taken to fill up the depressions and craters with the help of clay and rock material from the nearby places of origin to avoid long distance transport of materials.

After the project activity is over, these sites would be splattered with the leftovers of rocks and boulders. These leftovers can support the growth of mosses and lichens which will act as ecological pioneers and would initiate the process of succession and colonization. Boulders of moderate sizes would be used to line the boundary of the path. The top soil removed before the start of the project activity would be used for covering the filled up depressions/craters at the quarry

sites. Fungal spores naturally present in the top soil would aid the plant growth and natural plant succession.

(Please Refer Chapter 8 of EMP Report)

(f) Green belt plan:

A green belt around the reservoir will be created to avoid erosion of soil and prevention of land slips from the direct draining catchment into the reservoir. The creation of green belt on either side of the reservoir will ensure protection of the reservoir area from any minor slips due to fluctuation in the water level. The slopes on both the banks will be planted with suitable tree species for creation of a green belt around the reservoir rim. The green belt will start from the immediate vicinity of the reservoir rim on both the banks, up to the tail of the reservoir wherever moderately steep slopes are available for plantation. The average width of the green belt will be around 35 m varying from only 10 m at places to 50 m or as physiographic and land features allow. There would be at least 2 layers of plantation.
(Please refer chapter 9 of EMP Report)

(g) Compensatory afforestation plan:

Compensatory Afforestation Plan will be prepared as per the Forest Conservation Act, 1980 with subsequent amendments in consultation with the State Forest Department.

4. Climate and Air Quality:

(a) Windrose at site:

The wind speed at Joshimath in Alaknanda valley usually vary from 1-19 km per hour in E, NE, SE or SW directions.

(b) Max/Min/Mean annual temperature:

Summer temperatures at barrage site peak before the onset of the monsoon in May/June at around 20°C, whilst the minimum average temperature is in January. During the night, temperatures in the mid-winter fall to well below zero at the barrage site, with the minimum daily winter temperatures falling as low as -10°C. The lowest temperature of -15°C recorded at Joshimath in the month of January 1974 and the highest temperature of 34°C was recorded in the month of June 1978. During the winter months the temperature at Badrinath can go down up to -6°C. During the monsoon period the temperature rises up to 20-25°C and 25-35°C at Badrinath and Joshimath, respectively. The water temperature at Vishnuprayag, downstream of the Alaknanda power station varies from -4°C to +10°C.

(c) Frequency of inversion:

Not Applicable

(d) Frequency of cyclones/tornadoes/cloud burst

No Cyclones or Tornadoes are observed. Occasional cloud bursts reported with no significant damage to property.

(e) Ambient air quality data

The proposed Alaknanda H.E. project on Alaknanda river does not come in the category of air polluting projects and whatever impacts will be there, those will be at the time of construction phase.

(f) Nature & concentration of emission of SPM, Gas (CO, CO_2, NOx, CH_n etc,) from the project.

Not Applicable

5. Water balance:

(a) Water balance at site:

Lean Season flow (cumec)

1. At the dam/reservoir site ... ... **4.9 cumecs.**
2. At the periphery of submergence (major streams only) ... **4.9 cumecs.**
3. One KM downsyream of dam/reservoir **5.4 cumecs.**

Water Required (cumec)

1. Power Generation ... ... **68.80 cumecs.**

(b) Lean season water availability; ... **varying from 4.9 to 25.0 cumecs**
Water Requirement; ... **68.80 cumecs.**

(c) Source to be tapped with competing users (River, Lake, Ground, Public supply):

River Alaknanda

(d) Water quality:

Refer Table 1 and 2 of the Questionire

(e) Changes observed in quality and quantity of ground water in the last 15 years and present charging & extraction details:

Not Applicable

(f) (i) Quantum of waste water to be released with treatment details:

Nil

(ii) Quantum of quality of water in the receiving body before and after disposal of solid wastes:

Nil

(iii) Quantum of waste water to be released on land and type of land:

Not Applicable

(g) (i) Details of reservoir water quality with necessary Catchment Treatment Plan:

Catchment area treatment plan has been formulated with the main objective of arresting soil erosion in the free draining catchment area up to diversion site. Based upon the topographic factors, soil type, climate, landuse/vegetation cover in the catchment area, various measures, both engineering/mechanical and biological, are being proposed to be undertaken with the aim to check the soil erosion, prevent/check siltation of reservoir and to maintain its storage capacity in the long run. The engineering measures will comprise construction of a number of check dams/ walls, retaining walls, wire crates, etc. for gully control, stabilisation of flood prone nallahs, landslides/slopes, river banks, roads, etc.
(Refer Chapter 2 of EMP Report)

(ii) Command Area Development Plan:

Not Applicable

6. Solid wastes:

(a) Nature and quantity of solid wastes generated

The solid waste if any is only domestic in nature. An estimated quantity of about 291.32 tonnes of solid waste will be generated annually. This waste would not be allowed to be dumped near any surface water body or a stream or in Alaknanda river.
(Refer Chapter 5 of EMP Report)

(b) Solid waste disposal method:

The solid waste will be collected in masonry vats of at least 25 cum capacity constructed at suitable sites near the colony area. The garbage would be transported to the landfill sites located at least 0.5 km away from the colony area. All the waste will be segregated and organic waste will be suitably processed to form compost, which can be used as manure. Paper, plastic, glass and metallic waste will be recycled. The waste, which is of no use should be incinerated properly.
(Refer Chapter 5 of EMP Report)

7. Noise and Vibrations

(a) Sources of Noise and Vibrations;

Movement of Construction equipment and Drilling and Blasting.
(Refer Para 15.3.3 & 15.4 of Chapter 15 of EIA Report)

(b) Ambient noise level:

60 to 110 dB

(c) Noise and Vibration control measures proposed:

Only well maintained/new equipment that produce lesser noise than old and worn out one would be installed at the work sites. The heavy equipment like rotating or impacting machines will be based on anti-vibration mountings. The combustion engines are required, they will be fitted with silencers. The traffic (trucks, etc.) used by the project works will be managed to produce a smooth flow instead of a noise producing stop and start flow. While clearing the land of vegetation for any project work, the project authorities will ensure that the work area has sufficient layers of tree cover around it. It will act as an effective noise absorber. It will be better not to have bigger trees lopped or cut around the periphery of the site. The tree layer will act as buffer zone and these are known to cut off noise by about 3-12 dB at a site depending upon the density of vegetation.
(Refer Para 11.1.2.3 of Chapter 11 of EMP Report)

(d) Subsidence problem if any with control measures:

No subsidence is observed in the area.

8. Power requirement indicating source of supply: Complete environmental details to be furnished separately, if captive power unit proposed:
The Power requirement for construction would be about 6 MW. Out of which about 3 MW would be met from the State Electricity Supply and balance 3 MW will be generated by deploying Silent Diesel generating sets.

9. Peak labour force to be deployed giving details of:
650 persons

- Endemic health problems in the area due to waste water/air/soil borne diseases:

  The inhabitants of these small towns and villages are prone to diseases like diarrhoea, dysentery, malaria, jaundice, TB, etc. People, particularly children and women have very little immunity to these diseases.

  (Please Refer Chapter 4 of EMP Report)

- Health care system existing and proposed:

  During survey of the project area and the vicinity villages (total population is 12435 and number of households are 1658, CISMHE Survey 2007) it was found that the existing medical facilities is not adequate in the region(Table 4.1 of Chapter 4 of EMP).

  A dispensary would be developed at a site, which is accessible from the labour colonies. Doctors along with adequate para-medical staff can be employed in the dispensary and will reside in the staff quarters adjacent to the dispensary. (Table 4.2 of Chapter 4 of EMP Report)

10. (a) Number of villages and population to be displaced:
Nil

(b) Rehabilitation Master Plan
Not Applicable

11. Risk Assessment Report and Disaster Management Plan.

The Himalayan valleys are subject to the occurrence of apparently sudden calamitous events. These events, in fact, represent the climax of the interaction of numerous independent or unrelated natural phenomena, whose final action is synchronized to produce a sudden and major catastrophic effect. For example, an earthquake represents the culmination of a sequence of tectonic events which trigger seismic action. The seismic waves may lead to the occurrence of significant geo-morphological changes and create conditions for massive landslides and trigger snow or debris avalanches. These events could set the stage for a temporary lake formation in a river valley. Such a lake will have potential of creating a catastrophic flood downstream in eventuality of overtopping. Similar effect could be generated by a cloud burst in any of the sub-watersheds. some of the potential phenomena and sites, where catastrophic conditions are foreseen in alaknanda valley, are **glacial** lakes, cloud bursts –

flash floods and avalanche hazard mitigation. The methods like structural control or afforestation arrests the creep and glide motion of snow on slopes, and thus avalanches too, artificial triggering helps to bring down the avalanches before they reach stupendous proportions. The latter method is relatively cheap. The passive methods include: a) Awareness, b) Forecasting and c) Safety and Rescue.
(Refer Chapter 12 of EMP Report)

12. (a) Environmental Impact Assessment: **Enclosed**
(b) Environmental Management Plan: **Enclosed**
(c) Detailed Feasibility Report: **DPR Enclosed**
(e) Duly filled in questionnaire: **Enclosed**

Report prepared as per guidelines issued by the Central Government in the MOEF from time to time: Yes.

13. Details of Environmental Management Cell:

Based on the findings of the Environmental Impact Assessment study various Environmental Management Plans *viz.* Catchment Area Treatment, Biodiversity Conservation & Management, Public Health Delivery System, Fisheries Development, Relocation & Rehabilitation of Dumping Sites, Landscaping and Restoration of Construction Area, Creation of Green Belt, etc. have been proposed. In order to monitor the impact and efficacy of these plans a number of parameters have been proposed during and after the completion of the management plans. Proposal of constituting a local committee for looking after and monitoring the environmental aspect has also been Planned. A project environment monitoring cell also will be formed during the stage of implementation of the project.

I hereby give an undertaking that the data and information given above are true to the best of my knowledge and belief and I am aware that if any part of the data/information submitted is found to be false or misleading at any stage, the project be rejected and the clearance given, if any, to the project is likely to be revoked at our risk and cost.

GMR ENERGY LIMITED

28/12/2007

J Henry Robertson
GMR Energy Limited,
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D-Block, 2nd Floor,
1&2, Ishwara Nagar,
New Delhi-110065

Given under the seal of Organisation
On behalf of whom the applicant is signing

Date: 28.12.2007
Place: New Delhi