

The rampur hydroelectric power project construction essay



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The Rampur Hydropower Project was undertaken by Sutlej Jal Vidyut Nigam Limited (SJVN). The Government of India hopes of achieving high levels of economic expansion during 2002-2007, by alleviating poverty and advancement of relatively less developed region. In order to make this dream a reality, the Government adopted universal access to electricity as one of the most important agendas.

India as a country has been infamous for lack of quality infrastructure which is a major deterrent in the growth path. Severe power shortages, sometimes as high as 12%, impair the infrastructure and in spite of corrective measures, such as loss reduction and efficiency gains, only marginal reduction in power shortages is expected. Hydropower generation has been on the decline and now constitutes only 25% of India's total generating capacity. Due to negligence of hydropower sector, India has been unable to meet power demands and puts enormous pressure on fossil fuel based plants and presence of outdated technologies create economic problems.

The few hydropower projects that exist in India are making large contribution to development and poverty reduction in India. They are, however, plagued by environmental and social issues. The government has started to address these deficiencies, by constituting a central agency to, inspect and select sites, public consultation, monitor environmental and social impacts, improve institution capacity related to project identification, design and management. In addition to this, environmental issues like, CO2 emissions, GHG gases etc. prevent India to meet its power requirements.

Scope of the Project

India will require additional 100, 000 MW to match 8% expected growth. The development objective of the project is for SJVN to develop the Rampur hydropower project and, after commissioning, to provide 1, 800 million units of electricity per year in an economically, environmentally and socially sustainable manner. In addition to satisfying the demands of power hungry citizens, the hydropower project will also reduce dependence on fossil fuel based plants and bridge the gap between now and nuclear powered plants. It will also reduce green house gases emission and provide carbon credits to India. Compared to thermal generation, hydro projects have very different risk and benefit profiles and, accordingly, a much greater public financing role. These include the geological and hydrological risks, the long-lived nature of the assets, and the fact that many hydropower projects are multipurpose projects providing public goods such as flood control and drought protection. By constructing Rampur Hydropower Project, India will delay the necessity of the construction of either coal or oil-fired thermal plant of the same capacity, and will thus reduce the country's greenhouses gas emissions, and positively impact on India's global warming effect? By displacing an equivalent sized coal-fired thermal plant; Rampur Hydropower Project will obviate the need for India to emit about 12, 000 tons of SOx emissions and about 6, 000 tons of NOx emissions and about 2 million tons of carbon dioxide into the atmosphere each year. The Government plans to apply for carbon finance for this project.

Introduction to Rampur Hydroelectric Power Project

The Rampur Hydroelectric Power Project (RHPP), undertaken by Sutlej Jal Vidyut Nigam, is situated on the Sutlej River in the Indian State of Himachal Pradesh (as shown in Figure 1). It is planned as a 412MW power plant consisting of a 15km transfer tunnel bringing water from the point where it leaves the Nathpa Jhakri Hydroelectric Power Project (NJHP) to a new surface powerhouse some 15km from Rampur town. Thus RHPP will in effect be operated as a cascade station to the NJHP run-of-the-river power plant. NJHP was constructed with the help of IBRD financing and has been in operation for about two years. The first unit was commissioned in October, 2003 and the last or sixth unit commissioned in May, 2004. Since Rampur hydro project will take water from the NJHP, it will require neither a dam nor any new reservoir capacity or land inundation. No additional desilting chambers will be required, as the water will already have been desilted within the NJHP plant⁷. The Rampur intake arrangement was excavated and built during the construction of the NJHP scheme. Rampur will be developed by SJVN, a joint venture between Government of Himachal Pradesh and Government of India. The project will generate some 1, 900 million units (in a 90% dependable year as regards hydrology); and this power will be used in the states of the Northern Region of India. The project will also contribute to the development of the state of Himachal Pradesh which will receive a royalty of 12% of the power generated (approx \$10 million per annum) in return for the use of the state's indigenous hydroelectric resource, in addition to its share of the power station dividends, (which it will receive as an equity partner).

The project required 81 hectares of land for the powerhouse, permanent camps, access roads, quarries etc. This included 32 hectares of private land and the balance is government forest-land. It was provisionally estimated that about 215 title-holders will be affected as a result of private land acquisition and about 20 families will be physically displaced. The land acquisition process has been initiated. To mitigate the impacts associated with the land acquisition and the consequent resettlement, a resettlement policy framework outlining the entitlements and assistance for different type of impacts has been executed by SJVN with the state government. The Bank will review the R&R policy provisions for consistency with the World Bank's Operational Policy on Involuntary Resettlement and propose modifications, if required, for updating the policy provisions to bring to the level of Bank's Operational Policy provisions.

Figure 1. Rampur Hydropower Project

The total cost of project was estimated to be \$400 million, out of which \$390 million was earmarked for capital investments for financing hydropower project and the rest was towards technical assistance.

World Bank Project Life Cycle

The project management lifecycle (as shown in Figure 2) at World Bank is set by pre defined guidelines containing rules and procedures as part of effective operations management. The World Bank lends money to low and middle income countries to support sustainable development and change.

The World Bank has pre specified rules and procedures in place to guarantee that money allotted to development projects reaches its intended target and

the project is implemented by borrowing nations. The steps involved in World Bank's Project Life Cycle are

Figure 2. World Bank's Project Life Cycle

Country Strategy and Project Identification: This phase involves analysis of financial and technical assistance required to produce maximum impact and thereby producing strategies to reduce poverty and improve living standards. This may include focusing on sectors like education, infrastructure, and health or government financial management. The output of this phase is Project Concept Note, which consists of objectives, risks, scenarios and timelines and policies regarding environmental and social issues, etc.

Project Preparation: The borrower government conducts feasibility studies to generate engineering and technical design in association with consultants. The World Bank plays an advisory, monitoring and evaluator roles. The borrower plans mechanisms for management, procurement, reporting, monitoring, evaluation and mitigation of risks during the course of the project.

Project Appraisal: The borrower and World Bank review the project proposal and confirm outcomes, beneficiaries and evaluation tools to monitor progress. All aspects of the project are studied to ascertain its viability and conformance to operations requirements. Both parties agree on disclosure of key document and timetables. Post this, the Project Appraisal Document or Program Document is prepared.

Project Approval: Either the Project Appraisal Document or Program Document along with other legal documents are submitted to Board of Directors for final approval.

Project Implementation: Upon receipt of funds and technical support, the project is carried out by borrower as per the guidelines. Any unexpected events may cause restructuring of objectives. Periodic reviews assist in managing the progress and Status of Project reports gives annual feedback to World Bank's Board of Directors. The project's progress, outcomes and impact is monitored by both parties in terms of effectiveness of operations and results.

Project Completion: Upon completion, the parties document the results achieved, problems encountered, lessons learnt and knowledge gained. This is comprehensively reported in Completion and Results Report. This serves as comparison benchmark against expected outcomes which helps in managing improvements and sustainability and further use in similar projects

Project Evaluation: The World Bank's Independent Evaluation Group assesses the performance of one out of every four project, measuring outcomes against original objectives, sustainability of results and institutional development impact on people and environment.

Rampur Hydropower Project Life Cycle

World Bank had experience in these kinds of projects and it could help institute international technical and sustainability practices. GoI wanted to

engage the Bank for the long term, starting with Rampur Hydropower
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Project. Gol was targeting 1600 MW of hydropower as part of its 11th year plan and the Bank would provide experience of good practice for hydropower development. The Bank could thus help strengthen the Gol's plans of scaling up the development of 100, 000-150, 000 MW of India's renewable hydropower potential by 2030.

The broader Bank engagement in India's power sector seeks to support the Gol's priorities of improving services, expanding access and optimizing the utilization of indigenous resources, while also helping to put the country on a lower carbon emission path than under a "business-as-usual" scenario. The Bank's main added value will be in advancing good implementation models, and helping create an enabling policy and institutional environment for sector development.

Project Preparation

Before starting the project a blue-print was prepared detailing aspects such as input of the hydropower plant (water), local benefits, and social and environmental impact. The risks related to environment and society is very high in these kinds of projects. Before starting the project proper resettlement and rehabilitation plan was carried out resulting in minimal land acquisition and physical displacement.

Water for the Project

The hydroelectric scheme utilized the water exiting from the NJHP tailrace. There was no need for a dam nor any new reservoir capacity or land inundation. No additional de-silting chambers were required, because the water already had been de-silted within the NJHP plant.

Local Development Benefits

The projected tariff for electricity was Rs 2. 28 (5. 1 US cents), which was competitive in the current power market in India. The project would also contributed to the development of the state of Himachal Pradesh, which could receive a royalty of approximately US\$12 million per year related to 12% of the total electricity Rampur generates, in return for the use of the State's environmental assets.

Social and Environmental Impact

The project did not take water from the river Sutlej directly. There was relatively small amount of land acquisition and physical movement compared to other similar projects. A two stage resettlement plan was followed for relocation of physically displaced families. To mitigate the impacts associated with the land acquisition and resettlement, a resettlement action plan (RAP) was prepared by SJVN in consultation with the stake holders and the state government, outlining the entitlements and assistance for different type of impacts. The Bank reviewed the RAP, which was found to be consistent with the Bank's policy on social impacts.

The table below shows the components of the Project and the estimated costs.

COMPONENT

INDICATIVE COST (US\$M)

BANK FINANCING (US\$M)

Capital investments for finance of hydropower investment – Rampur

565

360

Investment support to implement measures for NJHP project for maintaining its higher availability

50

30

Technical Assistance for Institutional Reform and Capacity Building, in particular to progress towards international good practice and improve the standard of project preparation for future projects

15

10

Total

630

400

Analysis of the Alternatives

A process of prioritization, analysis and ranking of all the alternatives was followed. A portfolio approach to project development was adopted. A total of 162 Preliminary Feasibility Reports (PFRs) had been prepared, as part of

the 50000 MW, initiative by the Gol. PFRs include a conceptual project design, preliminary project and equipment layouts, environmental and geological studies, planning for power evacuation, cost estimates and financial appraisal. The 162 PFRs were then screened according to the following criteria

Projected levelized tariff below Rs 2. 51 kwh – 78 projects met this criterion

Excluding projects with major environmental impacts or international issues – 5 were excluded on this basis.

Therefore, 73 projects were selected for detailed feasibility analysis, i. e. Preparation of “ detailed project reports” – Rampur project is one of these which falls within the top ten projects in the Indus basin and as such is a Government priority.

A “ No Project” scenario was also considered by the Bank. But this alternative was discarded based on the following reasoning:

A “ no project” scenario would lead to increased use of coal for power generation. Currently, India faces severe power shortage (of 8%-12% during peak hours). Under a “ business as usual” scenario (heavy reliance on coal), it might produce 13% of the world’s total CO2 emissions by 2031. For a “ lower carbon” development path, it would be important that cleaner power generation activities, such as hydro are scaled-up. Rampur project was on the priority list of the Gol.

Due to the finite nature and limited number of feasible hydropower projects, it is unlikely that a gap created by not developing Rampur project can be
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filled up by developing another hydropower project which was currently low in Gol's ranking and feasibility studies. According to PFR, even if any such project replaces Rampur, the environmental and social impacts of that project will be higher.

Hydropower is a major resource in Himachal Pradesh which is essential for the economic development of the state. A “ no project” scenario would mean an annual revenue loss of around US\$ 19. 3 million for the state.

Hence, a “ no project” alternative is not in-line with the Bank's philosophy. Consequently, Rampur Hydropower Project was selected by the Bank for funding. In addition to “ no project” alternative, a total of six other alternative layouts were formulated and analyzed. Rampur project was selected (approved) based on the preliminary studies of geological features, environmental and sociological aspects, project components and operational parameters.

Risk Analysis

Since the project did not involve building any dam or reservoir, technical risks were quite high. In addition to technical risks, social and environmental risks were also present which are discussed in the table below.

Risk

Risk Mitigation Measure

Risk Rating after Mitigation

Institutional Risk

Poor performance of state government agencies

Clearly defined roles and responsibilities

Set timelines and monitoring system

Major resettlement issues taken care of

Modest/Substantial

SJVN's poor contract management skills

Contract management plan prepared by international consultation

Constant support from Bank during project implementation

Substantial

Bureaucratic issues – SJVN being a public entity

Gol priority project

Bank in constant touch with the government

Modest

Technical Risks

Geological and hydrological risks – leading to time and cost overruns

Detailed investigation by SJVN reviewed by CEA and CWC engineers, and national/international experts

Experience effect – Nathpa Jhakri project where geology is similar to Rampur project

Unpredictable/unforeseen Himalayan conditions

High

Delay in building the evacuation transmission line could lead to a loss in generation and sales

POWERGRID, an experienced and dependable player

Low

Environmental and Social Risks

Delay in implementation of social actions

Implementation guided by RAP and Sustainable Community Development Plan (SCDP)

Involvement of communities and local leaders

Continuous follow up by the Bank team

Modest

Inadequate implementation of the environmental safeguard actions

Bank's involvement in key activities such as catchment area treatment and compensatory afforestation

High

Commercial and Financial Risks

Poor credit worthiness of some off-taking state utilities

Payment discipline imposed by Tripartite Agreement

Low/Modest

Inadequate internal control framework in the finance function

Action plan by SJVN related to financial management and corporate governance

Continuous monitoring by the Bank

Substantial

Overall Rating

Substantial/High

Project Appraisal

Some of the salient features of the project are as follows:

Lease cost development plan: The project was low cost (both in capital cost and energy cost terms) relative to other candidate hydro plants, and low cost relative to gas based power generation under a range of assumptions.

Economic and financial rate of return were satisfactory, 19.3% and 9.53% respectively

Financial health of the implementing agency was satisfactory with 11% return on equity though lower than 14% as stipulated by Central Electricity Regulatory Commission

The project was technically challenging since there was neither a dam nor any reservoir support. It utilized water exiting from the Nathpa Jhakri tailrace.

There was strict control of the finances by the Bank through a project audit report and the entity audit report of SJVN within six months of the end of the fiscal year

Procurement was carried out in accordance with the World Bank's Guidelines by SJVN

There was continuing communication between the implementing authorities and all other stakeholders so that benefits of the project were widely understood and both real and perceived concerns of the stakeholders were addressed

There was minimal social impact since small amount of private land was acquired with after proper compensation and there was little physical displacement

Environmental impact was also minimal only 12 patches of protect forest came under the influence of the project and to compensate the loss of acquired forest land, a compensatory afforestation plan was implemented

The project was rated as an “ Environment Category A” operation i. e. it did not affect the natural habitats of animals or tribal population

Project Approval

Though the project uses diverted water from tailrace outfall of Nathpa Jhakri HEP; to head race tunnel through Rampur intake structure located 15 km of Rampur near village Bayal opposite to Dutt Nagar on right bank of river Satluj; it still requires 80 hectare. Out of 80 hectares; 50 hectares is forest land and also displaces a number of villages. This has mandated the following approvals:

Environment Approval: The Environmental Management Plan submitted by SJVNL was examined and the Ministry of Environment and Forests accorded environmental approval issued on 12. 01. 2006. As per the clearance; Catchment Area Treatment (CAT) Plan has been formulated for 1062. 5 sq. km. Out of this 612. 50 sq. km. falls in Rampur Forest Division and 450 Sq. km in Ani Forest Division. The clearance encompasses a proportionate area reforestation. This implies restoration of construction area including dumping site of excavated materials to be restored by leveling, filling up of burrow pits, landscaping etc. and the area to be properly treated with suitable plantation.

Social Settlement: Total 215 families from four villages will be affected due to this project. Public Hearing was held on 26. 10. 2005 and the families affected due to acquisition of land & affected would be rehabilitated as per R & R Policy of SJVNL. The approval also envisages that all the assurances/ commitments given by the project authority in the Public Hearing must be

honoured in letter and spirit, particularly with regard to the employment to project affected persons and locals. The implementation of Fish Management Plan was to be carried out in consultation with the State Fisheries Department and during the lean season 23. 7 cumecs water should be made available in the released downstream of the dam for immediately aquatic life.

Seismic Clearance: The project lies within seismic unstable Himalayan region hence a approval from National Committee of Seismic Design Parameters (NCSDP) was obtained with regard to the project structure.

Archeological Approval: There are no archaeological sites/ monuments in the project area.

During Project Implementation: The approval for the project also makes it mandatory to minimize the adverse effects on the environment/ social fabric of the area during the construction. Adequate free fuel arrangement is to be made for the labour force engaged in the construction work at project cost so that indiscriminate felling of trees is prevented. Fuel depot may be opened at the site to provide the fuel (kerosene/wood/LPG). Medical facilities as well as recreational facilities should also be provided to the labourers. All labourers to be engaged for construction works should be thoroughly examined by health personnel & treated before issuing them work permit.

Financial Closure: The capital cost of the project was \$ 670 million (Rs. 2049.98 Cr. march 2005 Price Level). Out of the above capital outlay \$ 400 million was to be contributed through lending by the IBRD (World Bank) and the remaining \$ 270 million to be contributed by the Indian government and <https://assignbuster.com/the-rampur-hydroelectric-power-project-construction-essay/>

Himachal state government. The capital cost included provision for implementation of the above suggested safeguard measures. Six monthly monitoring reports were to be submitted to the Ministry and its Regional Office, Chandigarh for review. In case of change in the scope of the project, project was to require a fresh appraisal.

Once all the above project details were negotiated and accepted by the Indian government and the World Bank, the project team prepared the Project Appraisal Document (for investment lending) along with other financial and legal documents. After the funding approval was obtained, conditions for effectiveness were met, and legal documents were accepted and signed, the implementation phase began.

Project Implementation

In case of the World bank funded projects such as the Rampur Hydropower Project; the implementing government agency (SJVN), with technical assistance and support from the Bank's team, prepares the specifications for the project and carries out all procurement of goods, works and services needed, as well as any environmental and social impact mitigation set out in agreed upon plans. Financial management and procurement specialists on the Bank's project team ensure that adequate fiduciary controls on the use of project funds are in place.

The loan amount for the Rampur Hydropower project was sanctioned by the World Bank on 13/07/2007. The loan disbursement as envisaged by the World Bank is shown in Table 1 below:

Table 1. Loan disbursement as envisaged by the Bank

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Estimated Disbursement (Bank FY/ \$ million)

FY

2007

2008

2009

2010

2011

2012

2013

Annual

0

30

60

90

90

90

40

Cumulative

0

30

90

180

270

360

400

With the financial closure the work on the project started in end 2007. As per the distribution of responsibility SJVN was responsible for project implementation, with support in some areas (e. g. catchment area treatment, afforestation, etc.) by the relevant agencies of government of Himachal Pradesh. SJVN was also to provide quarterly progress reports, quarterly information on the progress of key performance indicators, billing and collections, quarterly un-audited financial reports and annual audited financial statements to the concerned agencies. SJVN will also carry out a mid-term review in 2010.

At the end of the 3rd quarter of 2009 following work has been done in project:

Physical Construction Work

Tunneling: The excavation of the various tunnels that comprise the Project has been slower than anticipated due to the poor quality of rocks encountered. Work on all the adits has been completed and some 12 km of the total 20 km of tunnels is now complete, but this is slower than the 15 km that was expected to have been completed by September 2009. SJVN, in consultation with the civil works contractor and the World Bank, is working on finalizing an Acceleration Plan and to deploy a twin-cutter to hasten excavation in some stretches of the head-race tunnel.

Powerhouse and surge-shaft works: Some 98 percent of excavation for the powerhouse has been completed. Work on the 150 m-deep surge shaft is also on schedule and the pilot hole has been widened up to a depth of 69 meters.

Electro-mechanical works: Turbine model tests have been completed. Delays in the excavation works due to poor geology will impact the schedule of electro-mechanical works as well. SJVNL is in the process of updating the overall project schedule.

Environment Management

The debris is being disposed off carefully so as to ensure that no muck falls into the river. The overall progress on environmental management at the project is moderately satisfactory. Independent monitoring the environment of the project area has also been initiated. SJVNL has also begun work on a pilot project aimed at reclaiming a muck disposal site and restoring its landscape. Regarding the compensatory afforestation and catchment area

treatment (CAT) plans, work has been initiated by the government agencies who will be implementing the various activities. In order to facilitate speedy work, the state Forest Department has agreed that SJVNL will undertake some of the soil and moisture conservation activities proposed under the CAT plan. Procedures for these are being finalized.

Land Acquisition and Resettlement and Rehabilitation

The resettlement colony at Averi: The 29.86 hectares of private land needed for the Project has been acquired and compensation paid to all 208 land-owners. Of these, the 37 families who will be left with less than five bighas of land after the Project acquires their land have also received from SJVNL the additional rehabilitation grants they were entitled to.

Local Area Development: Candidates from the project-affected area were sponsored by SJVNL for skills training at the ITIs. Small community infrastructure facilities — like footbridges and footpaths, street lighting and drinking water supply — have been completed in various villages. In addition, construction of a bus station, a senior secondary school, medical dispensary has been completed. The Project has also ensured that local petty contractors also get a share of the work being done and small works — such as community development works.

Procurement

In addition to the above physical construction and Environment/ Social management tasks the contracts for major procurement, construction and installation of different equipments were also carried out through international bidding. Petty constructions were awarded to the local

contractors. A summary of the major contracts awarded upto 3rd quarter of 2009 is as follows:

Contract Description

Supplier Contract Amount (US\$M)

Main Loan Credit (US\$M)

Procure Group

Procurement

Procure Type

Sector 1

Supplier Name

Supplier Country

Civil works for head race tunnel, river diversion works & hydro mechanical works

91.477

48700

Goods & Works

International Competitive Bidding

Works, Installation

Renewable energy

Patel & Gammon (JV)

India

Const. of civil works for head tunnel, surge shaft, pressure shafts valve hse, power house complex, tail race and hydro mech. works

82. 198

48700

Goods & Works

International Competitive Bidding

Works, Installation

Renewable energy

Patel & Gammon (JV)

India

Electro mechanical works

146. 324

48700

Goods & Works

International Competitive Bidding

Works, Installation

Renewable energy

BHEL

India

Project Completion

In case of a World Bank financed project as the given Rampur Hydropower Project it is mandatory to prepare a project completion report when a project is completed and closed at the end of the loan disbursement period. The document reflecting the completion stage of the Project Life Cycle contains a summary of the results achieved; the problems encountered; the lessons learned; and the knowledge gained from carrying out the project.

As the Rampur Hydropower Project is expected to be completed in 2013 the completion phase of the Project Life cycle is still not been achieved.

However, The SJNV is supposed to prepare a mid-term review report by March'10.

Project Evaluation

Owing to the non completion of the project this phase of the PLC has not been done for the Rampur Hydropower Project. However, the lessons learnt from similar activities can be easily used as a benchmark for such project e. g. Nathpa Jhakri Hydropower Project which was also executed by SJNV

(earlier NJHP) and was financed by loan from the World Bank. Moreover, during the review of the project

Issues relating to the Nathpa Jhakri Hydropower Project:

During the construction of the Nathpa Jhakri Hydropower Project (NJHP), two major concerns; the speed of decision making within the Nathpa Jhakri organisation, and the time taken for environmental protection and remediation work to be arranged with the Himachal Pradesh Department of Forests came to fore. Although the organisation strength of SJNV has improved and developed over the intervening time, the issue of the institutional strength of the organisation (now SJVN) continues to be a concern; for example, there are still frequent periods when the organisation has less than its full complement of Directors.