Fiji Electricity Authority

MR 323/2017 – Feasibility Study of Pumped Storage Hydropower at Monasavu

Request for Prices

November 2017

Quality Assurance Statement	
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Revision Schedule					
Rev. No	Date	Description	Prepared by	Reviewed by	Approved by
1	13 Nov 17	Initial Draft	M.A. Khan	E. Tawake	
2		Review & Final Draft	M.A. Khan		E. Tawake
3					

Definitions:

RFP:	Request for Proposals
TOR	Terms of reference for the works
Tenderer:	The company or consortia that is providing a submission in response to this RFP document
FEA:	Fiji Electricity Authority, 2 Marlow Street, Suva, Fiji
Works	The project, assignment
HEP:	Hydro Electric Scheme
PSH:	Pumped Storage Hydropower
CBA:	Cost Benefit Analysis

1. Background

The Fiji Electricity Authority (FEA)

The FEA is a wholly Government of Fiji owned statutory body that was established under the Electricity Act of 1966. It is supervised by a Board of eight members comprising a Chairman, Deputy Chairman, the Chief Executive Officer of FEA, the Permanent Secretary of Infrastructure and Transport, the Permanent Secretary of Economy, and representatives of Business and Consumer Groups. All members are appointed by the Minister of Infrastructure and Transport except for the Chief Executive of FEA, who is appointed by the Board with approval of the Minister. The Management team of the FEA consists of Chief Executive Officer, Chief Finance Officer, General Manager Human Relations, General Manager Generation, General Manager Network, General Manager Systems Planning and Control, General Manager Customer Services, Chief Information Officer, General Manager Major Projects & Strategy and General Manager Commercial.

FEA maintains power supply systems on the larger islands Viti Levu, Vanua Levu, Taveuni and Ovalau, which account for some 90% of the country's population. Installed generation capacity is approximately 215MW, comprising 83MW in the Monasavu Hydro Scheme and 44MW in the Nadarivatu Hydro Scheme in Viti Levu and about 94MW of diesel capacity in 12 stations on the three main islands. Of the diesel capacity 77MW is on Viti Levu which has been supplementing the Monasavu hydro scheme for the Viti Levu Interconnected System (VLIS) which has been reaching maximum demand of 152MW. Transmission is provided by 140km of 132kV lines (connecting Wailoa Power Station to the East and West coasts) and about 266km of 33kV lines. Power distribution is by means of more than 9,000km of 11kV and 415/240V lines.

2. Project Overview

2.1 Project Drivers and Summary

FEA has embarked upon an ambitious program of renewable energy development in order to fulfil its strategic objectives. These include development of new generating and power system projects as well as improving reliability and capacity-building for future load growth.

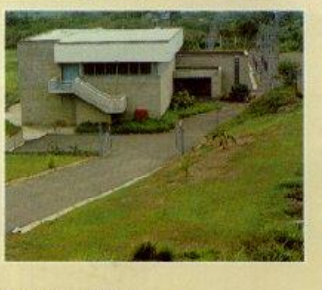
The Nadarivatu Renewable Energy Project is complete and feasibility studies are underway for potential hydropower schemes in the Qaliwana and Upper Wailoa Catchments and Upper Navua River areas. A construction project for the raising of the Wainisavulevu Weir has recently been completed in December 2014.

As part of this ambition program, FEA wishes to explore the potential of developing a pumped hydropower capability with the current Monasavu Hydropower Scheme.

3.0 Monasavu Hydropower Scheme Description

The Monasavu Dam is a rock-fill embankment dam on the Nanuku River about 60 kilometres (37 mi) northwest of Suva in Naitasiri Province, Fiji. It is located just above the Monasavu Falls and is both the tallest and largest dam, which also withholds the largest reservoir in the country. The primary purpose of the dam is to produce hydroelectric power and it supports an 80 megawatts (110,000 hp) power station. To offset fossil fuel imports for power production on the island, the Monasavu-Wailoa Hydroelectric Project was authorized by the Fiji Electricity Authority in 1977 and construction began in May 1978.[2] The dam was complete and power station commissioned in 1983.[3] About US$15 million of the project's total US$234 million cost was supplied by the World Bank, the rest by the host government and loans.

Water from the dam is diverted through nearly 5.4 kilometres (3.4 mi) of tunnels to the Wailoa Hydro Power Station to the east on the Wailoa River. The power station contains four 20 megawatts (27,000 hp) Pelton turbine-generators and the drop in elevation between the reservoir and power station affords a hydraulic head (water drop) of about 625 metres (2,051 ft).[5] In 1992, the power station was supplying 92% of Viti Levu's, the main Fiji island, power.



THE FOUR 20-MEGAWATT GENERATORS OF WAILOA POWER STATION AND (RIGHT), THE NATIONAL CONTROL CENTRE, VUDA.

The National Control Centre (NCC) Vuda

This is the nerve centre of the power generation and distribution system. The transmission project was completed and commissioned early in 1981 linking Suva, Monasavu and Lautoka. It enables the FEA to make the most efficient use of its generating system before hydro comes on stream in 1983.

PUBLISHED BY
FIJI ELECTRICITY AUTHORITY

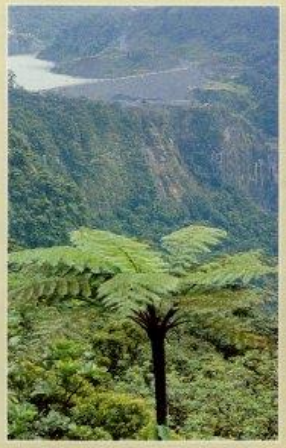
PRINTED BY FIJI TIMES

FIJI HYDRO POWER

The Monasavu Story

The Monasavu Story

When engineers made their final selection of a site for the creation of a hydro electric scheme, few people would have doubted their wisdom. Even fewer would have known where Monasavu was . . . an unpopulated, cloud-covered area of dense virgin rain forest where a little-known creek, the Nanuku, plummeted towards the Wainimala River Valley below. High and wet, it had what the engineers were looking for. They chose the spot to build an 82-metre high clay and rock dam, creating a 17-kilometre-long lake covering 470 hectares. The lake is cradled in the Nadrau Plateau about 1000 metres above sea level in central Viti Levu, Fiji's largest and most mountainous island. The plateau's rainfall averages about 360 cm a year.



The hydro scheme is designed to reduce the country's reliance on imported diesel fuel used for generating electricity, and to spearhead further development plans. The Fiji Electricity Authority approved the Monasavu scheme in 1977 and construction began in May, 1978. It was financed by overseas and local funds and Government grants, a multi-million dollar project which remains the most ambitious development scheme undertaken in Fiji. Armed with a fleet of earth-moving machines, tunnelling devices and international expertise, a work force of about 1500 men set about carving out the scheme from virgin bush. For many of those men, it would mean working in conditions far cooler — and wetter — than anything they had encountered before.

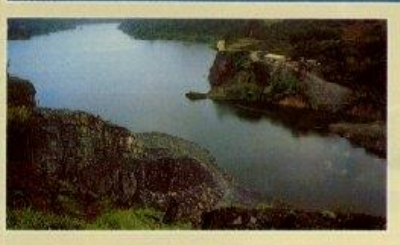
The theory behind hydro-electricity is quite simple: water under high-pressure turns the turbines, rather than diesel-fueled generators. But if the theory is simple, the mechanics of building a dam and a series of tunnels is not.

The Wailoa River turbines, 625 metres lower than the lake, are capable of producing double the power needs of Viti Levu in the 1980's.

Facilities for the transmission of power from Wailoa to Vuda and Suva also had to be set up a trans-Viti Levu link across the very centre of the island.

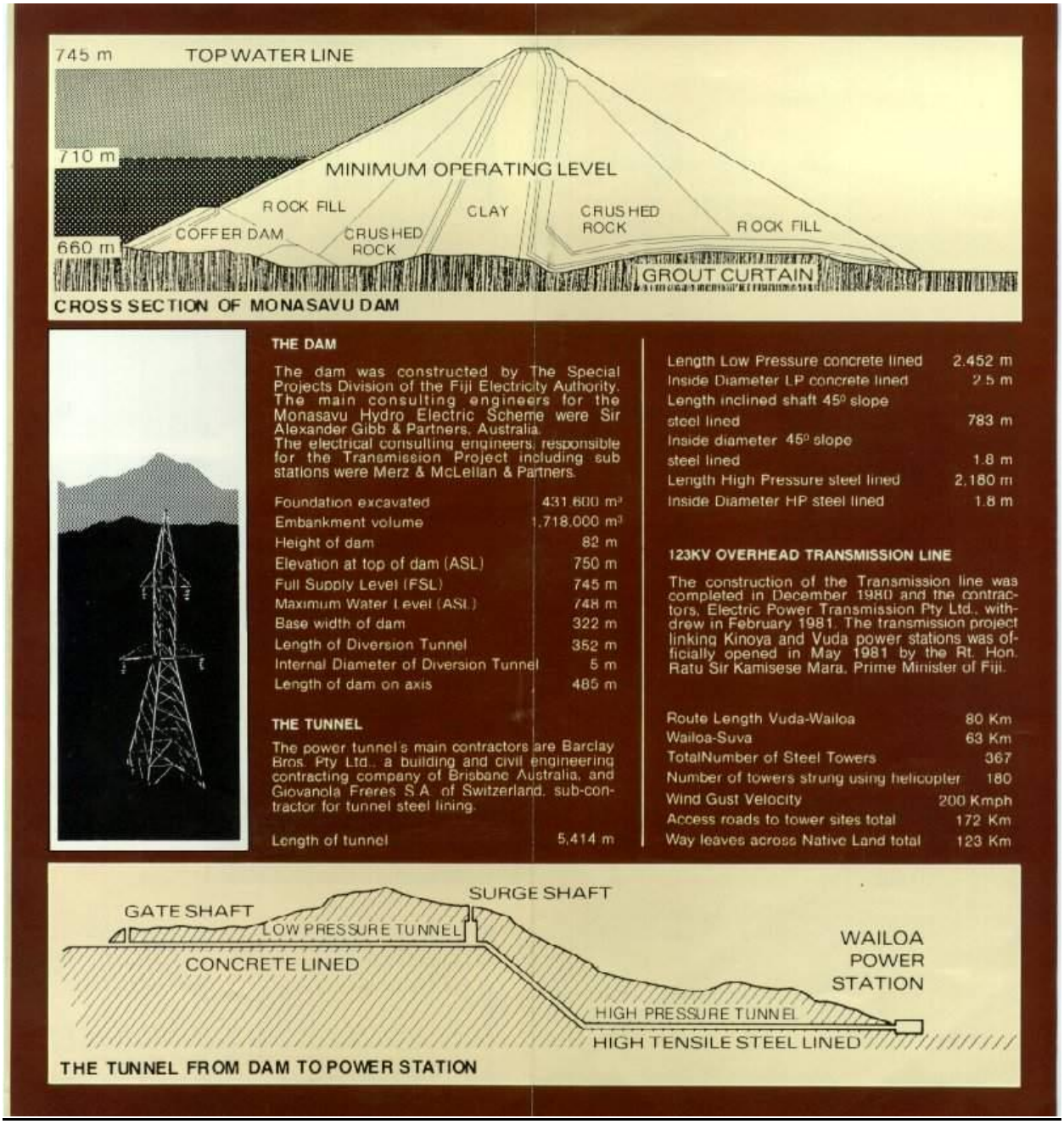
The Project involved the construction of:

- The 82-metre high Monasavu Dam across Nanuku Creek.
- Wailoa Power House with four 20-megawatt generators.
- A 5.4 kilometre tunnel from the lake to Wailoa Power House.
- The National Control Centre at Vuda near Lautoka, sub stations at Vuda, Wailoa and Cunningham Road near Suva.



MONASAVU DAM AND THE LAKE IT CREATED; KONO-NI-O CAMP SITE, AND WELDERS IN THE STEEL-LINED HIGH PRESSURE TUNNEL.

- 132KV transmission lines on 367 towers across Viti levu and installation of electronic computers and radio telephone for communications and systems control.
- 73.5 kilometres of access roads within the Monasavu area.
- Weirs, shafts, a 3.9 Km tunnel for the diversion of the Wainaka and Wainabua Creeks and a 7.02 Km tunnel for the diversion of the Nabilabila, Wainikasou and Wainasavulevu Creeks to Monasavu Reservoir.



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4.0 Project Objective

The primary objective of the consultancy service is to carry out a feasibility study and cost benefit analysis of developing a pumped storage hydropower at Wailoa Power Station as compared to developing a diesel powered station.

Additional objectives of this feasibility study are as follows:

- To determine the capital cost of developing a pumped storage hydropower at Monasavu using the tailrace of the Wailoa Power Station.
- To identify and estimate the operational parameters and requirements of the scheme.
- To determine the staffing level and their qualifications to manage this scheme for FEA.
- To determine, describe and propose mitigating factors for vulnerability of the proposed system to natural hazards, including the frequency, magnitude and distribution of cyclone, flood and earthquakes.
- To provide an analysis of any environmental impact, which are likely to directly or indirectly affect the environment through the proposed development.

5.0 Scope of Services

This section sets out the Scope of Services for the Feasibility Study of Pumped Storage Hydropower Potential at Monasavu, as described in Section 3 above. The scope of services for this assignment is defined along the following tasks which shall be undertaken:

5.1 To undertake relevant study of the current Monasavu Hydropower Scheme parameters and provide a notional scheme design of the pumped storage hydropower scheme, highlighting key parameters.
5.2 To identify, estimate and prepare full capital costs of all civil, structural, electrical, mechanical and environmental management works required to develop this scheme. Also identify any constraints that may arise.
5.3 To carry out Feasibility study, economical and financial assessment of the sites viabilities.
5.4 To determine the land area requirements for development of this scheme.
5.5 To prepare a preliminary drawing for the layout of the scheme with all structures included.
5.6 To identify any possible environmental and social-economical impacts and provide possible mitigating factors.
5.7 Prepare an estimated project implementation schedule of the scheme.
5.8 To prepare and present an energy model of the pumped storage scheme, with comparison of unit cost of developing a diesel powered station of similar energy output.

6.0 Request for Price (RFP) Submission

The Request for Proposal for the Consultancy Service shall include the following:

6.1 A covering letter including the complete name and address of the firm(s) performing the project, the principal firm including the name and title of person principally responsible for the project.

6.2 A detailed technical proposal with standards, specifications, methodology and indicative drawings or sketches including a programme for the works/services. Comments on the Scope of Services can be included to add value to the submission.

6.3 State a lump sum fee for the entire works/services, and clearly identifying the breakdown of costs in accordance to the scope of services mentioned above.

6.4 State hourly rates of personnel resources, if FEA requests to undertake additional work related to this assignment.

6.5 Company background and evidence of similar works undertaken by the firm(s) over the last five years including project name, summary of work carried out, contact name and address of clients.

6.6 Provide summary of at least five (5) similar assignments undertaken by the firm(s)/consortium in the Asia/Pacific region.

6.7 Background of proposed sub-consultants, if any.

6.8 CV's of personnel that will be engaged in the work/services including sub-consultants/contractors.

6.9 Completed Responsibility matrix as shown below.

7.0 Responsibility Matrix

The responsibility matrix shall define key personnel who will be involved directly and indirectly with the proposed hydro project.

Responsibility Matrix – Please use similar template

Name	Firm	Speciality/ Skills Required							
		Overall Project Management	Designer						
John X	XYZ	X							
Mary Y	ABC		X						

NOTE:

a) Complete the first row with the Specialties required

b) Complete the first column with the names of Project Key Staff.

c) One Project Key Staff person may be responsible for more than one Specialty.

d) Place a mark in the appropriate column relative to the appropriate Project Key Staff and Specialty.

8.0 Contract Condition

FIDIC General Conditions of Client Consultant Agreement or Conditions of Contract for Construction shall be used. The bidder can propose an alternate if deemed necessary.

9.0 Insurance

The consultant shall be required to provide Certificates of insurance including any Professional Indemnity Insurance cover.

10.0 Evaluation Methodology

The RFP submissions shall be checked for completeness, firms that fail to submit all information required above may not be considered for award. A 65% weighting shall be given for the firm and personnel background and performance and 35% for the lump sum price.

11.0 Additional Information

FEA Project Manager

The FEA Project Manager for this Assignment shall be

Mr Eparama Tawake
General Manager - Generation
2 Marlow Street, Suva.

12.0 Closing Date

Submissions close at **1600hrs (Fiji) Time 6 December 2017** at FEA's Suva office. Submissions are to be received at this location in an envelope prior to the specified time and marked:

Tender MR323/2017
RFP - Feasibility Study of Pumped Storage Hydropower Potential at Monasavu
Secretary Tender Committee
Fiji Electricity Authority
2 Marlow Street
Suva, Fiji

- Facsimile submissions will not be accepted.
- Late submissions will not be accepted
- All submissions shall be in the English language.
- Hard copies will be accepted if the elecrtronic copy is received prior to closing date.
- All proposals shall be in a two complete and bound hard copies with one soft copy on CD

13.0 Costs

All costs of preparing the submission shall be borne by the tenderer.

14.0 Enquiries

All enquiries shall be directed to:

Tuvitu Delairewa
General Manager Commercial
2 Marlow Street, Suva
Phone: + 679 331 1133
Facsimile:+ 679 331 1882
Email: TDelairewa@fea.com.fj

15.0 Site Visit

A visit to site can be arranged by FEA, upon request, giving 1 weeks advance notice. All logistics and costs for site visit to be borne by the Tenderer.

16.0 Notification and Award

Following FEA board approval, tenderers will be advised, by letter, whether they have been successful or not. Tenderers will be able to debrief with the evaluation team should they so request, however the scoring information will not be released to any of the tenderers at any time.

Notwithstanding any other provision of this document, FEA reserves the right to:

- Accept or reject any proposal
- Seek clarification of any aspect or information provided in the RFP document and to seek further information from any party
- Amend the closing date for submission of the RFP or any other date referred to or implied in this Request for Proposals
- In whole or in part, suspend or cancel this RFP process and/or the overall process
- Re-advertise this RFP

Tender Submission - Instruction to bidders

It is mandatory for Bidders to upload a copy of their bid in the **TENDER LINK** Electronic Tender Box no later than **4:00pm, on Wednesday 06th December, 2017.**

To register your interest and tender a response, view 'Current Tenders' at: **https://www.tenderlink.com/fea**

For further information contact The Secretary Tender Committee, by e-mail **TDelairewa@fea.com.fj**

In additional, hard copies of the tender, one original and one copy must be deposited in the tender box located at the FEA Head Office, 2 Marlow Street, Suva, Fiji no later than **4:00pm, on Wednesday 06th December, 2017-** Addressed as

Tender – MR 323/2017 – Feasibility Study for Pumped Storage Hydropower at Monasavu
The Secretary Tender Committee
Fiji Electricity Authority
Head Office
Suva
Fiji

- **Hard copies of the Tender bid will also be accepted after the closing date and time provided a soft copy is uploaded in the e-Tender Box and it is dispatched before the closing date and time.**

Tenders received after **4:00pm** on the closing date of **Wednesday 06th December, 2017**

- will not be considered.
- Lowest bid will not necessarily be accepted as successful bid
- **It is the responsibility of the bidder to pay courier chargers and all other cost associated with the delivery of the hard copy of the Tender submission including any Duties/Taxes. Hard copies of the Tender submission via Post Box will not be considered.**