

# Environmental Assessment Report

---

Summary Initial Environmental Examination  
Project Number: 39521  
November 2006

## Fiji Islands: The Western and Central Networks Reinforcement and Extension Project

Prepared by Richard Watling for the Asian Development Bank (ADB).

The summary initial environmental examination is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature.

## SUMMARY INITIAL ENVIRONMENTAL EXAMINATION (SIEE)

### A. Introduction

1. This Summary Initial Environmental Examination (SIEE) outlines the findings and recommendations for the reinforcement and extension of the central and western electricity networks which are proposed for financing under a loan from the Asian Development Bank (ADB). The environmental assessment process follows the ADB Environment Policy and Guidelines<sup>1</sup> which has categorized the project as a Category B Project requiring the preparation of an Initial Environmental Examination (IEE). The IEE was prepared in accordance with the ADB Environmental Assessment Guidelines (2003) and is compliant with the ADB Environment Policy (2002).

### B. Description of the Project

2. The Fiji Electricity Authority (FEA) proposes to augment and extend the western and central networks of Viti Levu to meet demand from the rapidly growing urban areas of Nadi and Suva and from new tourism developments on the Coral Coast. The Project forms part of FEA's renewable investment plan to create a resource efficient, cost effective, and environmentally sustainable power sector through the development of indigenous and renewable energy sources and reduced dependence on diesel imports and will reduce greenhouse gas emissions, including carbon dioxide, a key contributor to global warming. The Project will strengthen FEA's transmission network to (i) meet growing demand from renewable and clean energy sources, (ii) improve system reliability and quality of supply, (iii) facilitate power transfers from renewable energy resources, (iv) reduce transmission losses, (v) optimize utilization of existing and planned power plants, and (vi) integrate independent power producer (IPP) generation into the power system network.

3. The western network upgrade will serve the Coral Coast and includes (i) extension of the 132 kilovolt (kV) network from Vuda to Maro (53.9 kilometers [km]); (ii) construction of a new 132/33/11 kV substation at Nawai; (iii) expansion of the existing substation at Maro; (iv) interconnection of the 132 kV system at Nawai with the existing 33 kV Waqadra/Maro line to provide support for the feeders to Waqadra; (v) construction of new 33 kV lines from Nawai to Momi Bay (5.6 km) and from Maro to Natadola (7.9 km); and (vi) provide connections at the Maro Substation for the various IPP generators planned in the area. Work planned for the Central Network will improve supply to Suva by upgrading the Kinoya power station and the Suva substation with new switchgear and transformers, together with a new underground 33 kV cable to link Kinoya to Suva (10 km).

4. Single treated wood or concrete poles will be used for the 132 kV system, while the 33 kV lines will use treated wooden poles. The transmission lines will be located within existing FEA easements or road reserves and no additional land is required. The routes for the transmission lines will traverse agricultural or pastoral land and do not pass through any forest or protected areas. The only land to be acquired is for a new substation at Nawai where 0.2 hectare of land is currently being acquired by FEA. Construction will involve machine boring of holes for the poles, erection of the poles, back filling and compacting soil, stringing the conductors, testing and energizing. Compensation will be paid for crop damage/losses. The entire right of way (RoW) is accessible and no new access roads will be required.

---

<sup>1</sup> While Fiji enacted the Environmental Management Act in 2005, supporting regulations to empower the Act are still being developed.

5. The design of the transmission lines and substations will be undertaken by FEA, who will also supervise construction. Construction will be undertaken by contractors. Work is planned to commence in April 2007 and be completed by the end of December 2009.

## **C. Description of the Environment**

### **1. Physical Resources**

6. The transmission line RoW is located in flat to gently rolling and hilly topography in the coastal region of western and central Viti Levu. The land is mainly used for sugar cane farming while the steeper hill areas are mainly used for extensive grazing.

7. The western and central climate zones have a dry season that extends from May to December. The western zone is drier with an average annual rainfall of 1,900 millimeters (mm) while Suva in the central zone is wetter with an average rainfall of 3,500 mm. Tropical cyclones accompanied by torrential rain and storm surges can occur between October and May and normally occur 2–3 times every 10 years. Moderate to severe damage may occur every 10 to 20 years.<sup>2</sup>

### **2. Ecological resources**

8. The ecology of the project area has been highly disturbed by agricultural and urban development. There is no vegetation on or adjacent to the transmission line easement or on the substation sites that is of any conservation significance. There are no protected areas or sites of national significance adjacent to or close to the proposed line alignment. There are no known rare or endangered terrestrial or aquatic fauna or flora whose habitats will be disturbed by the Project's alignment. No invasive species are found along the transmission line routes. While some trees will need pruning along the easement, no trees will need to be cut down.

### **3. Human and Economic Development**

9. The western upgrade will serve five districts (*Tikina*) which has a combined population of approximately 113,935 persons (1996 census) while approximately 400,000 persons - 40% of Fiji's population live in the Greater Suva area. Cane farming provides the main source of employment in the Western Region. Public and private sectors are also significant employers and employment in the tourism industry is increasing.

---

<sup>2</sup> Climate change is expected to cause an increase in extreme weather events. The intensity of such extreme weather has been reviewed, and its implication on the transmission line and substation design has been considered. *Climate Proofing Power Sector Development Projects in Fiji* (prepared under the PPTA) suggests that stronger structural design will be needed if there will be substantial increase in extreme weather events. For rainfall, there is expected to be a 50% reduction in return periods for daily and hourly rainfall events. For transmission lines, the design will need to consider increased wind strength and sea level rises. For wind, the 100 year peak gust which is currently established at 180 knots may increase to 185 knots by 2025, or a 5 knot increase which may not be considered substantial (nonetheless, the Project will take it into consideration when designing the transmission line). The projected sea level rise of 23 cm by 2050 will need to be related to the siting of transmission lines close to the coast at Momi and Natadola. It was assessed that even with the projected sea level rise of 23 cm, relocation of transmission lines located close to coastal areas are unnecessary.

#### **4. Quality of Life Values and the Socio-Cultural Environment**

10. The project area has a well developed social infrastructure of health and education facilities. National hospitals are located at Suva and Lautoka with regional hospitals at Nadi and Sigatoka. Private health and educational facilities are also available in Nadi and Suva. The area is well supplied with roads while electricity is supplied to the area from FEA's national grid. Land alongside the transmission line easement is mainly customary-owned under agricultural leases.

#### **D. Forecasting Environmental Impacts and Mitigation Measures**

##### **1. Environmental Impacts and Mitigation Measures during Design Phase**

11. Project design has given attention to mitigating concerns related to (i) reducing the possible adverse visual impact of the transmission line by siting it away from areas of high aesthetic value, (ii) reducing impacts on environmentally sensitive areas such as environmentally valuable riverine or coastal mangrove areas by avoiding these areas, (iii) incorporation of climate proofing in design as necessary, (iv) prohibiting the supply of PCBs<sup>3</sup> and promoting the safe use of SF-6,<sup>4</sup> (v) provision of safety blast walls for transformers, (vi) bunding of transformer bases to collect oil, (vii) selection of concrete poles or providing base protection for wooden poles where cane fires are common, and (viii) payment of compensation for loss of any private property and loss of livelihood.

##### **2. Environmental Impacts and Mitigation Measures during Construction Phase**

12. During construction, impacts will be mitigated by ensuring that (i) site erosion and production of sediment from clearing of vegetation and excavation of substation sites and the cable trench will be minimized by limiting the excavation areas and erecting silt fences; (ii) fuel and lubricants are to be stored and handled according to accepted industry practices; (iii) noise and construction activities that pose a risk to workers and local communities will be mitigated by timing of the work and provision of protective safety equipment; and (iv) pedestrian and traffic hazards will be mitigated by the use of warning signs, barriers and stop-go men.

##### **3. Environmental Impacts and Mitigation Measures during Operational Phase**

13. During operation, attention will be given to mitigating concerns related to (i) trimming of vegetation so as to maintain safety clearances for the conductors by the use of hand labour and limiting the use of herbicides, (ii) issues with regard to possible electro-magnetic radiation hazards will be reduced by ensuring that no houses are constructed within the easement, (iii) warning signs are to be erected to show the location of the buried 33 kV cable from Kinoya to Suva and (iv) handling of hazardous gases and other wastes at the substations will be addressed by an FEA waste handling program.

14. Details of expected impacts, mitigating measures and monitoring programs are provided in the Environmental Management and Monitoring Plan (EMMP), Annex 1.

---

<sup>3</sup> Polychlorinated Biphenyls (PCB) are mixtures of man-made chemicals and due to their non-flammability, chemical stability and high boiling point have been used extensively as insulators. PCB's are highly stable, toxic and persistent chemicals. Their use has now been banned in many countries. (*USEPA web page on PCB's*).

<sup>4</sup> Sulphur hexafluoride (SF6) is a highly stable, non-poisonous, non-reactive, colourless, odourless and non-flammable gas and has excellent electrical insulating properties. The SF6 molecule is highly reflective and has been identified as a greenhouse gas. (*ABB web page, Questions and Answers about SF6*).

## **E. Institutional Requirements and Environmental Management and Monitoring Plan**

15. As FEA has limited capacity to undertake supervision or monitoring of the Environmental Management and Monitoring Plan (EMMP), FEA will need to initially outsource these tasks by recruiting consultants while strengthening its internal environmental capacity. Capacity building will be facilitated by the World Bank's Renewable Power Development Project and supported by counterpart financing.

16. The EMMP conditions will form part of the contract documents and will be required to be addressed by the contractor during bidding. After the contract is awarded, the contractor will prepare a detailed Site Environmental Management Plan (SEMP) to implement the mitigation measures outlined in the EMMP (Table A15.1). The SEMP will be submitted to FEA and the Ministry of Environment (MoE) for approval prior to the contractor mobilizing.

17. During construction, the conditions contained in the SEMP will become the contractor's responsibility and will be supervised by FEA's Supervising Engineer (SE). The contractor will prepare a monthly SEMP compliance report which will be submitted to the FEA and MoE. The FEA will include a section concerning SEMP compliance in the quarterly project report to be submitted to ADB. During the operational phase, responsibility for environmental monitoring and management will rest with FEA.

18. The cost of the environmental mitigation and monitoring measures, which comprise mainly monitoring costs, is estimated at US\$58,000.

## **F. Public Consultation and Disclosure**

19. Consultations have been held with FEA, local and provincial government, and local communities. The consultations show that the communities endorse the project and wish to see it proceed. Although public disclosure of the IEE is not formally required, FEA in coordination with MoE have arranged public disclosure by advertising the Project in local media. It was posted on 24 October 2006 with comments due by 07 November 2006. During a two week period, copies of project design and IEE were available for public inspection and comment. Following this, the MoE have two weeks to review the IEE for consideration by 07 December 2006. No comments were received during the disclosure period.

## **G. Findings and Recommendations**

20. Based on discussions with the FEA staff, review of documents, and field assessment of the project, it is concluded that the project will have few impacts, all of which can be readily mitigated. The Project has strong public support. No irreversible impacts have been identified. The Project complies with ADB's environmental safeguard policies in that it is not located in any environmentally sensitive area nor will it require any old growth forest to be cleared. Thus a more detailed environmental impact assessment is not warranted and the SIEE will be the final environmental assessment for the project. By adopting the environmental mitigation and monitoring measures outlined in the EMMP, the Project will create few environmental concerns.

## **H. Conclusions**

21. From the initial environmental screening process and analysis of potential environmental impacts, it is concluded that the project will not result in any direct significant adverse

environmental impact and will not require further study. As shown in the Environmental Management and Monitoring Plan (Table A15.1), all potential environmental concerns can be adequately mitigated and monitored.

**Table A15.1: ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN**

Project Activity	IMPACT MITIGATION				IMPACT MONITORING			
	Potential Environmental Impact	Proposed Mitigation Measure	Implementing Responsibility	Mitigation Cost	Parameter to be monitored	Frequency and means of Verification	Monitoring responsibility	Monitoring Cost
<b>PRE-CONSTRUCTION</b>								
Siting of transmission lines	a. Adverse visual impact. b. Intrusion into environmentally sensitive areas	a. Avoid locating transmission line in areas of high aesthetic value. Or (b) environmentally sensitive areas	a. and b. Design Engineer and FEA-EMU	Cost is already included in overall project	Location of transmission line with regard to (a) and (b) and (c) public comments	a. Once, to verify design location. b. Comments received from public consultation.	a. and b. Project Engineer and FEA-EMU	Cost included in overall project
Climate proofing in structural design	Costly structural failure of trans. lines and substations	Structural design criteria reviewed to incorporate Climate Proofing parameters	Design Engineer and FEA-EMU	Cost incorporated in design	Structural and location design drawings	a. Once, to verify structural and location design.	Project Engineer and FEA-EMU	Cost included in overall project
Use of PCB's and SF6 for electrical insulation	a. PCB is highly persistent/ toxic b. SF-6 a highly stable gas	a. Contract to specify no PCB's to be supplied. b. SF-6 to be handled according to Operations Manual.	a. Electrical Design Engineer b. Contract Supervisor c. Safety Officer	a. Avoided cost  b. Contract cost	a. Contract documents  b. Procedures Manual	a. Once, to verify contracts. b. Once, verify SF6 handling procedure.	a. Project Engineer and FEA-EMU b. Operations Manager	a. Met by FEA  b. FEA training budget
Transformer safety	Equipment loss human safety	Installation of blast walls at Suva substation	Electrical Design Engineer	Cost included in design	a. Design drawings b. Specifications	Once, to verify drawings & specs.	Project Engineer	FEA cost
Transformer oil leaks	Soil and water pollution	Transformer base banded. Oil/water separators	Design Engineer	Cost included in design	a. Design drawings b. Specifications	Once, to verify drawings & specs.	Project Engineer	FEA cost
Pole protection from fires	FEA losses Human safety	Pole bases protected. Use concrete poles	Transmission Line Engineer	Cost included in design	a. Design drawings b. Specifications	Once, to verify drawings & specs.	Project Engineer	FEA cost
Land acquisition for substation	Loss of livelihood	Compensation to be paid for loss of land	FEA	Cost included in project design	Land acquisition quarterly reports	Outlined in LARP procedures	FEA	FEA cost
<b>CONSTRUCTION</b>								
Clearing easement Loss of crops and livelihood	Loss crops and livelihood	Compensation to be paid for loss of crops and livelihood	FEA	Cost included in project design	Compensation payments quarterly reports	Outlined in LARP procedures	FEA	FEA cost

Project Activity	IMPACT MITIGATION				IMPACT MONITORING			
	Potential Environmental Impact	Proposed Mitigation Measure	Implementing Responsibility	Mitigation Cost	Parameter to be monitored	Frequency and means of Verification	Monitoring responsibility	Monitoring Cost
Excavation for cable, transmission line and sub-stations	Sediment entering water courses	a. Limit disturbed areas and plan work. b. Use silt fences	a and b: Contractor and Supervising Engineer (SE)	Costed by contractor and cost carried into contract	Site erosion	Spot checks and weekly inspections	a and b: Contractor SE and FEA-EMU	FEA-EMU cost
Storage and handling of fuel and lubricants	Contamination of soil and water	Use accepted industry practices	Contractor and Supervising Engineer	Contractor's cost.	Fuel and lubricant handling procedures	Spot checks and weekly inspections	Contractor, SE, FEA-EMU and DOE	FEA-EMU budget item.
Noise from construction equipment	a. Nuisance to surrounding communities b. Work place health hazard	a. Limit work in residential areas to daylight hours. b. Operators provided with ear protection	a. Contractor and Supervising Engineer b. Contractor and Supervising Engineer	a. Contractor's cost b. Contractor's cost	a. Noise levels in community areas b. Noise levels in workplace	a. Noise levels in residential and workplace areas b. Workers have ear protection	a and b: Contractor a and b: SE, FEA-EMU and DOE	FEA-EMU budget item
Construction activities posing risks to traffic and pedestrians	a. Hazards to traffic b. Hazards to pedestrians	a. Erect warning signs before work areas b. Stop- go men to control traffic	a. Contractor b. Contractor	a. Contractor's cost b. Contractor's cost	Pedestrian and traffic accident records	Spot checks and weekly inspections.	a. Contractor and SE b. Contractor and SE	a. FEA-EMU budget item b. FEA-EMU budget item
<b>OPERATION</b>								
Maintaining RoW – clearing vegetation and controlling development within RoW area	a. Disposal of vegetation b. Improper use and handling of herbicides	a. Operations Manual for RoW maintenance b. Operations Manual for RoW maintenance	(a and b) FEA Line Operations Manager with input from FEA-EMU	FEA operations cost	a. Vegetation maintained within specified clearance b. Correct use of herbicides	Six monthly for RoW maintenance.	Line Operations Supervisor	FEA operations cost
Maintaining RoW - human health issues	Possible electromagnetic effects on human health	Conductor clearances maintained with regard to corona and electromagnetic fields.	FEA Line Operations Supervisor with FEA-EMU, FEA Safety Officer	FEA Operations Cost	Houses kept outside specified clearances.	Six monthly check for illegal RoW occupation.	Line Operations Supervisor and FEA-EMU, FEA Safety Officer	FEA Operations Cost
Community safety issues for cables, transmission lines and substations	Electrocution	a. Warning signs erected for cables. Substations fenced. b. Safety awareness	a and b: FEA Line Operations Supervisor and Safety Officer	FEA Operations Cost	Human health and safety	Annually. FEA safety records.	FEA Safety Officer	FEA Operations Cost

Project Activity	IMPACT MITIGATION				IMPACT MONITORING			
	Potential Environmental Impact	Proposed Mitigation Measure	Implementing Responsibility	Mitigation Cost	Parameter to be monitored	Frequency and means of Verification	Monitoring responsibility	Monitoring Cost
		program						
Handling of SF-6 and other waste at substations	Pollution of air soil and water resources	a. Install waste handling systems b. Training and awareness programs on SF-6	a. and b. Substation manager with FEA Safety Officer and FEA-EMU	FEA Operations Cost	Waste handling procedures and records	Initially monthly until procedures are in place, then annually.	Substation manager and FEA-EMU	FEA Operations Cost

EMU = Environmental Management Unit; FEA = Fiji Electricity Authority; LARP = Land Acquisition and Resettlement Plan; SE = Supervising Engineer; RoW = Right of Way (also referred to as the transmission line easement or alignment)

Where the FEA-EMU is identified, this organization has the responsibility for arranging the outsourcing of the monitoring requirements. An amount of \$58,000 has been allocated within the ADB loan to allow for this.

The contractor will prepare a Site Environmental Management Plan (SEMP) which will identify the contractor's responsibilities during construction.