PROJECT INFORMATION DOCUMENT (PID)
APPRAISAL STAGE

Project Name	INDIA - Adoption of 3 Phase IGBT Technology in Indian Railways (IR) for EMUs (Electric Multiple Units) in Mumbai Suburban Area Leading to Reduction of Green House Gases (GHGs) project
Region	South Asia
Sector	SASDT
Project ID	P108339
Borrower(s)	NA
Implementing Agency	Indian Railways
Environment Category	[ ] A [X] B [ ] C [ ] FI [ ] TBD (to be determined)
Date PID Prepared	Revised on August 10, 2010
Date of Appraisal Authorization	June 30, 2010
Estimated Date of ERPA Signing	October, 25 2010
Estimated Date of validation by Designated Operational Entity	December 31, 2010
Estimated Date of registration with the Executive Board of the Clean Development Mechanism	June 30, 2011

I. Country and Sector Background

Mumbai Metropolitan Region (MMR) is the largest urban area in India with a population of 18 million in year 2001[1]. The urban transport network in MMR is linear in a North - South direction. Two suburban railway services are the backbone of MMR's transport system. Model share of total trips (without walk) by suburban rail system in MMR is more than 50% with average trip length of more than 23km. These suburban railway services are provided by Central Railways and Western Railways, the two zonal railways systems of Indian Railways. Western railways operates about 1100 services per day over a route network of 120km. Central Railways operates more than 1450 services over a route network of 310km. Average weekday suburban rail travel demand is estimated to be 227 million passenger km in 2008-09 with about 7.5 million trips. Rail passengers suffer from severe overcrowding. The constraint of carrying capacity is being overcome partly by procuring more EMUs under the ongoing Bank funded Mumbai Urban Transport Project (MUTP).

II. Objective

The proposed development objectives of the Project are:

- Contribute to development of sustainable urban transport by providing energy efficient braking technology in Electrical Multiple Units (EMUs)
- Reduce global emissions of carbon dioxide.

[1] Census of India 2001

III. Rationale for Bank involvement

This Regenerative Braking project will facilitate greenhouse gas emission reductions and support the development of the international market mechanism for trading Emission Reductions (ERs) developed under the framework of the Kyoto Protocol.

The sale of emission reduction credits to the World Bank-executed Danish Carbon Fund will allow Indian Railways to implement an energy efficient regenerative braking system by providing an additional revenue stream, which will provide increased financial comfort to otherwise loss making operations.

IV. Description

The project consists of the sale of Certified Emission Reductions (CERs) resulting from improvements in the braking system in Electrical Multiple Units (EMUs) in Western Railway (WR) and Central Railway (CR) in Mumbai (India), to the World Bank-executed Danish Carbon Fund.

The project will help reduce greenhouse gas emissions through the reduction in energy consumption. The project is using advanced regenerative braking technology in new three-phase Electrical Multiple Units (EMUs), which are passenger trains whose carriages have the ability to draw electricity for captive use directly from the overhead grid. Regenerative brakes essentially make use of the kinetic energy that is normally lost upon braking, which can be of the order of 30% of the total energy consumption, and converts it to reusable energy, which is fed back to the overhead equipment and is used by other powering rolling stock. This, in turn, results in savings in energy requirement to operate these EMUs.

The technology used in the project is advanced Insulated Gate Bipolar Transistor (IGBT) based technology with regenerative braking system. The regenerative braking system converts kinetic energy into electrical energy by Variable Voltage Variable Frequency (VVVF) control, altering the direction of power flow for traction motor in reverse direction and the traction motor working as generator.

Regenerative braking system requires additional cost. The saving in energy alone is not sufficient to justify the project financially. Financial inflows from sale of carbon credits will provide additional financial comfort.

Monitoring and evaluation will be undertaken through the specific plan for Verification of Emissions Reductions that will be developed in the clean development mechanism (CDM) Project Design Document. Mumbai division of WR and Mumbai Division of CR with the help of Mumbai Rail Vikas Corporation (MRVC), a special purpose vehicle created mainly to implement rail component of MUTP, will be accountable for overall reporting on implementation progress, preparation of financial monitoring reports, and preparation of audited project accounts.

V. Financing

Source:	($m.)
Carbon funds	5.33
Total	**5.33**

VI. Implementation

MRVC is responsible for procurement of the electrics under MUTP and Integral Coach Factory (ICF) for counterpart fund contract for these EMUs. All these EMUs are manufactured at ICF. Once procured, these will be operated and maintained by Mumbai Division of WR and Mumbai Division of CR zone of Indian Railways. Mumbai Division of WR and Mumbai Division of CR will be responsible for all CDM related tasks to ensure that CERs are monitored and accounted for.

VII. Sustainability

The financial incentive to Western Railway and Central Railway from actual achieved energy savings complemented by the additional financial benefits of actual achieved carbon reductions will help ensure that the energy efficiency equipment is properly maintained over the life of the equipment.

VIII. Lessons Learned from past experiences in the country/sector

This project draws from World Bank experiences in supporting procurement of these equipments as part of Bank funded Mumbai Urban Transport Project and a similar project for Delhi Metro Rail. The project applies an approved small-scale CDM Methodology utilized by several CDM projects.

IX. Safeguard Policies (including public consultation)

The project essentially involves replacement of technology for brakes. This is being done in part under the Mumbai Urban Transport Project (MUTP) being funded by the World Bank for which preparation has followed the Bank guidelines, including Safeguards Policies. The project also supports the augmentation of workshop facilities for maintenance of the new technology EMUs, and a new car shed. This category “A” project had a full EA/SA carried out to address the requirements of OP4.01, OP4.04, (then) OPN11.03, and OP4.12. Appropriate consultations were held in the project area during the preparation, and since then project entities’ representatives continue to interact with a wide spectrum of stakeholders on a variety of issues. The preparatory work in the project has been recognized with a Green Award in 2002. Based on the foregoing, and since no new activities with large environmental impacts are currently envisaged under the project, which involves replacement of old braking system with new, no additional EA is being proposed for this project but OP4.01 has been triggered.

Safeguard Policies Triggered by the Project	Yes	No	TBD

Environmental Assessment (OP/BP 4.01)	[X]	[ ]
Natural Habitats (OP/BP 4.04)	[]	[X]
Pest Management (OP 4.09)	[ ]	[X]
Physical Cultural Resources (OP/BP 4.11)	[]	[X]
Involuntary Resettlement (OP/BP 4.12)	[]	[X]
Indigenous Peoples (OP/BP 4.10)	[ ]	[X]
Forests (OP/BP 4.36)	[ ]	[X]
Safety of Dams (OP/BP 4.37)	[ ]	[X]
Projects in Disputed Areas (OP/BP 7.60)[2]	[ ]	[X]
Projects on International Waterways (OP/BP 7.50)	[ ]	[X]
Piloting the Use of Borrower Systems to Address Environmental and Social Issues in Bank-Supported Projects (OP/BP 4.00)	[ ]	[X]

Overall, the project will have beneficial global impacts on the environment due to the avoidance of generation of GHGs from power that would have been required in the absence of the energy saved by these advanced brakes. MRVC is already an ISO 14001 certified organization and has satisfactorily continued to implement the rail component of MUTP. Through a follow-on Bank-supported project, additional enhancement to the environmental management aspects at Workshops being augmented under the project is also under active consideration. This project does not involve any adverse social impact in terms of involuntary resettlement or indigenous people. The social issues relating to health and safety, and other labor norms will be addressed within the existing systems and procedures in place in the India Railways.

X. List of Factual Technical Documents

- Project Idea Note (PIN)
- Clean Development Mechanism (CDM) Project Design Document (PDD)
- EA for the MUTP (Rail Component)
- Integrated Safeguards Data Sheet (ISDS)
- Carbon Agreement Template

XI. Contact Point

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XII. For more information contact:

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[2] *By supporting the proposed project, the Bank does not intend to prejudice the final determination of the parties' claims on the disputed areas*

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