



Heavy Haul Rail Capacity Development in India (HHRCDI)

TERMS OF REFERENCE **(Indicative)**

1. BACKGROUND AND PROJECT INFORMATION :

- 1.1:** The vast railway network of Indian Railways spread over 65000 route kms handles more than 1050 million tonne freight traffic and is poised to increase its business due to the significant traffic potential related to industrial production and other components of GDP. Considering the need for quantum augmentation in rail capacity for meeting transport demand of the country, in 2007, GOI established the Dedicated Freight Corridors Corporation of India (DFCCIL) under the Companies Act of 1956, as a Special Purpose Vehicle, wholly owned by Ministry of Railways (MOR). DFCCIL has been mandated to build and operate the railway infrastructure for the DFC. The dedicated freight corridors entails construction of railway tracks capable of handling 25 tone axle load initially and 32.5 tone axle load eventually with provisions for longer trains and double stacking of containers. Upgraded technology for transportation, preparedness for increase in productivity and minimization of unit transport costs remained the guiding principles for formulating this ambitious project of Indian Railways which will be transforming the entire transport infrastructure of India. Various operating system, motive power, signaling and work processing conform of this broad objective of infrastructure advancement. The relationship between MOR and DFCCIL will be governed by a concession agreement and most of the traffic using the lines will be from/to points on IR's larger network.
- 1.2** Over the last decade IR has adopted various measures to improve the operational and commercial performance of its rail freight operations. These include an increase in the permissible axle-loading for major commodities; improvement in wagon utilization by improving wagon turn-round times together with incentives to customers to consign full rakes of wagons and to avoid detention of wagons; rationalization of train examination procedures to reduce service delays; better tracking and management of wagons; a revised and simplified tariff system better reflecting 'pricing to market' of bulk commodities; and a gradual rationalization of staff functions and numbers which, together with traffic growth, has allowed labour productivity to double over a decade.
- 1.3** The International Heavy Haul Association, IHHA, defines a heavy haul railway as one that meets at least two of the following criteria (International Heavy Haul Association, 1998).
- A. Regular operation of trains of at least 5000 tonnes.



- B. Hauling at least 20 million tonnes per year over a line haul segment comprising at least 150km in length.
- C. Regular operation of equipment with an axle loading of 25 tonnes or more.

IR is a member of International Heavy-haul Association (IHHA), and can leverage that membership to transfer knowledge and experience from other countries involved in heavy haul operations. Since IR and the upcoming DFCCIL infrastructure establish a position, that recognizes and builds on the fundamental competitive advantages of the rail mode, the development and research work for Heavy haul is extremely necessary for the way ahead. The strategy for heavy haul operations should include cost effective solutions, improvement in services and ensure enhancement of productivity of the infrastructure. To adopt proven international technologies and approaches for such heavy haul systems for a dedicated freight corridors and its feeder routes and to translate the Indian Railways Policy Statement for long term development as enunciated in “ Vision 2020 of IR “stressing the need to reinvent freight services so as to start reversing model share in favour of railways, further steps are needed to evaluate the available road maps ahead, narrowing the choices of technologies and systems, suiting the regional requirements for each freight sector.

1.4 The Heavy Haul Research Development & Application (HHRD&A) Program shall be oriented to develop system parameters for heavy-haul freight systems suitable for India’s markets and circumstances, and provide individual specifications for key asset components (infrastructure, motive power, wagons and maintenance equipment) of technologies in the following areas:

- **Infrastructure:** Track standards and design; grade and curves; rail specifications and fastenings; switches; power requirements and catenary; bridges; loading gauge (e.g. for double-stack); track inspections; welding methods; rail grinding; maintenance regimes etc.
- **Rolling-stock:** Train mass and capability of progressive increase: axle-loads; motive power; wagon capacity and design; draw-gear; high performance braking systems;; distributed motive power, hot box detectors, hanging part detectors; wheel testing and management, rolling-stock maintenance regimes, etc.
- **Power supply and energy savings:** Power supply system if electrified with provision of increasing capacity to support heavier trains and increase in throughput; energy efficiency and carbon footprint; full fuel cycle analysis of the power supply to reduce reliance on fossil fuels; technology assessments for energy efficiency of freight operations; methodologies to assess and certify of carbon savings.



- **Freight traffic operations:** Train-load and train-lengths and infrastructure consequences (e.g. loop lengths, marshalling yards); loading gauge (for double-stack); Signalling and communication systems, train dispatch system; operating and maximum speed of loaded and empty trains: train protection with guards; driving methods; special operating rules and regulations; MIS, identification of routes requiring capacity augmentation in planned manner; maintenance systems for track, wagons and locomotives that ensure very high levels of reliability as well as availability.
- **Terminal operations:** Loading and unloading systems to reduce terminal delays and minimize wagon turn round time; required development parameters; equipment needs; Stations and yards, gathering of loaded wagons and formation of trains; modification of existing terminals; etc.

1.5 To address all the key issues involved in India's adopting heavy-haul in a comprehensive and integrated manner, including both existing IR routes and DFC routes (currently planned and all possible future expansions), the IRB has formed a multi-divisional committee (hereinafter referred to as the Heavy-Haul Committee or HHC) including DFCCIL and IR officers, convened by the EDPP and under the Chairmanship of the Adviser (Infrastructure). The development of commercial and marketing strategies for heavy-haul rail will be within the oversight of and steered by the HHC, while DFCCIL will be responsible for procurement and administration of consultants to assist in this task, according to Terms of Reference contained herein.

1.6. This TOR is for a suitable technically and managerially qualified Consultant to help shape a long-term research and development program for heavy-haul freight in India by preparing a blue print to set up a heavy haul Institute to meet objective of HHRD&A program. The Program must take account of railway commercial and marketing imperatives so as to ensure that the R&D program is rooted in the real application needs and priorities of India's industries and freight shippers.

2. OBJECTIVES OF THE ASSIGNMENT:

The overall objective of the HHRD&A Program will be to increase the technical capacity of India's railways to implement heavy-haul freight initiatives that will improve the safety, transport capacity, quality, competitiveness and share of India's rail freight transport services and to prepare concrete proposals of an effective and cost-efficient heavy-haul freight Research, and capacity Development Program including plans for establishment in India of a world class Heavy-haul Research Institute (HHRI). This should include detailed program for development and research capabilities identifying the major areas of the heavy haul Cost drivers viz productivity enhancements through increased axle loads, reduced wagon requirement, higher pay load to tare weight ratio, , energy saving technologies, reduced human resource requirement & desired skill enhancements.



- 2.1.: To achieve the above objective, the selected Consulting team will, in close consultation with DFCCIL, prepare a programme for setting up of a world class Heavy Haul Research Institute and capacity building in heavy haul technologies by borrowing through international experience.

3. **SCOPE OF WORK** :

- 3.1 To meet the needs of IRB and DFCCIL, the consultant will carry out assessment of existing technical capacities in Indian railways and DFCCIL, especially with respect to heavy haul railways, capture international technical expertise and institutions worldwide in heavy haul railways and prepare a programme for developing similar capacity in India including for heavy haul institute, training and skill enhancement and other related infrastructure. The consultant will also prepare the required institutional arrangement, implementation schedule and broad cost estimate.

The potential activities that may be included in the HHRD&A Program shall be classified as follows:

- **Implementation Plan for a National Railway Heavy-Haul Institute:** A cost-effective proposal and specific implementation plan for a world class Heavy-Haul Research Institute in India, which will be a pioneer institute in research and development related to heavy-haul and will support India's indigenous research capacity.
 - **Training:** Programs for Indian Railway/DFCCIL staff to be involved in heavy-haul train operation and Research.
 - **Twinning activities:** Establishment long-term learning and supporting relationships with other heavy-haul railways or railway research institutions.
 - **Dissemination activities:** Plans for HHRD&A Program website, technical reports, stakeholder consultations, workshops and seminars, including exposures to international peer review.
- 3.2 To develop the HHRD&A Program , the Consultant shall:
- i. Prepare a document that will articulate the specific objectives of an HHRD&A program; present experience of other international heavy-haul railways and list down their key features, strengths and weaknesses and relevance for Indian Railways/DFCCIL. To this end he will work closely with DFCCIL and through DFCCIL with Heavy Haul Committee (HHC) to familiarize themselves with existing IR infrastructure, operation and system of working.
 - ii. Prepare a detailed and cost-effective implementation plan for a world class heavy-haul Research Institute (HHRI) to conduct research and development to support



heavy-haul railway system both in maintenance and operation. The Consultant shall prepare a Concept and Implementation Plan on the setting up of the HHRI in accordance with best international practice which shall include, inter alia, strategic vision, mission and objectives of the Institute, governance, location(s) including possible location within or co-location with an existing institution, possible partnering or twinning arrangements with an international institute(s), organization and staffing structure, affiliations, scope of R&D activities, defining relationships and interfaces with stakeholders like Ministry of Railways, RDSO, industry, other national and international research bodies etc, human resources policies, financing model for long term sustenance, facilities and costs, implementation schedule, milestones for decisions and actions etc.

- iii. For each activity and sub-activity as mentioned in 3.1 to prepare a task scoping and appropriate terms of reference for technical resolution by experts; where the specification requires employment of external professional services, draft the terms of reference in a form suitable for bidding according to World Bank Procurement Policies and Rules.
- iv. Similarly, for each individual activity and the total HHRD&A Program prepare cost estimates and funding options thereof.
- v. Prepare and submit a draft Proposed HHRD&A Program Report setting out the recommended and fully-documented HHRD&A Program, containing a detailed specification of activities within modules, and their deliverables, a Program time/workflow diagram, critical path identification, detailed budgets for each module and activity, (allowing for contingencies and allocations for activities still to be defined).
- vi. Prepare as an Annex to the HHRD&A Program, a Procurement Plan which provides information on proposed means of procurement of relevant parts of the Plan drawn up in accordance with World Bank Procurement Policies and Rules.

Each of the items of TOR will require submission of a report covering the scope of work defined in the TOR.



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