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Monsoon Oriented Seasonal Freight Density Operation of Railways and Rolling Motor Way

S. Ramamoorthi

Abstract: ***In the world, railway transport system only utilizes electricity with high efficiency for running the trains and carrying heavy loads through electrified traction as when compared to other transport systems. Since if it possible to run the road vehicles under electric power four to five times of electric energy will be needed which consumed by railway transport system for carrying the same load. On the other hand, million numbers of batteries are needed to operate the road transport, which catches high cost and also create environmental pollution. In this context, Green energy is in the form of electricity and generated through solar photo voltaic cells and wind mills is considered as an alternative resource for operation of transport system. Also, wind mill energy can be got in abundance during monsoon season of each country and it is heaviest energy in Giga watts among all other non-conventional energy sources. So, expansion of electrified traction of railways in all possible routes of each country can be done by installing more wind mills and photo voltaic cell panels. This process will help the railway to get maximum demand of electricity without any harm to environment during monsoon season. Loaded lorries and trucks for long journey may be carried with railway wagon called as "Rolling Motor way". Then by increasing traffic density of freight movement during availability of wind and hydro electric power of monsoon period of each country called as Monsoon oriented seasonal freight density operation which is the new role of railways. Though existing track of railways is enough for the movement of Rolling Motor way, It will be better separate corridor of electrified traction for freight movement. Since in road transport system goods traffic of lorries and truck uses larger amount of diesel than buses. The process of monsoon oriented seasonal freight density operation will regulate the role of railways through which global warming can be reduced and fossil fuels can be saved. This will lead to control the prices of essential commodities.***

1. Introduction

In the world, the tremendous increase in global warming is a big threat to the future generation. This can be reduced by many ways viz., control on the emission of carbon dioxide in coal based electric power generating station, growing of forest and trees, running of electric cars and electric buses on roads, utilizing white LED bulbs and increasing non-conventional energy sources through wind mills and solar photo voltaic cells. However, these ways may help us to reduce the global warming only to some extent. Therefore, there is a need to identify further ways to control or reduce the global warming. Regarding this, research reports indicated that one of the ways is to increase non-conventional energy as many times in accordance with the existing position and utilize it in possible ways. In this context, the possible way of utilizing this produced non-conventional energy economically is called as Monsoon Oriented Seasonal Freight Density Operation (MOSFDO). Research studies indicated that the effective utilization of renewal energy viz., hydro power and wind power through MOSFDO will also save fossil fuels and control the global warming. Periodically available energy from newly installed wind mills and solar photo voltaic cells cannot be stored but can be utilized through moving railway transport in electrified traction, which may prohibit the carbon dioxide emission. This article presents the details of railway transport system in India, description of MOSFDO, use of railways as a big tool to control the global warming and how it will absorb the enormous amount of green energy. The amount earning through tax on petroleum products can get thorough introducing of **"Rolling Motor way**" in railways.

Railways Transport System in India

During Paris Summit on climate change held on 5th December 2015, the leaders of the world have taken important decisions to control the global warming. They agreed to control the carbon emission from industries and coal power stations. But, daily carbon emission is not only coming from industries but also the existing enormous number of daily running vehicles through diesel and petrol along road transport system also emitting carbon dioxide beyond the dangerous limit.. This is increasing day by day due to increasing population and requirements. Since global warming will increase the frequency of Elnino effect which causes the flood and drought. These running vehicles on Road using petroleum products not only pose the threat of increasing carbon emission. It is also sucking millions of gallons of petroleum products beyond the limit and evacuates the petroleum reserves rapidly which will be a need for future generation.

Recently, there will be a planning to install offshore windmill system with development and innovations which will give tremendous amount of electricity. Also, the department of renewable energy source planning to increase the wind mill energy more than 100 Giga watts. From these increasing green energy, railway only can tap up it with minimum loss. Railways also utilize low amount of fuels to run the vehicles due to low frictional loss as when compared to road transport, which is as follows.

Rail transport is an energy efficient[1] but also capital intensive that means of mechanized land transport. The tracks provide smooth and hard surfaces on which the wheels of the train can roll with a minimum of friction. Moving a vehicle on and/or through a medium (land, sea, or air) requires overcoming resistance to motion. A land vehicle's total resistance (in pounds or Newton) is a quadratic function of the vehicle's speed and given by:

$$R = A+BV+CV^2$$

where, R is total resistance, A is initial constant resistance, B is velocity-related constant, C is function of shape, frontal area, and sides of vehicle, and Vis velocity (km/hr).

Essentially, resistance differs between vehicle's contact point and surface of roadway. Metal wheels on metal rails have a

significant advantage of overcoming resistance[2] compared to rubber-tired wheels on any road surface, which is presented in Table 1

Table 1

	For railway	Truck
Friction	0.001g at 10 miles per hour (16 km/h) and 0.024g at 60 miles per hour (97 km/h) truck	0.009g at 10 miles per hour (16 km/h) and 0.090 at 60 miles per hour (97 km/h)).
Utility	long-haul train – can carry 500,000 tmi/day (730,000 tkm/day)]	fully utility truck- Can carry 20,000 tmi/day (29,000 tkm/day)

From the reports, it is noted that the Indian railway transport system only absorbs[3] less than 2% of the total generation of electricity for its electrified traction is about 42% of the total route. It is a very small fraction of total electric energy generated in India. Also, the wind mill and other renewable energy sources contribute 20% of the total generation. So, electricity produced by wind mills and other non conventional energy is enough to run the electric trains. This indicated that a huge amount of petroleum products can be saved and the air pollution will be controlled with little input of electric energy. The government has now taken interest to run the road vehicles through electricity as electric car, ebike, etc to control the global warming and air pollution. The reports indicated that the electrified traction in all possible routes give five to twenty times more benefit than these electric vehicles. The reports also suggested that there will be provided separate route of track for freight movement. Though at present, railways use electricity for running of vehicles from coal powered stations, in future it may be shifted to electricity from non conventional energy sources. Also, there will be a possibility, running AC loco engine on down gradient of electrified traction areas acts as power generator in reverse and produce the electricity and give return to the power grid.

In view of the above, we can say that the railway transport has more energy efficiency as when compared to road transport and can extract less fuel of non conventional energy. Green energy can be produced enormous amount through wind mills and solar energy. It can be taped up in proper way to save the fossil fuels and prevent the carbon emission through railway transport system. This showed that railway transport system only can tap up this green energy in proper way through goods-passenger train management system.

Description of MOSFDO System

In India, windmill energy is normally obtained above peak value during the southwest monsoon period, from May 15th to October end of every year. During this period, the electricity generated by wind mills will be more and also received by the power grid above the demand value which in turn that the excess energy cannot be stored. Hence, many wind mills were found stopped during that time. Also, hydro electric power will be obtained more due to overflow of dams during the monsoon period. If we utilize this energy for the use of railways in proper way, we can save energy. Just like seasonal passenger express trains, if running of more number of seasonal special goods trains in the electrified track during this period of southwest monsoon, the storable materials like food grains, fertilizers, cement and steel materials can be transported more from one end to another end of the country where it will be needed and stored. All the loaded lorry vehicles which going to long distance also can be carried through empty container goods train during this period. This will lead to save the diesel and cut the carbon emission. Revenue of railway will be increased to hike due to this activity. The best evidence for loaded lorry carrying railway wagons is trucks on trains, i.e. '**Rolling Motorway'**[4], which is described in the ensuing section.

Overview of Rolling Motorway[4]

The rolling highway is a special form of combined transport in which full trucks are transported on special rail cars, generally accompanied by the truck drivers, who travel in a passenger car. Trains are loaded horizontally only, in other words, without a crane. The truck manoeuvres onto the train on its own via a ramp. The rail cars, called low-loader cars, have especially small wheels and a low loading surface. Generally, topographic barriers also play a major role for this special type of transport and the majority of these rolling highway transports are known as transalpine connections, which are presented in Figure 1.

In the early 1970s, a European wagon manufacturer created a revolutionary new freight wagon for combined road-rail transport, say 'rolling motorway' wagon. The principle was similar to that of combined road-rail transport in the USA in which each wagon had a loading surface that was low and completely flat so that the entire loading area of the rake of wagons could be driven on. The first Heavy Goods Vehicle (HGV) would drive up an end-loading ramp at the rear of the train and continue over the coupled wagons until it had reached the head of the train, where it would be maintained in place (generally with its own handbrake), and the driver would disembark. In the meantime, the next HGV would board the train, until the entire train was laden. A normal European rolling motorway train can carry 20 to 27 trailer trains or semi-trailer trucks and can be loaded within 30 minutes. Figure 2 presents the diagrammatic representation of the transport system, i.e., Piggy-Back transport to an **Intermodal transport system** implemented by Europe during the past 40 years.

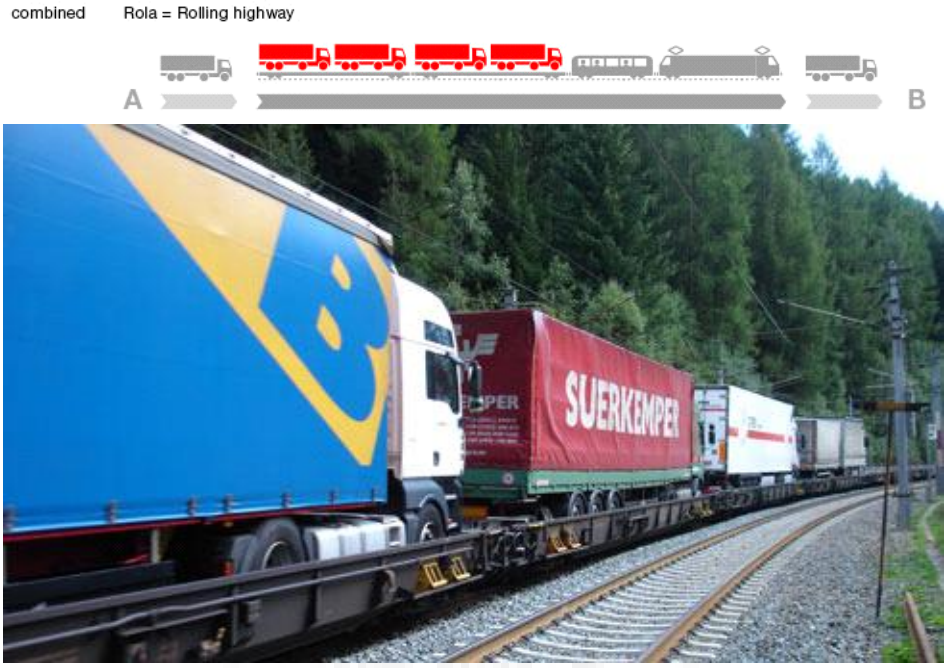

Figure 1: Rolling Road (Source: SBB Cargo International)

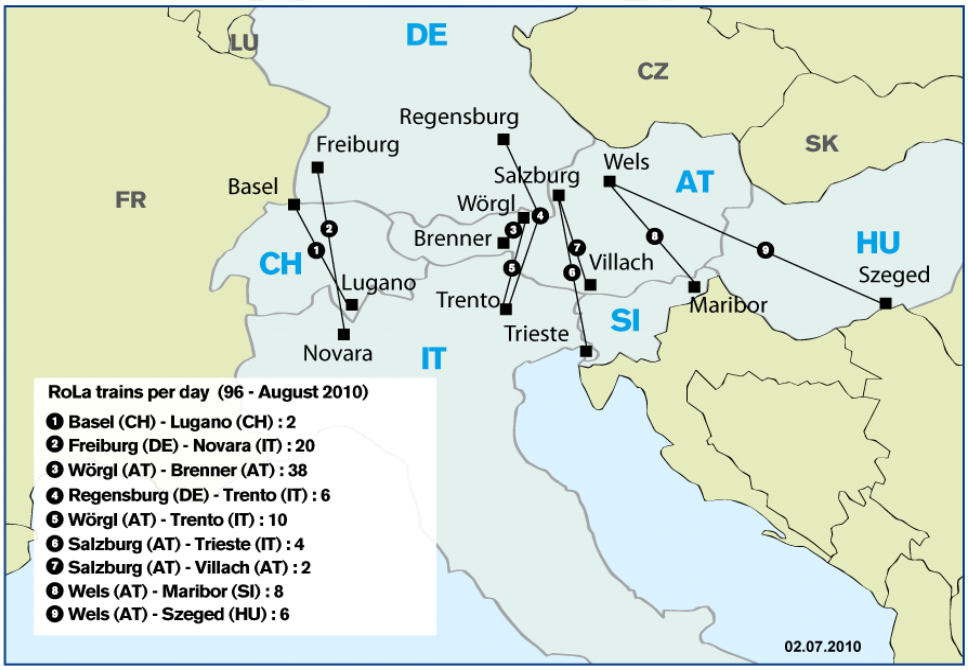

Figure 2: Piggy-Back transport to an intermodal transport system of Europe (Source: Christoph Seidelmann, 2010)

Evaluation

The rolling highway saves fuel, tolls and cuts time by avoiding traffic jams, and drivers can comply with legally required rest times without interrupting transport. A major demand for this type of service appears when road costs (fuel, tolls) increase significantly. For example, a toll equivalent for the passing of a truck through the Alps inclines the balance in favour of the rolling motorway in Switzerland and Austria. In the case of the rolling motorway service, the travel time is easier to estimate and known by user, but it depends, however, on different aspects (speed, load, type of rails, locomotive), time departure factors and bottlenecks. According to the UIRR, the speed average is 4S km/h (2009) with a 70% punctuality, while for road transport, the travel time varies a lot depending on traffic congestions, accidents etc. For example, for the Trieste Fernetti-Chop relation it is estimated that the rolling motorway would take 22 hours including loading and unloading, while, according to truck drivers, it takes on average 26 hours by road.

In India at Konkan railway, lorries are transported through railway wagon, say 'RORO'. For working Rolling motor way in india, all routes of Indian railway would be electrified traction instead of the current position of 42%. Also installation of more wind mills and photo voltaic cell farm will be required. for this separate path of railway with fully electrified Due to this activity the owners of wind mills also will get more benefit. More employment opportunities will be created directly and indirectly. Since in the world, electrified railway system only has been giving more employment compared to other systems. Figure 3 presents

the details of hydroelectric installed capacity in various countries.

In this context, each country should arrange separate corridor of electrified track for freight movement and utilizing it for carrying lorries and trucks and other essential commodities. There should be expanding the existing railway route in possible ways. Also, there should be increase in the number of wind mills and solar photo voltaic farm so much. Then the grid path to extract this electric power from wind mills and solar energy should be used for monsoon season oriented goods trains. Though there is an initial cost to install these arrangements for inter linking of wind mills and electrified traction, the future benefits of it will balance this cost. In this way, railway may be big consumer for wind mill energy and will get cheapest fuel for its running. Hence, profit of railway will be increased. The government of all countries now take interest to running the road vehicles through electricity via electric car ebike etc to control the global warming and air pollution. So, it should also take interest in electrified traction in all possible routes which will give five to twenty times more benefit than these electric vehicles. Also, there will be provided separate route of track for freight movement.

2. Conclusion

So, investing more money in railways and non-conventional energy will reduce the global warming and decrease the foreign exchange currency through saving of petroleum products. Since, the currency value of Indian Rupee has been falls down against the Dollar day by day. Hence, through this saved foreign exchange currency we can stabilize the economic growth and sustained growth of economy.

Finally, if the Government of each country hesitate to invest money in Railways and production of non-conventional energy sources, the majority amount of its yearly budget will go to rehabilitation work for flood and drought and also balancing the foreign exchange currency. It will lead to threatening for food security and energy security of each country. Also, it will cause for increasing global warming. The government of each country can expect of the earning in the way of petroleum products can get through indroducing **"Rolling Motor way**". So, all non-developing countries should emphasis the World Bank or developed countries to release more fund to increase the electrified railway infrastructure and renewable energy sources to stop the increasing activity of evacuating fossil fuels and global warming.

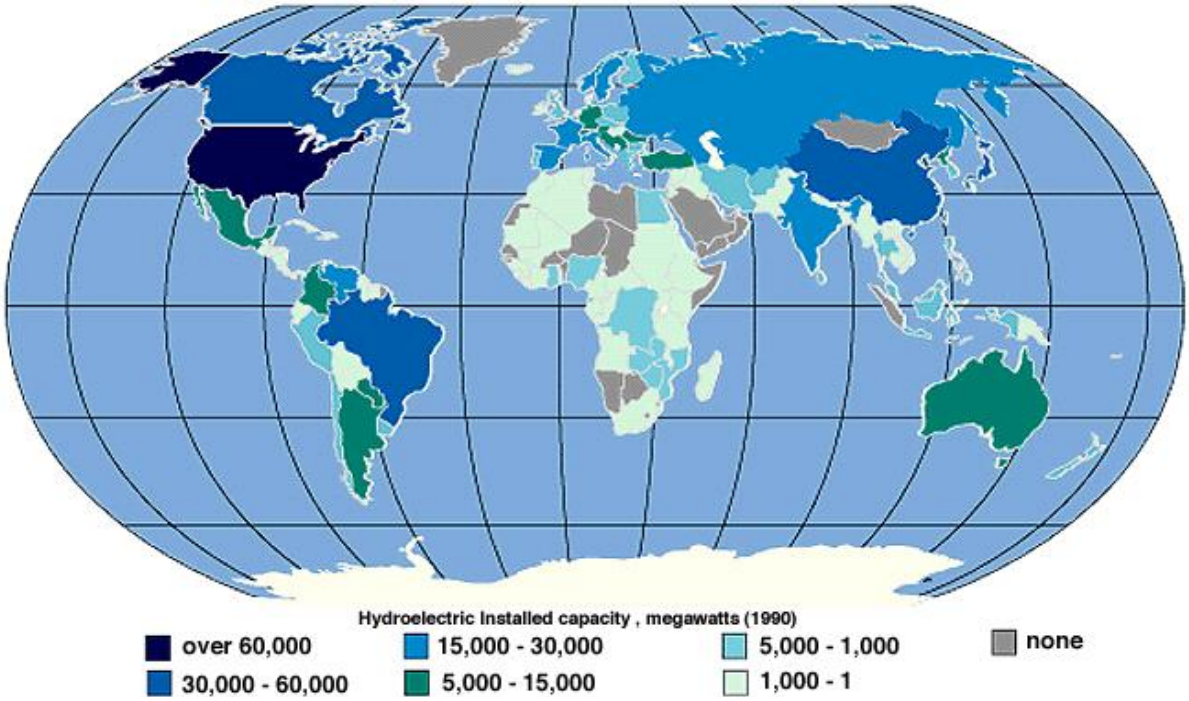

Figure 3: Hydroelectric installed capacity in various countries

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[3] Energy scenario home, Railways system for analysis of vidyut Energy 2013-2014 as
[4] For its traction and non-traction applications and paid about Rs.10,000 crore towards electricity Indian Railways (IR) consumed over 17.5 billion units during 2013-14 corresponding to about 4000 MW, which constituted about 1.8% of the total country's power generation charges
[5] Christoph Seidelmann (2010), 40 years combined transport road-rail in Europe: From Piggy-Back transport to an intermodal transport system, International Union of combined Road-Rail transport companies (IURR) .