



Institution of Railway  
Electrical Engineers



Ministry of Railway  
Government of India



सत्यमेव जयते  
NITI Aayog



# E-Mobility in Indian Railways

4TH SEPTEMBER' 2018

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## E-Mobility in Indian Railways

Indian Railways (IR), is world's fourth largest railway network and is spread over 67,368 route km. It is connected with 8,495 stations and is serving people of this nation since 1853. Indian Railways, along with the national highways and ports, is the backbone of India's transport infrastructure. Currently, more than 35% of the total freight traffic (tonne-kilometers) of the country moves on rail.

Indian Railways being the largest consumer of energy in the country has always been conscious about the way energy is utilized. On date Indian Railways primarily uses electricity and diesel for traction applications. Electric traction hauls 64.50% of freight traffic and 53.70% of passenger traffic of Indian Railways, whereas the energy bill on electric traction is 36% of total traction fuel bill of Indian Railways. Hence, looking at the cost and environmental benefits, emphasis has shifted for electrifying the rail routes on a large scale on Indian Railways. By the year 2021-22, Indian Railways has planned to electrify 64212 Route kilometers of broad gauge network, raising the percentage of electrified tracks from present 44.85% to almost covering 100% of the major route requirement. During the year 2017-18 alone, 4087 RKM (11.19 RKM per day) has been commissioned against target of 4000 RKM.

As a part of the International Paris Agreement on climate change, 2015, India has pledged a reduction of 33-35% in emission intensity by 2030 from 2005 level. India has also set a target for transition to non-fossil fuel based energy with 40% of cumulative electricity generation capacity through renewable energy by 2030. One key sector of the Indian economy that could set a strategic example by turning green and meeting India's 2030 targets is the rail transport system.

### Objective of the Seminar

IR is proud to host the seminar on E-Mobility in Indian Railways on 4th September 2018 to bring project developers and other stakeholders on a common platform for making Indian Railways an efficient, preferred and Greener mode of transport. It will help in identifying pathways for attaining the goals under different scenarios. The conference is planned to advocate and disseminate the economical and environmental benefits of sustainable growth, optimum electrification of IR and progressively change in energy mix. The seminar will consist of 10 presentations spread over 3 sessions namely :

- a) Energy & Storage systems
- b) Railway Electrification
- c) Emerging technologies for Rolling stock



Faster & Safer

Greener & Future

Efficient & Reliable

Economical & Sustainable

COST EFFECTIVE TRANSPORT

Reduced imported  
oil dependence

Better  
infrastructure

"The Indian Railways  
will become  
the Growth Engine  
of the  
Nation's Vikas Yatra"

— Shri Narendra Modi  
Hon'ble Prime Minister

### Improved Mobility

Increased  
Line  
Capacity

Passenger  
Satisfaction

Rapid  
Transportation

**ENHANCED  
GROWTH**

Shifting from Road to Rail

Improved Operating Ratio

Environment friendly

Global leadership in  
decarbonizing

Reduced  
carbon  
footprint

Lower emission

Improving Energy  
security

## Performance and Achievements

4087 RKM (11.19 RKM per day) has been commissioned against target of 4000 RKM during 2017-18.

Routes of 8411 RKM have been commissioned on electric traction during 2014-18 against 3038 RKM commissioned during 2009-14, thereby increase of 177%.

59.6 MW Solar and 36.5 MW wind plants have been commissioned over IR.

All Railway stations have been provided with 100% LED (30th March 2018).

Indian Railways is a Deemed Licensee under third proviso to Section 14 of the Electricity Act 2003 and it started drawing power from November 2015 through this mode. With extensive efforts of Indian Railways, currently about 1100 MW power is flowing under open access in states (M.P., Maharashtra, Gujarat, Jharkhand & Rajasthan, Haryana, Karnataka, Delhi, Bihar, UP) & DVC area against total requirement of about 2000 MW.

Indian Railways is doing much better than what was targeted in Mission 41K and till May 2018, it saved about ₹7504 Cr. This is 15% more than the proportionate target of ₹6496 Cr, as envisaged in "Mission 41K."

80 trains have been converted to HOG system. There is saving to the tune of ₹136 Crore per annum.

Indian Railways has successfully converted 2800 HP Alco diesel locomotive to 5000 HP electric locomotive. Worldwide this is being done for the first time in Rolling Stock Application. Two units in multiple turned out on 31st March 2018 from DLW.

Hon'ble PM of India has dedicated to the nation High efficiency 12000HP WAG12 new generation Locomotives manufactured by ALSTOM from Madhepura electric locomotive factory on 10th April 2018. 800 such locos will be put in service in next 10 years.

In an initiative to meet the target set by Hon'ble PM to reduce diesel consumption, progressively 155 pair of trains have been shifted from diesel to electric traction which has led to a saving of about ₹286 Cr. annually.

Highest number of Electric Loco production of 377 during 2017-18 (CLW-350; DLW-25; DMW-2).

Up-gradation of speed potential of WAP5 locomotive from 160kmph to 200kmph.

Distributed Power Wireless Control System (DPWCS) is being used for heavy haul train operations.

## Strategies to Triumph E-Mobility in IR

To achieve ambitious target for electrification, 1735 RKM electrification work have been entrusted to Govt. PSUs IRCON, RITES and PGCIL.

EPC (turnkey) based contracting or large composite item rate contract in package size of 300/500/1000/1500RKM are being awarded.

Emphasis on mechanized execution of OHE construction works.

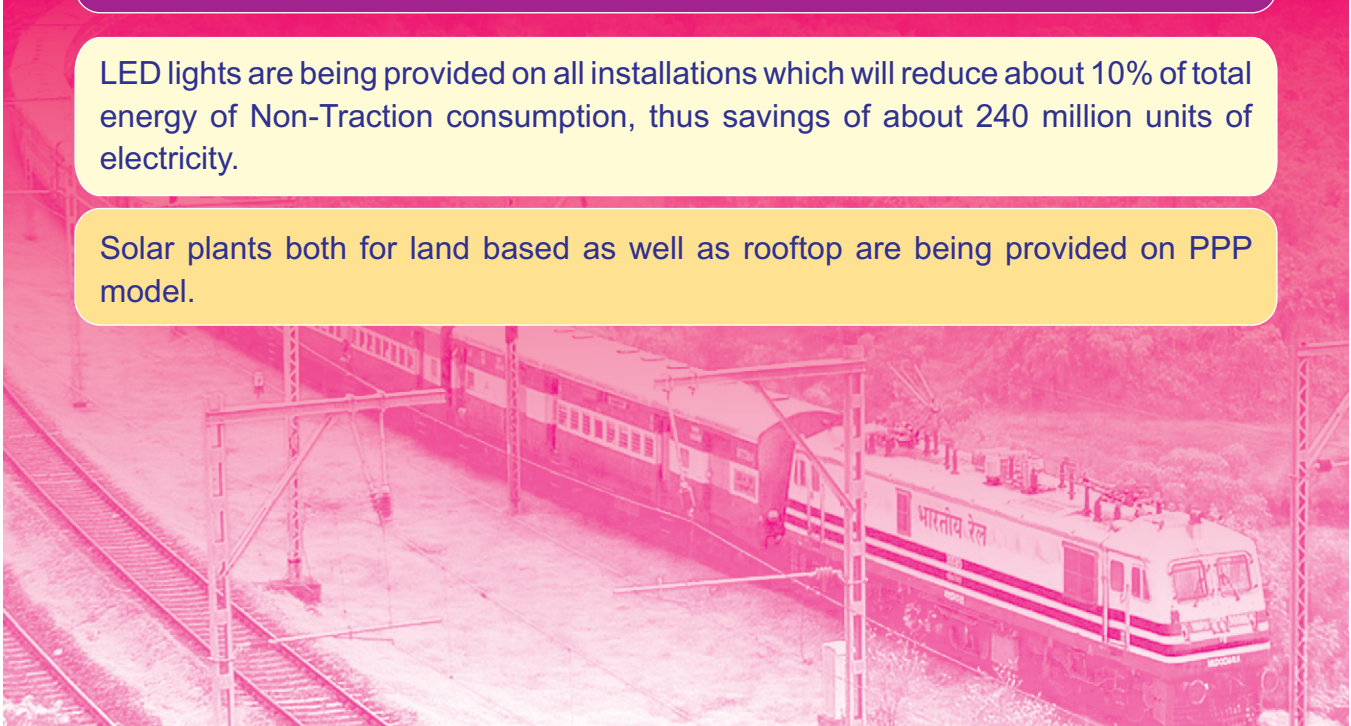
- a. Design for Cylindrical cast in-situ and prefabricated foundation developed for mechanized execution of foundation works.
- b. Anchor bolt type foundation developed in rocky soil to speed up foundation work.

Self-propelled wiring trains will be introduced for faster wiring of catenary & contact wires simultaneously.

1000MW solar power plant & 200MW Wind power plant will be set up by 2020-21. This will save about 1.64 million tonnes of CO<sub>2</sub>.

LED lights are being provided on all installations which will reduce about 10% of total energy of Non-Traction consumption, thus savings of about 240 million units of electricity.

Solar plants both for land based as well as rooftop are being provided on PPP model.



## Strategies to Triumph E-Mobility in IR

Switched over to 100% three phase locomotives with regenerative capability to the tune of 15% since 2016-17.

725 three phase electric locos per annum will be manufactured by Production Units during 2019-20 to 2021-22 to meet increased electric locomotives requirement.

End on generation rakes will be converted to HOG system to save diesel consumption and reduce noise pollution.

Existing 6000 HP locomotives will be converted to 9000 HP locomotives to haul longer trains.

Twin WAP5 loco in push-pull mode are under trial stage. It will result in significant saving in running time of around 112 Minutes between New Delhi - Mumbai.

Battery cum electric operated 1400-1600 HP, 25 KV locos for shunting purposes are under development stage.

First ever initiative taken worldwide to convert HHP Diesel locomotive (WDG4) to Electric locomotive (WAG11).

Regenerative braking feature will be provided in tap changer locomotives (WAG7).

Existing WAP5 locomotive will be up-graded from 5400HP to 6000HP.



## Programme Outline

0945 - 1115 hrs : **Inaugural Session**

1115-1140 hrs : Tea Break

1140 - 1300 hrs : **Technical Session I : Energy & Storage Systems**

- **Presentation - I** : *New Paradigm in Solar for Railways through Optimum Scheduling* by **Mr. Manu Srivastava**, CMD, RUMS & Principal Secretary, Govt. of Madhya Pradesh
- **Presentation - II** : *Open Access* by **Ms. Shilpa Agrawal**, Joint Chief (Engineering), CERC
- **Presentation - III** : *Power Trading* by **Mr. Deepak Amitabh**, CMD, PTC
- **Presentation - IV** : *Energy Storage systems for Railway Applications* by **Mr. Jaideep Nandi**, M/s Ultralife & **Mr. Dhiraj Chawla**, M/s Delta

1305-1345 hrs : **Technical Session II : Railway Electrification**

- **Presentation - I** : *Railway Electrification* by **Mr. R. K. Pandey**, Tata Projects
- **Presentation - II** : *Mechanized method for Railway Electrification* by **Mr. Sanjeev Kumar**, Customer Director, M/s ALSTOM

1345-1445 hrs : Networking Lunch

1445-1625 hrs : **Technical Session III : Emerging Technologies for Rolling Stock**

- **Presentation - I** : *Push Pull application & Passenger Locomotives* by **Mr. Fu Ying**, M/s CRRC Dalian Co Ltd.
- **Presentation - II** : *Loco Trol & Loco monitoring* by **Mr. Rakesh Jain**, Vice President, GE Transportation
- **Presentation - III** : *EOTT & digital tools for enhancing safety* by **Mr. S. L. Ahuja**, Director, Wabtec
- **Presentation - IV** : *Push Pull arrangement with Electric locomotives on Rajdhani route* by **CMD - Stanhopes** and team of CRRC ZELC

1625-1630 hrs : **Vote of Thanks** by **Shri Shalabh Goel**, ED(EEM), Railway Board

1630-1700 hrs : Tea and End of Programme



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