E-Mobility in Indian Railways : Railway Electrification

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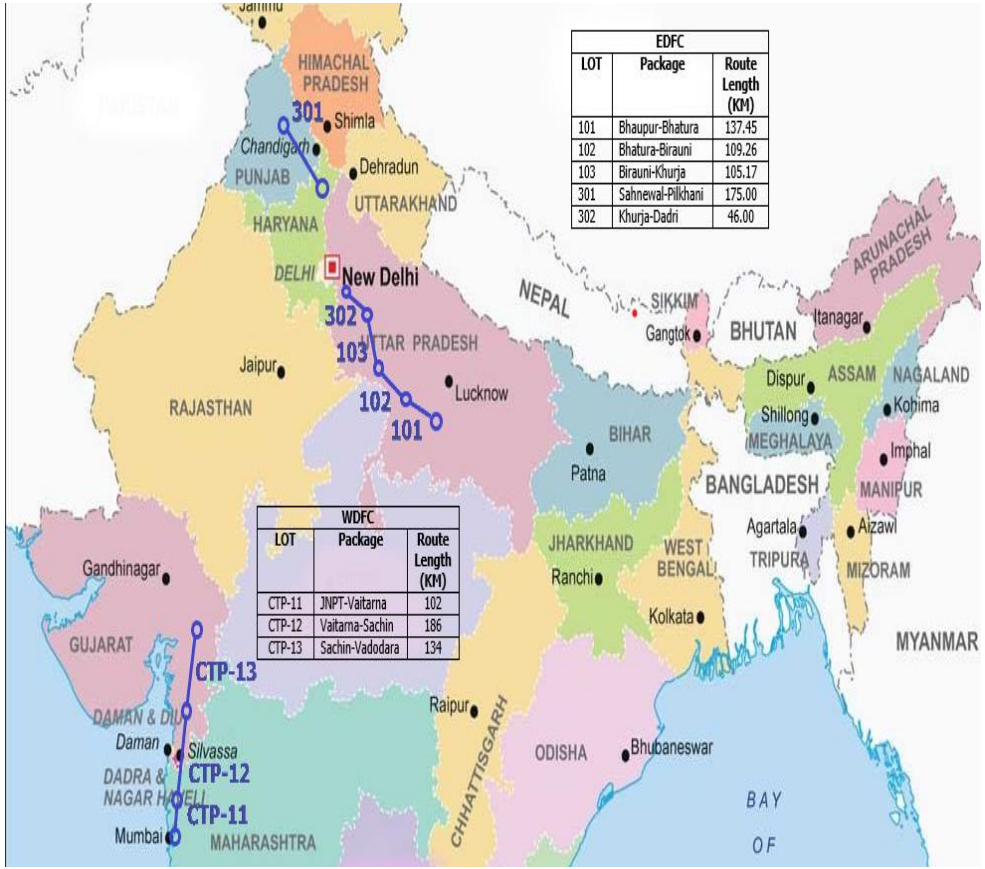
Presentation Outline

- Snapshot of Tata Projects in Railway Business Arena
- Imperatives of Railway Electrification
- Synopsis of Railway Electrification
- Railway Readiness to Deliver Transport Decarbonisation
- Methodology to Bring Differentiation
- Approach to Make Overall Efficient System
- Sustainable Construction Practice
- The Conclusion – Sustaining Innovation & E Factors

Snapshot of Tata Projects in Railway Business Arena



Track Works 2000 TKM for DFCC Projects

S.No.	Client	Project Name	RKM	TKM
1	CORE	Nallapadu - Pagidipalli	285	375
2	RVNL	Jalpaigudi - Bongaigaon	223	413
3	RVNL	Guna - Gwalior	227	236
4	RVNL	Jhansi – Bhimsen	69	90
5	RVNL	Ghatkesar - Maulali, MMTS – 1	14	32
6	RVNL	Tellapur - RC Puram, MMTS-2	22	45
7	RVNL	Medchel - Bollarum - Malkajgiri, MMTS-3	40	89
8	PGCIL	Londa - Parakanhatti	91	110
9	PGCIL	Parakanhattti - Miraj	95	210
10	CIDCO	Navi Mumbai Metro	12	24
		Total	1078	1624

TPL Ongoing Electrification Works

Imperatives of Railway & Its Electrification

Parameters	Transport Mode	Regulating Factors
Energy Efficient	Road	1.2 – 8.0 MJ/TKM
	Rail	0.6 MJ/TKM
Mass Movement	Road	8 Ton/Axle
	Rail	25-32.5 Ton/Axle
Speed	Road	110-120 KMPH
	Rail	<150 KMPH

- Minimization of cost of negative impacts of air transport mode as air pollution that are not paid by users themselves but borne by society at large and being more than 4 times less than road passenger services & more than 6 times less for freight services
- To bring impetus on faster, safer, environment friendly, efficient & reliable mode of transportation
- Global Rail Freight Corriodor to focus on transcontinental corridors
- Environmental & Sustainability leadership of Indian Railway to to meet India's 2030 target of emission intensity reduction

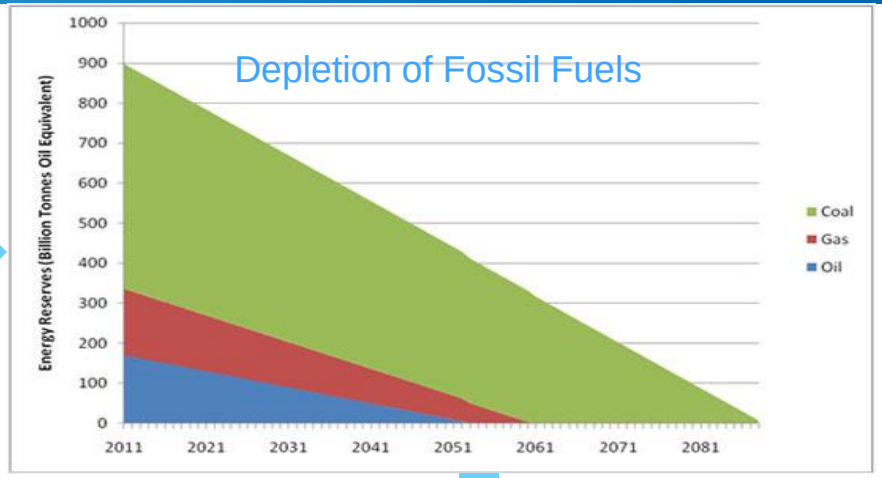
Synopsis of Railway Electrification

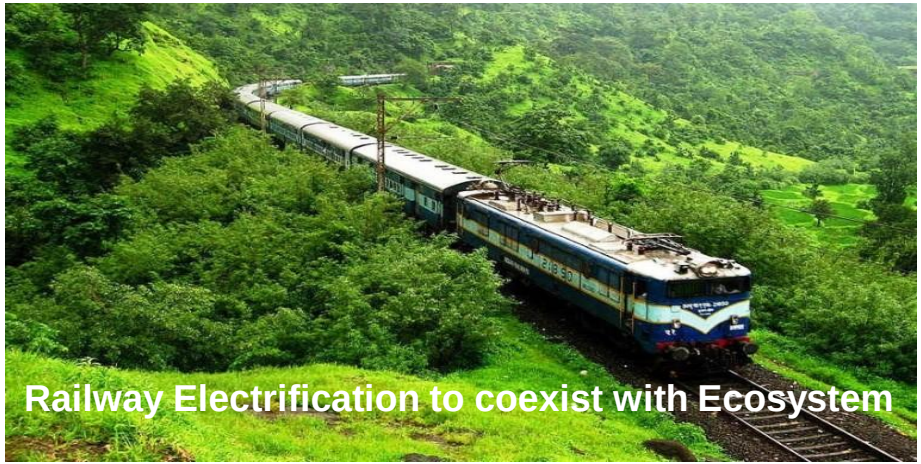
Period	RKM Electrified	Cumulative RKM
Up to VI Five Year Plan	-	6,440
VII Five Year Plan (1985-90)	2,812	9,252
Annual Plans (1990-92)	1,557	10,809
VIII Five Year Plan (1992-97)	2,708	13,517
IX Five Year Plan (1997-2002)	2,484	16,011
X Five Year Plan (2002-07)	1,810	17,821
XI Five Year Plan (2007-12)	4,556	22,377
2012-till date	7,635	30,012

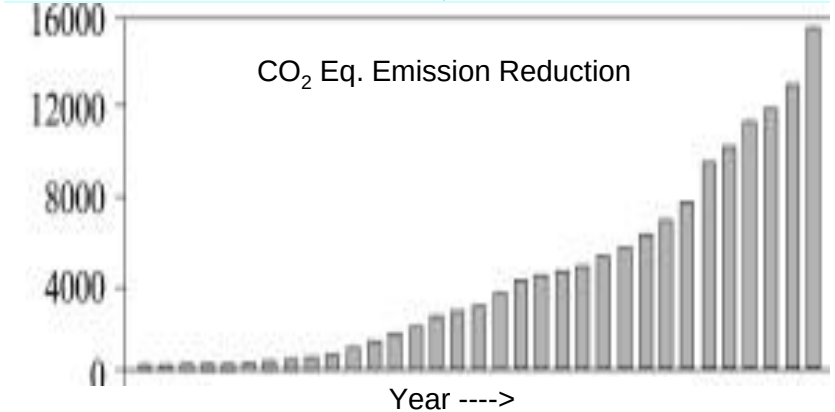
- Spreading over 67,368 route Km with connecting 8,495 stations being the backbone of India's transport
- IR plans to electrify 64,212 RKM by 2021-22, thereby, bringing almost 100% electrification from the current 44.85%
- FY 2017-18 shown the outstanding achievement by commissioning 4087 RKM against planned of 4000 RKM

- Throughput of 11.10 RKM electrification per day in FY 17-18, laid sound base to 100% electric traction by 3 years time
- Paradigm shifting to non fossil fuel that is renewable energy to be extent of 40% of the cumulative one, shall be driver to meet CO_2 emissions reduction of 35% by 2030

Railway Readiness to Deliver Transport Decarbonisation







Methodology to Bring Differentiation

OHE Mast Foundation

Being adopted in Pagadipalli-Nallapadu Project for approachable sites

Deployment in Souther regions Electrification jobs for sites where actual site is a few metres away from RMC.

Methodology to Bring Differentiation

OHE Mast Foundation

Cylindrical cast-in-situ foundation crashes the completion schedule and results in saving of concrete.

In practice for sites exist in high embankment area & used in Janpahad and Krishna River areas.

Methodology to Bring Differentiation

OHE Mast Erection

Traditional on-going practice necessitates usage of BFR wagons for mast erection

Efficient methodology with better productivity with less consumption of resources

Methodology to Bring Differentiation

OHE Wiring

Double Wiring

- Being exercised by RE-Secunderabad
- Maximised Block and Manpower Productivity

Mechanized wiring

Conventional Single Wiring Train

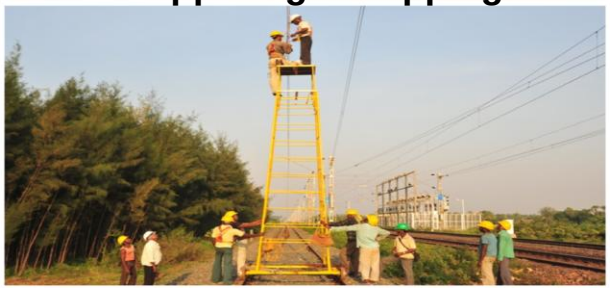
- Two blocks of 1.5 hrs each requires for catenary and contact wire
- Labour remains idle after catenary stringing
- Lesser output

- Wiring Machine All in one process
- More Output
- High Quality of Work
- Lesser Block Requirement
- Reduced Labour Dependency

Methodology to Bring Differentiation

Existing Practice

Droppering & Clipping

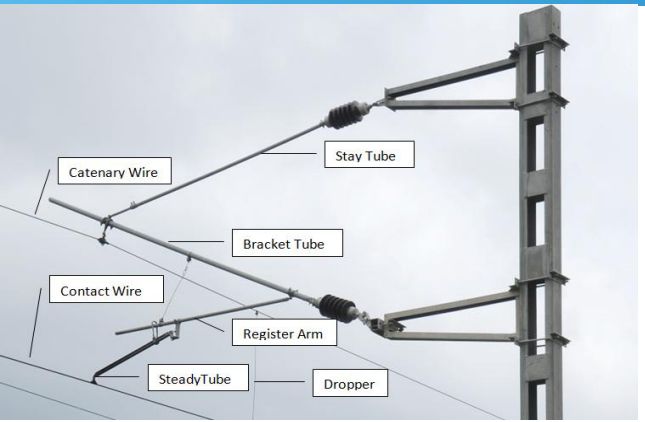


Bracket Adjustment

Post Wiring Activity

Combined Process through a Wiring Train

Approach to Make Overall Efficient System



- Universal cantilever to replace conventional one and over period of time, vendor for same may be developed in India
- Universal cantilever have less components compare to conventional cantilever

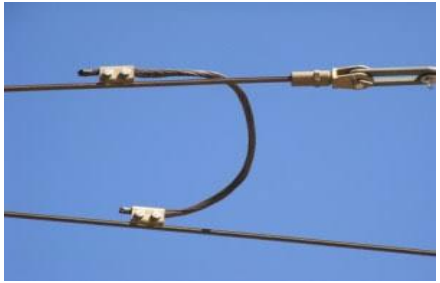
- Universal cantilever are more reliable in terms of quality, precision and efficient
- Concern as faced in DMRC for replacing copper pins with stainless steel can be avoided
- Steady arm should be replaced by bent steady arm to increase speed of railway moments.

Approach to Make Overall Efficient System

Present Practice

Dropper Wire

Jumper Wire



Dropper wires traditionally provide physical support of the contact wire without joining the catenary and contact wires electrically.

Modern systems use current-carrying droppers, which eliminate the need for separate Jumper wires.

Universal Practice

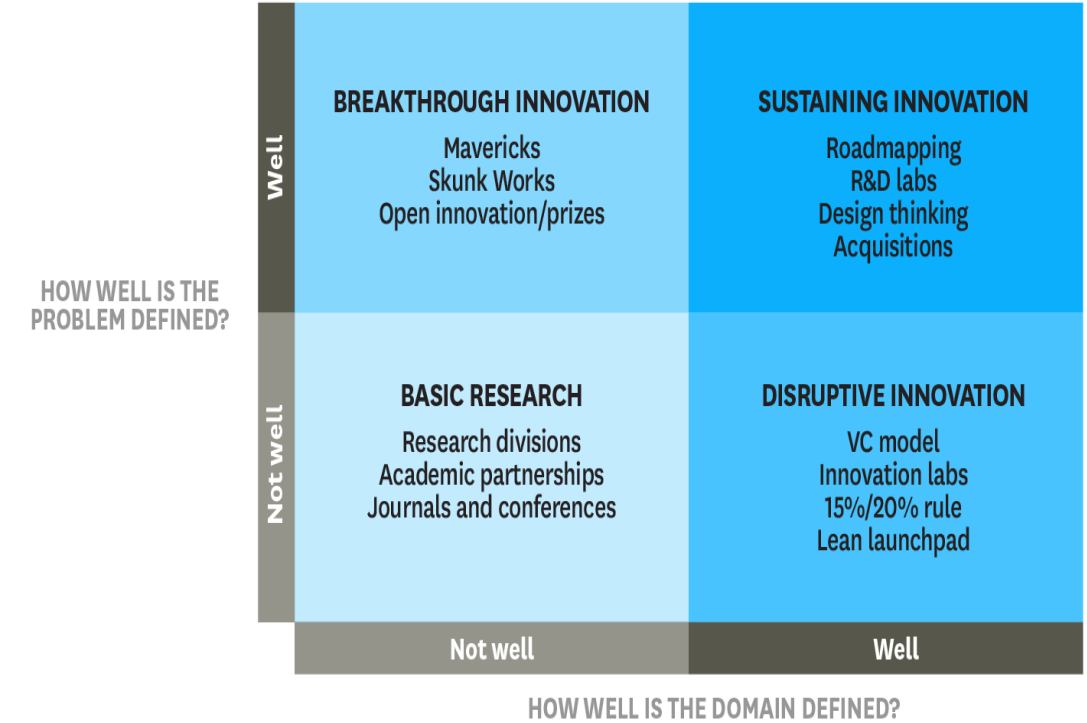
Sustainable Construction Practice

Alternate Material	❖ Usage of GGBS(Ground-granulated blast-furnace slag) in concrete to replace cement content up to 20% (Sands Infinite – Kochi site)
Modular Construction	❖ Reduction in wood requirements with practice of recyclable plastic formwork system , aluminium formwork system (Godrej United) & 80% temporary facility with reusable Fab structure. ❖ Enhance use of pre cast structure to minimize waste of aggregates sources, water sources (by using curing compound)
GHG Emission	❖ Adopt leading technology to reduce impact on nature like **I)** ACFC Panel **II)** More Efficient Equipment **III)** VFD & VRD / Inverter based low Energy consumption Machine **IV)** Solar based LED lights ❖ Carbon Sequestration: Carbon sequestration through Tree Plantation as well as we Driving GREEN THUMB Initiatives
Facilitate Regeneration(Water)	REUSE REDUCE RECYCLE

Health & Safety are the ingredients to create the environment for the sustainability and this drives the SDG 3 “Good Health & Well Being”

The Conclusion

Innovation Isn't About Ideas, But Solving Problems – Exploration, Iteration and Execution



SOURCE GREG SATELL

Innovation Matrix

ELECTRIFICATION to achieve new heights of **EFFICIENCY** by applied **ENGINEERING** and **EMPHASIS** on clean **ENERGY** to reduce **EMISSIONS.**

Taking into account the **EMOTIONS** to ultimately **EXCEL** with **ENDURING EFFORTS** of **EVERYONE** in an optimised **ECONOMY** to safeguard planet **EARTH**.

Thank You