URBAN MOBILITY INTERNATIONAL AND INDIAN ACTIVITIES

METRO NEWSLETTERS
88 - 93; December 2019

gathered by Dr. F. A. Wingler

METRO NEWSLETTERS
on Technologies for
“URBAN MOBILITY **AS A SERVICE**”

PUBLIC MULTIMODAL URBAN, SUBURBAN AND INTERURBAN PASSENGER TRANSIT TECHNOLOGIES WITH METRO-BUS, BUS RAPID TRANSIT, LIGHT-RAIL, TRAM-TRAIN, METRO-RAIL, METRO-TRAIN, REGIONAL RAPID TRANSIT, COMMUTER-RAIL, ROPE-WAY/TRAIN, MAGLEV AND HOVERCRAFT TRANSIT/PEOPLE MOVER, WATER-METRO, AUTONOMOUS PEOPLE-MOVER

MOBILITY SOLUTIONS, PUBLIC TRANSPORT TECHNOLOGIES AND ECONOMIC DEVELOPMENTS IN MODERN URBAN/MEGAPOLIS ENVIROMENT

METRO Newsletter by Dr. F.A. Wingler
METRO 88, September 2019

“The perfect** Tamping **Machine for India`s Metros”: Manufactured in India Plasser & Theurer Track Tamping Machine for Maha Metro, Nagpur, Pict. by Plasser & Theurer India

PART I: INDIAN ACTIVITIES AND INITIATIVES FOR URBAN MOBILITY AS A SERVICE

Driving Digital Transformation in India; India

Siemens India, Kalwa, Thane

For over 40 years, the low-voltage switchgear factory at Kalwa has been manufacturing industrial Control Products. The factory has kept pace with changes in customer demands while maintaining high levels of quality and reliability. With the advent of digitalization, the factory has transformed into a globally-benchmarked showcase digital factory capable of producing over 180 variants at the rate of one product every 9 seconds.

The SIRIUS range of switchgear products that will be manufactured here requires a high degree of precision and quality at global standards that can be achieved only through digitalization. The plant can now manufacture over 5 million devices annually. Products at the plant communicate with machines and all processes are optimized for IT control, resulting in a minimal failure rate. The production methods deployed at the plant are expected to be a standard for small and medium-sized manufacturing units in India, achieving a visionary model for the Future of Manufacturing: end-to-end digitalization where the real and virtual worlds merge in “Digital Factory”.

Siemens, Kalwa, Thane

Re-engineering Observation and Measurement, O&M, Wing of Metro Rail with Technology; India

By Ranjesh Kumar; Metro Rail News, September 2919

Can Metro Rail operations catch up with Technological advancements? If you are operations personnel working in Metro Rail Industry, I challenge you to ask this question to yourself.

What's your answer, yes or no? My answer is yes, what's yours?

In this article, I am going to share the ways, which I believe can be used to re-engineer the O&M wing of Metro Rail. Metro Rail is one of the fastest-growing industries in this country. Several new Metro rail Projects have been inaugurated in a past couple of months. In those upcoming projects, several latest technologies are being used in the field of signalling and rolling stock to provide uninterrupted train and passenger movement. In the Era of Augmented Reality, Artificial Intelligence, and other technological advancements, it is harder to avoid technological interference in Metro Rail Operations. When the world is redesigning itself with the assistance of latest technologies, it will be wise if we catch the bus in this very beginning. In my opinion, the following are the ways in which we can take help of technology to smoothen the Metro Rail Operations:

Using Artificial Intelligence, AI, to empower customer service: Artificial Intelligence can be used to make ticket vending machines more effective and interactive. For all those readers, who don't have any Idea about Artificial Intelligence, it is a technology which allows machines to have human cognitive functions like learning and problem-solving. In simpler words, with the help of this technology, machines can act and work like humans. This will help us reduce the human workload and remaining manpower can be utilized in other progressive work. A traditional customer interface can be upgraded to AI Powered customer service. Ticket vending machines can be improvised with the help AI technologies. AI technologies can allow Ticket vending machines to listen and respond to customer requests. For example, those who don't know how to operate the machine can just talk with a machine. Another feature that I can think of is that there can be vending time restrictions in ticket vending machines. For example, if last revenue train for the certain train has already departed then ticket vending machine should not vend the tokens for that station directly. It should display and speak that "The last revenue train for that particular station has been already departed, do you still wish to buy a token to that station?". These types of features will reduce the need for station agents and can reduce the operative expensive to a greater level.

Replacing Registers with Portals: There are several types of registers that are used for the record-keeping purpose on daily basis in every metro rail organization. These registers are generally stored for auditing purpose for in between 3-8 years. If these registers are replaced with portals, data becomes easily available and reduces the human labour. In a portal-based data collection system, data is stored in the cloud and can be accessed easily.

Data-Driven Decision making: There is a popular saying in the modern work culture, "Without data you are just a person with Opinion". And, as we all know companies don't run on opinions. We need facts to base our decision. To know facts, we need to know the data. And, to know the data, we need to collect a lot of data. Data collection and Data mining can be utilized to predict the trends for footfall, workload etc. For example, if we have the hourly data of ridership, we can predict the number of footfalls in an hour on a specific day. Based on the inputs from the data, we can decide how many housekeeping staffs are required to keep the station clean, we can also decide how much additional staff will be required to provide smooth passenger and train movement.

Interactive E-SOPs: Standard Operating Procedures are generally distributed in printed forms. A Portal or app can be developed to provide SOP in an Interactive electronic format. Candidates will need to clear the test after reading SOP to get an Assurance certificate. Individual's Assurance certificates can be collected in the cloud for the auditing purpose.

(Ranjesh Kumar) Ranjesh is a metro rail professional with 3.5 years of experience in station & revenue operations. Presently working with Gujarat Metro Rail Corporation.

Bureau Veritas bags Contract for independent Safety Assessment (ISA) for Mumbai Metro-3; India

September 19, 2019 Rail News

The Mumbai Metro Rail Corporation Limited (MMRC) awarded contract for independent Safety Assessment (ISA) Services for Signalling and Train Control, Platform Screen Doors and rolling Stock Subsystems for Mumbai Metro Line-3 (Colaba-Bandra-Seepz) project.

The contract for the same has been awarded to M/s Bureau Veritas Italia S.p.A, being the most competitive amongst the respective tenderers.

More Information:

- Commenting on the same Ms. Ashwini Bhide, Managing Director, MMRC said, "Independent Safety Assessment work is a mandatory requirement for safe and successful opening of Metro Line."

- She said, ”we aim to ensure that Independent Safety Assessment for signalling and train control, platform screen doors and rolling stock subsystems for Mumbai Metro Line 3 are done within stipulated timelines.”
- Mumbai Metro line-3 is a 33.5 km long underground corridor running along Colaba-Bandra-SEEPZ.
- Length of the corridor is marked with 27 key stations out of which 26 will be underground and 1 at grade.
- The 33.5 km long corridor running along Colaba-Bandra-SEEPZ, envisages to decongest the traffic situation in Greater Mumbai.
- Mumbai Metro Rail Corporation Limited (MMRC) is the nodal agency responsible for the implementation of the project.
- It has been constituted as a JV of the Govt. of India (GOI) and the Government of Maharashtra (GOM) on 50:50 sharing basis.

Mumbai Metro: Here's all you need to know about the entire City Network; India

Updated: Sep. 13, 2019, 08:46 IST | Rajendra B. Aklekar; mid-day

The Mumbai Metro is now proposed to be a 14 Corridor Network of about 337.10 km being built at the Cost of 1,40,814 Crores with an expected daily Ridership of 142.90 Lakh by 2031.

This Picture of Mumbai Metro has been used for representational Purpose only

When Prime Minister Narendra Modi laid the foundation stones for the three new Metro Lines, that will serve the city and also the Metropolitan Region, a larger picture of how many Metro corridors will operate in Mumbai and nearby areas have emerged. As of now September 12, 2018 a total of 14 Metro lines will be built in the city and are scheduled to get completed by 2031. The comprehensive Metro network will cover areas including Mumbai, Navi Mumbai, Thane, Kalyan-Badlapur and even industrial areas of Bhiwandi and Taloja.

Modi in Mumbai on September 7 laid the foundation stone of Mumbai Metro Lines 10, 11 and 12. While the 9.2 km long Gaimukh to Shivaji Chowk (Mira Road) Metro-10 corridor and 20.7 km long Kalyan to Taloja Metro-12 corridor will serve the region; the 12.8 km long Wadala to Chhatrapati Shivaji Maharaj Terminus Metro-11 corridor will ease commuters to SoBo from the Central suburb Wadala.

The Mumbai Metro is now a proposed to be a 14 corridor network of about 337.10 km being built at the cost of 1,40,814 crores with an expected daily ridership of 142.90 lakh by 2031 (see photo below):

Line	Corridor	Length (Km)	Cost (Rs. Cr.)	Expected Daily Ridership (Lakh) (2031)
Line 1	Versova-Andheri-Ghatkopar	11.4	2,356	8.0
Line 2A	Dahisar-D.N. Nagar	18.6	6,410	9.0
Line 2B	D. N. Nagar-Mandale	23.6	10,986	10.5
Line 3	Colaba-SEEPZ	33.5	23,136	17.0
Line 4	Wadala-Kasarwadavali	32.3	14,549	12.1
Line 4A	Kasarwadavali-Gaimukh	2.7	949	1.3
Line 5	Thane-Bhiwandi-Kalyan	24.9	8,417	3.03
Line 6	S Samarthnagar-Vikhroli	14.5	6,716	7.7
Line 7	Dahisar (E)-Andheri (E)	16.5	6,208	6.7
Line 8	Airport Metro (CSIA-NMIA)	35	15,000 (approx)	8.90
Line 9 (7 Extn.)	Dahisar (E)-Mira Bhayander & Andheri (E)-CSIA	13.5	6,607	4.42
Line 10	Gaimukh-ShivajiChowk (Mira road) (from CSMT)	9.2	4,476	21.62
Line 11 (4 Extn.)	Wadala-Chattrapati Shivaji Maharaj Terminus	12.7	8,739	16.9
Line 12	Kalyan-Taloja	20.7	5,865	2.62
Line 13	ShivajiChowk (Mira Road)-Virar	23.0	6,900 (approx.)	4.8
Line 14	Kanjurmarg - Badlapur	45	13,500 (approx.)	7.9
TOTAL		337.10	1,40,814	142.90

Metro-1: Versova-Andheri-Ghatkopar Corridor

The first 11.40 km Versova-Andheri-Ghatkopar Metro corridor has been commissioned on June 8, 2014. The 12-station corridor has caught the fancy of Mumbaikars as it provides the vital East-West connectivity to the commuters. One required almost 90 minutes crossing this Versova-Ghatkopar distance. Now, this very distance is being crossed in a mere 20 minutes. The four coach Metro, today, is carrying close to four lakh happy Mumbaikars every day. This air-conditioned, comfortable and safe Metro is brought to the city at the cost of Rs. 2,356 crore.

Metro-2A: Dahisar to D.N.Nagar Metro Corridor

The corridor is the first phase of Dahisar-Charkop-Bandra-Mankhurd Metro-2 corridor. The 18.5-km long Metro corridor will have 17 stations and will provide connectivity to areas, that are not connected with rail-based public transport. The system has been designed for 8-coach trains, and the expected daily ridership is about 4.07 Lakhs in 2021, (PHPD 11,560). The corridor will reduce traffic congestion, save fuel, time and improve the environment. The estimated cost of the project – Rs. 6,410 crore.

Stations on the Route:

Dahisar (E), Anand Nagar, Rushi Sankul, I.C.Colony, Eksar, Don Bosco, Shimpoli, Mahaveer Nagar, Kamraj Nagar, Charkop, Malad, Kastur Park, Bangur Nagar, Goregaon Metro, Aadarsh Nagar, Shastri Nagar, DN Nagar.

Metro-2B: DN Nagar to Mankhurd Corridor

This is a 23.5 km, Rs.10,986 crore project that will have 22 stations. The system designed for 8-coach trains. The expected daily ridership for this is 8.09 Lakhs in 2021.

Stations on the route: ESIC Nagar, Prem Nagar, Indira Nagar, Nanavati Hospital, Khira Nagar, Saraswat Nagar, National College, Bandra, MMRDA, Income Tax Office, ILFS, MTNL Metro, SG Barve Marg, Kurla Terminal, Kurla-E, EEH, Chembur, Diamond Garden, Shivaji Chowk, BSNL Metro, Mankhurd, Mandala (Depot).

Metro-3: Colaba-Bandra-Andheri (SEEPZ) Corridor (implemented by MMRC)

Likewise, one more Metro corridor is being brought to the city. This, entirely underground Metro corridor will run from Colaba to SEEPZ. The cost of this 32 km long and 27-station corridor will be approximately Rs.23,136 crore The Project will be completed with the financial assistance from the Government of India, Japan International Cooperation Agency and the State Government. This corridor will help connect business centres such

as Nariman Point, Bandra-Kurla Complex and SEEPZ. This corridor is expected to carry more than 20 lakh commuters daily.

Stations on the Route:

Cuffe Parade, Vidhan Bhavan, Churchgate Metro, Hutatma Chowk, CST Metro, Kalbadevi, Girgaum, Grant Road, Mumbai Central (M), Mahalaxmi (M), Science Museum, Acharya Atre Chowk, Worli, Siddhi Vinayak, Dadar, Sheetaladevi Temple, Dharavi, Bandra (M), Vidyanagari, Santacruz (M), Domestic Airport (Santacruz), Sahar Road, International Airport (Sahar), Marol Naka, MIDC, SEEPZ (Car Shed at Aarey).

Metro-4: Wadala-Ghatkopar-Thane-Kasarwadavali Corridor

Mumbai Metropolitan Region Development Authority (MMRDA) has proposed to implement the Wadala-Ghatkopar-Thane-Kasarwadavli Metro Corridor. The Detailed Project Report (DPR) has been completed by consultants M/s. Consulting Engineering Services (CES), Mumbai. Considering the growth of Thane City (Along Ghodbunder Road) and demands by elected representatives, convenience to commuters and also need to connect Thane with Mumbai city, it is appropriate to implement the Wadala-Ghatkoapar-Thane-Kasarwadavli Metro combined corridors and not separate corridors. Once, the combined Wadala-Ghatkoapar-Thane-Kasarwadavli Metro corridor is implemented, areas of Wadala, Chembur and Ghatkopar will get easy connectivity through public transport. The 32 km Wadala-Ghatkopar-Thane-Kasarwadavli Metro corridor will have 30 stations with Base Project Cost approximately Rs.19,000 crore (Including Taxes and Duties) – at April 2014 price level.

Stations on the Route:

Bhakti Park Metro, Wadala TT, Anik Nagar Bus Depot, Suman Nagar, Siddharth Colony, Amar Mahal Junction, Garodia Nagar, Pant Nagar, Laxmi Nagar, Shreyas Cinema, Godrej Company, Vikhroli Metro, Surya Nagar, Gandhi Nagar, Naval Housing, Bhandup Mahapalika, Bhandup Metro, Shangrila, Sonapur, Mulund Fire Station, Mulund Naka, Teen Haath Naka (Thane), RTO Thane, Mahapalika Marg, Cadbury Junction, Majiwada, Kapurbawdi, Manpada, Tikuji-ni-wadi, Dongri Pada, Vijay Garden, Kasarvadavali with car depot at Owale (39 Ha.)

Metro 5 Corridor: Thane-Bhiwandi-Kalyan; 24 km – Rs. 8,416 Crore

The 24 km long Metro corridor will have 17 stations and the system designed for 6-coach trains. The expected Daily Ridership for the corridor is 2.29 Lakhs in 2021 and 3.34 lakh in 2031.

Stations on the Route:

Kalyan APMC, Kalyan Station, Sahajanand Chowk, Durgadi Fort, Kon Gaon, Gove Gaon MIDC, Rajnouli Village, Temghar, Gopal Nagar, Bhiwandi, Dhamankar Naka, Anjur Phata, Purna, Kalher, Kasheli, Balkumbh Naka, Kapurbawdi.

Metro-6 Corridor: Swami Samarth Nagar-Jogeshwari-Kanjurmarg-Vikhroli; 14.5 km – Rs. 6,672 Crore:

The 14.5 km long Metro corridor will have 13 stations. The system is designed for 6-coach trains and the Expected Daily Ridership is 6.5 Lakhs in 2021 and 7.69 Lakhs in 2031.

Stations on the route: Swami Samarth Nagar, Adarsh Nagar, Momin Nagar, JVLR, Shyam Nagar, Maha Kali Caves, SEEPZ Village, Saki Vihar Road, Ram Baug, Powai Lake, IIT Powai, Kanjurmarg (W), Vikhroli-EEH.

Metro 7 Corridor: Andheri-E to Dahisar-E; 16.5 km – Rs. 6,208 Crore:

The 16.5 km long Metro corridor will have 16 stations and will provide connectivity to areas that are not connected with rail-based public transport. The system has been designed for 8-coach trains and the expected daily ridership is about 5.29 Lakh in 2021, (PHPDT-18,086). The corridor will reduce traffic congestion especially on the Western Express Highway and will save fuel, time and improve the environment. The estimated cost of the project is Rs 6,208 crore. The 16.5 km long Metro corridor will have 16 stations with the system designed for 6-coach trains. The Expected Daily Ridership will be 4.07 Lakhs in 2021.

Stations on the Route:
Andheri (E), Shankarwadi, JVLR Junction, Mahanand, Aarey, Pathan Wadi, Pushpa Park, Bandongri, Mahindra & Mahindra, Magathane, Devipada, National Park, Ovaripada and Dahisar (E).

Metro 9 Corridor: Dahisar (East) to Mira-Bhayandar and Andheri (East) to CSIA Metro-9 Corridor; 13.5 km – Rs. 6,518 Crore:

Stations on the Route:
Dahisar (East), Pandurang Wadi, Mira Gaon, Kashi Gaon, Saibaba Nagar, Medetiya Nagar, S.Bhagat Singh Garden, Subhash Chandra Bose Stadium.

Metro 10 Corridor: Gaimukh to Shivaji Chowk; 11.2 km – Rs. 5,000 Crore:

Stations on the Route:
Gaimukh, Gaimukh Reti Bundar, Versova Chaar Phata, Kashi Mira, Shivaji Chowk.

Metro 11 Corridor: Wadala to GPO; 14 km – Rs. 8,000 Crore:

Stations on the Route: Wadala RTO, Ganesh Nagar, BPT Hospital (Elevated), Sewri Metro, Hay Bundar, Coal Bundar, Darukhana, Wadi Bundar, Clock Tower, Carnac Bundar, CSMT Metro (all Underground).

Metro-12 Corridor: Kalyan to Taloja; 25 km – Rs. 11,000 Crore:

Stations on the route: APMC Kalyan, Ganesh Nagar, Pisawali Gaon, Golvali, Dombivli MIDC, Sa Gaon, Sonar Pada, Manpada, Hadutane, Kole Gaon, Nilje Gaon, Wadavali, Bale, Vaklan, Turbhe, Pisawe Depot, Pisawe, Taloja.

Rajendra Aklekar, Railway Historian and mid-day Senior Assistant Edito,r says, "The Mumbai Metro network is long due to ease the pressure on an existing suburban railway network, that is saturated beyond a limit. The tram network on city's roads shut in 1964 and

after that Mumbai has been dependent on just buses and multiple road transport modes. The Metros should have come much earlier, probably two decades ago. But better late than never. A complete functional network will revolutionise public transport in Mumbai."

Metro Rail or Monorail will not solve the Mumbai Transport Problem; India

Jhanavi J., Metro Rail News, September 2019

Mumbai's overburdened suburban rail system is overwhelmed when rainwater floods its tracks. This year, the Central, Western and Harbour lines were the worst hit, with trains running at 30-minute intervals, when they ran at all. Commuters like Sanjay Garg, 32, who are totally dependent on the suburban service to commute to and from work, were forced to take two days of unpaid leave, as heavy rains brought mobility to a complete halt. Sharing his anger and agony were literally millions of Mumbaikars. The only ones who enjoyed the 'holiday' were students as schools had to shut down.

With 70 lakh people using the suburban rail system, city authorities went in for metro rail projects and an expensive monorail as alternative commuter choices to ease the congestion on the suburban rail system. The Mumbai Metropolitan Region Development Authority (MMRDA), the nodal agency for implementing infrastructure projects in the city, spent Rs.. 1,000 crore for an 8.26 km monorail system, running from Chembur to Wadala with seven stations in between. However, this monorail was used more as a 'joyride' by people rather than for work commute.

The second phase, one of the longest monorail corridors in the world was 19.54 km from Chembur to Wadala to Jacob Circle, which became operational in 2019 at a cost of Rs 3000 crore. Fares on the monorail range from Rs 10 to Rs 40, and these have the capacity to carry 1.5 lakh to 2 lakh commuters every day.

However, it hasn't proved to be a popular choice of transport for Mumbaikars. With **poor last-mile connectivity** and long-time gap between trains (30-45 minutes), commuters still prefer the local trains and buses. Sujata Singh, 25, whose office is in Lower Parel, is frustrated as she often has to wait at least 20 minutes to ride the monorail from GTB Nagar to Lower Parel. She feels the monorail is for those, who can travel at leisure. Though the government was confident that the monorail would achieve high ridership, the reality is that it is catering to just 7,000 commuters daily. Nor has it proved to be a good revenue generator for the city.

The Metro Network

The other major mobility project taken up by the MMRDA is the Mumbai Metro. Construction for the stretch from Versova to Ghatkopar began in 2007 with over Rs 4000 crore spent on it. The metro has a carrying capacity of four lakh persons daily and has reduced travel time by 20 minutes on the east-west route. It runs around 200-250 services every day, which has to an extent reduced congestion on the roads with carbon dioxide levels too expected to drop by 1,66,000 tons a year.

It is also safer compared to the suburban stretches, where eight people reportedly die daily, while crossing the tracks or falling off the train as people scramble to get in and out. Such accidents are prevented by the metro system.

Overall, it has had limited success so far. The current metro ridership is at seven lakh per day and is expected to rise to 11 lakh. More metro lines are being added, which are expected to become functional by 2022. Having a corridor of 58 km, Metro 2A line will cover Dahisar to DN Nagar (18.5 km), line 2B will cover DN Nagar to Mandale (23.5 km) and line 7 will run from Dahisar East to Andheri East (16.5 km), connecting the western and eastern extremes.

There will be 63 new metro trains, each with six coaches, which will be brought in to complete the metro network. The metro fare generally ranges from Rs 10 to 40, though no revenue figures are currently available. The $ 926-million project is funded on a loan from the Asian Development Bank.

However, just having a Metro or Monorail will not solve the city's transport woes. Nikshit, 20, who uses the metro from Andheri to Ghatkopar, agrees that it is time-saving. But, to reach the metro station, he has to take a bus and then a local. This **'last-mile' connectivity is one of the major issues that prevents more commuters from using the metro or monorail.** According to the survey done by Centre for Public Research (CPPR) in Kochi, **last mile connectivity is an important factor in people using public transport.**

In Mumbai, though there is an option to take shared on demand auto-rickshaws at the stations, this is not regulated and has sprouted as the outcome of a lack of other transport options. Like Delhi, Mumbai needs to introduce e-rickshaws. To make it popular, the fare can be set at Rs 10 and subsidy can be provided by the government to encourage operators. It will also reduce the need for creating parking space for private vehicles at stations.

Linking Metro to Transit Points

To bridge the gap between metro station to transit points, the Delhi Metro Rail Corporation (DMRC) started **200 feeder bus services** on most routes. Recently, DMRC introduced 'one card' to pay for all tickets — bus, metro as well as parking fees. According to a survey by the School of Planning and Architecture (SPA) in Delhi, 50 percent of the people, who use private vehicles, will switch to metro if there is good transit system in place. This survey also pointed out that **last-mile connectivity** is the key to increasing metro ridership.

The MMRDA does have plans to use some of the funds to improve last mile connectivity enabling more people to use metro and monorail. Recently, MMRDA has approved a Rs 3500-crore project to build **ropeways** on the Malad-Marve and Gorai-Borivali routes. The project will also include widening of footpaths, improving street lighting, cycle tracks, dedicated parking zones, introduction of e-rickshaws etc. Also, 'OnGo'- a mobile transport ticketing system will be launched soon, enabling users to pay using phones and scan the codes to open the AFC gates at stations.

Solving last Mile Issues for Monorail Travellers

Mumbai's 20-million plus population, who have the reputation of being on the move 24 hours on 7 days of the week, urgently needs alternatives to the suburban rail. While the monorail hasn't proved to be a popular choice so far, it can be a success with higher frequency and better connectivity to its stations. It runs on an elevated structure, which makes its capital cost cheaper as compared to the metro. Though it has only four coaches, with higher frequency it can help reduce vehicular traffic and numbers on the local trains. It can also act as a feeder system. There is no doubt that the metro has far higher

passenger capacity-to-cost ratio, but in dense cities like Mumbai, both can work in tandem. This can also take the pressure of an aging bus system, which at present caters to below 20 lakh commuters daily.

With the city expanding, the suburbs need better connectivity and alternative transport systems can bring that about. But effective implementation depends on transparency and accountability from MMRDA. Delays and cost increases cannot be written off every time.

Active citizen participation is needed, not just for accountability, but also in planning the routes. Though the Mumbai civic authorities have so far not initiated any citizen participation process for infrastructure development, some groups have been proactive.

For instance, last year, residents had protested at Khar against Metro 2B elevated construction over safety concerns. They wanted the line to be construed underground.

(Authored by Jahanvi J) Jhanavi J. is based in Mumbai and holds a postgraduate degree in development.

Ministry of Railways enters into an MoU with Government of Odisha for joint Redevelopment of Bhubaneswar Station as a Multi-Modal Transport Hub; India

Posted on: 19 SEP. 2019 6:48PM by PIB Delhi

East Coast Railway under the aegis of Ministry of Railways signed a Memorandum of Understanding with Government of Odisha for development of Bhubaneswar station as Multi-Modal Transport Hub in New Delhi today. Chief Minister of Odisha, Shri Naveen Patnaik, the Minister of Railways and Commerce & Industry, Shri Piyush Goyal and the Minister of Petroleum and Natural Gas and Steel, Shri Dharmendra Pradhan joined the MoU signing ceremony through video conferencing.

Under this MoU, Bhubaneswar station will be redeveloped as multi-modal transport hub, jointly by Ministry of Railways and Government of Odisha. The multi-modal Hub expected to completed in three years shall have new terminal building for Railway Station, City Bus terminal, Public Car parking and other allied public utilities. Mixed use land development and Air concourse connecting both side of the Railway station.

Shri Dharmendra Pradhan said that citizens of Bhubaneswar would be greatly benefited by this project and it could become a hub for tourism in the area. The Chief Minister of Odisha complimented the Railway Ministry for coming forward to develop the project. He said it will be a world class multi modal transport hub and could be a first-of-its-kind in the country.

Shri Piyush Goyal in a statement issued for the occasion, said that the focus of Indian Railways is to improve the infrastructure to make it at par with world class level. The Minister said that he is happy that the Government of Odisha has come forward to collaborate with the Ministry of Railways to develop Bhubaneswar as a multi-modal hub.

Titagarh Firema bags Rs. 1125 Cr Rolling Stock Order for Pune Metro; India

Metro Rail News, September 2019

In a big boost to PM Narendra Modi's **'Make In India'** initiative, an Indian multinational firm Titagarh Wagons has I won an international bid from Pune Metro for the supply of 102 Aluminum bodied Metro Rail coaches. The Consortium formed by Titagarh Wagons Limited with its wholly owned subsidiary: Titagarh Firema SPA ('TFA') has emerged as the bidder in the tender issued by Maharashtra Metro Rail Corporation Limited (MAHA-METRO) for 'Design, Manufacture, Supply, Testing, Commissioning Of Passenger Rolling Stock (Electrical Multiple Units) And Training Of Personnel' for Pune Metro Rail Project.

According to reports, the bid has been won by Titagarh Firema S P A, which is the wholly-owned Italian subsidiary of Titagarh Wagons Ltd.

Titagarh Wagons Ltd is an Indian multinational company based near Kolkata. As per the contract, the ultra-modern Aluminium coaches will be manufactured for the first time in India. The joint bidding by the Consortium consisting of the company as Lead Member along with its wholly owned subsidiary was made in the said tender for design, manufacture and supply of 102 Metro Coaches for Pune Metro Rail.

Design by Titagarh Wagons Ltd. For Pune Metro Rail

According to tender documents, first 3 Car Prototype Metro Trainset is required to be supplied in 78 weeks and the balance 33 train sets in several phases over 160 weeks. The order valued at approximately Rs. 1125 Crore, Titagarh Wagons Ltd had announced sometime that its wholly-owned Italian subsidiary has been awarded the 'Letter of Acceptance' for design, manufacture and supply of 54 units of Metro for Ferrovia Circumetnea, Italy.

PART II: GLOBAL ACTIVITIES FOR URBAN MOBILITY AS A SERVICE

Siemens *INSPIRO* Metro Trains for Klang Valley Metro, Kuala Lumpur; Malaysia

September 12, 2019; Data Sheet by Siemens Mobility

Metro Train Design by Designworks, a BMW Group Company, Germany

The INSPIRIO Metro Trains for the Klang Valley Kuala Lumpur Metro are designed for operation in tunnels and on elevated tracks. In keeping with the city's objectives, the trains

are especially environmentally friendly. Implementing Inspiro concept solutions ensure optimized energy consumption, low maintenance costs and high recyclability of the trains at the end of their service life. The fully automatic system went into service in December 2016. These trains will be used on the newly built 51 kilometer Sungai Buloh–Kajang Line, which connects Kuala Lumpur with the Klang Valley area.

Highlights of the Metro trains for the Malaysian Capital

- Fully automated operation – unattended train operation (GoA 4).
- Prize-winning design concept – Good Design Award 2014.
- High passenger safety – thanks to a CCTV system with 26 live cameras per train and 16 emergency intercoms with integrated cameras.
- Modern passenger comfort – thanks to an infotainment system with dynamic map displays above each door.
-

Design Concept:

Designworks, a BMW Group Company, developed the interior and exterior design of the trains. The "guiding light" design concept was inspired by the architectural characteristics of modern Malaysia and reflects the dynamism, elegance and technological progress of Kuala Lumpur. The interiors are equipped with LED lighting; indirect lighting below the passenger seats generates a pleasant sense of space and supports safety and cleanliness in the train. The interior colour concept with varying shades of blue and traditional symmetrical patterns with a modern interpretation in the entry area symbolizes the vitality and cultural diversity of Kuala Lumpur. Colour contrasts in the door entrance areas provide the passengers better orientation, making it easier for them to get in and out of the train.

Fully automated Operation:

The trains are equipped for fully automated, unattended train operation (GoA 4).

A state-of-the-art train automation system is integrated into the train, ensuring reliable and highly available operation. In addition, the train is equipped with an array of safety systems, including obstruction sensors at the end bogies and a fire detection system. Auxiliary driver's cabs at both ends of the train enable manual operation in emergencies and in the depot. The auxiliary driver's cabs are equipped with convenient touch-screen displays and all necessary controls for train operation.

Car Bodies:

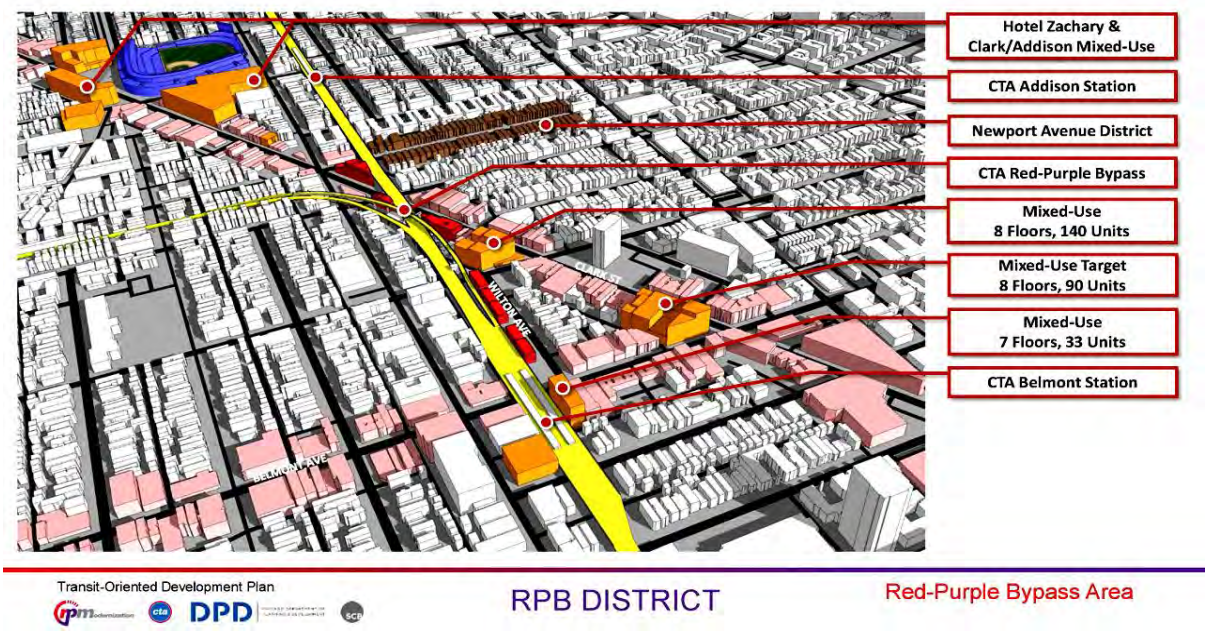
The metro train has been designed with a lightweight stainless-steel construction. The exterior car body surfaces are painted, and the colour stripes are made of adhesive foil. Traction system The trains are electrically driven. The traction power is supplied from the third rail via current collectors. Two of the four cars in the trains are motorized. Each motor bogie is driven by two self-ventilated traction motors from the proven 1TB 20 series. The motors are controlled without speed sensors for a high level of reliability. The two traction motors in the motor bogies are each controlled by a natural air-cooled **Sibac® IGBT traction inverter.** The highly efficient slip / slide protection is implemented on a per bogie basis. The Sitrac™ control allows electrodynamic braking to standstill. This feature provides the advantage of a non-wearing service brake under normal conditions, and it significantly increases the stopping accuracy in stations. The installed tractive effort per train is 1,840 kW.

Bogies:

The **SF 3000 Bogie**, developed for advanced metro vehicles, has been further optimized and is suitable for operating speeds up to 100 km/h and for axle loads of approximately 17 tons. The bogie frame consist of high- strength low-alloy steel. Each wheel of the bogie is equipped with one brake disk and one compact brake calliper unit. The bogies are equipped with spring break actuators that serve as parking brakes. Secondary suspension is provided by an air spring, and a metal-rubber spring is used for primary suspension. One current collector is mounted on each side of the motor bogies. The traction motors are transversally installed and fully suspended on the bogie frame.

Transit oriented Development, TOD, – Chicago; USA

Written by Todd Meyer, Principal, Stantec Urban Places
September 12, 2019; Railway Age



RAILWAY AGE, SEPTEMBER 2019 ISSUE: Effectively leveraging Rail Infrastructure: Dynamic, walkable, higher-Density urban Neighborhoods in Proximity to Transit can improve Quality of L**ife. Here's how it's done** in the Windy City.

In the fourth installment of our ongoing series on transit-oriented development (TOD), we've focused on Chicago. Our previous articles looked at how New York got TOD right, how California is doing something different in TOD and the key role P3s can play in booming Toronto.

Chicago has long been considered a significant rail hub in the U.S., including freight and passenger service. As an early adopter of transit investment, Chicago's first raised "L" line (L is short for "elevated") began service in 1892. It took less than a decade for the L to expand to include multiple lines and neighborhoods, including Chicago's downtown core,

known locally as “The Loop.” This name was derived from the multiple elevated train lines that encircle the city’s primary business district.

Chicago’s adoption of mass transit was necessary in order to efficiently move large numbers of people in a growing city that served as a crossroads of goods and services nationally. In part, the existing rail lines that facilitated the movement of freight also helped to create a modern, robust and multi-modal transit system. With that system, America’s largest Midwestern city had the foundation to build TOD as a matter of normal course, as evidenced in buildings of all shapes and sizes throughout town.

While the Chicago Transit Authority’s (CTA) urban network of trains and buses can get passengers within a block or two of almost any destination in the city, Metra commuter lines connect farther out to Chicago’s suburban communities. Daily ridership on these lines approaches 300,000 on weekdays. Because of the prevalence of these rail lines reaching farther regional destinations, neighboring communities have also benefitted from TOD by way of their rail connections to Chicago.

Many of these suburban municipalities have evolved through the decades, some from being small industrial outposts and bedroom communities, to corporate headquarters and bustling communities of their own. Motorola moved its headquarters from Chicago to Schaumberg in 1976, and McDonald’s decided to establish its global headquarters in Oak Brook.

However, along with Kraft and other large corporations, both companies have responded to recent talent trends and relocated their headquarters locations downtown. In addition to relocating back to walkable, urban neighborhoods where many people want to live and work, convenient transit access is commonly cited as a critical element for companies choosing an office location and individuals making decisions of where to live.

TOD in Chicago

The City of Chicago has always employed TOD as an approach to ongoing densification and development. In 2013, the city introduced its TOD policy around Chicago’s many train stations to “encourage lower carbon transportation choices and reduce household costs associated with car ownership.” The policy allows developers to build more dense, multi-family residential projects without parking structures, and under a streamlined approval process. This removes one of the major obstacles to building dense urban projects—costly

parking. This makes absolute sense financially, but also because cities are looking to increase transit ridership and move people more efficiently, as we consider a future of reduced car ownership through the advent of autonomous vehicles. Developments that meet the TOD requirements must also comply with the city's Affordable Requirements Ordinance, which mandates projects dedicate a percentage of units to affordable housing.

In 2015, Chicago's Zoning Committee approved a measure to expand the areas where TODs can be built in the city's north end. The ordinance more than doubled the area of land where developers can build projects with reduced parking requirements. In 2018, the city expanded its TOD policy to high-ridership bus lines. This is one of the first initiatives in the country to pursue a citywide policy that encourages TOD around bus lines. A well-traveled bus route can carry thousands of people every day, and incentivizing their use is a good way to expand a network of connectivity throughout the city, while addressing affordable housing needs.

While these are big positive steps to increase TOD, they will make even more sense in the future as mobility choices shift through the advent of autonomous vehicles (AVs). While AVs are not going to replace personal cars, buses or trains in the near future, they are going to provide an additional mobility option that does not require parking on location. Urban car ownership is already declining in most major centers; this will likely continue as ridesharing and other mobility options become better ingrained in the way we get around. As a company that advises clients on how to best approach development, we are already looking at ways to repurpose or redevelop existing parking structures and surface lots that could be sparsely used within a decade. We're also advising clients to wait as long as possible to build new parking structures to leverage walking, biking and transit, but also to see the impacts of AVs as they gradually come online.

Equity and Inclusion

One of the biggest challenges in cities across the country is to ensure that housing policies are inclusive of all socio-economic groups and do not exclude certain geographies or segments of the population. As normal market forces continue to gentrify various neighborhoods in Chicago, we see the "price of success" where many TODs yield luxury apartments in neighborhoods that have historically been more affordable or traditionally had lower rents. The concern is that many existing residents are displaced as an

increasing number of wealthier people seek walkable, mixed-use urban neighborhoods that are connected to transit lines.

Many civic leaders are trying to address this issue, but it's clear that the popularity of these neighborhoods is in part due to access to good transit options. These are complicated issues to solve for certain, but with the right balance of policy, incentives and infrastructure, the future holds promise for fair and equitable housing that includes all segments of the community.

Civic leaders in Chicago are working to promote more equitable TOD by increasing the number of required affordable units to 15% of each project, up from 10%. In addition, there is strong support to spur more TOD on the economically challenged South and West sides of town. Regarding transit itself, the following measures are currently being debated to increase accessibility and ridership in Chicago, as indicated by John Greenfield, transportation reporter for the Chicago Reader and editor of StreetsBlog Chicago:

- A reduction of transit fares for low-income residents of various ages.
- A goal that every resident can live within a 15-minute walk of reliable 24-hour transit service.
- Encourage CTA to implement all-door bus boarding to increase operational efficiency.
- Work with state legislators to permit fair camera enforcement of bus lanes.
- Revisit Bus Rapid Transit (BRT) corridors in the city, such as Ashland Avenue.
- Create 50 miles of dedicated bus lanes (Chicago currently only has 4.1 miles).
- Support the creation of dedicated transit lanes as part of North LSD reconstruction.
- Develop a strategy for transitioning Chicago's bus fleet to electric-only by 2030 or earlier.
- Upgrade the Metra Electric District line with frequent service and discounted CTA transfers.

Investment and Sustainability

Chicago's Regional Transit Authority (RTA) has laid out a plan and identified $37.7 billion in capital projects for the CTA, Metra and Pace (the RTA's suburban bus and regional paratransit division). Transit investment by nature makes sense from a sustainability perspective: Reducing traffic congestion, reducing vehicle-miles traveled and greenhouse gases are a priority for many cities. Maintaining, modernizing and expanding transit service makes it that much more attractive, and makes any transit-adjacent development

that much more valuable. A larger strategy that links transit investment and development makes TOD initiatives significantly more effective.

The Red and Purple Modernization Program (RPM) is one way that transit is already being prioritized in Chicago. The $2.1 billion design-build project will reconstruct, modernize and build 1.9 miles of elevated tracks, including bridges and support structures, along Chicago's busiest transit corridor. Led by Walsh-Fluor Design-Build Team, Stantec and our design partners are working on plans that include reconstruction and modernization of four of the oldest stations on the Red Line. In addition, a new bypass or "flyover" structure will relieve congestion at a century-old rail junction north of Belmont Station, alleviating service delays at a portion of the system that carries more than 150,000 daily riders.

As part of the RPM Phase 1 project, a TOD plan was prepared for several parcels adjacent to the rail corridor that have been acquired to accommodate the infrastructure improvements. Led by Chicago-based Solomon Cordwell Buenz, a multi-disciplinary consultant team created a TOD plan as part of the Federal Transit Administration's (FTA) pilot program for TOD. CTA's goal was to promote redevelopment in neighborhoods along the Phase 1 project that is feasible, thoughtfully designed, contributes positively to the community and promotes a transit-rich lifestyle. Once the infrastructure construction is complete, this plan will be used to create a community-driven guide for future development on TOD sites.

Future Opportunities for TOD

One of the fascinating aspects of TOD is that while the idea is generally supported, opinions about the right level of density vary by community. While residents of Chicago's Loop wouldn't be surprised that a TOD project reached 40 to 50 stories in height, that would not typically be the case in one of Chicago's suburbs such as Evanston, Oak Park or Arlington Heights, where 10-20 stories is more common. Since public support for these projects is key to their success, gauging this type of input from local residents is an important part of the process.

Interestingly, many of these suburban communities—which are often referred to as "villages"—are generally on commuter rail lines, making them good candidates for TOD projects. In fact, Metra often has large Park-and-Ride lots next to their stations that provide convenient access for passengers. These surface parking areas could easily be developed

to facilitate the Park-and-Ride users in structures, while maximizing the real estate value by placing mixed-use buildings above. The additional multi-family residential, hotel or office uses would help to support the restaurants and retail stores that residents in these communities enjoy and desire more of.

Of course, scale and context are also important considerations. Some municipalities are certainly more welcoming to high-density development than others. Residents in the various Chicagoland villages are likely to be much more supportive of TOD that transitions gracefully from station areas in a downtown core to lower-density existing buildings, as well as buildings that reflect the image and character of the community. As an increasing number of people realize that we need to increase our urban densities over time, TOD holds some promise as Chicago and cities like it look to alleviate congestion, impacts on the environment and affordable housing challenges.

Another innovative idea in TOD—alternative financing methods—is also on the rise across the country. In our previous installment in the series, we outlined how P3s are a more developed tool in Europe and Canada than they are in the U.S. But we're quickly catching up, navigating financing models that work to bring projects on line more quickly by using a capital stack that consists of public and private sources that result in a win-win for all parties. Continuing to explore how we can bring diverse funding sources to serve public and private sectors is a worthwhile endeavor and a key element in unlocking the potential of TOD.

It takes a holistic approach to design and build a city with a world-class transit system that works for all members of the community. In the same manner, municipalities should continue to work with transit authorities and private investors to develop the housing we need. The more we can work together to promote dynamic, walkable and higher-density urban neighborhoods in proximity to our transit infrastructure, the better it will be for our collective quality of life. Residents of our urban communities deserve access to quality housing, interesting commercial areas, usable open spaces and mobility options that are independent from car ownership.

About the Author: Todd Meyer is a consultant based in Chicago and a Principal with Stantec's Urban Places practice, a network of experts that provide professional services focused on public realm and private development strategies for clients across the U.S. and Canada. He is currently part of the design management team for Phase 1 of the RPM project with the CTA.

Ottawa opens Light Rail Line 1; Canada

THE Canadian Capital of Ottawa opened its second light rail line on September 14th 2019. Formerly known as the Confederation Line, the 12.5km Line 1 runs from Tunney's Pasture east to Blair with an end-to-end journey time of around 24 minutes.

Ottawa opened Line 1, its second Light Rail Line

On October 6th, 2019,, Ottawa-Carleton Transportation Commission (OC Transpo) will reorganise bus routes across the city to simplify the network and provide frequent connections to Line 1.

Construction on the $C 2.1bn ($US 1.6bn) scheme, described as Ottawa's largest-ever public works project, began in 2013 and was carried out by Rideau Transit Group with partners ACS Infrastructure Canada, Ellis-Don and SNC-Lavalin.

The line was originally planned to open last year, but progress was delayed by construction problems including the appearance of a sink hole above the 1.5 km tunnel in the city centre. The rest of the line is above ground, and mainly follows a former busway, which was constructed on an abandoned railway. Line 1 has 13 stations including an interchange with the Trillium Diesel LRT line at Bayview.

The city plans to extend Line 1 12.5 km east from Blair to Place d'Orléans and Trim with five stations and 15 km west from Tunney's Pasture to Moodie Drive with a branch to Algonquin, adding 11 stations.

The cost of Stage 2 is estimated at $C 4.66bn. East-West Connectors, a consortium of Kiewit and Vinci, was selected by the City of Ottawa in February to design, build and finance the extension.

Japan Railway Technical Research Institute, RTRI, tests Fuel Cell multiple Unit; Japan

JAPAN: Railway Technical Research Institute has started test running with a prototype multiple-unit which can work as a conventional or battery EMU or using a fuel cell powerpack.

Converted from an older 1·5 kV DC EMU, the test train comprises a 34 tonne motor car and 29 tonne trailer vehicle. Each car is 19 760 mm long and 2 950 mm wide. It is able to operate as a conventional EMU when running under overhead catenary, or as a battery unit off-wire, with or without the fuel cell in use to trickle-charge the batteries.

Two polymer electrolyte fuel cells are contained in an underfloor module 2 600 mm long, 2 655 mm wide and 720 mm high, which weighs 1·9 tonnes. Hydrogen is stored in four high pressure cylinders at 35 MPa, with a capacity of 180 litres, giving a range of 72 km.

As well as the fuel cells, the test train has been equipped with a silicon carbide traction inverter pack that is 25% smaller than the one originally fitted, and a 540 kW Li-ion battery that is around 20% smaller than its conventional equivalent but has around 50% more capacity.

The two fuel cells can each produce a maximum of 90 kW at 200 V to 350 V, which is converted up to 700 V to feed the three storage batteries. This in turn is stepped up to match the 1·5 kV DC that is drawn from the overhead line.

The four 95 kW traction motors provide a maximum acceleration of 0·7 m/s^2, and an electric braking rate of 0·86 m/s^2.

Photos: Akihiro Nakamura

Hyundai Rotem tests new permanent Magnet synchronous Traction/Propulsion Motor for Rail Vehicles; South Korea

Sep. 20, 2019
Written by David Burroughs; IRJ

The Company plans to aggressively target the domestic and overseas electric Rail Vehicle Market with its PMSM Propulsion Technology.

HYUNDAI Rotem has completed 6000 km of test operations with its newly-developed permanent magnet synchronous motor (PMSM) traction system on Seoul Line 6.

The company began developing its PMSM technology three years ago and in 2016 signed a joint technology development memorandum of understanding (MOU) with Seoul Transportation Corporation.

The motors were installed on a Line 6 train in May.

In 2018, Toshiba Infrastructure Systems and Solutions (Toshiba-ISS) supplied five eight-car trains equipped with PMSM for Busan metro Line 1. Hyundai Rotem says its system is the first of its kind to be developed in South Korea, and is 10% more efficient than the Japanese-developed system.

Compared with conventional induction motors, PMSM reduce noise by 10dB at low speeds and 3dB at high speeds, while energy consumption is reduced by 31%.

Hyundai Rotem says, the new system could result in Won 35.8bn ($US 30.1m) savings in energy costs and Won 3.8bn savings in maintenance costs over 30 years.

The company says it plans to aggressively target the domestic and overseas electric rail vehicle market with its PMSM propulsion technology.

First Hybrid Battery Trolleybus delivered to Salzburg; Austria, Switzerland

3. September 2019 ; Railway Gazette International

AUSTRIA: Swiss manufacturer Hess delivered the first of 15 battery trolleybuses that it is supplying to Salzburg AG to the operator's depot on August 27. The vehicle travelled to Salzburg on a low-loader.

Salzburg AG ordered 15 battery trolleybuses for €15·3m, with deliveries to be completed by the middle of 2020.

Testing of the first trolleybus is due to begin on September 9, with the second joining it on October 14. Entry into regular passenger service is planned for December 15.

The 18·7 m long articulated buses have capacity for 155 passengers. The permanent magnet motors are powered directly from overhead wires and through traction batteries that allow off-wire operation. The batteries are charged through the overhead wires, with regenerated braking energy also stored in the batteries.

The buses will enable Salzburg AG to extend trolleybus Route 5 by 4·2 km to Grödig without the need to put up wires.

From December 15, trolleybuses on route 5 will run every 10 min on weekdays, with every other bus going to the new terminus. The frequency will drop to 20 to 30 min on weekends. At Weidenstraße the buses will automatically transition between overhead and battery traction.

The Global Future of Urban Transport is on Track with Light Rail Transits/Trams; Global

Johannes Zinner, in Plasser & Theurer ***today***, issue 134

Be it the tram in the classical sense or the suburban and interurban railways, that combine features of underground railways and trams, the global future of urban transport is on the rail with Light Rail Transits. While the construction and running of underground or elevated systems incur a huge cost, tram and light rail transit systems can be constructed and integrated into the cityscape at a comparatively lower cost.

Global Activities with Trams and Light Rail Transits

First Odyssey-Max Tram unveiled for Odessa; Ukraine

18 September 2019

Photo: Alexander Velmozhko

UKRAINE: Odesa tram operator Odesmiskelektrotrans presented a three-section version of an Odyssey-branded tram on September 17.

Branded Odyssey-Max, the 30 m long unidirectional vehicle comprises three sections, of which the central section has a low floor. It has capacity for 250 passengers including 62 seated.

Odesmiskelektrotrans has ordered six vehicles from local supplier Vagonoremontni Maisterni, which is assembling them at the operator's workshop. The bodyshells are being manufactured by Polytechnoservis to Pragoimex designs, and the bogie frames are recycled from older trams. Each tram costs 18m hryvnia.
In June 2018 Odesmiskelektrotrans ordered six single-section Odyssey trams.

Photo: Alexander Velmozhko

Victoria plans Next-Generation Trams and Trains for Melbourne; Australia

24. September 2019

AUSTRALIA: The Government of Victoria has invited suppliers to participate in a 'collaborative design process' for Melbourne's next generation of trams and trains, with workshops to be held in coming months.

The Department of Transport is working with rolling stock manufacturers on an interactive process to develop technical proposals for a potential next-generation tram. The business case will also identify and assess supporting infrastructure requirements, such as maintenance facilities.

Intended to enable the replacement of older high-floor trams, the new vehicles would be required to be fully accessible, and should have onboard energy storage to reduce the need for power supply upgrades.

The Department of Transport is also undertaking a similar process to further develop a business case for new regional trains. These would be required to be fully accessible, energy efficient and capable of carrying more passengers than the current V/Line fleet.

Final proposals would need to maximise local content and jobs, and integrate with the existing public transport infrastructure to minimise the need for expensive infrastructure enhancements.

'We're doing the vital design work needed to deliver new trains and trams that are reliable, accessible and meet the changing needs of Victorian passengers', said Minister for Public Transport Melissa Horne on September 22, 2019: 'Whether it's building more trains and trams, upgrading tracks and signals, or planning for the future, we're getting people where they want to go sooner and safer.'

Bergen, Norway, orders more Stadler Trams; Norway

24 September 2019

NORWAY: Hordaland County Council has exercised an €27m option for Stadler Pankow to supply a further six Variobahn trams for the Bergen Bybanen tramway, taking the total fleet to 34.

The additional trams are scheduled to be delivered from the end of 2021, ahead of the opening of the Phase 4 extension to Fyllingsdalen in 2022.

The seven-sections bidirectional vehicles will be 42 m long with five doors per side, fully low-floor and step-free access and a capacity of more than 280 passengers.

'We are looking forward to offer our commuters and travellers even more of the comfortable vehicles from Stadler', said Ingrid Holm Svendsen, Chief Executive of Hordaland County Council, on September 16.

Hitachi to supply Trams to Torino in Italy; Italy

ITALY: Torino Transport Operator GTT has selected Hitachi Rail SpA as preferred bidder for a contract to supply 30 trams.

Hitachi beat four other bidders to win the €63·4m contract, which is expected to be signed by the start of October. The value includes €1·1m for spare parts.

The first tram is due to be completed in 18 months, and is due to enter passenger service in early 2021. Work is due to take place at Hitachi's factories in Napoli, Pistoia and Reggio Calabria; styling and interior design will be carried out by Giugiaro Architettura.

The 28 m long low-floor vehicles will have capacity for 200 passengers, and will be equipped with air-conditioning and two wheelchair spaces.

The order is being financed by the Ministry of Infrastructure & Transport. The city of Torino and GTT have applied to the ministry for financing of a further 40 trams.

Minneapolis Southwest LRT Systems Contract awarded; USA

20 September 2019

USA: Railway for the Southwest LRT extension of the Green Line light rail route in Minneapolis are to be supplied by a joint venture of Aldridge and Parsons under a $194·4m contract awarded by the Metropolitan Council on September 18.

The deal covers the supply and installation of overhead line equipment, traction power supplies and communications for the 23.5 km extension from downtown Minneapolis to Hopkins, Minnetonka and Eden Prairie.

This is the second-largest contract for the project, after the $800 m civil works package awarded in November 2018, and means that 97% of all Southwest LRT contracts have now been awarded. Local firm Aldridge had previously undertaken systems work on the initial phase of the Green Line, the Central Corridor linking Minneapolis and St Paul. Parsons worked on the city's Northstar commuter rail line.

Award of the systems contract follows the receipt of a Letter of No Prejudice from the Federal Transit Administration on August 30, ensuring that early construction work is eligible for federal reimbursement once the Full Funding Grant Agreement has been finalised. With agreement currently expected in early 2020, the FFGA would provide a federal contribution of $929m to meet almost half of the total project costs.

Describing the award as a 'major milestone', Met Council Chair Nora Slawik said 'we look forward to working with our project partners and stakeholders as we seek approval of the FFGA, and are eagerly anticipating opening day in 2023'.

METRO NEWSLETTERS
on Technologies for
"URBAN MOBILITY AS A SERVICE"

PUBLIC MULTIMODAL URBAN, SUBURBAN, INTERURBAN AND REGIONAL PASSENGER TRANSIT TECHNOLOGIES FOR URBAN MOBILITY AS A SERVICE WITH METRO-BUS, BUS RAPID TRANSIT, LIGHT-RAIL, TRAM-TRAIN, METRO-RAIL, METRO-TRAIN, COMMUTER-RAIL, MONORAIL, AERIAL ROPEWAY, BOTTOM CABELLINER, MAGLEV AND HOVERCRAFT TRANSIT/PEOPLE MOVER, WATER-METRO, AUTONOMOUS PEOPLE-MOVER, POD CARS

TRANSPORT TECHNOLOGIES AND ECONOMIC DEVELOPMENTS IN MODERN URBAN/MEGAPOLIS ENVIROMENT

METRO Newsletter by Dr. F.A. Wingler
METRO 90, October 2019

The Future of Urban Mobility with City Tram Trains (Light Rail Transits); City Tram-Trains have recaptured public Transport once lost to individual Road Traffic in Los Angeles, USA

PART I: INDIAN ACTIVITIES AND INITIATIVES FOR URBAN MOBILITY AS A SERVICE

Industry 4.0 : Indian Railways to integrate Big Data, Artificial Intelligence, Machine Learning and Cloud Computing; India

October 3., 2019 Rail News

The Railway Ministry, Department of Science & Technology and IIT-Kanpur have forged an association on a project on 'Industry 4.0', which includes a host of digital technologies like **artificial intelligence, Big Data, machine learning and cloud computing**. The project will be launched at Modern Coach Factory (MCF), Raebareli.

More Information:

- 'Industry 4.0' will be commonly referred as the 4th industrial revolution amid current trend of automation, interconnectivity and data exchange in manufacturing technologies to increase productivity, a statement by the ministry of railways said.
- The statement said: "Industry 4.0 is a complex Cyber-Physical System which synergises production with digital technologies, the Internet of Things, Artificial Intelligence, Big Data & Analytics, Machine Learning and Cloud Computing."
- MCF is a state-of-the-art coach manufacturing unit with the capacity to manufacture 1,000 passenger coaches annually.

- “About Rs. 4,000 crore are expected to be spent in years to come in Interdisciplinary Cyber Physical Systems (ICPS) to foster and promote R&D in this emerging field of research,” Mr. Rajesh Agarwal, Railway Board (Member Rolling Stock) said.
- The statement made a reference to Prime Minister Narendra Modi, who during his recent address in Houston, USA, highlighted the importance of ‘Industry 4.0’ in the global economy and to India’s advantage.
- The Railway official said:”Full transition to the digital factory using ‘Industry 4.0’ across entire value chain from design to production will help enhance productivity hugely by providing insight into production process to take the decisions in real time basis.”
- The statement added, ”Industry 4.0 would be based cyber/physical digital system and would involve various packages, systems, applications and Hardware within Design/Planning, Networking and Production to be added in a modular and incremental manner in MCF.”

Delhi Metro Phase-IV may get Light Urban Transit Metrolite for 3 Corridors; India

By Aradhana Patel; 09/10/2019; Metro Rail News

The maximum operational Speed of the Delhi Phase IV Metrolite is envisaged for 60 kmph.

Animation for Mauritius LRT Project; proposed also for the Delhi Light Urban Rail Transit, Metrolite-Project, Metro Phase IV (Urban Transport News, Delhi)

Delhi (Metro Rail News): The Ministry of Housing & Urban Affairs is planning to starts Metrolite system for three corridors of Delhi Metro Project Phase IV.

According to sources, a high-level meeting was held at the Ministry on September 26h to discuss the adoption of Metrolite standards for remaining 3 corridors of Delhi Metro Phase-IV project, which include Inderlok to Indraprastha, Lajpat Nagar to Saket G Block and Rithala-Bawana-Narela covering 42.28 km. A senior official of Delhi Metro, DDA and National Highways Authority of India attended the meeting.

Delhi Metro asked DDA to provide population details along the Rithala-Narela corridor, and also the estimated population increase in the next 30 years for assessing the traffic projection of the corridor, also the DDA was asked to fund the project.

The maximum operational speed of the Metrolite is 60 km per hour In any case, even with the failure of onboard signalling, the speed is restricted to 25 km per hour. The train is to accommodate around 300 passengers sources said.

NMRC also proposes Light Urban Rail Transit 'Metrolite' to connect Interior Areas of Noida; India

By Urban Transport News; 07/10/2019

New Delhi (Urban Transport News): After Delhi Metro and Chennai Metro, Noida Metro Rail Corporation (NMRC) has planned to run **Light Urban Rail Transit** 'Metrolite' to connect interior areas of Noida and Greater Noida.

In a recent meeting called by the Ministry of Housing & Urban Affairs (MoHUA), the NMRC has proposed to run 'Metrolite' in upcoming metro corridors in Ghaziabad, Noida and Greater Noida to connect interior areas.

NMRC officials said that the 'Metrolite' will be more useful and budget-friendly as the demand will be optimized by increasing its frequency during peak hours and reducing it during non-peak hours. Metrolite infrastructure can be built on the surface (at grade) as well as elevated, as per the availability of land and space in the city. Its tracks are narrower than the standard/broad gauge used in most of the existing metro lines and there is no overhead extension for wiring, making it safer.

The Delhi Metro Rail Corporation has also planning to deploy 'Metrolite' trains in its upcoming corridors under the phase-IV project. This is because a light urban rail transit system with smaller coaches is nearly 50% cheaper as compared to the standard/broad gauge metro network; PD Upadhayay, the spokesperson of Noida Metro, said.

The Centre had proposed that we go for a Metrolite system as it's less cost-intensive. A Metrolite system is economically more viable as the overall cost of the entire system is almost half of the normal metro network.

Presently, the cost of constructing the metro rail system is around Rs. 200 crores per kilometer, while the Metrolite system costs around Rs 60-100 crore, depending upon the infrastructure requirement. However, the passenger-carrying capacity of a Metrolite coach is anywhere between 70 and 300 which is much less as compared to the current metro coach that can carry 1,034 people at a time.

“Metrolite can be managed by increasing frequency during peak hours and reducing headway during non-peak hours”. “It would be better for us often we need to operate a metro even if it’s going empty. In such cases, the cost of operating the Metrolite will be much less than operating a normal metro,” Upadhyay said.

He said that the metro network may also be at grade at some places in Noida as the Metrolite can be made at the surface level as well be elevated. The existing metro systems either elevated or underground so far.

Noida has wide road space where we can use the green belt and wayside for the Metrolite track, unlike smaller cities with narrow roads. We just need to create a crossing like a small bridge or an underpass near intersections to avoid mixing with usual traffic. The surface system will be very convenient for people as it will be easily accessible. There will be no need for an extensive platform and security checks.

The Noida Metro has also suggested that the proposed metro lines from Pari Chowk to Jewar also be converted to a Metrolite system, which will require another interchange requirement at Pari Chowk station.

Bangalore BMRCL prepares Land for Airport Line Metro; India

By Aradhana Patel ;07/10/2019 ; Metro Rail News

BANGALORE (Metro Rail News): Bangalore Metro Rail Corporation Limited (BMRCL) has starts preparing the ground for its airport line by initiating works on shifting of utilities.

The revised alignment of the airport line Phase 2B, which is planned to begin from KR Puram instead of Nagavara, will reach the airport via Hebbal. The BMRCL has invited tenders for shifting of street lights infringing on the proposed metro line.

A separate tender will be called for shifting of pipelines and other utilities Said Senior officials . The six-month work includes setting up of new street light system with LED lamps under the watch of the BMRCL as well as the BBMP.

Chennai Metro Update: 2.23 Crore Passengers travelled in Metro from January 2019 till September 2019; India

October 3, 2019 Rail News

Chennai: In the month of September 2019, a total of 31, 89,591 passengers have travelled in the Metro Train proving that the efforts taken by CMRL to provide a safer and time efficient way of travel a success!

In the month of September 2019, more than1 Lakh passengers have travelled in the Metro trains for a total of 21 days. And on the following days a total of:

- 1,19,888 passengers have travelled on 13th Sept 2019.
- 1,16,575 passengers have travelled on 6th Sept 2019.
- 1,16,347 passengers have travelled on 12th Sept 2019.
- 1,15,329 passengers have travelled on 16th Sept 2019.
- 1,14,240 passengers have travelled on 2nd Sept 2019.
- 1,14,123 passengers have travelled on 30th Sept 2019.
- 1,01,430 passengers have travelled on 7th Sept 2019.

So far a total of 2.23 crore passengers have travelled from Jan 2019 till September 2019. CMRL has undertaken several initiatives of providing several Last Mile Connectivity. Measures for the Metro Train Passengers among which Share Auto and Share Taxi, Metro Cab services are currently plying at Metro Rail Stations in addition Small Buses by MTC and Tempo Traveller Feeder services to IT corridors in OMR have also been provided for the benefit of passengers.

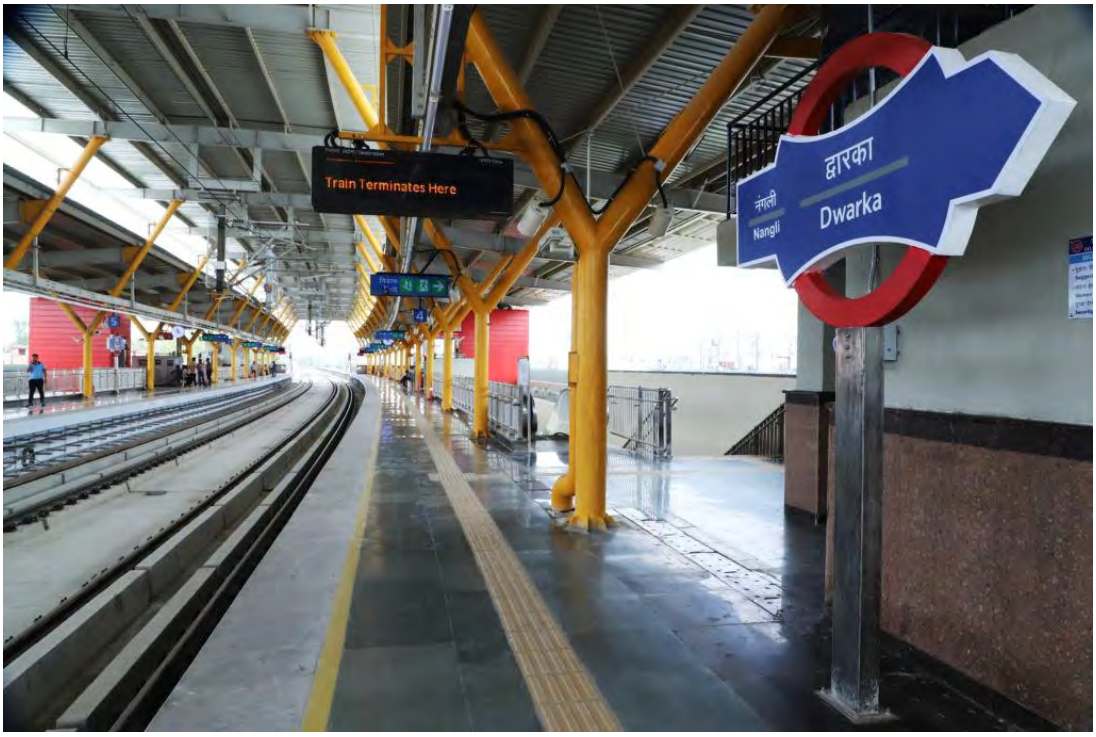
Delhi Metro's Dwarka-Najafgarh Corridor to be flagged off on October 4, 2019; India

October 1, 2019 Rail News

The over 4.2 km-long Dwarka–Najafgarh corridor (**Grey Line**) of Delhi Metro will be formally flagged off on October 4 by MoS (Independent) for Housing & Urban Affairs and Civil Aviation Hardeep Singh Puri and Delhi **Chief Minister** **Arvind Kejriwal**, a senior **DMRC** official said.

More Information:

- The corridor consists of 3 **stations** — Dwarka (interchange with Blue Line), Nangli and Najafgarh.
- Anuj Dayal, the executive director, corporate communication of the DMRC said that the flagging-off ceremony is slated to take place at Metro Bhawan at 12.15 pm, and passenger services on the section shall commence from 5 pm on the same day.



- With the opening of this section, the Delhi Metro network will expand to 377 km with 274 stations, including the Noida-Greater Noida Aqua Line.
- The Grey Line is 4.295 km long section — 2.57 km is elevated and 1.5 km underground.
- With the opening of this section, the Dwarka metro station is all set to emerge as an **interchange facility**, that will connect the sub-city with the locality of Najafgarh.
- Commissioner of Metro Rail Safety (CMRS) Janak Kumar Garg had accorded the mandatory approval for starting passenger operations after inspecting the corridor.
- 3 train shall ply on this section, and a fourth train has been planned, he said.
- The DMRC had earlier said the corridor is being extended by another 1.18 km till Dhansa Stand, which is slated for completion by December 2020.

- At present, the DMRC runs 376 trains, spanning 2,206 coaches and 4,778 trips per day, he added.
- After the Dwarka Sector 21 station, now Dwarka will become the second interchange facility in the Dwarka sub-city.
- Overall, the metro will have 28 interchange facilities after its opening, the official said.

- This section was not sanctioned as part of the Phase 3 project and work started on the Grey Line in 2015, he said.
- The 288 m-long Najafgarh station will become the longest stand-alone underground station in the network, senior DMRC officials said.
- “It was one of the most challenging work to build the Najafgarh station in congested area and it is a ”dumbbell” station (span wise) in its design.”

Bhopal Metro to be called ‘Bhoj Metro’; India

September 28, 2019 Rail News

Animation presenting a Metro Train

Metro Rail in Bhopal will be called ‘Bhoj Metro’, announced Madhya Pradesh Chief Minister Kamal Nath. He said this while laying the foundation stone of Metro Rail in State capital on Thursday. The Metro project will be called ‘Bhoj Metro’, named after city’s legendary ruler Raja Bhoj, he said.

More Information:

- The CM performed the bhumi pujan of the project near Gayatri Mandir on Hoshangabad Road.
- The total length of the metro rail would be around 27.87 kilometre on two corridors.
- First corridor will be from AIIMS to Karond and will cover a distance of 14.94 km, while the second corridor will start from Bhadbhada to Ratnagiri, and will cover a distance of 12.88 km.
- Metro corridors will have **Multi-Modal Integration/Connectivity** with Railway and **Bus Rapid Transit System** stations and **Feeder Network** of buses, intermediate public transport and non-motorised transport.
- The total cost is estimated to be Rs. 6941.40 crore.
- The project has 28 stations including a 1.79 km long underground section with two stations.
- The first phase of the project is expected to be completed by December 2022.
- A SPV namely Madhya Pradesh Metro Rail Co Ltd. (MPMRCL) has been constituted for implementation of the Project.

. PART II: GLOBAL ACTIVITIES FOR URBAN MOBILITY AS A SERVICE

Global Urban Transport News in Brief; Global

2. October 2019; Railway Gazette International, Metro News

Khmelnitsky has taken delivery of the first of 10 trolleybuses that it ordered from Bogdan Motors The 100 m hryvnia order includes five vehicles with traction batteries to enable up to 20 km of off-wire operation.

Krasnodar transport operator KTTU has taken delivery of the first of 12 trolleybuses that it ordered from Trans-Alpha. The 100% low-floor vehicles are equipped with traction batteries to enable up to 15 km of operation off-wire.

The Korea Development Institute has approved the development of GTX Line B in **Seoul**. Construction is due to begin in 2022 for opening in 2027.

Construction of **Shenzhen** metro Line 8 phase 2 and an eastern extension of Line 5 has started.

All-night weekend services have started running on some **Istanbul** metro lines.

ZUE has signed two contracts to maintain the **Kraków** tram network. A 56m złoty contract covers tracks and a 40·8m złoty contract cover the traction power network.

Solaris is to supply six electric buses and three chargers to MZK **Konin** and the same amount to MZK **Ostrów Wielkopolski**. Each order is worth 16m złoty.

Tracklaying has started for a tram extension in **Plzeň**.

DP **Praha** has awarded Metroprojekt a KC11m contract to prepare project documentation for a 500 m tram extension in Václavske Náměstí.

The *Land* of Bayern is providing €25m towards the purchase of metro trains and trams for **Nürnberg**.

Brakar has ordered 12 fast charging stations from Ekoenergetyka to charge battery buses operating in **Drammen**. The contract includes options for 13 more.

Siemens Mobility and Bytemark are developing a multi-modal journey planning and ticketing app for **Columbus**, Ohio.

The Foothill Gold Line Construction Authority awarded the main design-build contract for **Los Angeles**' Foothill Gold Line light rail extension to a joint venture of Kiewit and Parsons. The $805·6m contact covers the first phase of the eastern extension and includes an option for a further 5·3 km, two-station extension to Montclair.

Shift2Rail – Driving Innovation in Railway Communication to the next Level; Global

By Igor López Orbe and Michael Mikulandro; ETR, No. 10, October 2019, page 12, DVV Media Group GmbH.

The rail systems are evolving at an unprecedented pace enabled by the latest innovations of Digitalisation and state-of-the art technologies. Advanced rail applications such as Artificil Intelligence (AI), Internet of Things (IoT), predictive Maintenance, Autonomous Train Operation (ATO), Big Data, Cloud Computing and Moving Blocks have emerged over the last years. These innovations will be deployed in the coming years to improve train operations and make the rail system more attractive by increasing its capacity, safety and reliability.

Application of Building Information Modelling (BIM) Technology for Repair Measures and Maintenance in Railway Systems; Global.

By Dr.-Ing. Chrisoph Schütze, ETR, No. 10, October 2019, page 12, DVV Media Group GmbH.

Up to now, the Building Information Modelling (BIM) technology has been focused on the planning process of new construction or bigger reconstruction projects. But even repair measures and maintenance for railway systems provide several possibilities to apply the new methods in the construction and planning process.

Combatting Cybersecurity Threat; Global

By David Burroughslooks, IRJ, October 2019, page 42

As Railways become more digitalised and connected, they are increasingly susceptible to malicious Hacks and Cyberattacks. David Burroughslooks at the Risks facing the Industry and how they can be managed.

THE trend towards the full digitalisation of the railway industry is bringing with it wide ranging benefits. Predictive maintenance, advanced signalling systems and innovations, that improve the customer experience, are all enhancing the way networks are managed and services are operated. But the more these technologies become imbedded into the everyday cycle of running a railway, the more susceptible to cyberattacks they become.

Sensors and equipment are also generally distributed across large geographical areas, often in remote locations, compounding the difficulty of ensuring they are secure. This threat grows more serious as digital technology becomes more prevalent in safety-critical systems.

In the Rail Cyber Security Strategy published in January 2017, Britain's Rail Delivery Group (RDG) noted the potential for cyberattacks on the railway, which could result in a number of

potential impacts, including: = threat to safety of the workforce, passengers or the public resulting in harm = disruption to services = financial loss, including to the wider economy = the loss of commercial or sensitive information = criminal damage = reputational damage, and = a failure to comply with the law. The serious ramifications, that could result from a cyberattack, mean it is an issue, that must be taken seriously across the industry. While large companies may have more resources to prepare against attacks, they are still susceptible.

As the Wanna Cry ransomware swept around the world in May 2017, German Rail (DB) was caught up by the crypto worm, that targeted the Windows operating system, encrypting data and demanding ransom payments in Bitcoin. DB Network IT-security management, Mr Christian Schlehuber, says the incident hit DB hard from a public relations point-of-view due to the highly visible nature of the attack, but didn't result in a breach of its secure systems, with quick thinking from station staff reducing the disruption to services. DB has a triple-layer network, and Wanna Cry only penetrated level three, not coming close to level one, which includes safety critical systems such as signalling.

However, the resulting media attention led to a large increase in the importance given to cybersecurity in the company. Speaking at the Rise of IoT and Big Data in Rail conference in Munich in May, Schlehuber said that while the company currently has the multiple layers of defence in place, it isn't in a position to sit back and rest easy. "We have several layers of defence, between those things like data files and firewalls and so on, and in general it looks quite good," he says. "We think this part, the signalling section, is quite secure because we have isolated systems, but if you look at a system from an attacker's point of view, you look for the weakest link. This is not the signalling system but this is something coming from the office IT network, where most of the people have access." He says that while researching vulnerabilities in one of DB's systems, they were able to access a manual version of the setup programme, that still had administrative privileges, which allowed access to parts of the network, that should have been blocked. Schlehuber said, hackers would not start an attack by directly targeting the main systems, instead looking for small vulnerabilities and gaps in the defence such as this system, which they could then exploit to gain deeper access into the network. "They explore what infrastructure is there, search for websites, and find credentials, then build a system with administrative privileges, a new home base from which they begin operating," he explained. "This is what could have happened had we not found this ourselves."

Sometimes, it is not a lack of processes and safeguards, that can cause vulnerabilities, but a lax attitude towards following them. As an example, Schlehuber says, he was once on a visit to an operator outside of Germany, where the server passwords were listed out and easily available. The cabinets were also locked, but the keys were kept inside the locks. "If I, as an attacker, enter this building, I would think 'nice work,' take the keys from the cabinets and do whatever I want," he says. "I've seen this several times".

"Missing awareness is one of the biggest issues in the railway domain."

Another mistake, often overlooked by some in the rail industry, was leaving set-up programmes installed after a system had been initialised, leaving it open to attack. "You want to deploy a new solution like a diagnostics solution or an interlocking system," Schlehuber says. "Somebody needs access to it because they do not want to drive out to the middle of nowhere every day to maintain it. So you deploy some sort of initial setup programme, which is good for the setup, but after it is running think about whether you need them and whether you can remove them because otherwise someone will find it." While having security against complex attacks is imperative, Schlehuber also highlighted the importance of ensuring that basic tasks are done properly. "You might have several layers

of defence in your control system, but think about what happens if someone can bypass it," he says. "Don't think only about the complex modern things, like sophisticated attacks, that are in the media. These are relevant but normally we have another issue, and that's the basics."

These basic risks can include storing passwords on easily accessible file shares, not changing default passwords, missing updates and software patches, and using the same passwords across multiple systems and applications. Network infrastructure While processes and software can go a long way towards defining the security of a network, the basic design of a network setup can also play a critical part in ensuring it remains secure.

One issue facing operators is finding ways to share valuable data from mission-critical, safety-critical and reliability-critical systems with as many staff as possible, without opening these systems to attack. A sensor mounted beside the track may not seem like a likely target for hackers, but attacks in the past have shown that creative hackers have devised innovative ways to access networks. British-based cybersecurity firm Darktrace identified two separate cases where casinos in the United States were targeted through IoT-connected fish tanks. In the first case, reported in 2017, the tank was equipped with a state-of-the-art system, that allowed the temperature, food and cleanliness of the tank to be monitored and changed remotely. However, this same system also provided an opening for hackers to gain access to the rest of the network, with Darktrace finding 10 GB of information was taken from the casino's network and sent to a device in Finland. In a similar event reported in 2018, an IoT-connected thermostat in a fish tank was used to gain access to another casino's network, allowing the hackers to make off with a list of high-roller customers.

At the Rise of IoT and Big Data in Rail conference, Waterfall director of business development, Mr Jesus Molina, said, there were a number of different architectures, that could be built into a network to ensure the data from the sensor is readily available while the network itself remains secure. The first is the use of a demilitarised zone (DMZ), which uses an isolated network, that acts as a buffer between a front-facing website or network and an internal secure network, replicating the data from the secure server onto a non-secure server in real time, where it can be safely accessed without compromising the secure network. While this can be useful for low- and medium-security systems, it doesn't always provide the level required by some high-security systems.

The second process is similar and also uses a DMZ, but adds distinct security protocols to transfer the data through the zone. Data is collected within the secure network and stored or transmitted to the DMZ, where it is then transferred to the non-secured side with encryption on both streams.

The third, and most secure system, uses unidirectional security gateways, which create an impassable physical barrier preventing all external attacks entering through the gateway.

The industrial systems and servers are 'exported' to the corporate network over a fibre optic cable in real time using server-replication and device emulation, which retains the data and functionality of the original network. As it is only fitted with a fibre-optic transmitter at one end and a receiver at the other end, the device is physically incapable of sending information and data back to a secure network, preventing unwanted access. In an effort to improve the security of European Operators, DB Network and Infrabel have worked with the EU Agency for Railways (ERA) and European Union Agency for Cybersecurity (ENISA) to develop a European Railway Information Sharing and Analysis Centre (ER-ISAC). Working with operators and other organisations such as DG Move, the goal to create a secure and confidential platform for information exchange across the railway sector about incidents, threats and concepts to improve security.

Schlehuber says, ER-ISAC is progressing well, and is starting the first cybersecurity working groups and sharing works between the participants. ER-ISAC has also become one of the main partners for several EU institutions for addressing cybersecurity in the railway industry across Europe. “Most of the other operators will have the same issues because we have the same suppliers and the same processes for operation and maintenance,” he says. “We need to join forces to ensure safe and secure rail operations.” **IRJ**

Wuppertal Suspension Monorail “Schwebebahn” adopts Level 3 ETCS for ATO; Germany

Railway Gazette International, October 2019

Wuppertal Suspension Monorail “Schwebebahn”, Germany

Wuppertal, Germany: ETCS Level 3 train control has been commissioned on the Wuppertal Schwebebahn suspension monorail in Wuppertal. Under Level 3, track occupancy is determined solely by the vehicles communicating their positions to the central computer via radio. This obviates the need for conventional trackside train detection components such as axle counters, which have now been removed. Alstom has supplied its Atlas ETCS technology under a contract signed with WSW Mobil in 2012. This covered the onboard equipment for all 31 vehicles in the new Schwebebahn fleet, as well as the heritage Kaiserwagen. It also included lineside equipment, such as the radio block centre, replacement interlockings and an interface to the operation control system. Wuppertal is the

first city in Germany to adopt ETCS for an urban rail application, according to Alstom's Managing Director for Germany and Austria Jörg Nikutta.

ATO on London Circle Line with CBTC, London, UK

Railway Gazette International, October 2019

London Underground Circle Line goes Driverless with CBTC from Thales

A second section of London Underground's Circle Line has been converted to **automatic train operation** under the Four Lines Modernisation programme. Thales CBTC was commissioned on Signal Migration Areas 1 and 2 over the weekend of August 31 – September 1. This was the first section of the resignalling programme to include some of the busy flat junctions which are crucial to the operation of the complex subsurface network. It covers Latimer Road – Euston Square, including the junctions at Praed Street, where the Hammersmith & City Line joins the Circle and District lines west of Edgware Road, and at Baker Street, where the Metropolitan and Circle lines converge, together with a short section of the Metropolitan Line running north to Finchley Road. Both junctions rely on pairing train movements in opposite directions to maximise throughput. The resignalling will facilitate a future increase from 28 to 32 trains.

Moscow Metro Operations consolidated in new digital Control Centre

Oct. 8, 2019
Written by David Burroughs; IRJ

MOSCOW Metro opened its new Single Dispatch Centre (EDC) on October 3, which will consolidate various control functions previously located around the city in a single building.

The Moscow Metro Single Dispatch Centre (EDC) was opened by the **City's M**ayor Mr. Sergei Sobyanin

Press Service of the mayor and the government of Moscow. Denis Grishkin

The EDC was created under the Digital Subway programme, which was launched in 2013 and is currently 65% complete.

The centre incorporates traffic management along with management of electromechanical equipment and escalators, which were located on Prospekt Mira, the electrical service and situational centre, previously based on Gilyarovskogo Street, and power supply control, previously based on Bolshaya Nikitskaya Street.

"With an increase in passenger traffic, which reaches 700,000 passengers in the evening peak period, the number of trains in operation will increase to 682 units," says Moscow Metro's chief dispatcher, Mr Andrey Zhabin. "And of course, managing so many trains and all that infrastructure, including more than 900 escalators, is much more efficient from a single centre."

Information on the operation of all metro lines and the Moscow Central Ring (MCC) is incorporated into the single building, with the future 430km Moscow Central Diameter suburban network, the first two lines of which are due to open next year, and other suburban lines also due to be managed from the centre when they open.

About 800 staff from dispatchers to media managers will be based in the EDC.

Traffic controllers and infrastructure managers for each line will share a room, allowing them to exchange information quickly and make decisions, with the Lublin – Dmitrov line the first to be managed from the centre.

Before the opening of the EDC, the Moscow metro primarily operated in analogue mode, with dispatchers contacting each other by phone. An internal communications officer would report a problem or incident, and through a series of calls, the information would be passed to the dispatchers on duty who would make the necessary decisions before informing the management and network. The digitalisation of the system will increase the speed of response to emergency situations and make the metro more reliable for passengers.

The data transmitted from the different metro systems in real-time is displayed on a video wall consisting of 36 monitors. In normal mode, these display the general status of the metro, including the timetable, the number of passengers and other indicators.

EDC employees can monitor the operation of all the main elements of the metro infrastructure such as train location, system status and the condition of various systems.

In the event of an incident, dispatchers will see a two-way metro line diagram, information from the main CCTV cameras, and data on current speed limits, along with incoming messages from internal and external information sources, a mnemonic diagram of the station with the location of the incident, and, if necessary, a city map.

The EDC has a decision support system which is already programmed with around 100 scenarios and can provide dispatchers with an optimal procedure in case of an incident.

“It is not enough to build a large number of stations and lines, it is also important to manage this network efficiently,” says Moscow mayor Mr Sergei Sobyanin, who attended the opening ceremony. “Such a metro control centre, which has been opened today and will gradually be filled with life throughout the year, is, of course, a big step in the development in terms of managing traffic quality, punctuality, regulatory procedures, safety, and the quick resolution of emergency situations.”

Bombardier and Leclanché sign Battery Traction MoU; Global

2th October 2019; Metro News

A Prototype Talent 3 EMU equipped for Battery Operation was unveiled **at Bombardier’s Hennigsdorf Plant, Germany, in September 2018**

INTERNATIONAL: Bombardier Transportation announced on October 2. that it has signed a memorandum of understanding with Leclanché SA which would see the Swiss company become its preferred global provider of battery systems for rail applications.

According to Bombardier, Leclanché will deliver 'imminently' its first performance demonstrator battery systems, after which it will be in line to supply traction equipment worth in excess of €100m for use in more than 10 rolling stock projects.

Bombardier will use Leclanché's GNMC and LTO cells, modules and pack technology across its extensive portfolio of trains. The collaboration is intended reduce dependence on diesel engines and lead to a reduction in greenhouse gas emissions by the railway sector.

The partnership is also intended to accelerate the shift from lead-acid batteries to lithium-ion cells. Bombardier says that Leclanché's battery systems provide better density, efficiency and longer life, resulting in lower operational and maintenance costs for end customers.

'Leclanché's ability to cover the complete value chain and the leading cell technologies from design and production of lithium cells in Europe to full battery systems for railway applications, together with our traction technology, positions us together as leaders in electrification solutions for all train types', says Frédéric Hendrick, Head of Module Center Energy & Motion at Bombardier Transportation.

'Leclanché is delighted to have been awarded preferred supplier status by Bombardier Transportation', said Anil Srivastava, CEO of Leclanché. 'We look forward to working with Bombardier to develop and provide battery systems that help to deliver sustainable, connected, zero-emission solutions for the rail industry.'

Driverless Metro to South Korea Gimpo Airport inaugurated; South Korea

30. September 2019

SOUTH KOREA: The Gimpo Gold Line in northwestern Seoul opened on September 28 2019.

The 23.7 km driverless metro line runs north-south from the Yangchon district to Gimpo International Airport. There are 10 stations, including an interchange at the airport with metro lines 5 and 9, as well as AREX airport express services.

The line runs mostly underground, coming above ground just before the northern terminus. All stations are equipped with platform screen doors.

Services run between 05.30 and 01.00, with peak headways of 3 to 4 min and 6 to 12 min off-peak. The end-to-end journey time is 32 min.

Hyundai Rotem has supplied 23 two-car Series 1000 trainsets. The driverless vehicles have a maximum speed of 80 km/h and are stabled at the Gimpohangang depot near Yangchon. Construction of the Gimpo Gold Line started in March 2014 and was managed by South Korea Railroad Authority and Seoul Transportation Corp. The 1·6tr won cost was financed from Korea Land & Housing Corp (1·2tr won) and the city of Gimpo (30·9bn won). The original opening date was planned for November 2018.

On September 28 a groundbreaking ceremony was held for the Dongbuk Line in Seoul. The 13.3 km driverless metro line will serve 16 stations between Wangsimni and Sanggye, with services operated by two-car trainsets. Opening is planned for December 2024.

Battery Vehicle Recharging Project launched in Sweden; Sweden

27. September 2019

SWEDEN: The Solaris Sverige subsidiary of Solaris Bus & Coach is supplying a trolleybus for the Evolution Road R&D project that aims to test dynamic electric vehicle charging.

Evolution Road is led by Elonroad and the Faculty of Engineering at the University of Lund. Other partners are the Swedish National Road & Transport Research Institute, Lund municipality, Innovation Skåne, Kraftringen Energi, Ramboll and Skånetrafiken.

A 1 km section of road in Lund is to be fitted with embedded rails that supply power to charge traction batteries in electric vehicles. Each of the 1 m long conductive segments will be live only when a vehicle is passing over it, with vehicle-to-road wireless communication being used to identify vehicles as they approach. Charging can occur when the vehicle is moving or when it is static.

Solaris will supply a modified Trollino battery trolleybus with an underfloor current collector. The manufacturer says that this method of charging would enable vehicles to be fitted with smaller traction batteries.

Swedish transport administration Trafikverket is the main investor in the € 9m three-year project. Construction of the test track is due to begin in the first quarter of 2020.

Ground-Level electric Bus Recharging Technology presented in Malaga; Spain

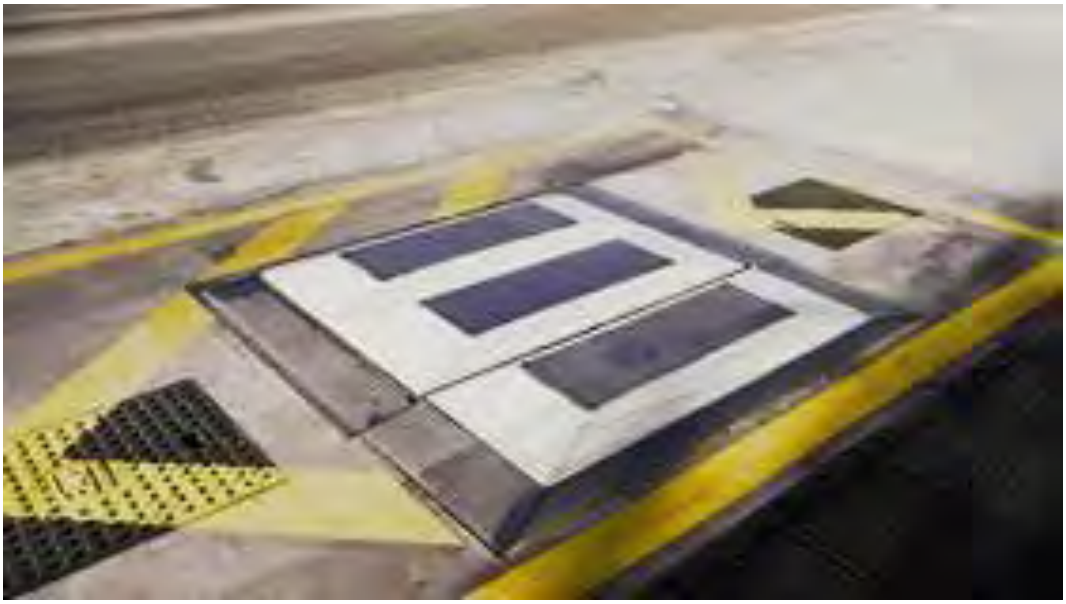
27. September 2019

SPAIN: Alstom has unveiled a Pilot Installation of its SRS ground-based Recharging System for electric Buses in Front of the University of **Malaga's School of Industrial Engineering**.

Based on the supplier's established recharging technology for trams, this is designed to provide a safe ground-level static recharging system which can be used in 'top-up' mode at bus stops or to charge vehicles within depots. It eliminates the need for overhead infrastructure, preserving the aesthetics of the urban landscape and simplifying maintenance.

Underfloor/Ground-Level Rapid Automatic Charging Device for Malaga`s electric Buses

The 200 kW charger will be used to provide power for a 12 m Linkker electric bus which local operator EMT is using on Malaga's Route 1.



Ground-Level electric Contact Areas for Recharging

'This installation of SRS for e-buses in an important step for both Alstom and the city of Malaga, taking us a step further in the move towards fully sustainable urban mobility', said Eric Marie, Alstom's Vice-President of Systems & Infrastructure, on September 25. 'The project shows a way forward for the smooth operation of the enormous electric bus fleets we will see in coming years across Europe.'

The Future of Urban Mobility with City Tram-Trains (Light Rail Transits); City Tram-Trains in Los Angeles; USA

By Dr,-Ing. Andreas Kossek; ETR, Oct. 2019, No. 10, page 37, DVV Media Group GmbH.

Los Angeles City Tram-Train

Los Angeles in USA is a shining example for a modern dense public transport system with LRT, so-called “City-Tram Trains”. At the beginning of the 20th century, the US metropolis Los Angeles had one of the largest and dense urban rail systems worldwide. In the course of the “march” of the automobile traffic, the rail system had completely been removed. Since 1990, the reconstruction of a new attractive public transport system has been developed. Its backbone is a modern Light Rail Transit Installation. City Tram-Trains have recaptured also in several other American cities public transport once lost to individual road traffic. This process is supposed to be an example for other big cities/metropolises around the world.

Tram-Trains proposed for Austrian Montafone Valley Line; Austria

IRJ, Edition October 2019

Montafon Valley Tram-Train, Austria

AUSTRIA's 12.7km Montafon Valley line could be converted to a tram-train line and doubled in length following the recommendations of a recently completed feasibility study. The privately-owned Monterfon Railway (MBS) operates the line between a junction with the Arlberg Line at Bludenz and Schruns in the Silvretta mountains in the western province of Vorarlberg. Under the tram-train concept, which was adopted from several variants examined in the study, the line would be extended south from Schruns to St Gallenkirch, Gortipohl and Gaschurn. A new loop would also be constructed at Vandans on the existing section which would enable tram-trains to serve the town centre. The total cost of the project is estimated at É284m excluding rolling stock. Services would be operated by a fleet of 40 m-long tram- trains, each with capacity for 200 passengers, which could operate in multiple if required.

Limmattal Metre-Gauge LRT Stage One opens in Switzerland; Switzerland

IRJ, October 2019

Limmattal Meter Gauge Light Rail Transit opens; Pict.: RailwayPRO

FOLLOWING two years of construction, the first phase of the Limmattal light rail project linking Zürich Altstetten (Farbhof) with Schlieren Geissweid opened on August 30. A groundbreaking ceremony for the second stage took place on the same day. The 2.9 km initial section has seven stops while the second stage encompasses two sections: a short stretch between Farbhof Zürich Altstetten main line station; and a longer stretch linking Schlieren with Killwangen station. In total, the Limmattal line will cover 13.4 km and 27 stops with the project budgeted at SFr 755m ($US 761.7m) and completion scheduled for 2022. Trams will run on a dedicated alignment for 92% of the route and the line will be electrified partly at 600V DC and 1.2 kV DC. Services will operate at 15minute intervals with a commercial speed of 22 kmph and offer an end-to-end journey time of 37 minutes.

Limattalbahn is initially operating two-car metre-gauge trams on the route. However, the operator is set to receive eight new metre-gauge Tramlink LRVs from Stadler as part of a joint order for 18 vehicles with Basel Land Transport (BLT). The order includes options for two to eight additional vehicles. The scheme also includes complementary projects such as a depot and modifications to roads and access routes for pedestrians and cyclists. The Swiss government is contributing around a third of the cost of the project, with the canton of Zürich accounting for three-quarters of the remainder and the canton of Aarau the last quarter. In addition, the City of Zürich is investing SFr 136 m in road network modifications. The entire project is designed to improve public transport connections in the Limmattal area following rapid industry growth in the area.

Consultation begins on Réunion interurban LRV Tram-Train Rail Line; French Indian Ocean Island of Réunion

IRJ, October 2019

Animation of proposed Tram-Train Line on Réunion; Pict. Railway Gazette

PUBLIC Consultation began on the French Indian Ocean Island of Réunion on August 26, 2019 on plans for a É395m light rail line serving the capital Saint-Denis. The 13km line would link Le Barachois in the west with Duparc and Roland Garros Airport in the east serving 18 stations including four parkand-ride facilities.

The journey time between the terminus stations will be around 25 minutes and services are expected to operate between 05.00 and 01.00 with trams running at six-minute headways at peak times. The project is being developed by the Intercommunal Community of Northern Réunion and is due to be completed in 2022.

Messina Tramway's Future secured; Italy

26th September 2019

ITALY: The Ministry of Infrastructure & Transport has provided an initial €11·1m for track (€4·4m) and rolling stock (€6·7m) maintenance on the Messina tramway. Works are due to start within weeks and will require partial closures.

The funding marks a turnaround from September 2018 when Mayor Cateno De Luca proposed the closure of the loss-making tramway in favour of a reorganisation of bus routes.

However, the Ministry of Infrastructure & Transport said it would not provide funding for an alternative transport mode along the route earlier than 2033, 30 years after the start of tram operations. Instead it has allocated €100m for an upgrading programme and the construction of an extension north from Annunziata to serve the university.

Chinese BYD Company Limited signs Messina electric Midibus Contract; Italy

21th August 2018

ITALY: Messina Municipality signed a contract to purchase 13 electric midibuses from BYD, the Chinese battery supplier announced on August 21 2019.

To be delivered in two batches this year, the 8.7 m long buses will have two doors and capacity for 53 passengers.

The municipality will own the buses, which will be loaned to Messina public transport operator ATM. The purchase is being funded through the government's Metropolitan Cities National Operational Programme 2014-20.

BYD had previously won contracts to supply electric buses to Padova, Torino, Milano and Novara.

NSW chooses Bi-Mode Option for regional Train Replacement; Australia

Sep. 30th, 2019
Written by Mark Carter; IRJ

In a surprise announcement, the New South Wales (NSW) state government says that the new rolling stock ordered to replace the NSW Trains regional passenger fleet will be now delivered with bi-mode capability.

In February 2019 the NSW government awarded a $A 2.8bn ($US 1.89bn) contract to the Momentum Rail consortium for a new fleet of diesel-electric trains, which also included a 15-year maintenance contract and a new train maintenance facility at Dubbo, in regional NSW. The 29 new trains will now be delivered by Momentum rolling stock partner CAF with bi-modal capability, to operate as a diesel-electric multiple unit to operate over the bulk of the NSW Trains regional network and draw power from 1.5 kV DC overhead lines where available.

The segments of the Sydney electrified interurban network over which the new regional trains will run extend 163 km north from Sydney to Newcastle (Broadmeadow), 43 km south to Macarthur, and 153 km west to Lithgow.

Minister for regional transport and roads, Mr Paul Toole, says the trains will transform passenger rail travel in regional NSW.

“This means when our trains enter electrified parts of NSW’s rail network they can connect to overhead power, which will see around $A 2m in annual savings on the cost of diesel fuel,” Toole says. “We are leading the charge for more efficient and sustainable regional rail travel, with our new fleet being built with diesel-electric bi-mode technology, which is an Australian first.”
With transport accounting for almost 45% of the state’s energy consumption, Transport for NSW plays a key role in reducing emissions and contributing to the NSW Government’s long-term target of net-zero emissions by 2050. The government estimates a further $A 1m per annum in environmental impact cost savings.

The first deliveries of the new trains are expected in 2023.

Wolmi “Sea Train” – a Centre Rail guided Light-Monorail People Mover finally opens in South Korea; South Korea

8. October 2019; Metro Report International

SOUTH KOREA: The Wolmi Sea Train Monorail opened to passengers on October 8, following a ceremony led by Incheon Transportation Corp President Jeong Hee-yoon and Mayor Park Nam-Chun.

The 6.1 km single track elevated loop line around the former island of Wolmido has four stations at Incheon Station, Wolmi Park, Wolmi Culture Street and Wolmi Museum. The journey time for a complete circuit is 35 min.

The route serves various tourist destinations at the seaside resort. Jeong Hee-yoon hoped passengers would have ‘memories of their precious trips with the colourful leaves of Wolmi Park in autumn.’

The line was built using Urbanaut monorail technology. This features rubber tired driving wheels running on top of a narrow steel roll guideway fixed on a steel beam, with the vehicles stabilised and guided by a **central guide** mounted on top of the beam. **This is intended to enable the use of smaller and lighter beams than concrete straddle-beam monorail designs**. The two-car trainsets were built by Rowin.

The monorail was first completed in 2009, but the start of services was repeatedly delayed because of various safety concerns, including the loss of a wheel during testing.

CAF wins West Midlands Catenary free Metro Battery Tram Order; UK

7. October 2019; Metro Report International

UK: The West Midlands Combined Authority has selected CAF to supply 21 additional battery-equipped trams for the West Midlands Metro light rail line from late 2021, with an option for 29 more.

The £ 83·5 m contract was announced on October 7 following a competitive tender. It includes the provision of spare parts, as well as maintenance and renewal of the **onboard lithium-ion batteries** during the 30-year design life of the vehicles.

The line's Centenary Square extension in Birmingham, which is scheduled to open in early 2020, will be the first section of modern tramway in the UK to feature catenary-free running, eliminating the need for the potentially disruptive and expensive installation of visually-intrusive overhead electrification equipment.

Under a separate contract, the current fleet of 21 CAF Urbos trams is being retrofitted with **Saft's Greentech lithium-ion batteries**.

'The CAF Urbos tram will be the first example of battery technology being used in a high-intensity passenger service here in the UK', said CAF's UK Director Richard Garner. He added that the 'modern, spacious design' of the new 70 kmph trams would 'provide passengers with a quiet, smooth and comfortable travel experience'.

Midland Metro Trams to be converted for Catenary-free Operation; UK

12. February 2016; Metro Report International

UK: The 21 CAF Urbos Trams used on the Midland Metro light rail line are to be retrofitted with batteries to enable catenary-free operation, West Midlands transport agency Centro announced on February 12, and four more trams have been ordered which will be supplied with batteries already fitted.

This will allow catenary-free running on four planned extensions:

- Birmingham New Street station –Centenary Square extension scheduled to open in 2019, running through the architecturally sensitive Victoria Square with the 182-year-old Town Hall;

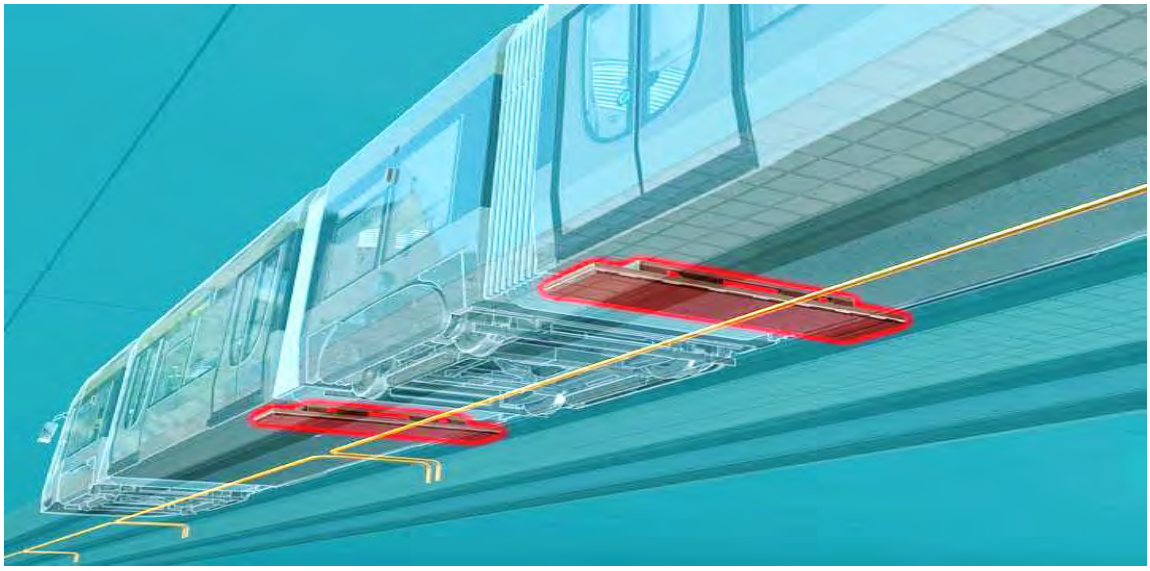
- Edgbaston extension from Centenary Square, through Brindleyplace and the underpass at Five Ways;
- Eastside extension between Moor Street Queensway and Digbeth High Street, where battery operation would avoid the need to lower the existing road under the West Coast Main Line and reduce the headroom required under the proposed HS2 station at Curzon Street;
- Wolverhampton city centre extension between the bus and railway station tram stops.
- Centro estimates the saving from catenary-free operation on the four sections at £650 000, with longer-term savings from avoiding the need to prepare roads or buildings for overhead lines. The proposed Wednesbury – Brierley Hill extension is also being evaluated to identify catenary-free sections.

West Midlands Integrated Transport Authority Chairman Councillor John McNicholas said catenary-free operation had been envisaged when the CAF trams were ordered in 2012, and the contract included provision for retrofitting. Urbos trams fitted with **supercapacitors** are used in Zaragoza and Sevilla, however, this technology was felt to be unsuitable for the steep hill in Birmingham's Pinfold Street, while battery technology was not sufficiently developed when the order was placed.

Negotiations are now underway with battery suppliers. The cost has not been finalised, but the Greater Birmingham & Solihull Local Enterprise Partnership will contribute £3·15m and industry association UK Tram £1m. **The batteries will be fitted on the tram roof and will be recharged from the overhead lines** along other parts of the route. They are expected to require replacement at approximately seven-year intervals.

Primove Catenary-free Induction Tram in Bautzen; Germany

23. January 2009; Metro Report International



GERMANY: A Tram powered by Bombardier's Prototype Primove Induction Technology was formally launched at the company's Bautzen plant on January 22. A potential rival to Alstom's APS ground-level power supply, Primove removes the need for catenary.

Power is transferred to the vehicle by induction, as used in transformers. The principle is used in industrial applications and household appliances including electric toothbrushes, but Bombardier says Primove is the first tram application.

A primary circuit is formed from power cables buried between the rails and connected to a substation. This produces a magnetic field, which is converted back to electrical current by a pick-up coil mounted under the vehicle.

Cables can be laid under any surface, including concrete, tarmac or grass, and can be fitted to an existing trackbed. The components are not visible and are not affected by the weather, and the supply is only energised when the cable is covered by the vehicle, ensuring safe operation. As there is no direct contact the components are not subject to wear.

The 250 kW continuous output of the prototype is designed to power a typical 30 m light rail vehicle operating at 40 kmph on a 6% gradient. Commercial applications of 100 kW to 1 000 kW are planned.

Development is being carried out using a Bombardier Flexity tram from Halle. This has also been fitted with a roof-mounted Mitrac Energy Saver which uses double-layer **'ultracapacitors' to store energy regenerated during braking** for re-use during acceleration. The system has been on test in Mannheim since 2003, where energy savings of up to 30% have been claimed.

'Catenary-free Operation offers an entirely new prospect, particularly for trams operating in historic city centres where impressive cityscapes can now exist unencumbered by visual pollution from overhead lines', said Dr-Ing Carsten Struve, Director of Advanced Technology Development at Bombardier Transportation.

The technology could be commercially available by 2010.

Primove was described in more detail by Gerald Newesely and Dr-Ing Carsten Struve of Bombardier in the December 2008 issue of Metro Report International

TAMPERE City Trams Tracklaying on the Tram Route began in May 2017; Finland

Tampere is developing its first ever Tram Network, with some innovative methods being used to keep the public informed of construction progress. Toma Bačić reports: Tampere prepares for its first tramway.

Residents of Tampere will have their first glimpse of their transport future in January, when the city's first tram is due to arrive. The red-and-black livery, chosen in a public vote, will make the tram stand out from the blue-and white buses that run in the city. The buses will themselves be reorganised once the trams begin carrying passengers on August 9th 2021. In the meantime, future operator VR Group is busy preparing for the opening of the first stage of the tramway. The development phase of its contract with the city began in mid 2019, and initially includes operational, personnel and timetable planning, with VR due to take responsibility for test running and staff training later on. Tampere's first ever tram line will shake up the public transport scene, which is dominated by buses. Yet the city is no stranger to electric modes, as it already has four battery buses in its fleet, and operated a trolleybus network between 1948 and 1976. Public transport in the region is organised jointly by the city and seven municipalities: Tampere, Pirkkala, Nokia, Kangasala, Lempäälä, Ylöjärvi, Vesilahti and Orivesi. The city manages the overall network, as well as transport planning and ticketing. Tampere is the most populous inland city in the Nordic countries. Its population of 235 000 is growing by more than 2 000 people a year, and already includes nearly 40 000 university students. By 2040 the population is forecast to grow to 280 000, and that of the wider urban area is predicted to mushroom from 353 000 today to 460 000. Higher-capacity transport is often mooted in response to growing populations, but plans to build a tram network in Tampere date back to 1907. They were abandoned at the outbreak of World War I, but resurfaced in the 1920s before buses were ruled to be more financially viable. In 1991 plans for a tram network emerged again, and initial planning eventually started in 2001.

On June 16th 2014 the city council approved plans to build a Y-shaped network in two phases. The first stage covers an 11.5 km route between Pyynikintori and Hervantajärvi, with a 4.7 km branch from Sammonaukio to Kaupin Kampus via Tampere University Hospital; 11.2 km will be on a segregated alginment. In the second stage, the line will be extended 8 km west from Pyynikintori to Lentävänniemi. Construction progress The city hosted an industry day in November 2014 for potential suppliers, and this was followed by a call for tenders in December. In January 2015 the city council announced that four bidders had prequalified to bid for the construction contract: • a consortium of Lemminkainen, Ramboll, Alstom and Insinöörit Suunnittelu; • Gülermak; • a consortium of Destia, Siemens

and Sito; • the Tralli consortium of VR Track, YIT Construction Services and Pöyry. The Tralli consortium was selected as preferred bidder in June. Pöyry and VR Track are responsible for engineering design, while VR Track and YIT Construction Services are in charge of construction. The consortium has formed an alliance with the city called Raitiotiealliansi to act as project manager. In November 2016 the city council gave its final approval for construction along the full route, and work began in March 2017 at five sites. In May 2017 the first rails were laid. Arcelor Mittal is supplying 60R2 grooved rails and 49E1.

The livery will make them stand out from the blue-and-white buses that run in Tampere.

5.3 km of the standard gauge route will be on ballasted track, with the rest on slab track. The first phase was more than half complete by April 2019. The original estimated cost was €250m, which was revised to € 282·9 m during the development phase; these figures do not include rolling stock. Government funding covers €55m of the first phase and €16m of the second phase, and the European Investment Bank has provided a € 150 m loan. Tampere is taking an innovative approach to keeping the public and other stakeholders informed of construction progress and possible disruption. To this end, two technology-focused initiatives were launched in 2018. Bluetooth beacons have been installed at construction sites as part of a pilot conducted in co-operation with Globeon. The beacons send information to nearby smartphones about construction progress and possible traffic disruption. An alert is sent with information about the specific sector in which the beacon is located, and smartphone users have the option of accessing details of other worksites, as well as news and social media content by tapping through to a dedicated app. The other public information initiative is a 3D model of the city that shows how the tramway is being built. The model, accessible on a public website, is based on the Unity gaming platform, which enables the use of augmented and virtual reality. This project has been jointly developed by the cities of Tampere and Helsinki, and Tampere University.

Rolling stock and operations Construction of the depot at Hervanta near the southeastern terminus started in September 2017.

A 1 km branch will connect the depot to the running lines, and the depot will itself have 1.8 km of tracks. Tram washing machines are being supplied by Tammermatic. The depot will be used to stable the fleet of 19 trams being supplied by Škoda Transportation subsidiary Transtech, which was selected as preferred bidder in October 2016, beating bids from CAF, Pesa and Stadler Rail Valencia. Its € 104 m contract includes options for up to 46 more trams. Work on the first vehicle started at Transtech's Otanmäki factory near Kajaani in December 2018. The three-section For City Smart Artic X34 trams will be bidirectional, 100% low-floor vehicles with capacity for 264 passengers, including 64 on fixed seats and 40 on tip-up seats. Each tram will have space for six wheelchairs, six bicycles and four seats designated for guide dogs. Traction motors totalling 800 kW will give a maximum speed of 80 kmph. The air-conditioned vehicles are designed to maintain an interior temperature of 21°C while the outdoor temperature is between 35°C and 35°C. In June 2019 Transtech and Etteplan agreed to co-operate on the technical documentation for the trams. Doors are being supplied by Tamware. The trams will be 37.3 m long, but each of the 23 stops on the first phase will have 47 m platforms so that longer vehicles could be accommodated in the future. The trams will draw power at 750 V, and 10 traction substations are being built along the route. The average speed would be 19 to 22 kmph, giving a journey time from Pyynikintori to Hervantajärvi of 29 min, and between Pyynikintori and Kaupin Kampus of 15 min. Services would run between 05.00 and 23.00 at headways of 7½ min on the branches, leading to a tram every 3 to 4 min in the city centre. Ridership is forecast at 47 700 passengers per day by 2030. National passenger rail operator VR Group won the operating contract in April 2019, beating bids from Länsilinjat, a Transtech-Keolis consortium, Spårvägar and Väinö Paunu. The contract includes 30 months of development and 10 years

of operation, and is worth €7m a year once operations start. VR Group would therefore still be the operator once the second phase opens to passengers. Construction of the extension to Lentävänniemi is scheduled to begin in 2021 for completion three years later. ‘Tampere’s first ever tram line will shake up the public transport scene’.

METRO NEWSLETTERS
on Technologies for
"URBAN MOBILITY AS A SERVICE"

PUBLIC MULTIMODAL URBAN, SUBURBAN, INTERURBAN AND REGIONAL PASSENGER TRANSIT TECHNOLOGIES FOR URBAN MOBILITY AS A SERVICE WITH METRO-BUS, BUS RAPID TRANSIT, LIGHT-RAIL, TRAM-TRAIN, METRO-RAIL, METRO-TRAIN, COMMUTER-RAIL, MONORAIL, AERIAL ROPEWAY, BOTTOM CABELLINER, MAGLEV AND HOVERCRAFT TRANSIT/PEOPLE MOVER, WATER-METRO, AUTONOMOUS PEOPLE-MOVER, POD CARS

TRANSPORT TECHNOLOGIES AND ECONOMIC DEVELOPMENTS IN MODERN URBAN/MEGAPOLIS ENVIROMENT

METRO Newsletter by Dr. F.A. Wingler
METRO 91, October 2019

"METRO ON TIRES" is the new Slogan in the World of Public Urban,
Suburban, Interurban and Regional Transport for
URBAN MOBILITY IN INDIA

PART I: INDIAN ACTIVITIES AND INITIATIVES FOR URBAN MOBILITY AS A SERVICE

Implementation of European Train Control System, ETCS, and Train Protection Warning System, TPWS, over Indian Railway Network; India

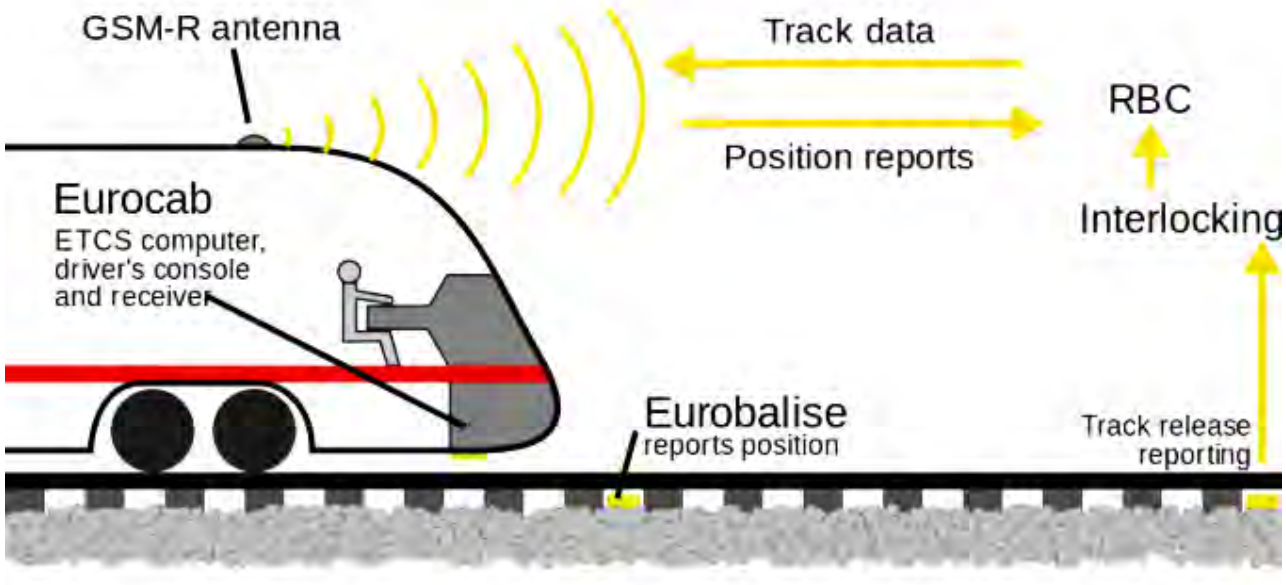
October 10th, 2019 Articles Rail Analysis India

European Train Control System (ETCS):

Introduction: European Railway Traffic Management System (ERTMS) is evolved to harmonize cross-border rail connections for seamless operations across European nations. ERTMS is stated to be the most per formant train control system, which brings significant advantages in terms of safety, reliability, punctuality and traffic capacity. ERTMS is evolving as a global standard. Many countries outside Europe: US, China, Taiwan, South Korea and Saudi Arabia have adopted ERTMS standards for train traffic command and control.

Cab Signalling, ETCS Level 2 on German Federal Railway, DB

ETCS (European Train Control System) is a train control system designed to replace all existing national systems on the Trans European Rail Network. The ETCSs system enables trains equipped with onboard units from different suppliers to operate freely over track equipped by the same/different suppliers. It consists of both onboard and trackside subsystems, with a choice of transmission system for the communication between the two.



ETCS Level 2, limited Supervision, Schematic (Image Credit: Wikipedia)

How ETCS can be used: The functional and system requirements for ETCS are contained in two documents, the Functional Requirements Specification (FRS) and the System Requirements Specification (SRS). The FRS is produced by the operators (EEIG) and in theory is the base document for the creation of the SRS by the suppliers (UNISIG) but in some cases the relationship has been the other way round. The functional and system

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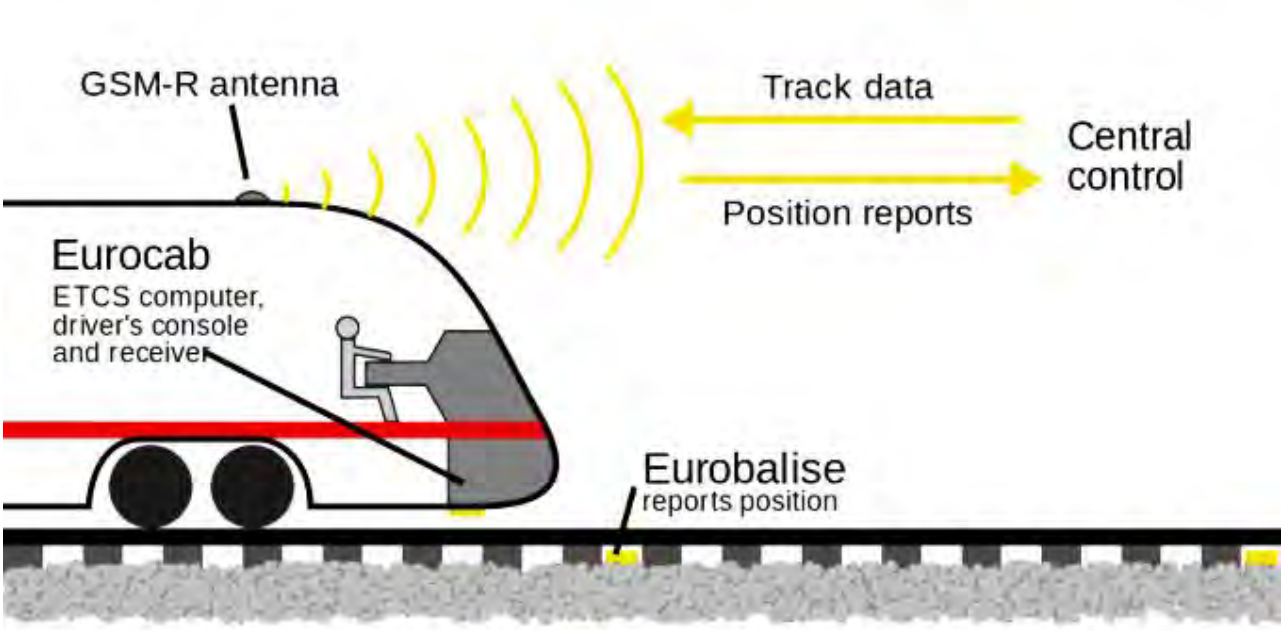


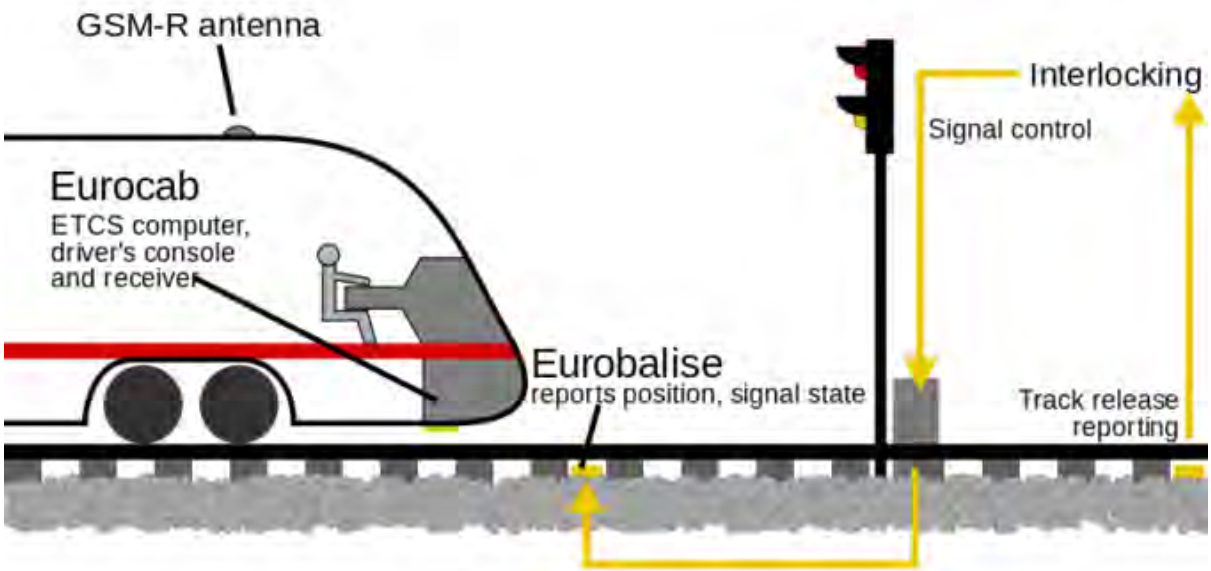
ETCS Level 3, Unlimited Supervision, Schematic (Image Credit: Wikipedia)

Application Levels: Signaling component of ERTMS has basically four components: European Train Control System (ETCS) with Automatic Train Protection System, Global System GSM-R, European Traffic Management Layer (ETML) and European Operating Rules (EOR).

ETCS is not a signaling itself, but provides a layer over existing signaling. It has 5 application levels and 16 operating modes. Each application level defines level of protection to trains. GSM-R is though a separate element; ETCS make use of GSM-R for its voice and data communication. Different levels (STM, 0, 1, 2 and 3) have been defined to allow each individual railway administration to select the appropriate ETCS application trackside, according to their strategies, to their trackside infrastructure and to the required performance. These levels mainly differ in the trackside and communication systems that are used, and in which functions are processed in the trackside and in the on-board equipment respectively. There are four application levels to be considered; levels 0, STM, 1 and 2. Level 3 is not currently being offered by the suppliers by mutual agreement in order to focus on the other levels.

Level 1 is where OBE on Locomotives and LSE are provided. In Level 2, GSM-R over a fixed network is required in addition to OBE and LSEs and Line side signals are not mandatory. Level 0, 1, and 2 work on fixed block concept where train sections have been

demarcated with signals or signs. In Level 3, moving block in place of fixed block will be mandated. Level STM is meant to provide interface to trackside existing national protection systems AWS, TPWS & TPWS+ (UK) and OBE.



ETCS Level 1 Schematic (Image Credit: Wikipedia)

How can Indian Railways use ETCS: The railways earlier decided that 100% ETCS over the next six years and give the contract in one go, giving the suppliers the benefit of economies of scale. The Railway Board has approved the proposal of ETCS (European Train Control System) Level 2 signalling between Ghaziabad and Mughalsarai, since the Delhi-Mughalsarai route has high traffic density, modern signalling will help in enhancement of safety. The capacity utilization on this route is 150% and the punctuality is also the worst among the 17 zones of Indian Railway. Modern signalling will help to reduce congestion in rail network and increase the line capacity by 40%-50%. It will also improve the punctuality of train delays sue to automated signalling real-time information of train movements.

The railway tested the ETCS Level 1 on total 342 km from **Agra-Delhi, Chennai-Suburban** railway and **Kolkata Metro**, where in locomotives are fitted with screens, that receive intermittent message about signals ahead through track-side devices. This mitigates the risk of locomotive pilot's error of running over signals due to fog or human error, or over-speeding as the locomotive comes to a halt upon making error. According to the railway official, the per km cost of implementing the ETCS Level 2 is 30% higher with the ETCS Level 1.

Train Protection & Warning System (TPWS):

Introduction: TPWS primarily offers additional safety in a fully automatic signal circuit and comprises on-board computer consoles or the Driver-Machine Interface. The system will be connected to wireless track-side Balise devices that employ electromagnetic induction and transmits the aspect information of line side Signals to on-board. A standard TPWS facilitates trains to run at maximum permitted speed and allows train drivers to slow down and run at safe speed levels.

The TPWS system in IR is based on European Rail Traffic Management System (ERTMS-Level 1) technology, that will create a signalling loop to warn train drivers about the obstacles ahead, as well as control the speed in case of emergency. The system will also activate the

train braking system automatically if the driver fails to notice the warning signs, and help regulate speed if a train is travelling too fast on the approach to certain speed restrictions.

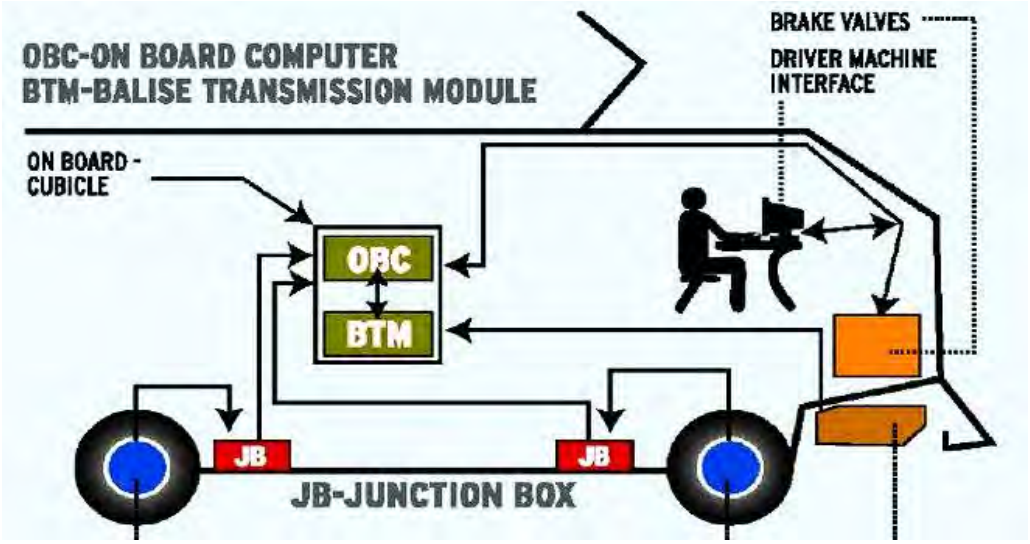


Image Credit: Southern Railway

How TPWS works: TPWS will be provided on sections equipped with Multi Aspect Color Light Signalling and train driver will follow Line Side signals as per prevalent operating rules. Provision of TPWS will be an additional safety aid to the train driver to prevent consequences arising out of Signal Passing at Danger (SPAD) and to control train speed within specified limits.

TPWS is a data-driven system; it is of the utmost importance that the data held by both the ETCS trackside equipment and ETCS on-board equipment is correct and up-to-date. This requires robust procedures to ensure:

- Raw information is measured accurately.
- Raw data is transposed accurately into a form used by ETCS equipment.
- Transposed data is correctly entered into ETCS equipment.
- Data is stored securely with appropriate safeguards, change control and records management.
- Changes to infrastructure are promptly reflected in the data held by ETCS equipment.

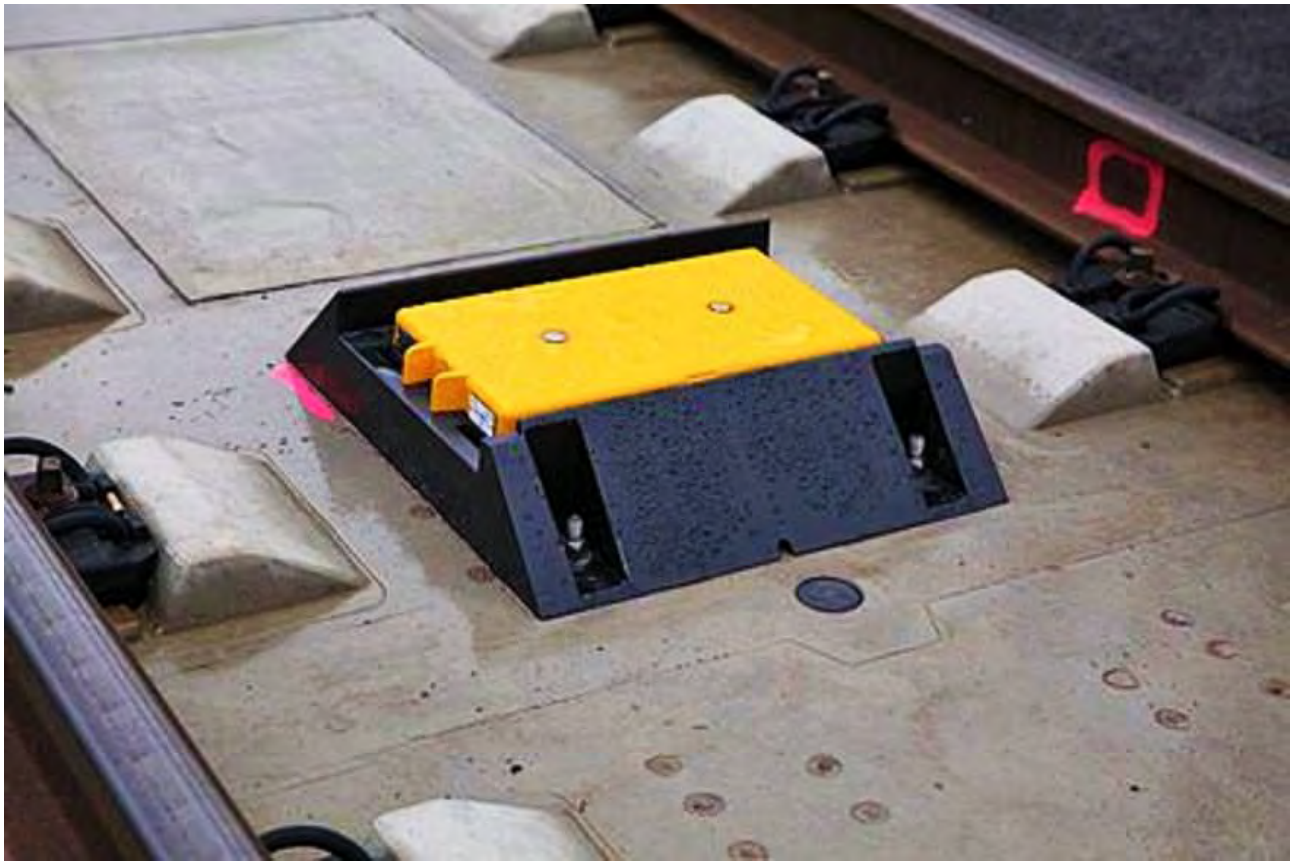
SPAD Indicator (Image Credit: Wikipedia)

How Indian Railways can use TPWS: Indian Railways is working towards making the train travel faster and safer in trunk routes by introducing Train Protection and Warning System (TPWS) on 3,330 RKMs at an estimated cost of Rs. 2,000 Crores. The aim of this paper is to understand the aspects in speedy implementation of TPWS on IR. This necessitates understanding basic concepts of TPWS, preparation detailed estimates, tendering, execution of works including testing and commissioning and maintenance aspects. An attempt is made to capture these aspects as far as possible so as to benefit the IR Engineers who are engaged in implementation of TPWS in their respective railway.

Indian Railways had commissioned a TPWS system on trial basis for the EMU service on mixed tracks on the Southern Railway in 2009, providing ERTMS-Level 1 Balise based control linked to the aspects of each Automatic signal encountered by the EMU trains. Since this was a retro-fit on existing aged EMUs with 25 KV A.C traction, a number of problems due to EMC/EMI issues have cropped up which are yet to be fully solved and efforts for required level of reliability and availability as per ERTMS are continuing.

As per the Action Plan 2022 issued by Railway Board, TPWS (ETCS Level-1) system to be introduced on 10,000 RKMs on IR by 2022. The need of IR today is to quickly deploy a train protection system with basic features of SPAD (Signal Passed at Danger) protection and availability of information of ahead signal for safe train operations during foggy conditions. As an immediate priority, Automatic Block Signalling Sections need to be covered first with TPWS coverage since such sections have higher chances of human errors on part of drivers resulting into accidents as trains run closer to each other.

A TPWS Transmitter Loop; one of a Pair, that form an Overspeed Sensor System (OSS) (Image Credit: Wikipedia)



ETCS EUROBALISE Transponder on German High Speed Track

Comparing ETCS and TWPS briefly: TPWS has the capability to control the speed of the train in accordance with the sectional permitted speed and signal aspect ahead by automatic actuation of brakes, in case loco pilot fails to do so in time, therefore, it mitigates safety risk of accidents collisions due to loco pilots error of signal passing at danger or over speeding. A pair of electronic loops is placed 50–450 m on the approach side of the signal, energized when it is at danger. The distance between the loops determines the minimum speed at which the on board equipment will apply the train's emergency brakes. When the train's TPWS receiver passes over the first loop a timer begins to count down. If the second loop is passed before the timer has reached zero, the TPWS will activate. The further the pair of loops is from the signal, the more widely spaced they will be, there is another pair of loops at the signal, also energized when the signal is at danger. These are placed together and will stop a train that runs past the signal.

Whereas, ETCS is not just signalling system itself, but it provides an additional layer over existing signalling. It has 5 application level and 16 operating modes and each application level can define the protection of trains. A variant of Level 3 is ERTMS regional, which has the option to be used with virtual fixed blocks or with true moving block signalling. It was early defined and implemented in a cost sensitive environment in Sweden. In 2016 with SRS *3.5*+ it was adopted by core standards and is now officially part of Baseline 3 Level 3. The Wuppertal Suspension Mono-Rail in Germany operates driver-less with ETCS Level 3.

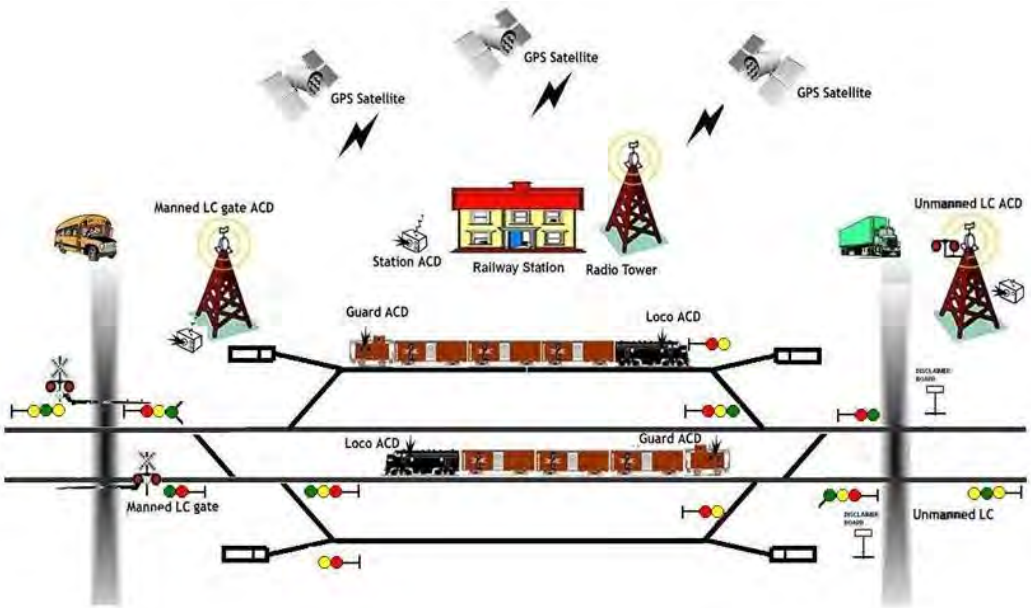
Modernization of Signalling System in Railways with TCAS; India

October 9th, 2019 Articles Rail Analysis India

Introduction: Indian Railways is planning to upgrade its entire rail network with modern signals and anti-train collision system. Right now the signalling system on the vast Indian Railways network does not have the modern signalling system but Indian railways are in the process of upgrading the entire signalling system in the next few years with the Anti-collision technology.

With newer technologies being utilized, The cabinet cleared the plan to upgrade the IR Network to higher speeds such as the Mumbai-Delhi and Delhi-Howrah route to 160kmph which is targeted to be completed in the next four years The Indian Railways ambitious 508km Mumbai – Ahmedabad High Speed Train is also under construction now.

What is Anti-Collision Device: The ACD network is a train collision prevention system that was invented by Shri Rajaram Bojji and patented by Konkan Railway Corporation limited. It relies on GPS satellite for position updates. They exchange information through radio frequency transmission to automatically brake and prevent collision. ACDs brakes to reduce the train speed to 15 kmph if on approach.



ACD Network ... *A Train Collision Prevention System (TCPS)*

Image Credit: Ajaykumar A. Bhatt

Railways Future with ACD: Indian Railways have successfully piloted ACDs in the Northeast Frontier Railway, covering 1736 km of its broad gauge route. They are now installing the ACDs on 760 km of Konkan Railways. The on board train protection device, the first device designed by Konkan Railway with their technical partner Kernex Microsystems ltd, was installed throughout the Indian Railway Network.

A new ACD version-11, now called the Train Collision Avoidance System (TCAS) is under development by the Research Designs and Standards Organization (RDSO). ACD, which was more of a distributed system which acted independently has now a new successor: TCAS , which will be more of a centralized system where TCAS controls communication between the train and with the TDMA protocol. The TCAS under development is meant to be a vital safety system in Railways.

Image Cedit: Ajit Kumar

Deficiencies of ACD: The ACD system is based on GPS based positioning and track detection. This has inherent problems as with GPS service and course acquisition, the best possible horizontal accuracy is 10 m. This is inadequate for detection of rail tracks separated by a distance of 10–15 feet. ACD does not even have DGPS, differential GPS that gives accuracy close to 2.5 m, and hence had errors in track detection using their patented Deviation Count Theory that worked in block sections but failed in station sections.

The result was erratic breaking that disrupted train movements and proved to be ineffective. After seven or eight years of problems with the ACD system, RDSO, Lucknow drafted the Train Collision Avoidance System (TCAS) specifications with amendments. In 2012, the Ver3.1.1 specification was released after joint consultation with companies manufacturing signalling equipment for the Indian Railways. The ACD system used in Indian Railways had inherent problems in station sections due to their design, using GPS for unfeasible track detection. TCAS is now being developed in India by qualified companies, manufacturing railway safety systems selected by RDSO through an Expression of Interest (EOI). These companies include Kernex Microsystems; Medha servo drives Hyderabad, Invensys Bangalore, Siemens, HBL Power Systems Ltd Hyderabad and others.

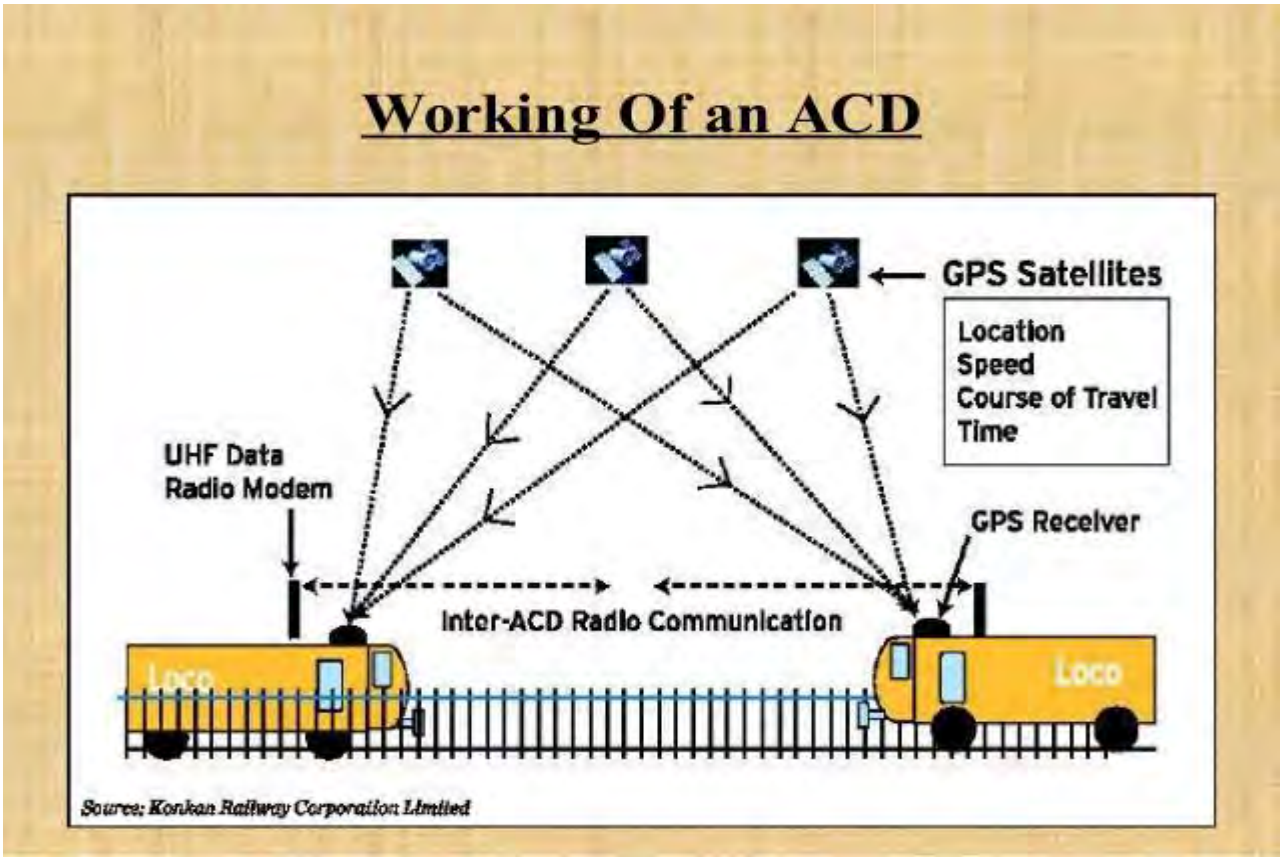


Image Credit: Konkan Railways

Conclusion: Sources stated that the TCAS would not only help avoid collisions due to human errors in signalling and invisibility of signals due to heavy rain or fog, but also alerts about fire on trains and warnings about damage to the tracks during natural calamities or sabotage.

Thales selected for India's first Communication Based Train Control, CBTC, for Hyderabad Metro Deployment; India

Dec. 11th, 2012 Written by Keith Barrow; IRJ

LARSEN & TOUBRO, the Indian Contractor responsible for Construction of the initial Phase of the Hyderabad Metro has awarded Thales a Contract worth around Rs. 7.4 bn ($US 134.3 m) to provide CBTC, the integrated Communication and Supervision Systems on all three Lines.

Artist's Impression of Hyderabad Metro.

This will be the first commercial CBTC deployment in India, covering the whole phase 1 network totaling 71 km, which is due to be completed by 2017.

Thales will supply its SelTrac® CBTC technology, and trains will initially run in automatic train operation mode with minimum headways of 90 seconds, although the system will support eventual migration to unattended train operation (UTO).

The first stage of Line 1 is due to open in March 2015 and further sections will be commissioned at roughly three-month intervals to complete the first phase by December 2017.

The network is being built by Larsen & Toubro under a 35-year design, build, finance, operate and maintain PPP contract awarded by the Andhra Pradesh State Government in September 2010. The metro will be operated and maintained by Keolis, and Hyundai Rotem will supply the train fleet.

Thales has also confirmed that it is bidding for the contract to supply automatic fare collection systems in Hyderabad and for CBTC provision on the third phase of the Delhi Metro network.

Committee formed to draft Standards and Specifications for 'Metro on Tyres'; India

October 12th, 2019 Rail News

A committee has been formed to draft a set of standards and specifications for 'Metro on Tyres' which runs on rubber tyres instead of steel wheels like Metro Rail or Metrolite, Union Minister for Housing and Urban Development Mr Hardeep Singh Puri said.

More Information:

- '**Metro on Tyres'** is much cheaper than both the Metro Rail and Metrolite.
- Officials said, while the per kilometer cost of Metro Rail is Rs 300 crore and Rs 100 crore for Metrolite but 'metro on tyres' will cost Rs. 60 crore.
- The minister said, "We have formed a committee to finalise a set of standards and specifications for metro on tyres. When they come out with their report there will be a process of approval and then will be presented in public domain for states to adopt. We have not frozen on the standards and specifications for it yet."
- The Metrolite has been approved by the ministry and the Board of the Delhi Metro has also given its nod for its use in a 20 km stretch from Dwarka sector 25 to Kirtinagar, he also said.
- Now, the ministry will await the proposal to come from the Delhi government to use it.
- A similar process, he said will be followed in case of 'metro on tyres'.

'Metro Neo' for Nashik

- In August, the Maharashtra cabinet cleared the mass transport system 'Metro Neo' for better connectivity across Nashik.
- However, Nashik will have to wait for the report of the committee and the final approval from the union ministry before it begins building, the Union Housing and Urban Affairs Secretary Durga Shankar Mishra said.
- As per the Nashik model, its 'metro on tyres' will have an elevated corridor.
- Its coaches will operate on electricity and battery and ply on elevated viaducts with state-of-the-art terminals.
- Mr Mishra said, "Nashik are the prime movers in this case and it is from there that we got the idea. However, they have to wait for the standards and specifications."

Delhi Metro Update: Metrolite to run on remaining 3 Corridors of Phase-4 Project; India

October 9th, 2019 Rail News

New Delhi: The government is planning to introduce metrolite system for the remaining 3 corridors of the Phase-4 project of Delhi Metro. This move will reduce cost by 25 to 40 per cent compared to the existing Metro system.

More Information:

- Recently, a high-level meeting was held to discuss the adoption of metrolite standards for the remaining 3 corridors of Phase-4 project, sources said.
- Senior officials of DMRC (Delhi Metro Rail Corporation), Delhi Development Authority (DDA) and National Highways Authority of India (NHAI) attended the meeting.
- **The remaining 3 corridors include:**
  - Inderlok to Indraprastha
  - Lajpat Nagar to Saket G Block
  - Rithala-Bawana-Narela
- DMRC asked DDA to provide population details along the Rithala-Narela corridor and also the increase in the next 30 years for assessing the traffic projection of the corridor.
- Also, the DDA was asked to fund the project.
- The maximum operational speed of the Metrolite is 60 kmph.
- The train is to accommodate around 300 passengers.

‘Metrolite’ approved from Dwarka Sector 25 to Kirtinagar; Delhi, India

October 12, 2019 Rail News

The Union Housing and Urban Affairs Ministry and the Board of the Delhi Metro has approved the ‘Metrolite‘ on a 20 km stretch from Dwarka Sector 25 to Kirtinagar. Now, the ministry will await the proposal to come from the Delhi Government to use it.

More Information:

- The Metrolite has been approved by the ministry and the Board of the Delhi Metro has also given its nod for its use in a 20 km stretch from Dwarka sector 25 to Kirtinagar, Union Minister for Housing and Urban Development Mr Hardeep Singh Puri said.
- The Union Housing and Urban Affairs Ministry has issued standard specifications of the ‘Metrolite’ system.
- The ‘Metrolite’ can be developed at a lower cost in comparison with existing metro system.
- It will also act as a feeder system to high capacity Metro.
- The 3-coach trains will have capacity of carrying 300 passengers.
- The ‘Metrolite’ system will have a dedicated path separating the road traffic with it.
- For segregation with road traffic, fencing can be provided on either side of network.
- The Centre has proposed light urban rail transit system – ‘Metrolite’ – in small cities and towns having lower projection of ridership, with each train having 3 coaches and a restricted speed of 25 kmph.
- The maximum operational speed of the Metrolite is 60 kmph.
- In any case, even with failure of On-board signalling, the speed is restricted to 25 kmph.

Delhi Metro Update: DMRC Starts E-Scooters Renting Services at 4 Stations; India

October 10th, 2019 Rail News

E-Scooter Renting Service of Delhi Metro Rail Corporation

In an effort to offer efficient last-mile connectivity to commuters, the Delhi Metro Rail Corporation (DMRC) has authorised e-scooters renting services at 4 of its stations — Vishwavidyalaya, Mandi House, Dwarka Sector 9 and Nehru Enclave.

More Information:

- The DMRC tweeted on Wednesday, ”To offer efficient last-mile connectivity to commuters, DMRC has authorised e-scooters renting services at 4 stations, namely Vishwavidyalaya, Mandi House, Dwarka Sector 9 and Nehru Enclave.”
- It may be noted that Vishwavidyalaya is situated on the Yellow Line, while Dwarka Sector 9 and Nehru Enclave are located on Blue and Magenta Lines respectively.
- On the other hand, Mandi House is an interchange station for the Blue and Violet Lines.
- The DMRC has been taking various steps to strengthen last-mile connectivity.
- The Delhi Metro has a provision for commuters to use bicycles for covering small distances at nominal charges at some of its metro stations, along with having a fleet of last-mile connectivity buses.
- Currently, the Delhi Metro spans nearly 350 km, having over 250 metro stations and 9 colour-coded lines.

Kochi Water-Metro Project gets environmental and CRZ Approval; India

October 12th, 2019 Rail News

The Ministry of Environment and Forests (MoEF) on Friday granted environmental and Coastal Regulation Zone (CRZ) clearance to the Kochi Water Metro Project. It is after going through the compliance report submitted by the KMRL (Kochi Metro Rail Limited) that the Centre gave the green light for the Water Metro project.

More Information:

- KMRL Managing Director Alkesh Kumar Sharma that this is a major boost to the Water Metro Project.
- He said, all the construction activities of KMRL will be done as per the norms.
- While clearing the project, the Centre has asked KMRL not to block creeks or rivers and ensure smooth flow of water in the project area.
- The authorities concerned have been instructed to devise a disaster management plan and frame safety guidelines.
- The ministry said in its order, a detailed traffic management plan should be drawn up.
- The KMRL in its project proposal clarified that Water Metro intends to introduce modern, energy-efficient, fast environment-friendly boats.
- The project, includes 15 different routes and 38 stations, covering a total length of 78 km.
- KMRL has already awarded the tender for construction of boats to Cochin Shipyard Ltd.
- The water metro project is estimated to cost around Rs. 747 crore.

Ahmedabad HSR Station to be integrated with other Modes of Transport; India

October 10th, 2019 Rail News

Artist's Impression: Ahmedabad HSR Station to be integrated with other Modes of Transport

Mumbai Ahmedabad High Speed Rail will traverse through Western Railways Ahmedabad Junction Railway Station and shall be integrated with Saraspur side of the existing Ahmedabad Junction station. Ahmedabad HSR station will be built over the existing railway lines on east side (Saraspur side) above platform no. 10, 11 & 12.

To ensure seamless integration of the HSR station with other modes of transport, NHSRCL has designed a user friendly station layout for Ahmedabad. An integrated Building for passenger transit is planned on east side of the existing railway station, where Passengers will be able to swiftly switch from one mode to another. This building will be equipped with escalators and elevators and will house many passenger convenience facilities like Booking office, Passenger lobby, tea/coffee kiosks and other amenities etc.

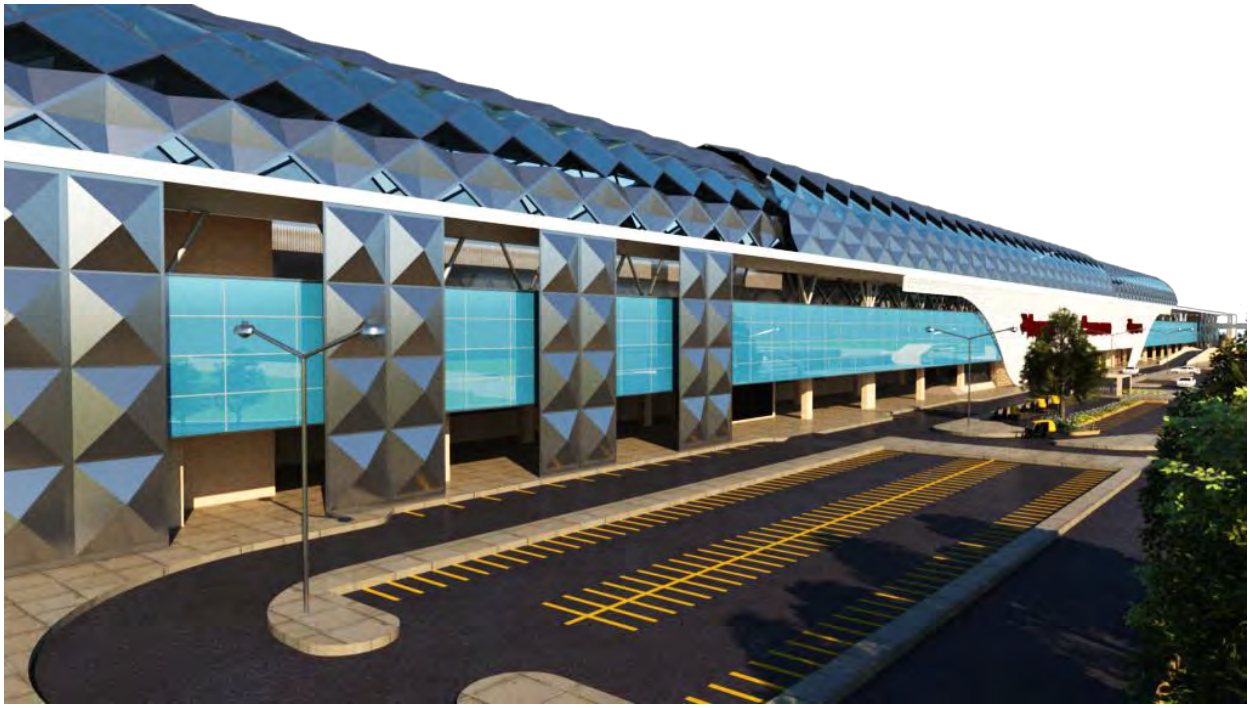
The integrated building shall provide connection to WR FOB's for passengers coming from platforms 1to9 and on other side it shall be connected to the underground metro station towards Saraspur side.

In addition, a detailed traffic management plan around the station is also proposed for smooth traffic movement outside the station. A Multimodal Transport Integration scheme shall be implemented at Ahmedabad Junction Railway Station for Smooth transition from other modes of transport like buses, taxis, three wheelers, private vehicles etc. The HSR Station forecourt is planned with one-way movement of traffic providing separate pick/drop areas for 2 Wheelers/3 Wheelers/4 Wheelers & Buses along with a dedicated area for Cycle Stand is also proposed. A mechanized multilevel car parking will be connected to the

integrated building through a sky bridge. Differently abled persons friendly parking space will be provided close to the station entrance.

Currently, Saraspur side of Ahmedabad Junction houses various railway offices, passenger waiting area, booking office, parcel office and other similar offices. All these offices are also planned to be accommodated in new integrated building.

Concourse level of HSR station (located above platform no. 11 & 12 of existing Ahmedabad junction station) will have various facilities like retail kiosks, coffee shops, comfortable waiting areas and lounge for passengers.



The construction of HSR station over existing railway lines will be quite challenging. Along the railway tracks there are multiple utilities like signalling and telecom cables, pipelines, electrical cables, tracks etc., which are to be shifted before the commencement of the construction activities. Some other challenges for NHSRCL will be to shift functional office buildings of Ahmedabad railway station, carry out construction activities of HSR station alongside ongoing Ahmedabad Mega metro construction, moving man and machinery over existing railway lines without disrupting passenger and cargo traffic at Ahmedabad Railway Station.

Ahmedabad station will be one of the very few stations in India where various modes of transportation like conventional railways, metro, private vehicles and HSR will be connected seamlessly. An effort is being made here to set an example of efficient coordination of multiple agencies/stakeholders for passenger convenience as main objective.

Work on Metro Rail Project in Kanpur and Agra to start soon; India

October 5,th 2019 Rail News

Work on the Metro rail project is going to start soon in Kanpur and Agra in Uttar Pradesh. The route for this has also been finalised. Recently, the Niti Aayog has assured to the state government that it would expedite the process of funding for metro rail projects in Agra and Kanpur.

More Information:

- The EIB (European Investment Bank) will invest in both metro projects.
- The estimated cost of the Kanpur metro rail project is about Rs. 17,000 crore.
- The Agra Metro Rail Project would cost about Rs .12,900 crore.
- After finalizing the DPR of both metro projects, tenders for civil work have also been floated.
- The state government had in February allocated Rs. 100 crore to Kanpur and Agra for the metro rail projects.
- The EIB will invest around Rs. 9,500 crore in both metro projects.
- Recently, AFCONS Infrastructure Limited has bagged Rs.676 crore contract for construction of 9 metro stations of Kanpur Metro rail project.
- The scope of work involves construction of elevated viaduct and 9 elevated stations including special span on Priority Section of Corridor-1, Phase-I of Kanpur Metro at Kanpur, Uttar Pradesh.
- The 9 stations include — IIT Kanpur Station, Kalyanpur Railway Station, SPM Hospital Station, Kanpur University Station, Gurudev Chauraha Station, Geeta Nagar Station, Rawatpur Railway Station, Lala Lajpat Rai Hospital Station, and Motijheel Station.

Metro Rail in Bhopal and Indore to be operational by 2023; India

September 23., 2019 Articles Rail Analysis India

Artist´s Impression of Multimodal Connectivity Hub

The first phase of the metro rail network Madhya Pradesh's Bhopal and Indore will be operational by the beginning of 2023. The state government on 19 August , 2019 signed a Memorandum of Understanding (MoU) with the Centre for metro rail systems in Bhopal and Indore. The MoU was signed in New Delhi in the presence of Madhya Pradesh's minister for Urban Development and Housing Mr. Jaivardhan Singh and Union Urban Development and Housing Minister Mr. Hardeep Singh Puri. Officials of the MP Metro Rail Corporation were also present.

The metro rail in these two cities will incur a cost of over Rs.14,000 crore and will have a combined length of 59.42 km. The first phase of the metro rail network in the two cities is expected to be operational by late 2022 or early 2023. The projects will be executed by the MP Metro Rail Corporation which will be a 50:50 joint venture between the Centre and the state government.

The state cabinet in June this year approved a proposal to enter into a tripartite agreement with the Union government and Madhya Pradesh Metro Rail Company for metro rail projects in Bhopal and Indore. The company's managing director was authorized to ink the agreement. The state and Centre would bear 20% cost each, while the remaining 60% funds would be raised through loans.

Construction Contracts awarded:

Last year in August, Dilip Buildcon (DBL) bagged a Metro rail project worth Rs. 247.06 crore for Bhopal Metro Rail project, phase-1. The company had been declared L-1 bidder for Bhopal Metro rail project, Phase -I, valued at Rs. 247.06 crore by the Urban Administration & Development Department Madhya Pradesh Metro Rail Co Ltd. The project is for construction of design and construction of elevated viaduct between AIIMS and Subhash Nagar (excluding stations) including entry and exit to depot for Bhopal Metro Rail project, phase-1.

Also, last year in September, Dilip Buildcon had said it has been declared L-1 bidder for Indore Metro Rail project, Phase -I, valued at Rs 228.96 crore by the Madhya Pradesh Metro Rail Co., Urban Administration and Development Department, Bhopal (M.P). The announcement was made on 20th September 2018.

The scope of the project is Design and Construction of Elevated Viaduct of length 5.290 kms between ISBT MR10 Flyover and Mumtaj Bag Colony excluding stations for Indore Metro Rail Project, Phase 1.

In October last year, the DBL received letter of acceptance (LoA) for Bhopal and Indore Metro Rail project, phase-I, valued at Rs 247.06 crore and Rs. 228.96 crore, respectively, by the Madhya Pradesh Metro Rail Co. Ltd, Urban Administration and Development Department, Bhopal (MP)," the company had said in a BSE filing.

The projects will be part-funded by the central and state government, besides loans from Asian Development Bank (ADB) and New Development Bank (NDB) for Indore Metro and European Investment Bank (EIB) for the Bhopal Metro.

Also, in September last year, the State Cabinet meeting chaired by then Chief Minister Shivraj Singh Chouhan cleared the proposal for 500 million euros loan from the European

Investment Bank (EIB) for the Bhopal Metro rail project. The other decisions taken by the state cabinet , included approval to 405 posts for the metro rail projects in Indore and Bhopal.

Metro Rail in Bhopal:

The Union Cabinet, chaired by the Prime Minister Shri Narendra Modi in October-2018 approved implementation of Bhopal Metro Rail Project comprising two corridors of total length 27.87 km (1) Karond Circle to AIIMS (14.99 km) and (i2 Bhadbhada Square to RatnagiriTiraha (12.88 km), which will connect major public nodes and city cluster areas of Bhopal.

Artist`s Impression for Connectivity Hub at Indore

Details:

1. The length of Karond to AIIMS corridor is 14.99 km, which is mostly elevated and partly underground (at Bhopal Railway Station & Bus Station) and comprises of 16 Stations (14-El.evated and 2-Underground).
2. The length of Bhadbhada to RatnagiriTiraha corridor is 12.88 km comprising of 14 stations all elevated.
3. The project will provide continuous availability of affordable, reliable, safe, secure and seamless transport system in the urban agglomeration of the city, which will reduce the accidents, pollution, travel time, energy consumption, anti-social incidents as well as regulate urban expansion and land use for sustainable development.
4. The estimated cost of the project is Rs. 6941.40 crore and the project will be completed in four years.

Benefits:

The population of 23 lakh of Bhopal agglomeration area is expected to be benefitted by Bhopal Metro Rail Project directly and indirectly. The corridors will be having Multimodal Integration with Railway Stations & BRTS Stations and will have feeder network of Bus, Intermediate Public Transport (IPT) and Non-Motorised Transport (NMT).

The Project will have non-fare box revenue from rental & advertisement as well as Value Capture Financing (VCF) through mechanism of Transit Oriented Development (TOD) and Transfer of Development Rights (TDR).

The residential areas along this Metro Rail corridors shall be immensely benefitted by this project, as the people of these areas will be able to travel on trains from their own neighbourhoods to reach different areas of the city conveniently.

Karond to AIIMS corridor will pass through the heart of city and connect densely populated areas with Bus Station, Railway Stations and AIIMS. Bhadbhada to Ratnagiri corridor will connect upcoming Smart City's Area Based Development (ABD) with BFIEL and surrounding industrial areas.

The Metro will provide Eco friendly and sustainable public transport to residents, commuters, industrial workers, visitors and travellers. A SPV namely Madhya Pradesh Metro Rail Co Ltd. (MPMRCL) has been constituted for implementation of the Project. The financing of Bhopal Metro Rail Project will be partly from GoI and GoMP on equal equity basis and partly as loan from European Investment Bank (EIB).

Metro Rail in Indore:

The Union Cabinet, chaired by the Prime Minister Shri Narendra Modi has approved the implementation of Indore Metro Rail Project comprising Ring Line of length 31.55 Km from

Bengali Square – Vijay Nagar – Bhawarsala – Airport – Patasia – Bengali Square which will connect major public nodes and city cluster areas of Indore.

Details:

1. The length of the Ring Line is 31.55 km.
2. The Ring Line will be from Bengali Square – Vijay Nagar -Bhawarsala – Airport – Palasia – Bengali Square.
3. Numbers of Stations on the Ring Line are 30.
4. The project will provide continuous availability of affordable, reliable, safe, secure and seamless transport system in the urban agglomeration of the city, which will reduce the accidents, pollution, travel time, energy consumption, anti-social incidents as well as regulate urban expansion and land use for sustainable development.
5. The estimated cost of the project is Rs. Rs.7500.80 crore and the project will be completed in four years.

Benefits:

The population of 30 lakh of Indore will be benefited by the Metro Rail Project directly or indirectly. The corridors will have Multimodal Integration with Railway Station & BRTS Stations and feeder network of Bus, Intermediate Public Transport (IPT) and Non-Motorised Transport (NMT). The Project will have non-fare box revenue form rental& advertisement as well as Value Capture Financing (VCF) through mechanism of Transit Oriented Development (TOD) and Transfer of Development Rights (TDR).

The residential areas along this Metro Rail corridor shall be immensely benefited by this project, as the people of these areas will be able to travel on trains from their own neighbourhoods to reach different areas of the city conveniently.

The Ring line will connect densely populated areas of the city with the new developing areas along with Railway Station, Airport and ABD under Smart City project. The Metro will provide eco-friendly and sustainable Public Transport to residents, commuters, office workers, students, visitors and travellers.

A SPV namely Madhya Pradesh Metro Rail Co Ltd. (MPMRCL) has been constituted for implementation of the Project. The financing of Indore Metro Rail Project will be partly from Central Government and State Government of Madhya Pradesh on equal equity basis and partly as loan from Asian Development Bank (ADB) and New Development Bank (NDB).

Another Building collapses in Bowbazar, Kolkata, due to Metro Work, Mamata demands Compensation; India

Metro Rail News, October 2019

West Bengal CM Mamata Banerjee interacts with Technicians at Bowbazar Area, Calcutta on Monday, September 3th, 2019. (PTI)

Another building, the second one on Bowbazar Street in central Kolkata, came crumbling down on September 3th, 2019. The first house collapsed on August 31th, 2019 night following the boring for the 16.6 km of East-West flank of the Metro.

Another Building collapses in Kolkata Bowbazar due to Metro Tunnel Boring in Alluvia Water containing Strata

The Metro will run underground for a stretch of 10 km, connecting twin cities of Howrah and Kolkata, before taking the surface.

About 52 houses in the central part of the city developed cracks and 70 families had to be evacuated in the apprehension of further cave-ins. The condition of a dozen of houses is quite bad.

West Bengal Chief Minister Mamata Banerjee held a meeting with Metro officials on September 3., 2019, and asked them to compensate each of the affected families with a minimum of Rs. 5 lakh.

Though the Metro was non-committal on this, it agreed to bear the cost of relocation, rent of the affected people until some permanent arrangements are made.

By announcing the compensation package in front of Metro officials, the chief minister's objective was served. She was able to give the message that she has good intentions of helping people and now the ball is in the Ministry of Railways' court. Describing the incident of collapse as "unprecedented" in the history of metros in the country, Managing Director of Kolkata Metro Rail Corporation (KMRC) said experts from Singapore and Hong Kong will be coming to assess what went wrong. “We have conducted sample soil test of each layer of soil and water pockets. There was no problem with 250 meters of water-bearing layers also," he said.

Comment*: For an Non-Indian expert it is “incredible”, that Kolkata Metro Rail Corporation (KMRC) took the risk in boring a metro tunnel with a boring machine only 14 m below a densely built bazar area through water containing soft ground alluvial strata.*

There had been no contingency plan for an emergency management in the eventually that building and surrounding structures above the tunnel might subside, crack or crumble down.

Risk is the product of the probability of an bad unwanted event to happen and the impact this bad event might have.

In case of the Kolkata tunnel boring the risk had been high.

With the tunnel boring instead of making use of cut-and-cover methodology, obviously one looked for a cheaper but more risky but way. Before starting the tunnelling the area should have been cleared from houses, and the metro tunnel should have been constructed in an open shaft as a cut-and-cover construction with freeze stabilization of the side walls. Under the prevailing circumstances and water containing soft soil conditions, the cut-and-cover method with side walls stabilization by ground freezing or grouted pipe spilling would have been the less risky method of choice or preferred technology.

The bad result proofs, that the unfavourable methodology had been implemented. But now it is too late. The area has now anyway to be vacated from building structures. The affected dwellers of the Bazaar area are now the suffering victims, which got deprived of livelihood and property without any hope of proper compensation under a situation, which could have been easily foreseen.

The legal procedure is in favor of the party, which planned, organized and executed this risky technical adventure. The victims are the losers.

The planners are making a fundamental mistake:

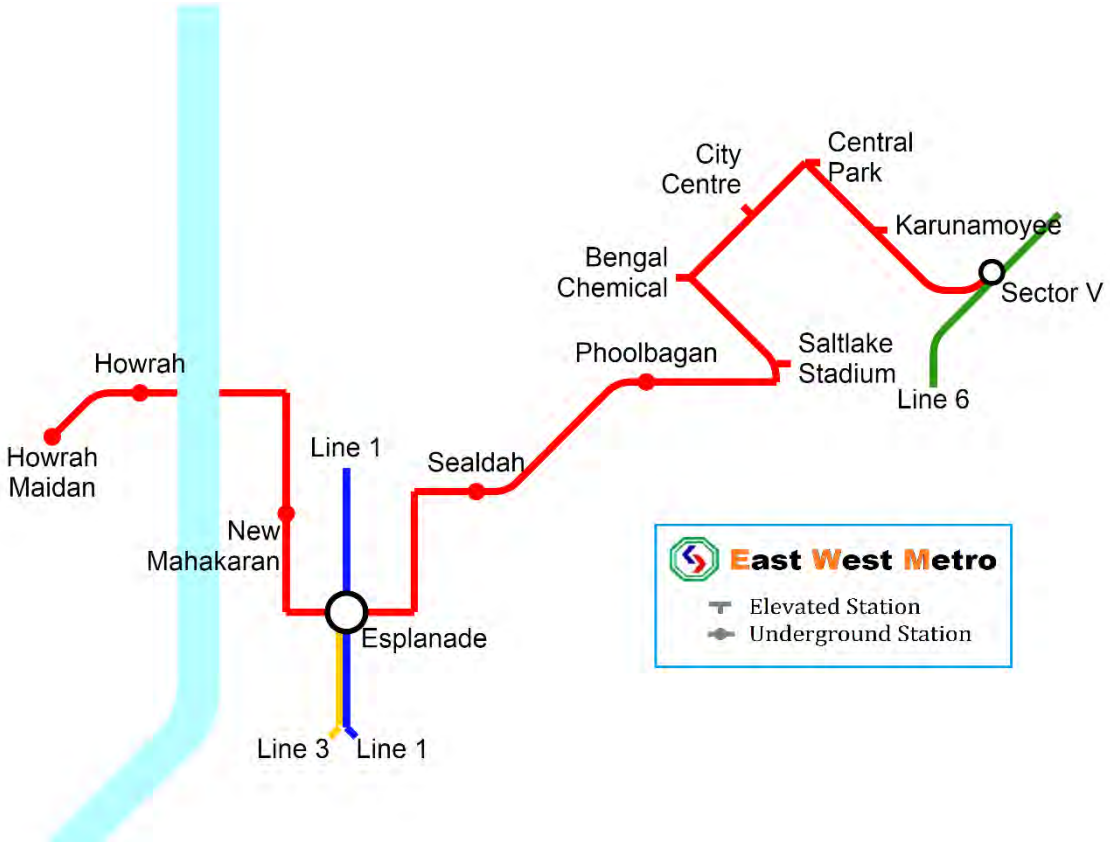
It is a FUNDAMENTAL AND BASIC KNOWLEDGE in SAFETY AND RISK MANAGEMENT:

"What did not happen in the past is more likely to happen in the future!".

"From the NON-OCCURANCE of a bad and unwanted event one cannot make any prediction for the future or regard an organisation as safe!"

Metro Tunnel Construction by Cut-and-Cover Methodology in India

For Information (Source Wikipedia):
East West Metro Hooghly River Tunnel is an underwater construction of Kolkata Metro in Kolkata, West Bengal to connect Howrah with Kolkata. The river tunnel is constructed 30 m underneath the Hooghly River. The tunnel length is 10.8 km (6.7 mi) and the width is 5.5 m (18 ft). A 520 m stretch of the tracks will go through the tunnel under the Hooghly River. The ascending tunnel on the Kolkata side will make a turn through the water containing soft alluvial ground 14 m under the buildings of Bowbazar. The tunnel will be first underwater river tunnel in India. The tunnel is used by East West Metro Line for metro rail service and constructed by Kolkata Metro Rail Corporation.



Soft Ground Tunnelling; Global

The internationally operating WSP Group works in all Forms of Soft Ground Tunnelling, from Cut-and-Cover, Tunnel Boring Machines, Tunnel Jacking and innovative Strategies like Ground Freezing.

Dave McAlister
Global Director, Transport and Infrastructure; WSP Group

Putting our Experience to Work for you

A tunnel built in soft ground – such as clay, silt, sand, gravel, or mud – requires specialized techniques compared to hard rock, to compensate for the shifting nature of the soil and water containing slurries. At WSP, we have extensive experience with soft ground tunnels on every continent, and we pride ourselves on developing innovative strategies to deal with even the most complicated soil and water situation while preserving stability. There are a wide variety of techniques for soft ground tunnelling, and the best fit is ultimately determined by ground type, timeline, budget, and surrounding structures.

In order to select the most appropriate method for a particular tunnel, several factors need to be taken into consideration, including but not limited to ground conditions, length, depth, diameter, alignment geometry, and budget. Another important consideration is the risk and sensitivity of nearby infrastructure and buildings to ground movement.

At WSP we know that an important aspect of soft ground tunnelling is the protection of existing structures and utilities, as many soft ground tunnels are located in sensitive urban environments where settlement caused by tunnelling is a major concern. Protective measures such as dewatering, ground improvement, compensation grouting, and positive pre-support can be used to ensure successful tunnelling in soft ground is achieved. Above all, a comprehensive real-time instrumentation and monitoring system is essential. In Seattle, WSP was heavily involved with the SR-99 Alaskan Way Tunnel project, which was constructed in challenging ground conditions, under more than 150 buildings. The tunnel has a diameter of 17.5 m, and is the second largest tunnel of its kind in the world.

Alaskan Way Viaduct, Seattle, United States; WSP Group

Cut-and-Cover

Cut-and-cover tunnelling is a common, well-proven technique for constructing shallow tunnels. This technique consists of an in-situ cast concrete structure in an excavated trench,

which is covered afterwards. This method accommodates changes in tunnel width and non-uniform shapes and is often adopted in the construction of underground transit stations. To minimize surface disruption, cut-and-cover tunnelling can be accomplished using the traditional bottom up method or as a top-down construction.

Tunnel Boring Machines

For deeper, longer tunnels in urban areas, or for a tunnel **crossing major bodies of water**, a pressurized-face Tunnel Boring Machine (TBM) is the best fit, because it is capable of handling the full range of expected ground conditions. A single pass, precast concrete segmental lining forms the tunnel behind the TBM. The selection and design of the precast segmental liner is critical for successful application. The segments are equipped with waterproofing gaskets and act as the structural support system and water barrier.

Compared to the cut-and-cover approach, TBMs significantly reduce the disturbance of traffic and the associated environmental impacts in urban areas. WSP has been a pioneer in the advancement of single pass liners, including its first application in the USA with the use of fibre reinforcement and double gaskets. We also introduced the use of special seismic joints in TBM driven segmental liner tunnel, outside of Japan.

There are two major TBMs used in soft ground tunnelling: Earth Pressure Balanced (EPB) and Slurry Type Shield Machines. An EPB TBM will perform better where the ground is silty and has a high percentage of fines. A slurry TBM is ideal in loose water-bearing granular materials. However, with the application of appropriate ground conditioning agents, the range of ground conditions for each machine can be extended. TBM technology has advanced significantly in the last 15 years, allowing for the construction of larger, deeper, and longer tunnels in more difficult ground conditions.

New Austrian Tunnelling Method

For shorter tunnel sections, non-circular tunnels, or tunnels with variable geometry, the New Austrian Tunnelling Method (NATM) – also known as the Sequential Excavation Method - provides another cost effective, flexible, and safe tunnelling option. The tunnel is sequentially excavated and support is provided by shotcrete, in combination with fibre or welded-wire fabric reinforcement, steel lattice girder arches.

Ground Improvement Methods such as **Jet Grouting, Dewatering, Ground Freezing and Grouted Pipe Spilling are also available** to stabilize the face.

Central Artery, Boston, United States

Tunnel Jacking

Tunnel jacking is a method for constructing monolithic, rectangular concrete box sections under surface areas with critical uses such as railways, major roadways, and airport runways. Due to its expense, it is generally only used when there is no other option, and so examples are rare. This method is generally applied in cases where the underground crossing is relatively short, is located in soft ground, and with shallow cover. Special construction techniques are required to minimize friction, reduce settlement, and maintain the tunnel alignment.

In Boston, WSP applied this approach during the construction of a section of the Central Artery/Tunnel, under a complex network of tracks leading into the South Station Railway Terminal. Three concrete tunnel box sections were jacked successfully under the track network, with typical cross sections of 11.6 x 24 m and lengths of 51 to 115 m.

PART II: GLOBAL ACTIVITIES FOR URBAN MOBILITY AS A SERVICE

Expert Focus: What is Communication Based Train Control (CBTC) ?; Global

Posted by Guest contributor: Naeem Ali on Sep. 14, 2015; SMART RAIL WORLD

"...track circuits will become relics of a forgotten past only of interest to museum curators and rail enthusiasts."

On a short stretch of track in London, William Robert Sykes tested the first track circuit at Brixton in 1864. In 1872, William Robinson invented the first fail safe track circuit and a method of block occupancy detection was born. 140 years later, block occupancy detection using track circuits (or conventional signalling) is still in use today. Today Consultant and Communication Based Train Control (CBTC) Expert **Naeem Ali** offers his insights into its characteristics, development and potential. Over the past 25 years the tide is changing as CBTC solutions find their way into traditional track circuit based applications. The primary advantage of a CBTC system is its ability to allow trains to operate safely at much closer headways then is possible in a track circuit based application due to its inherent limitation.

As CBTC becomes the technology of choice, track circuits will become relics of a forgotten past only of interest to museum curators and rail enthusiasts.

But what is CBTC or Communication Based Train Control?

Using the definition from IEEE's CBTC standard 1474.1, section 4.1 states:

The primary characteristics of a CBTC system include the following:

1. **High resolution train location determination, independent of track circuits.**

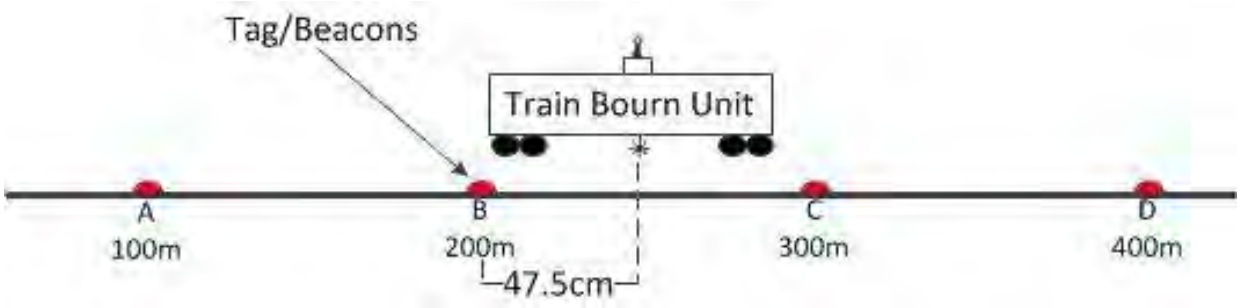
2. **Continuous, high capacity, bi-directional train to wayside data communications.**
3. **Train-borne and wayside processors performing vital functions.**

In other words, a CBTC system is able to determine the accurate location of a train, independent of track circuits, using a bi-directional communication link while keeping the system safe.

CBTC Characteristic #1

The main feature, which differentiates a CBTC system from conventional signalling, is the ability to determine the location of a train independent of track circuits.

Typically this is done using transponder tags or beacons installed along the track. The tags/beacons provide the train borne unit with a course position. The tachometers installed on the axles provide the fine position.



As the train crosses tag/beacon B, the train borne unit is aware that it's located at the 200 meter mark (course position). As the train moves away, the tachometers will count how far the train has moved (fine position). Taking the course and fine position together, the train borne unit will be able to determine that the centre of the train is located 247.5 m away from the zero reference point.

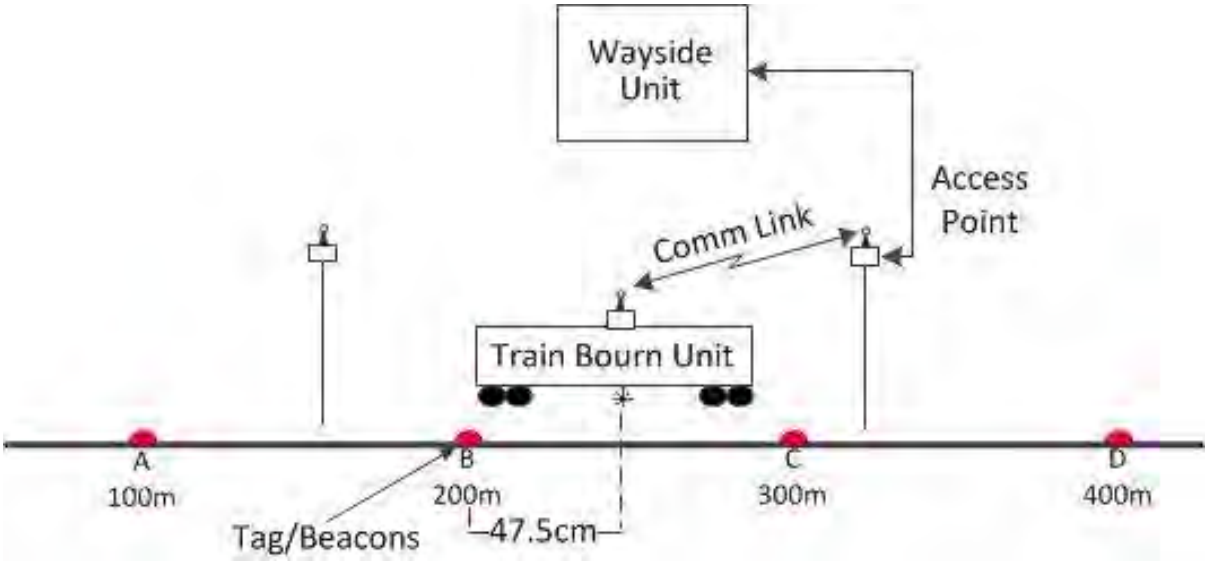
This is a simplified description (for illustration purposes) of how a CBTC system determines the location of a train.

CBTC Characteristic #2

Once the train is able to accurately determine its location, this information must be relayed to the wayside unit in a timely fashion.

There are various methods to accomplish this. In the past inductive loop was utilized as a communication medium but recently over the past ten years, radio has become the technology of choice for the majority of suppliers. As the technology matures, radio will become the default standard for the rail industry.

For a railroad application, access points are installed along the track. As the train comes within range of an access point, the train borne radio will lock onto its signal and disconnect from the previous access point.



The communication protocols utilized in this medium is usually the standard Ethernet TCP/IP or UDP/IP protocols. This gives the solution flexibility and expandability.

All data (vital and non-vital) is sent through this medium but this link is considered non-vital (TCP/IP and UDP/IP are not considered vital protocols). To maintain safety integrity, end to end vitality must be ensured. This means, the train borne and wayside unit must guarantee the information they receive is not corrupted or stale through various mechanisms (CRC, sequence numbers, Tx ID, Rx ID etc).

CBTC Characteristic #3

It's not enough that a CBTC system is able to accurately determine the location of a train it also has to protect that train from all types' failures.

Section 6.1 of 1474.1 lists the vital functions a CBTC system must perform. Reading through this section, it's quickly apparent that these vital functions can be placed into three categories: collision avoidance, over speed protection and miscellaneous protections.

These three categories are broad in scope and therefore they cannot be covered in a single post (I plan to in future posts) but the basic definition is as follows:

Collision Avoidance: Is the ability of the CBTC system to keep trains safely separated from one another and from other obstacles on the guideway.

Over Speed Protection: Is the ability of the CBTC system to accurately determine the speed of the train and to control the speed within a tight tolerance.

Miscellaneous Protection: These are "one of" functions that don't fit into any generalized category and, in my opinion, are not a fundamental part of a CBTC system. But IEEE has listed them as features that a CBTC system should protect against.

I thought CBTC meant Automation?

The primary characteristics defined in section 4.1 provide a basic definition of what a CBTC system is ,but in recent times CBTC has come to mean much more. When the term CBTC is used, it is commonly defined as an automated driverless system, but nowhere in section 4.1 is there a reference to "driverless" or "automation".

But IEEE recognizes that there are different CBTC configurations. Section 4.2 of 1474.1 states:

This standard recognizes that different configurations of CBTC are possible, depending on the specific application. For example, a CBTC system may:

1. **Provide ATP functions only, with no ATO or ATS functions.**
2. **Provide ATP functions, as well as certain ATO and/or ATS functions, as required to satisfy the operational needs of the specific application.**
3. **Be the only train control system in a given application or may be used in conjunction with other auxiliary wayside systems.**

At the high end (configuration 3) we have a completely automated CBTC system with ATP (Automatic Train Protection), ATO (Automatic Train Operation) and ATS (Automatic Train Supervision) functionality. At the low end (configuration 1) is the ATP only solution as defined by the primary characteristics in section 4.1 (ATO functional requirements are described in section 6.2 and ATS in section 6.3 of the 1474.1 standard).

The type of configuration a property needs depends on the problem they are trying to solve. If the desire is to increase throughput, then a completely automated system might be needed (Configuration 3). If the desire is to add another layer of safety protection, then an ATP only solution may suffice (Configuration 1).

The point here is a CBTC does not mean “driverless.” At its most basic form, a CBTC system provides automatic protection (ATP) only. More elaborate systems may provide ATO and ATP functionality but it’s not a requirement in order to apply the label “CBTC”.

The adaption of CBTC technologies is spreading far and wide as **A)** new systems demand a higher throughput and **B)** current systems try to squeeze more out of their existing infrastructure. As a result, a market has developed where more suppliers are entering the field. 30 years ago only one supplier provided a CBTC solution, today there are three top tier and four second tier suppliers.

The industry has entered a brave new world and the players need to become familiar with the terminology and the various technologies out there so informed decisions can be made.

Note: The opinions expressed in this post are my own and don't necessarily represent Parsons' positions, strategies or opinions.

Expert Focus: What is Communication Based Train Control (CBTC)? About the Author: Naeem Ali is a CBTC specialist designing CBTC solutions for the past 17 years. He has worked on 7 different CBTC projects around the world including Newark Airport People Mover (USA), Jacksonville Monorail (USA), Las Vegas Monorail (USA), Busan Gimhae Monorail (South Korea), Makkah Metro (Saudi Arabia), Sao Paulo Line 17 (Brazil) and is currently working on the YUS line CBTC upgrade for the Toronto Transit Commission (Canada). He can be contacted on LinkedIn: **https://ca.linkedin.com/in/naeemali1**

SmartMetro Madrid Speaker Dossier: Juliette Fournier, NExTEO's Systems Engineer at SNCF; Global

By Marcello Perricone, Oct. 14th, 2019

Current and possible Future Trends in CBTC

"CBTC systems have to take part in the evolution of a cities' transportation system; nowadays they can provide high quality of service, but in the future they will have to keep providing the same service while dealing with others communicating safety systems such as ITS roads."

Ahead of our SmartMetro Madrid conference, we sat down with Juliette Fournier, System Engineer for the NExTEO project at SNCF, for a quick chat about her job and the operator's latest CBTC endeavours.

Juliette will be a speaker in SmartMetro Madrid on November 25-27th, where she will talk about managing deployment activities for CBTC integration in the French rail network, in a presentation relevant to industry experts and decision makers alike. Join us in Madrid for the full topic, and find out a bit more about her in the interview below.

First off, a bit of background: How did you start your current career path, and what does your position as System Engineer at SNCF entails?

I've worked at SNCF for almost 6 years, where I helped define the NExTEO project writing specifications before the contract was awarded. Then I took part on the evaluation and validation of the supplier system and CBTC solutions, in particular the hardware equipment (and more recently, its parametric process).

Currently, I'm in charge of guaranteeing suppliers can deploy their CBTC system with the correct input data -- the French national railway always gets modified because of maintenance operations or infrastructure evolution, and we have to migrate from a legacy system to a CBTC system in a complex brownfield environment.

How has the rail industry changed since you started working in it?

The main evolution I see is digitization in general -- digitization of data and digitization of processes expand the scope of some activities, therefore adding new responsibilities. Some operators, like SNCF, tend to outsource development activities in order to concentrate on deploying and operating interlocking systems.

What industry challenges do you identify as the most pressing ones, and how is SNCF tackling them?

I think that the main challenge for all industries in the future is to ensure good protection against cyber-attacks. SNCF is concerned about that, and provides solutions to be deployed on its network.

What is the goal of the NExTEO project?

The aim of the NExTEO project is to deploy a new rail traffic management system on the French rail network, as part of the EOLE project which deals with the extension to the west of the existing E line (extension from Haussmann Saint-Lazare in center of Paris to Nanterre and Mantes-La-Jolie) in order to address the dense traffic issues in Paris.

The actual signaling subsystem on the E line is based on a fixed signaling block and manual train driving. Such a system does not offer the performance needed on high density lines, and there is a need for a new operating system such as NExTEO -- which is a CBTC system based on moving block. CBTC lines are already widely deployed in France in urban environments, but NExTEO will be the first one in a suburban zone.

What were the most noteworthy challenges you guys solved or are in the process of solving?

Generally speaking, the NExTEO project is a big challenge, because of the multiple interfaces it deals with (interlocking, rolling stock, information system applications, new radio network), and also because it is a complex migration project with three commissioning steps in three years.

The main issues are how to test the system during ongoing public transit operations, modifying the current interlocking interface, and adding new CBTC functionalities to the existing infrastructure. We also have to deal with new standardization (radio, cyber, etc) during development, and therefore must anticipate any changes to commission a successful system.

What are the pros and cons of sharing ITS bands between rail and road?

There is no pros for both sides when sharing the 5,9GHz bandwidth! CBTC and road ITS applications have different uses -- this became mandatory because of the European Commission decision in August 2008 to harmonize the use of radio spectrum in the 5,9GHz band for safety-related applications of Intelligent Transport Systems (ITS).

The difficulty for rail community is to find a way of sharing a part of the band with road ITS without impacting CBTC availability. Providing a high level performance as CBTC systems are supposed to do implies the guarantee that radio network will not fail because of interference from other roads systems “talking”.

A failure in CBTC radio transmission between on board sub-system and track-side equipment could stop automatic train traffic. Even if CBTC has priority in a part of the band, ITS vehicles have to apply a mitigation technique in order to not impact CBTC, and these mitigation technique and conditions are the main subject of the future European standards to be specified.

Recently, we spoke with Frédéric Jans-Cooremans, Project Manager & Radio Spectrum Manager at STIB-MIVB; who talked to us about the push to standardise frequencies and bands used by CBTC systems. Are you involved with that initiative in any way or taking that into account on your project?

Yes, for the NExTEO project, we will have to take into account the future standards of CBTC bandwidth. There is a need for the future NExTEO line, but also for future CBTC lines to be operated by SNCF. That’s why I participate on discussions in the JTFIR group at ETSI as a SNCF member -- I met Frédéric in this group, too, which is a group of experts is mandated to specify the sharing solutions between CBTC and road ITS.

What current and possible future trends in CBTC interest you the most?

Bandwidth evolution and the way to keep high availability, in order to be the user's preference for public transportation. CBTC systems have to take part in the evolution ofa cities' transportation system; nowadays they can provide high quality of service, but in the future they will have to keep providing the same service while dealing with others communicating safety systems such as ITS (Intelligent Transportation Systems) roads.

It’s interesting to work on that subject because it’ a big challenge to define a frame communicating standard, considering both road ITS and urban rail ITS have different uses and users. CBTC suppliers and operators have to work together in order to comply with future standards.

What's the biggest professional challenge you've ever faced?

Deploying the first CBTC system on the French rail network! The biggest professional challenge I've ever faced is the project I still working on. Indeed, the NExTEO project is the first CBTC system deployed on the French rail network -- it means that we have to insert CBTC trains into normal traffic, with dynamic transition towards CBTC domain in the Paris dense traffic area, while respecting planned timetables when the train gets the domain output in order to continue its run towards suburb stations. It would be easier if the CBTC domain was a closed zone, with only CBTC traffic inside.

Are there any past projects in your life you're proud of? Are there any upcoming ones you're excited about?

Some years ago, I participated on the first step of the commissioning of the extension of Rio de Janeiro Metro line 1, which was really exciting. The automatic metro line in Rio is based on fixed blocks, where analogical equipment are set-up along the track and the train captures the communicating signal when it runs above it -- the train knows the speed limits and the positions to stop automatically.

As for upcoming ones, in 2023 I will be proud to be part of NExTEO's commissioning success.

Finally, a question we ask all our interviewees: What's your favourite rail journey in the world, and why?

My favourite rail journey is the one where I can take the train in Paris in Winter after a working Friday, and arrive three or four hours later in the Alps -- it means I can ski the next day!

São Paulo Bombardier Innovia 300 Monorail with CBTC; Brazil


Image courtesy of Jvalienforce

Map showing the five São Paulo Metro Lines

The São Paulo Monorail is a 24 km long rail line, that will operate between Vila Prudente and Cidade Tiradentes.

Also known as Expresso Tiradentes, the new line will serve as an extension of metro line 2 of the Companhia do Metropolitano de São Paulo (CMSP / São Paulo Metro). The project is estimated to cost $1.6bn. It is expected to open by 2014.

The monorail system will reduce travel time between the two destinations from two hours to 50 minutes benefiting 500,000 passengers a day.

The project has been awarded to The Express Monotrilho Leste Consortium (Eastern Express Monorail Consortium) led by Bombardier. The total value of the contract is $1.44bn of which Bombardier's share is $1.4bn.

The other members of the consortium are Brazilian civil construction firms Queiroz Galvão and Construtora.

"The Expresso Tiradentes will be a further 24 km long extension from Vila Prudente."

Lines and Routes

São Paulo has five metro lines – Line 1 (Blue), Line 2 (Green), Line 3 (Red), Line 4 (Yellow) and Line 5 (Lilac). The new monorail system will be an extension of the 14.7 km-long metro line 2 currently operating between Vila Madalena and Vila Prudente with 14 underground stations.
Construction of this line began in January 1991.

Vila Prudente and Tamanduateí are the latest stations added to the route in August and September 2010 respectively.

The Expresso Tiradentes will be a further 24 km long extension from Vila Prudente to Cidade Tiradentes with 17 stations in between.

Rolling Stock

The project will feature **Bombardier's INNOVIA 300** system, which will transport 40,000 passengers per hour per direction. The technology will be complemented with the company's **CITYFLO 650 automatic train control technology** to enable driverless operation of the trains.

Bombardier's INNOVIA 300 Monorail for São Paulo

Bombardier will design and supply electrical and mechanical equipment for the extension. It will also supply 54 seven-car trains and provide project management, systems engineering and integration and testing and commissioning for new trains and signaling.

The vehicles will be engineered, designed and tested at Bombardier's site in Canada. The first few cars will be manufactured in Pittsburgh, USA and the others in Brazil at the manufacturer's plant in Hortolândia.

The **INNOVIA Monorail 300** operates at a top speed of 80 kmph on 750 V DC power. It can be configured in two-eight car sets to transport 1,000 passengers per trip.
The Monorail 300 system has an aluminium body, steel under frame and a composite end cap. Each car has two bi-parting doors per side and a roof mounted twin heating, ventilating and air-conditioning (HVAC) unit.

"The INNOVIA 300 trains will be equipped with a **CITYFLO 650 automatic control system**."

It is the first monorail with an inter-car walkway to provides free passenger movement and enhances passenger safety. The flexible seating arrangement allows for customer specific seating.

The INNOVIA 300 technology uses slender guide beams for structural support and vehicle guidance. This allows for less obstructive and easy-to-construct aerial guide way structures, which can be constructed off-site and assembled in a short time.

Signalling and Communication

The **INNOVIA 300** trains will be equipped with a CITYFLO 650 automatic control system capable of reducing **headway as low as 75 seconds**. The control system is used for driverless or unattended train operations for moving advanced metro and airport people movers.

It features a Communication Based Train Control (CBTC) moving block system, vehicle automatic train protection (VATP), automatic train protection (ATP), automatic train operation and train detection through radio transmissions of train positions.

The EBI Screen control system enables continuous tracking of the trains. This system can be complemented with the optional function of supervisory control and data acquisition (SCADA). It can also be connected to auxiliary systems such as passenger information displays, CCTV, public announcements, radio and telecoms.

New Company to steer Digitalisation of Germany's Railway; Germany

Sep. 24th, 2019;
Written by Keith Barrow ; IRJ

GERMAN Rail (DB) is set to form a new subsidiary to manage the digitalisation of the country's railway network, DB board member for infrastructure, Mr Ronald Pofalla, announced at the Digital Rail Summit in Berlin on September 23th, 2019.

Onboard ETCS Signalling and Train Control; DB AG

From January 2020, Digital Rail Germany (DSD) will be responsible for planning and implementing the rollout of digital technologies across the country, including digital interlockings and ETCS onboard and trackside systems. DB expects these technologies to increase the capacity of the network by up to 35%.

DSD's work will begin with the rollout of ETCS through three so-called starter packages:

- TEN-T Scandinavia – Mediterranean corridor (Rostock – Berlin – Leipzig/Dresden – Nuremberg – Munich – Austria)
- Cologne – Frankfurt high-speed line, and
- **Stuttgart S-Bahn City and Suburban Commuter Railnetwork**.

DB will spend €570 m on the three starter packages by 2023. According to a feasibility study by the federal government, an investment of €4.7 bn will be required to deliver the overall digital railway programme, which will equip around 80% of the network by 2030.

DSD will be responsible for coordinating the rollout of onboard ETCS and DB is currently discussing with the federal government how this can be financed.

DB has already awarded Alstom a contract to equip 17 class 407 ICE high-speed trains with ETCS Level 2 and this is due to be completed by 2022.

German Railway, DB, launches Driverless Shuttle to Station; Germany

11th October 2019; Metro Report International

GERMANY: Deutsche Bahn's autonomous vehicle subsidiary loki and its local bus operator Regionalbus Ostbayern have launched a driverless shuttle service using public

roads to provide ‘last mile’ transport between the centre of Bad Birnbach and the town’s station.

The service on the 2 040 m long route operates between 08.00 and 18.00. The two EasyMile EZ10 Gen2 electric shuttles can carry six passengers and feature a wheelchair ramp, wi-fi and USB charging ports. Travel is free of charge.

The presence of the 15 km/h vehicles is detected by roadside cameras, and digital signs are used to reduce the variable speed limit for all traffic to 30 km/h, ensuring safety while minimising the impact on other road users.

A steward on each vehicle can intervene in operation if necessary, and in the event of snow or thick fog the service will be operated using a conventional minibus.

The link to the station follows trials on a 660 m route launched in 2017. This has since operated for more than 21 000 km and carried more than 40 000 passengers.

New opportunities for public Transport

Federal Minister for Transport & Digital Infrastructure Andreas Scheuer and DB Passenger Transport Director Berthold Huber joined Mayor Josef Hasenberger on the first trip on the extended route.

‘The climate-friendly mobility revolution must also become a concern beyond major cities’, said Huber on October 7. ‘Rural areas in particular need new concepts to attract more people to environmentally-friendly public transport. Therefore, we want to link road and rail even more closely together. After all, individual mobility without a car should also be possible in rural areas.’

Scheuer said ‘transport is becoming more interconnected, and the first self-driving vehicles are already on our roads. This leads us to completely new opportunities for public transport and the connection of rural areas: people remain mobile into old age, while transport is becoming safer, more cost-efficient and climate-friendly. I am very pleased that DB has started a pilot project to test the technology in everyday life – and to get people excited about autonomous driving.’

Hiroshima Rubber-tyred Automated Light Guideway Metro Train delivered; Japan

11th October 2019 ; Metro Report International

JAPAN: Hiroshima Rapid Transit Co. has taken delivery of the first of 11 six-car rubber-tyred Automated Guideway Transit Light Metro Trainsets which Mitsubishi Heavy Industries Engineering is supplying to replace the existing vehicles on New Transit Line 1, known as the Astram Line.

Testing and commissioning of the first set will now be undertaken ahead of entry into service in spring 2020.

The operator ordered the Series 7000 cars in 2017 for delivery in phases by 2025. They have a double-skin aluminium-alloy structure designed to combine light weight, durability and easy recycling, and MHIENG's latest T-smover bogies, which offer low weight, durability, low noise and vibration and ease of maintenance. The G-Fit seats are designed to provide body support while encouraging seated passengers to keep their legs out of the aisle.

The chrome yellow livery was selected to convey peace, 'a befitting symbol for Hiroshima', the supplier said when the order was announced.

The Astram Line opened in August 1994 and is the longest AGT route in Japan, running 18·4 km from Hondori station in the city centre to Koiki-koen-mae in the northwestern suburbs.

Debunking the Myths around the optically-guided Bus (Trackless Trams); Global

21. January 2019; by Yale Wong, Study of the University of Sydney
Debunking the myths around optically-guided bus (trackless ...

https://sydney.edu.au › business › news › 2019/01/21

From our 'Thinking outside the box' series
Yale Wong explores some of the misconceptions surrounding optically-guided buses, otherwise known as trackless trams.

NB: This is a supplement to my March 2018 think piece Is it a bus? Is it a train? Notes on modal etymology and nomenclature.

"Various guidance technologies are further blurring the divide between bus and rail. Rubber-tyred metro systems, for instance, offer better traction and acceleration (especially at grade) on many urban rail systems. Kerb guided buses (e.g., Leeds, Adelaide O-Bahn) have been around for some time (though many would argue a gimmick only). Magnetic guidance systems have had various incarnations too, as well as optically guided buses—in Rouen, France and Castellón, Spain as examples, but recently gaining new attention through the "trackless train" marketed by China's CRRC and trialled in Zhuzhou. Do these modes operating on virtual tracks qualify as trains and is there an intention to mislead? Increasingly, there is a convergence of modes and so we are invited to ask exactly, what constitutes a bus and what constitutes a train."

Optically-guided bus is the latest in a long line of initiatives to repackage existing bus as premium rail-based technology. The name 'trackless trams', design of the vehicles and modest deployment cost has appealed to many, and the concept has gained traction in Australia, led by prominent individuals including Professor Peter Newman of Curtin University. Whilst we applaud the recognition for the role of upgraded bus and bus rapid transit, a certain level of dogma fuelled by more wilder claims about the technology and its potential has taken hold. Many misconceptions have been promulgated which prompts us to set out the facts and debunk the myths.

Myth 1: Optically-guided Tram-Bus is a revolutionary new Technology.

Optical guidance systems date back to the late 1980s[1] and have been deployed with limited commercial success since the early 2000s—we count just three applications in Rouen (Normandy, France), Castellón (Castelló, Spain) and Las Vegas (Nevada, United States). Whilst mechanically-guided bus remains the most popular—including [Adelaide O-Bahn styled] kerb-guided bus and to a more limited extent rail guidance systems—magnetic[2] and wire guidance technologies have also been trialled to deliver the same benefits including precision docking, lane assist, reduced road footprint and a better ride quality, but doing so for lower cost due to the absence of continuous physical infrastructure.

The three systems in Rouen, Castellón and Las Vegas are all based on the optical 'self-steering' guidance system developed in France by Matra under the trade name Visée, later rebranded as Optiguide upon acquisition by Siemens. The technology utilises a roof-mounted, forward-facing camera to detect a 'virtual rail' in the form of twin, white dashed lines painted on a darker road surface. The image is transmitted to an on-board computer which combined with the speed, yaw and wheel angle of the bus determines the correct path to be followed and in turn adjusts the vehicle's steering mechanism as required. In partnership with Renault, the Civis[3] concept was developed into a transport system based on Irisbus Agora articulated buses fitted with the optical guidance system.

The most extensive deployment has been on the Rouen BRT called TEOR (Transport Est-Ouest Rouennais), inaugurated in February 2001 (pictured). The system has subsequently grown to three lines totalling 32 km all using the same guidance technology. The second deployment has been in Las Vegas along Las Vegas Boulevard North on the Metropolitan Area Express (MAX) BRT, which launched in 2004 but was discontinued in 2016. This system was unique in that optical guidance was used for station docking only and not general lane assist. For many years, the technology was deactivated due to poor reliability arising from the desert sun, dirt, grease and oil build-up on the road diminishing the pavement marking's contrast, despite the system stated to work even if just one-third of the stripes are visible. The third implementation (before Zhuzhou) has been in Castellón (Transporte Metropolitano de la Plana), which is an 8 km trolleybus route launched in 2008.

Rouen BRT optical guided trackless Bus-Tram

This photo was taken by Florian Fèvre from Mobilys.

So what is different this Time round?

The present incarnation doing the rounds is admittedly a more advanced deployment of previous optical-guidance technologies. Led by Dr Feng Jianghua, the research arm of Chinese manufacturer CRRC[4] has used high speed rail technology (in particular, relating to the latest Fuxing series) to independently develop what it calls autonomous rail rapid transit or ART (智轨列车). The system is more akin to light rail than any of its predecessors. The

vehicle dimensions are larger (2.65 m wide[5] by 3.4 m high), and can be lengthened or shortened by adding/removing sections from each consist. The vehicles are electric, using supercapacitor batteries which are mounted on the roof and charged via a collector at stations only (which feature an electric 'umbrella'). This allows the vehicles to be 100% low floor (330 mm floor height), as opposed to low entry for most diesel fleets in Australia. Note that the supercapacitor technology is not new, and has been launched in Shanghai (buses), Nanjing (light rail), Guangzhou (light rail) and Ningbo (buses) over the past decade. Despite this, 'new energy buses' in China (including Shenzhen's 16,400 strong electric fleet—the largest in the world) has not taken up this technology, relying instead on traditional lithium-ion batteries.[6]

A major advantage of the CRRC system is its multi-axle hydraulic steering technology and bogie-like wheel arrangement, which is designed with less overhang thus requiring less clearance in turns. On the Zhuzhou test track (and as an example for comparison), the vehicles require just 3.83 m of swept path clearance, as compared with 5.74 m for a standard rigid bus. Each section of the 32 m vehicle is around 10.5 m long, and a minimum turning radius of 15 m is required. The cost of deployment is said to be USD 7-15 million per kilometre, as compared with USD 20-30 million for light rail and USD 70-150 million for metro. Capital costs for each vehicle is USD 2.2 million.

Image by : CRRC Zhuzhou Institute, Peter Newman

Myth 2: Optically-guided Bus offers improved Ride Quality?

This is true but to an extent only, and has as much to do with traction technology, route alignment and driver behaviour as it has with the optical-guidance variable. Ride quality is a direct result of rubber versus steel traction—think rubber-tyred metros compared with their steel counterparts. The track gauge (narrow, standard or broad) and axle loads (light or heavy) also determine the quality of ride on a railway. Another important factor is the alignment geometry. Light rail can handle only 4-6% gradients whilst rubber-tyred traction can reach 9%. A higher quality bus corridor with smoother gradients and curves will hence offer better ride quality. Pavement quality is another important factor which makes a marked difference to the ride experience.[7]

Optically-guided bus offers a much smoother ride, but this is primarily due to its advanced automation. It is true that the existing bus can be 'jerky', and this has a lot to do with buses getting more powerful (and lighter) over the years. An average bus engine generated 230

horsepower 20 years ago but today this can be up to 330 hp—important for uphill climbs but also allowing the driver (the opportunity) to accelerate quicker. One suggestion is to apply an acceleration limiter (perhaps more accurately the first derivative of acceleration or jerk limiter) in buses so as to limit the potential g-force experienced by passengers. The need for harsh braking is also an issue but linked to the level of bus priority afforded (i.e., traffic signals and traffic congestion) as well as driver training.

Myth 3: Optically-guided Bus will be Game Changing for the Provision of Transport Services and Infrastructure**?**

Two issues with optical guidance technologies have not been considered in the present debate. Like the Civis, these remain proprietary technologies so there are always huge risks when locked into a single supplier. Secondly, the technology remains unproven for snow, heavy rain and fog conditions—and environmental constraints can be quite problematic as proven in the Las Vegas case. **The potential success of the technology, however, is not related to whether the buses are optically-guided or not (nor linked to any of the above described characteristics, for that matter).**

The modern, sleek, rail-like appearance of these vehicles certainly appeals to the cultural and biological elements within us. There is the potential for optically-guided bus to challenge the age-old adage that **"buses are boring, and trains are sexy**" and what we term at ITLS as choice versus blind commitment in the bus and rail debate. **The challenge always is to avoid being emotionally fixated on technology,** but rather choosing the appropriate mode to meet a particular transport requirement. However, the core characteristics of transport service are 'invisible' to the customer—frequency, service span, travel time and connectivity. Running on the road, right-of-way quality remains the critical defining factor. What good is a 'trackless tram' if it continues to be stuck in traffic? In car-dominated Australia, governments have struggled to reallocate road space away from inefficient private cars (averaging just 1.1 people per vehicle for journey-to-work) to spatially-efficient mass transit. Whenever bus priority is built, it usually arises from the widening of a road rather than any redesignation of existing road space. As long as this mentality holds, we will struggle to improve the relativity of bus as compared with car—and this is the most important element for attracting users onto public transport.

That said, if 'trackless trams' can radically alter the political paradigm and garner the necessary support amongst the community for the sensible reallocation of road space including the provision of at-grade signal priority, then there exists a huge opportunity for the cost-effective deployment of high quality mass transit. After all, priority is the key to efficiency and urban amenity. ITLS research has shown there to be huge latent demand for public transport in the middle and outer suburbs of Australian capitals. We believe this to be where the technology holds its greatest potential, and can readily be deployed along cross-town and orbital strategic corridors presently serviced by (for example) Metrobus in Sydney and SmartBus in Melbourne. Time will tell whether 'trackless trams' can shift the conversation including altering the idea of permanence and fixed infrastructure from one synonymous with rail to the pressing issues of right-of-way quality and public transport priority.

Additional Resources

- Documentary of CRRC optically-guided bus (in Chinese)
- Video footage of Rouen optically-guided bus
- Video footage of Castellón optically-guided bus

Acknowledgements: I thank Graham Currie (ITS Monash), David Hensher (ITLS), Michael Apps (BIC), Lauran Huefner (BusSA), Stephen Rowe (Busways) and Darryl Mellish (BusNSW) for constructive feedback on an earlier version of this article.

1. See pioneering work on vision-based vehicle guidance systems by Dickmanns et al. and Pomerleau.
2. Most prominent being the Phileas bus, using guidance technology from FROG (Free Ranging On Grid) Navigation Systems.
3. A derivative called Cristallis was also offered which featured a different driver seating configuration to allow driver-operated fare collection.
4. CRRC is the world's largest rolling stock manufacturer, formed by the merger of CNR and CSR in 2015.
5. Hence does not meet Australian 2.5 m width limit as specified by the NHVR.
6. Supercapacitor (or ultracapacitor) buses recharge rapidly, but store just 5% of the energy that lithium-ion batteries can, and are thus limited to around 5 km per charge plus suited only for very predictable routes with frequent stops.
7. A prominent example of how pavement quality affects the ride may be found in Melbourne's Albert Park where roads are built with high specification concrete to accommodate the Australian Grand Prix.
8. Historically, the (incorrect) argument made for LRT has been that it does not take away from road capacity, but rather adds to public transport capacity.
9. See recent work on Metrobus by Chinh Ho and social exclusion by John Stanley.

Bayonne – Biarritz Electric Bus Rapid Transit, e-BRT, Route launched; France

14th October 2019 ; Metro Report International

FRANCE: Keolis has begun operating a 100% electric bus rapid transit route between Bayonne and Biarritz on behalf of public transport authority SMPBA .

According to Keolis, the service is designed to be simple for passengers to understand and use, with the 30 stops having real-time passenger information and ticket vending machines.

The 12 km route launched last month largely uses **dedicated lanes and has priority at traffic** lights. Services run from 05.30 to 00.30, extended to 02.30 from Thursday to Saturday, with daytime headways of 12 min and a journey time of 30 min.

The 10 battery buses supplied by Irizar are 18 m long with 150 seats with USB sockets and large windows. They can be charged in 3 to 4 h in the depot overnight, or topped up with fast charging in 5 min at the termini.

A second e-BRT route is to be launched next year between Bayonne and Tarnos, with a further eight vehicles.

The e-BRT services form part of a larger overhaul of the Chronoplus regional bus network, which Keolis has operated since 2017. The operator and authority are predicting that ridership will increase by 25% from the current figure of 9·5 million passengers/year by the end of 2023.

- Keolis is to launch a hydrogen BRT route in Pau by the end of the year.

Miami-Dade orders Proterra Battery Buses; USA

10th October 2019 ; Metro Report News

USA: Miami-Dade has agreed to purchase 33 Proterra Catalyst E2 battery-electric buses and up to 75 plug-in chargers.

'Florida is one of the most vulnerable areas in the country to climate change, and Miami is working tirelessly to lower its greenhouse gas emissions', said Mayor Carlos Giménez. 'Deploying battery-electric buses is one of the best actions we can take to improve our environment and our community's public health. We are looking forward to working with Proterra to deliver clean, quiet transportation.'

The county has set a target of at least 50% of its buses being electrically powered by 2035.

‘Miami-Dade has shown exemplary leadership, embracing proven EV technology and planning for a scalable electric fleet implementation’, said Proterra CEO Ryan Popple, when the order was announced on October 7th, 2019. ‘Proterra’s expertise in vehicle design, battery technology, charging systems and infrastructure installation best positions us to support Miami-Dade’s transition to zero-emission transit vehicles.’

Bangladesh approves two additional Mass Rapid Transit, MRT, Lines; Bangladesh

Oct. 16th, 2019; written by David Burroughs ; IRJ

BANGLADESH’S Executive Committee of the National Economic Council (ECNEC) has approved two large Mass Rapid Transit (MRT) projects in Dhaka worth Taka 940bn ($US 11bn), which, it says, will radically transform the capital’s transport.

Salim Khandoker/Wikimedia CC By SA 4.0

Oct. 16th, 2019 |

The approval for MRT Line 1 and MRT Line 5 (Northern Route) are among 10 projects worth Taka 1 trillion which were approved during a weekly ECNEC meeting held on October 15.

The government will cover Taka 304.6 bn of the project costs, while Taka 690.4 bn will come from international agencies such as the Japan International Cooperation Agency (Jica) and Asian Development Bank (ADB), with the remaining Taka 5.16 bn to come from the transport agency.

The 31.24 km Line 1 will run from Hazrat Shahjalal International Airport to Kamalapur Railway Station, and will be the country’s first underground metro line, with an elevated branch running from Notun Bazar to Purbachal Depot. The project is expected to be completed by 2026.

The 20 km Line 5 (Northern Route) will run from Hemayetpur to Bhatara via Gabtoli, Mirpur and Gulshan. The line will also consist of underground and elevated sections, and is expected to be completed in 2028.

JICA will provide up to Taka 685.67 billion for the projects.

The government aims to build five metro lines in the capital and surrounding area by 2030. The 20.1 km MRT Line 6, the city's first line, is expected to open in December 2021 in line with the country's golden jubilee of independence.

Colombo Light Metro Tender set for April 2020; Sri Lanka

Oct. 14, 2019; written by Kevin Smith; IRJ

TENDERS to construct a new light metro line in the Sri Lankan capital Colombo are expected to take place in April 2020 with contracts set to be awarded by the end of the 2020 or early 2021.

Artist`s Impression of a Light Metro on an elevated Concrete Beam Guide-Rollway

The 15.3 km Green Line will run from Colombo Fort main line station in the west to Borella, Battaramulla and Malabe IT Park in the east. The line will serve 16 stations with a journey time of 27 minutes between the termini.

"We're planning to commence construction once the documents are tendered and approved," Mr Chaminda Ariyadasa, Colombo Light Rail Transit project Director told the Third International Conference on Real Estate Management and Valulation in Colombo last week.

Commissioning of the project is expected to take place by the end of 2024 ahead of the start of operation in early 2025.

Land acquisition commenced in July 2018 following the completion of a feasibility study conducted by the Japan International Cooperation Agency (Jica) in 2017. Detailed design was carried out by a joint venture led by Oriental Consultants Global.

Jica will fund $US 1.8 bn of the cost of the project and plans to procure electric trains from Japanese manufacturers.

Monorail Port Harcourt - First in Africa; Nigeria

A fast and elegant Solution for a City, where the Road Traffic is threatened to collapse.

INTAMIN Light Monorail People Mover 100, Port Hacourt, Africa

Port Harcourt and its metropolitan area counts actually 3.7 Mio citizens and is characterized by oil production and its associated industries in Nigeria. The rapidly increasing traffic in the city regularly leads to congested roads. Therefore, city-planners were looking for a fast implementation of an efficient mass transit system. The monorail project is part of the city's and River State infrastructural investments to improve the traffic situation. The train is characterized by an innovative design, spacious cabins and is equipped with large size door openings for easy access for passengers with luggage. The modern design of the trains combined with a seamless appearance of the track system integrates the system excellently into the environment.

METRO NEWSLETTERS
on Technologies for
"URBAN MOBILITY AS A SERVICE"

PUBLIC MULTIMODAL URBAN, SUBURBAN, INTERURBAN AND REGIONAL PASSENGER TRANSIT TECHNOLOGIES FOR URBAN MOBILITY AS A SERVICE WITH METRO-BUS, BUS RAPID TRANSIT, LIGHT-RAIL, TRAM-TRAIN, METRO-RAIL, METRO-TRAIN, COMMUTER-RAIL, MONORAIL, AERIAL ROPEWAY, BOTTOM CABELLINER, MAGLEV AND HOVERCRAFT TRANSIT/PEOPLE MOVER, WATER-METRO, AUTONOMOUS PEOPLE-MOVER, POD CARS

TRANSPORT TECHNOLOGIES AND ECONOMIC DEVELOPMENTS IN MODERN URBAN/MEGAPOLIS ENVIROMENT

METRO Newsletter by Dr. F.A. Wingler
METRO 92, November 2019

The Challenge of First- and Last-Mile Connectivity for URBAN MOBILITY IN INDIA

PART I: INDIAN ACTIVITIES AND INITIATIVES FOR URBAN MOBILITY AS A SERVICE

India's Smart Cities Mission Spurs Domestic Manufacturing; India

October 5th, 2018, Syrma Technology Blog Articles

Artist`s Impression of **"SMART CITY" in India**

In 2015, India's Prime Minister Narendra Modi created the Smart Cities Mission Program, which is an urban improvement initiative. 100 Indian cities were selected to participate in the project after a competitive process that compared funding with each city's individual ability to comply with the program and reach its goals. The mission aims not only to improve city amenities and services throughout India, but also to prepare for an urban population explosion that's expected to render huge growth in Indian cities in coming decades. This growth has already begun, an estimated 1 million people move into urban areas throughout India every single month. The initiative's main goal is to improve the quality of life for citizens on a city level.

This includes improving public and private transportation, creating energy-efficient public structures, protecting the environment, and improving local government services. The initiative lays special emphasis on creating self-sustaining modern development that will allow for a high population to live well with access to modern technology and renewable energy. [1]

Below are examples of how technology has been used for these projects:

- **Handling Emergencies:** Developing flood monitors and emergency notification systems to provide better emergency response solutions and times.

- **Improving Transportation:** Implementing systems for public transportation tracking, such as online monitoring and GPS-guided vehicles, to improve traffic and reduce accidents.
- **Monitoring Air Quality:** Tracking local air quality to prevent exposure to harmful pollutants.
- **Protecting Property:** Using GPS devices installed in public structures, like garbage cans and lighting fixtures, to record data and send it to a city hub for surveillance.

As of May 2018, more than 1,000 projects had either begun or been fully completed at a local level, with a net worth of more than $7 billion (506 billion rupees). This program has opened new opportunities for India's manufacturers with the need for new technologies and amenities, especially ones that incorporate IoT (internet of things) applications. Businesses in India now have the ability to branch into new avenues, partnering with companies in technology, engineering, and construction. Partnerships with Indian companies are also prioritized and city employment has increased. [2]

Need for IoT Technology Expands

By 2025, 34 cities worldwide will have a population of more than 10 million people. To handle this growth, smart cities using IoT applications are being developed around the world. This technology generates data to help cities use their resources more efficiently. Presently, Asia-Pacific is the region accounting for the largest share of spending in smart city and IoT development. China's government has already selected over 200 cities to initiate smart city projects. Europe also strives to have 300 smart cities by next year, spending at least 1 billion Euro; 78 cities in Europe have already undertaken smart city development. And in the USA, $41 trillion will be invested over the next 20 years to upgrade city infrastructure by increasing the use of IoT applications. [3,4]

Our team is excited about the growth of Smart Cities worldwide and the creation of IoT applications. We recently created eco-friendly inverter controller boards for air conditioners that reduce normal power consumption up to 50%, as well as designed printed circuit boards for internal pollution monitors that are used to control pollutants emitted within power facilities and power supply enclosures that ensure extended electrical availability in remote areas. We've also started making and co-creating products for smart street lighting, solar power systems, and garbage collection. We hope to contribute our engineering expertise to create new products that will benefit humanity and our environment. [5,6,7]

Backed by 40 Years of Expertise

We contribute our 40 years of design and manufacturing expertise spanning multiple diverse markets, and we look forward to discussing how we can deliver world-class products for OEMs across the globe. We understand our home India market, familiar with its vast regulatory and selling environments. We foster growth opportunities within India through our strong technology incubation ecosystem. We also assist global OEMs seeking to enter the India market by leveraging the local supply chain and favorable operating environments for cost reductions.

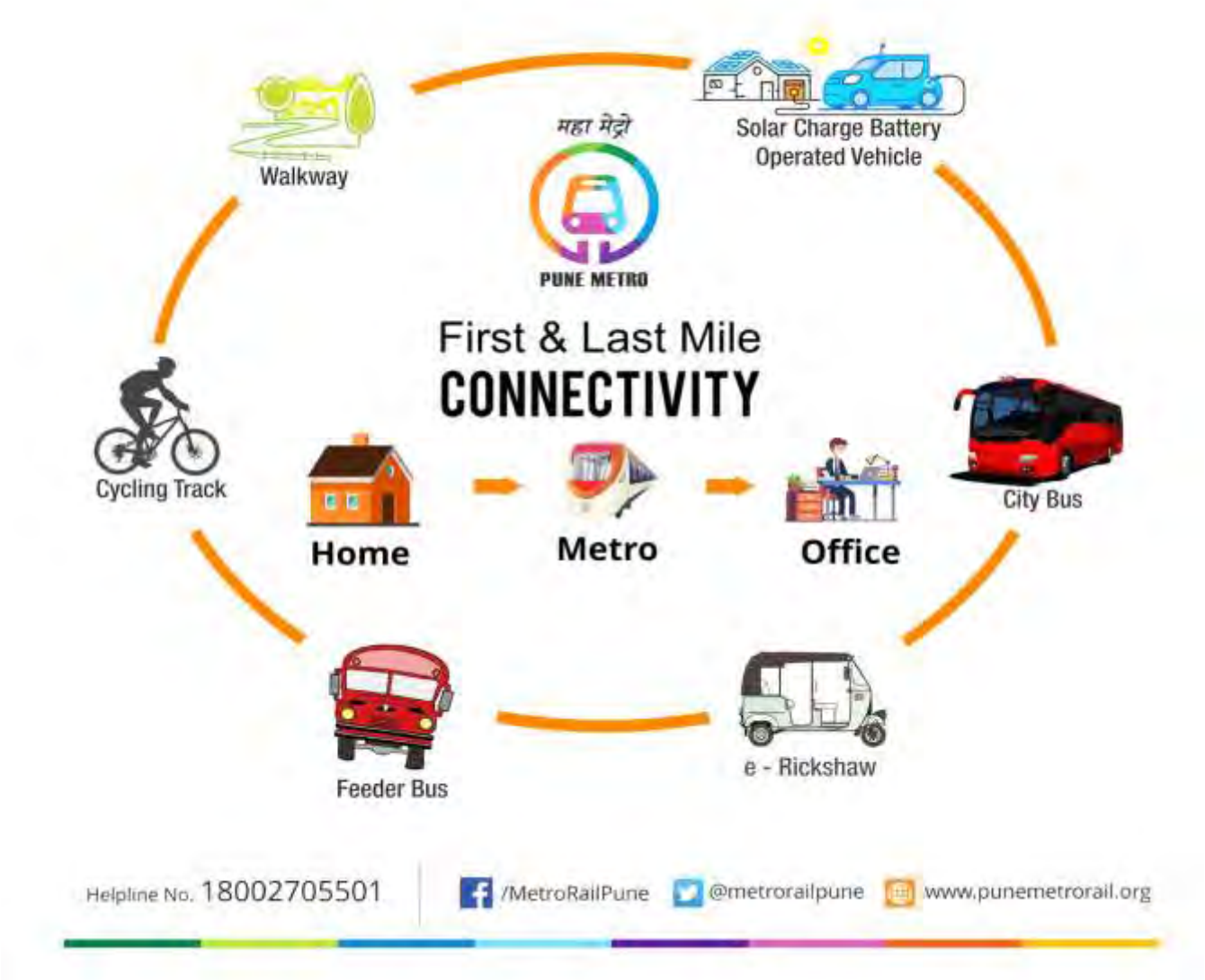
Our flagship Chennai location opened in 2006 and lies within a Special Economic Zone (SEZ) for electronics manufacturing, offering economic incentives for imports and exports. This primary facility is within 90 minutes of the Chennai seaport and 20 minutes to the international airport, with additional road and rail, connectivity linking to the rest of India and beyond, as well as infrastructure advantages with faster import and export clearances. We also have labor force availability, both technical and manual, to rapidly scale to client demand.

To learn more about this topic, please contact us.

Energy-Efficient Devices Energy-Efficient Meters India Air Pollution India City Amenities India Domestic Manufacturing India Modern Cities India Public Transportation India Smart Cities India Traffic India Transportation India Urban Areas India Urban Growth India Urban Population India Water Pollution India's Smart Cities Mission Indian Smart Cities Indian Smart City Smart Cities Mission Smart City Smart Energy Meters Smart Meters Smart Water Meters

First and Last Mile Connectivity: Overcoming a stumbling Block in India; India

By Jhanavi J.; Metro Rail News, October 2019, page 61



The Challenge of First- and Last Mile Connectivity for URBAN MOBILITY IN INDIA

As cities across the world invest billions of dollars in mass transit, they increasingly worry about ridership to justify large expenditure. A private operator too may be concerned if their revenue or the wider project viability is linked to footfall. Modern metro systems with high ridership and stable revenue streams require fewer subsidies. A healthy transport system is an economic contributor allowing politicians to pledge more resources to its growth and maintenance.

So why do we stumble so often when it comes to filling carriages and providing a convenient end-to-end journey? One reason is that a disproportionately large amount of planning and design time is put towards the main mode itself, which is the big-ticket item. Public agencies remain overwhelmed by decisions related to land acquisition, alignment and construction schedules. Little thought is given to how this expensive asset, once built, will be accessed and optimally utilised. The outcome could be a 'white elephant', where the asset is ready but does not witness expected demand.

Global Experience of Feeder Modes

Feeder connectivity is often seen as an after-thought rather than an essential element of the project. A change in approach is necessary. While there is no easy quick-fix solution, a few basic principles will help operators and authorities maximise the ridership and socio-economic benefits.

Here we identify five mode-groups to address first and last mile.

Walking

Some of the most successful mass transit systems worldwide ensure that pedestrians are given the highest priority of all. In a tropical country, a typical walk catchment would be within 1 km. It may seem obvious but there are far-reaching benefits of walking. It is the most carbon-neutral option. A high pedestrian share means less need for parking spaces and feeder pick up / drop points. In addition there are potential health benefits to individuals.

Global best Practice: Walking

Prepare a local pedestrian plan for each station catchment create safe, well-lighted walking paths to encourage existing as well as new users.

Provide tiled pavements, adequate and safe crossings approve a design that minimises pedestrian/ vehicular conflict.

Be sensitive to local climate, i.e. provide shade, protection from rain etc.

Para-Transit Modes

From the Ojek (motorcycle-taxis) in Indonesia and the shared Song Thaew in Thailand to the ubiquitous rickshaws whether manual, electric or CNG across India, para-transit modes play a critical role in urban mobility.

Some cities shy away from registering specific numbers believing that, if left on their own, market forces will create equilibrium in any zone. However, market forces take time to react to new situations and external economic factors are difficult to control.

Meanwhile there is chaos: Either there will be too few vehicles or too many. Station approaches become clogged, safety is compromised and an element of uncertainty is added to a mass transit journey. This discourages mode shift and makes for poor transit experience.

Regulation is anathema to politicians, who worry about employment and votes. Yet, the economic returns of a well-researched, professionally executed para-transit policy with soft regulation may work in everyone's favour. Passenger surveys could easily determine a base demand level for paratransit modes. This will allow a minimum number of these modes to be licensed in each station or administrative zone. Incremental licenses could be granted over time allowing some flexibility for latent market forces. Other innovative models are also possible.

Global best Practice: Para-Transit Modes

Identify existing pools of para-transit mode in station catchment.

Undertake studies to assess a baseline user demand-

'Light-touch' regulation such as vehicle safety checks, issuing zonal/ city-region based licenses following safety checks.

Ensure licensees have basic traffic know-how or provide training at subsidised cost.

Station design must have adequate pick up/ drop points.

Enforcement, at least in peak hours, to meet local traffic laws.

Potential future integration with smart ticketing.

City Buses

Typically, when a metro, tram or monorail is introduced in a city, the planning stage involves large-scale discussions with bus operators. Bus routes are rationalised to act as feeder modes to large metro/tram stations. This 'non-compete' approach is beneficial to all stakeholders. Passengers benefit from a seamless connection. The operators, instead of eating into each other's revenue stream, can actually increase their own revenues as more trips are generated. **In some cities, where low income passengers are price sensitive, some overlapping bus routes may still be required to ensure equitable social mobility.**

Admittedly, route rationalisation is a big task for a large city, that may have a number of bus operators and vehicles. Yet the earlier they start collaborating, the smoother will be the transition for all. In addition, bespoke mini-bus routes could be introduced at busy stations to meet specific first and last-mile connectivity needs.

Global best Practice: Bus

Mass transit agencies should work closely with existing bus operators right from the project planning stage.

Agree a route rationalisation plan.

Synchronize route rationalisation with opening of transit lines.

New bus/ mini-bus routes can be introduced in zones with high demand or large catchment.

Integrate smart ticketing.

High quality depot and maintenance practices to.

Cycling

Cycling aficionados may wonder why this green option is not higher in the list. In many cities across the globe, particularly northern Europe, cycling is a highly popular feeder mode and growing in size. However, it is important to acknowledge the ground realities of many tropical cities in emerging economies. This includes a mix of social conditioning, climatic factors, competing demand for limited road space and heterogeneous traffic, that makes a safe cycling network difficult to achieve even for small zones.

In specific localities, where the station is near school or university catchments, extensive and well-designed cycling paths are highly recommended. New townships will also have the opportunity to integrate cycling networks in their design. Indeed, a limited bike-share or cycle parking should be present in all stations.

Global best Practice: Cycling

Undertake a demand assessment around each station catchment to determine target customer segments for cycling.

Identify zones, where cycling paths will complement pedestrian walkways.

Create secure cycle parking or develop bike-share schemes.

Promote cycling for younger users who will be more open to green solutions.

What does the Future hold?

Technology is changing faster than one the blink of an eye. In less than a decade, shared mobility and taxi aggregators have gained popularity across much of the world. The new show in town is **on-demand transport**. This is essentially a form of public transport vehicle, that routes itself dynamically based on passenger destinations in a specific zone. Trials are currently being run in dozens of cities including London, Singapore, Auckland, Boston and New York. Vehicles are typically 8 to 12-seaters operated by registered individuals or existing bus operators. Japan has taken the concept further and is currently testing advanced **AI-based on-demand transport.** Many of these technologies aspire to be zero emission through use of battery-electric vehicles or hydrogen fuel cells.

FUTURE MOBILITY: How can we get ready?

Create space for adoption or retro-fitting of electric charging infrastructure.

Undertake trials for on-demand transport.

Develop capabilities to identify benefits and challenges of automation.

As always, the future is difficult to predict. Clarity of thought and expertise in the planning stages helps to avoid pitfalls later. As cities around the world race to meet the demand of growing populations, the cost of retrospective interventions will become higher. Let's develop seamless solutions right from the start.

******** The Author is a domain expert in transport finance and PPPs. Over the last 18 years, she has worked across Europe, Asia and Latin America advising bidders, investors and city authorities. For feedback, contact ira.ixom@outlook.com.

India's public Transport Challenge; India

Metro Rail News, October 2019

An effective mass transit system for India's large urban agglomerations can flourish only with adequate financing of buses, metros and suburban commuter rail.

Among the several services that haven't been able to keep up with the exponential growth of Indian cities is public transportation. As transit is integral to living in cities, residents have resorted to purchasing private vehicles to get around, adding to an already-severe congestion crisis in our cities.

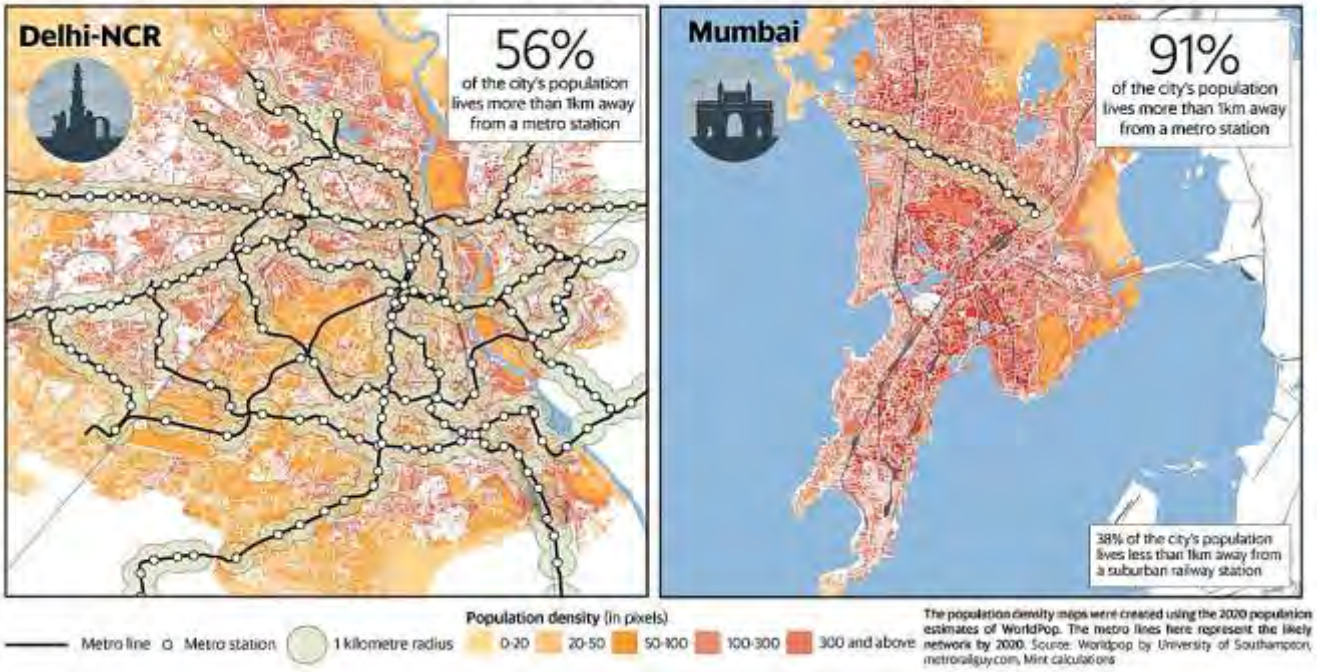
The solution to this challenge has been largely centred around metro rail networks, which have had a mixed record across cities so far. Currently, there are **630 km of Metro Rail in 13 cities, with more than half of it in Delhi (343 km),** and several hundred kilometers being planned in the next few years.

While metro rail networks may ease road traffic woes to some extent, the efficiency of investments in them remain a matter of debate. Even in Delhi, which received generous central assistance and low-interest foreign funding, together amounting to ₹70,000 crores between 2010 and 2018 to build its impressive network, more than half of its population still remain beyond easy reach of the network (beyond a 1 km radius from any metro station).

Other metropolitan regions are unlikely to build such large networks in the next decade or so given that they are facing financial constraints, and the Union Government framed new guidelines in 2017, which among other things, insist on participation from private firms in metro projects. While state and city authorities feel that the new guidelines impose onerous conditions, Union Government officials argue that local authorities **make plans in thin air, without thinking through the financial implications.** The upshot of all this: **Most cities will have large shares of their population away from a rapid mode of transit for the foreseeable future.**

Chart 1a

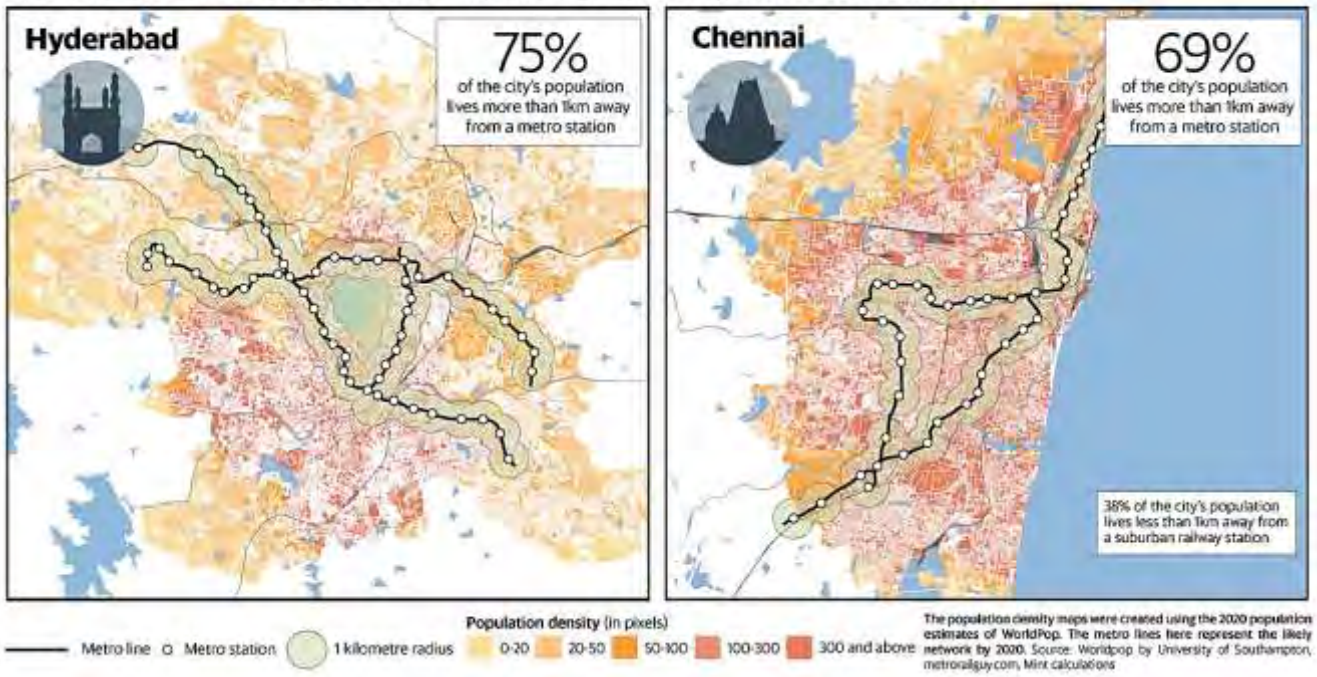
India's biggest metropolitan cities are a contrast in terms of metro access



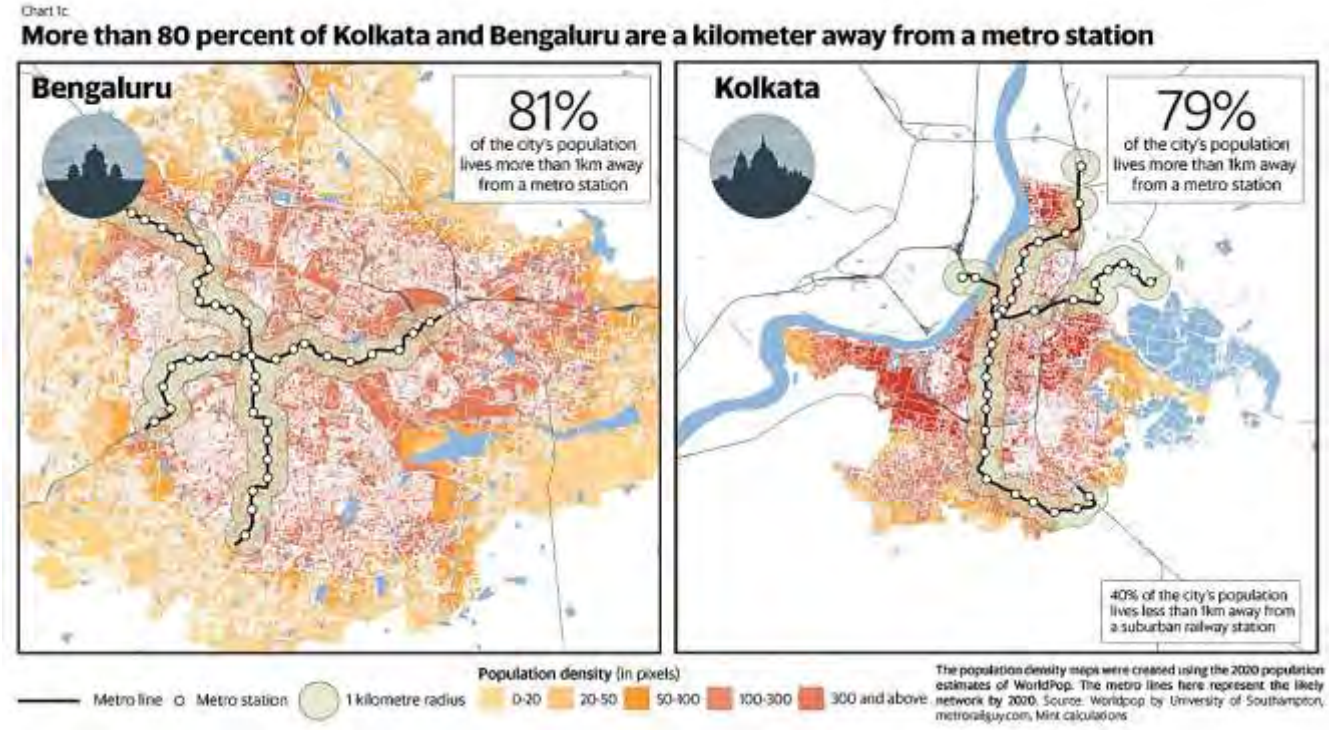
The population density maps were created using the 2020 population estimates of WorldPop. The metro lines here represent the likely network by 2020. Source: Worldpop by University of Southampton, metrorailguy.com, Mint calculations

Chart 1b

Less than one-thirds of Hyderabad and Chennai have easy access to the metro



The population density maps were created using the 2020 population estimates of WorldPop. The metro lines here represent the likely network by 2020. Source: Worldpop by University of Southampton, metrorailguy.com, Mint calculations



The feasibility question mark on India's metro plans arise from the relatively low ridership. To understand how underutilised Delhi metro currently is, we can compare it with Shenzhen in China. Both cities have started their metro networks around the same time and have near similar track-lengths. Shenzhen carried approximately 10,000 more people per kilometer than Delhi in the 2017-18 period (based on their respective official reports), which translates to around 730 million people more per annum. The Commuter Rail systems in other cities (such as in Kolkata and Mumbai) have high average ridership currently, but that's a statistical artifact, which will correct once the metro network expands.

Nagpur Metro to be Part of India's first four-Layer Transport System; India

The Proposal of Constructing a four Layer Transport System was given an unconditional Clearance by NHAI, which **amounts to a total of ₹573 C**rore.

By Kanika Verma; 08/11/2019 ; Metro Rail News

Artist`s Impression of **Nagpur Metro to be Part of India's first four**-Layer Transport System

NAGPUR (Metro Rail News): The city of Nagpur will get to see an engineering marvel soon after a proposal by Nagpur Metro for flyover and Metro route at Kamptee Road has been cleared by National Highway Authority of India (NHAI).

The proposal of constructing a four-layer transport system was given an unconditional clearance by NHAI which amounts to a total of ₹573 crores.

The proposed four-layer structure will come up on Kamptee Road of Nagpur. The structure is part of the Reach-II segment of Nagpur Metro Rail Project ,which stretches from Sitabuldi Interchange Metro Station to Automotive Square Metro Station.

The total length of the viaduct in Reach-II stretches to 7.23 km. The total length of fly-over to be constructed is 5.3 km.

Kochi Water Metro: A Unique Project; India

September 26, 2019 Articles , Rail Analysis India

The Kochi Metro Rail Limited (KMRL) is all set to implement the integrated water transport project at a cost of Rs.747 crore. The water metro project is being implemented with financial assistance from the German Bank, KfW. Kochi is the first city in the country to have achieved such a milestone whereby water transport has been integrated as a feeder service to the metro.

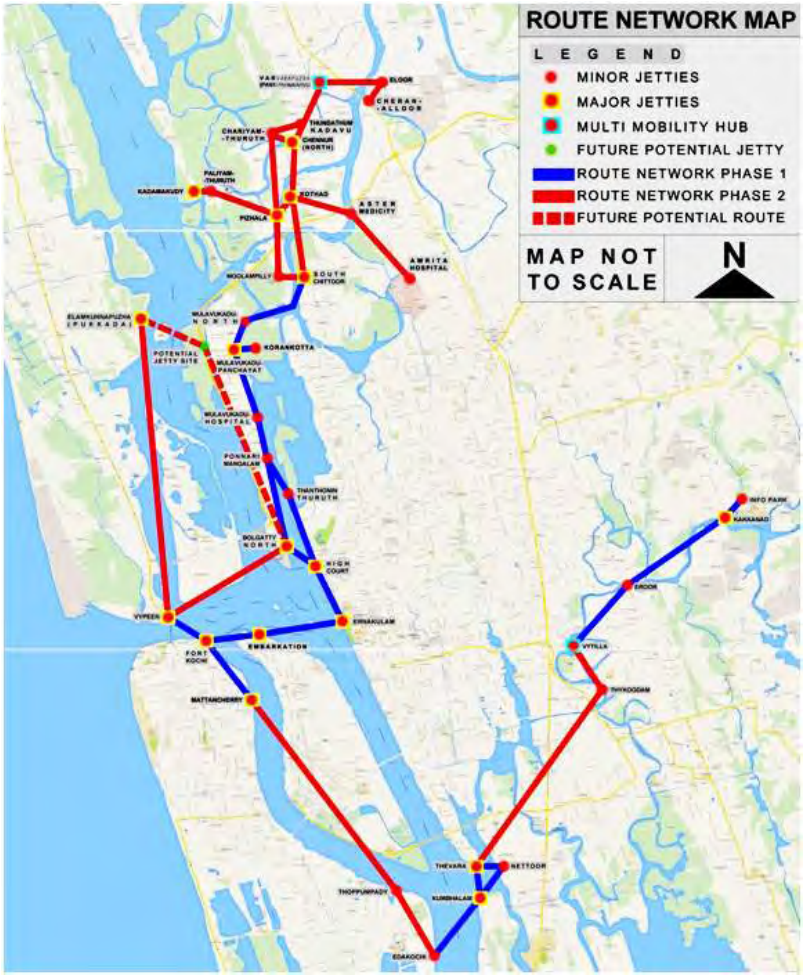
It is also for the first time in India that such a significant level of investment is being brought in for improving water transport. The Water Metro Project would be a reality by 2020.

The proposed project envisages the development of 16 identified routes connecting 38 jetties across 10 island communities across a 76-km route network. The identified routes and jetties are represented in the figure. There are existing jetties where boat services from

Kerala State Water Transport Corporation and private agencies are currently being operated.

The project intends to bring in a fleet of 78 fast, fuel efficient, air-conditioned ferries plying to 38 jetties, 18 of which will be developed as main boat hubs, while the remaining 20 will be minor jetties for transit services. More than 100,000 islanders are expected to benefit from the Water Metro, complete with modern watercrafts.

In May this year, the KMRL (Kochi Metro Rail Limited) awarded the contract to construct three major boat terminals for Kochi Water Metro Project to Marymatha Construction Company. The company will construct the Vyttila, Eroor and Kakkanad terminals, which are part of the phase-1 of the project.



On 05th September 2019, Cochin Shipyard Ltd. has announced that it has bagged the contract of Kochi Metro Rail Limited (KMRL) for building boats for the proposed Kochi Water Metro project. The CSL got the tender for 23 boats. The boats would be 24 meters long and have a capacity of 100 passengers.

The boats will be powered using an electric propulsion system equipped with high-quality Lithium Titanium Oxide batteries, a release issued by CSL said. “The batteries can be charged at the charging stations at various jetties using fast charging technology within 15 minutes.” “For emergency purposes and for achieving top speed, the propulsion system of boats shall also be connected through a hybrid system using power from diesel generators,” the release said.

The project shall be implemented to cater to daily ridership, which is estimated to increase 54,000 by 2025 and 86,000 by 2035. The project involves the renovation of jetties, boatyard and access roads around, providing parking facilities, maintenance dredging activities etc.

Kochi Water Metro Project is an integral link in the perceived Urban Metropolitan Transportation Model for Kochi, wherein the Metro rail, land feeder services, earmarked pavements for cycle and pedestrian movement and water metro would be integrated to ease the traffic congestion and reduce the pollution in the city.

Advantages of the Kochi Water Metro Project:

- Facilitate better connectivity of the islands around Kochi with mainland. This has been a long-standing requirement of the islanders and could be only partially mitigated through the Gosree bridges and International Container Transit Terminal road.
- Drastically reduce the road traffic by diverting the passengers to water transport. In turn, it would assist in reducing the road congestion on the roads.
- Reduction in the atmospheric pollution from land vehicles and carbon footprint of Kochi City.
- Impetus to tourism in and around Kochi providing easy access to the scenic islands around. This would lead to the development of all the islands connected by the Water Metro Project.

Impact:

The waterborne transport network is the ideal solution for Kochi in order to integrate all of its inhabitants on the various islands into an efficient transport system. The outer islands will be closely linked to the mainland, giving them easier access to employment opportunities, schools and health services.

Coordinating the individual transport modes with each other will save travellers' time on their daily routes. Underprivileged population groups in particular will benefit from the project and are more mobile.

The new ferries are safe, quick and comfortable, which will increase the attractiveness of the public transportation system in Kochi as a whole. They need significantly less fuel than the old boats and therefore create fewer greenhouse gases.

The significantly lower background noise, along with cleaner air, will also contribute to overall citizens' well-being. At the same time, a functioning and attractive local public transport system is an important prerequisite for further economic growth and social development.

Unique Project:

The project is unique since it introduces an integrated water transport system, whose schedule and route network will be aligned with the new metro and bus lines.Tickets are valid for the entire transport system and are designed to be affordable for the poorer population as well.

To improve efficiency, the previous point-to-point rides will be replaced by line traffic. Instead, the ferries will start from the main islands or the mainland and stop at the neighbouring islands. This will shorten the routes, thus saving time and resources and allows for a regular schedule. In total, 16 lines will be set up with 38 jetties and 78 energy-efficient boats to replace the old ones.

The project is to be implemented in just five years and is scheduled for completion in 2020. 80,000 trips per day are planned by then, with time savings of up to 30% in comparison to road transport. Furthermore, the enhanced technology of the boats means that up to 40%

less diesel will be consumed. Additionally, to make the ferry rides safe and comfortable for women in particular, separate passenger areas will be created and separate entry controls conducted.

Cochin Shipyard signs Rs. 175 Crore Contract for building 23 Boats for Kochi Water Metro; India

October 31th, 2019 Rail News

Kochi: Cochin Shipyard Limited (CSL) said it signed a Rs. 175.70 crore contract for designing and constructing 23 hybrid-electric passenger ferries for Kochi Water Metro Project. The company signed the contract on 29th October 2019.

More Information

- In September this year, Cochin Shipyard announced receiving Letter of Acceptance (LoA) from Kochi Metro Rail (KMRL) for building 23 boats for the Kochi Water Metro Project.
- The value of the contract is Rs. 175.70 crore.
- The contract is for design and construction of 23 Hybrid-Electric Passenger Ferries.
- The Water Metro Rail project is aimed at providing inland water transport using electric or hybrid technology.
- Total requirement of KMRL stands at around 78 high quality boats of international standards.
- Out of this, 23 boats having a capacity of 100 PAX was tendered by KMRL in which CSL also participated.

About Cochin Shipyard Limited

Cochin Shipyard was incorporated in the year 1972 as a fully owned Government of India company. In the last three decades the company has emerged as a forerunner in the Indian Shipbuilding & Ship repair industry.

This yard can build and repair the largest vessels in India. It can build ships up to 1,10,000 DWT and repair ships up to 1,25,000 DWT. The yard has delivered two of India's largest double hull Aframax tankers each of 95,000 DWT.

CSL has secured shipbuilding orders from internationally renowned companies from Europe & Middle East.

Centre gives Environment Clearance to Rs. 819 Crore Kochi Water Metro Project; India

October 29th, 2019, Rail News, Rail Analysis India

The Centre has given the environment clearance for Rs. 819 crore Kochi Water Metro project, that aims to provide better connectivity of islands around Kochi with the mainland, according to official document.

More Information:

- The Union Environment Ministry has given the final environment clearance to the proposed Kochi Water Metro project after taking into account the views of its green panel.
- Kochi Metro Rail Ltd (KMRL), a joint venture firm of the Centre and Kerala government, is the implementing agency of the Water Metro project.

- The project will cover 15 identified routes in Kochi connecting 38 terminals across 10 island communities across 78.2 km channel length and two boatyards, according to the proposal.
- It added, KMRL has proposed to take up development of 7 additional terminals (Info Park, Vaduthala, Njarackal, Mulavukad View Point and Embarkation jetty) as a social initiative.
- The cost of the proposed project is pegged at Rs. 819 Crore.
- About 9.51 hectare of land to be acquired for the Water Metro project.
- The proposed water metro project aims to provide easy access to scenic islands around the mainland Kochi besides will enhance overall employment opportunities, according to KMRL.

Delhi Metro Partners with Uber for last-Mile Connectivity at 210 Metro Stations; India

October 24th, 2019 Rail News

Hiring a cab from a Metro station in Delhi is set to become a lot more easier as ride hailing major Uber on Tuesday announced it has won a competitive bid to expand its operations across 210 Delhi Metro stations. Under the partnership to improve first and last-mile connectivity for users, Delhi Metro Rail Corporation (DMRC) will provide Uber dedicated pick up and drop points.

More Information:

- A pilot is being run at about 4 stations and the facility will eventually be made available in 210 of 274 Metro stations, DMRC Managing Director Mr. Mangu Singh said.
- “Research has shown that integrating on-demand services with public transport is beneficial for riders,” Mr. Singh said at an even which saw Uber launching its “public transport” service in Delhi.
- With this, Delhi becomes 9th city globally and first in Asia to have such a feature.

- He said,”This new initiative integrating public transport with mobility operators like Uber will certainly boost first and last mile connectivity solutions for around six million passenger journeys performed in the system daily.”
- He said,”DMRC has partnered with on-demand mobility operators like Uber to enhance their commuting experience with seamless last mile connectivity.
- Uber said it launched the “public transport” journey planning feature for Uber riders across New Delhi to make travel easier with the information riders need to make the smartest possible journey choices.
- Uber CEO Dara Khosrowshahi said,”We want to be the operating system of your everyday life. We want to replace your car with your phone.”
- He added,”India is core to Uber’s growth strategy for the next 5-10 years.”
- Pradeep Parameswaran, President, Uber India and South Asia said,”By launching Public Transport, live transit information about the city”s heartline, the Delhi Metro and the DTC, will be available in the Uber app, thereby helping us fulfill some of the important responsibilities that come with being a good partner to this great global city.”

Uber adds public Transport Options in Delhi; India

25th October 2019; Metro Report International

INDIA: Uber has added public transport options to its app for users in Delhi as part of a partnership with Delhi Metro Rail Corp.

From October 22, app users receive information on public transport modes so that they can ‘make the smartest possible journey choices’, according to Uber. Real-time departure information is available, in addition to walking directions to and from nearby metro stations and bus stops.

Noting that ‘the future of transport is multimodal and ridesharing alone can’t help build the smart cities of the future’, Uber is also developing a ‘model metro station’ with DMRC to explore how first- and last-mile transport can be integrated with metro services.

Delhi Metro Line Utilisation rise to 35% from May 2018 till September 2019; India

November 7th, 2019 Rail News

New Delhi: The line utilisation of the Delhi Metro network has risen to 54.26 lakhs in September 2019 from 40.25 lakhs, in May 2018, which is an increase of 35%. Line utilisation is calculated by the number of corridors used by a passenger to reach their destination.

More Information:

- DMRC (Delhi Metro Rail Corporation) tweeted,"Delhi Metro is truly Delhi NCR's backbone. In Sep 2019, Line Utilisation grew to 54.26 Lakh from 40.25 Lakh in May 2018, a hike of 35%. At this pace we are truly #UncloggingDelhi."
- It said in a follow-up tweet, "In a span of just 2 years, the average daily passenger km has seen an increase of over 27%. What was 406.01 lakh km in October 2017 has witnessed a tremendous growth to 517.39 lakh km in September 2019!".
- In December 2002, the Delhi Metro began its first services on Shahdara-Tis Hazari corridor of Red Line.
- Over the years, the network has spanned length and breadth across Delhi-NCR and carries more than 20 lakh passengers per day.
- Currently, Delhi Metro spans nearly 350 km, having over 250 metro stations and 9 colour-coded lines.

About Delhi Metro:

- Currently, the Delhi Metro network consists of about 389 Km with 285 stations.
- The network has now crossed the boundaries of Delhi to reach NOIDA and Ghaziabad in Uttar Pradesh, Gurgaon, Faridabad, Bahadurgarh and Ballabhgarh in Haryana.

- This network also includes the NOIDA – Greater NOIDA Aqua Line.
- In addition, the 11.6 km long Rapid Metro also connects with the Delhi Metro network at Sikanderpur station of Yellow Line.
- The Rapid Metro provides connectivity within the satellite city of Gurugram.

Adani Enterprises forms new Subsidiary Adani Metro Transport (ATML) to focus on Metro Rail Projects; India

October 19th, 2019 Rail News

Adani Enterprises has incorporated a wholly own subsidiary named Adani Metro Transport (ATML) for the business of building, construction of transportation facilities like the metro and mono rail segment, rapid rail transit system, the company said.

More Information:

- Adani Enterprises has set up a wholly-owned subsidiary Adani Metro Transport (ATML) to focus on Metro rail projects, it said.
- Shares of Adani Enterprises were gaining for the 5th straight session on Friday, surging over 8% in intraday trade on the Bombay Stock Exchange (BSE) after the company set up a subsidiary company named Adani Metro Transport (AMTL) to focus on metro rail projects.
- Adani Enterprises said in a filing to the exchange,"The company has incorporated a wholly own subsidiary for the business of building, construction of transportation facilities like the metro and monorail segment, rapid rail transit system, and engineering, procurement and construction, thereof".
- Adani Metro Transport, which is yet to start operations, has authorised share capital of Rs 5 lakh and paid-up share capital of Rs 1 lakh.
- Earlier this month, Adani Enterprises set up a subsidiary company Stratatech Mineral Resources for carrying out mining activities.
- In August, Adani Enterprises had incorporated Adani Airports for acquiring, promoting, operating, and managing airports in India and abroad.

DFCCIL, CRWCL signs MoU for upgrading and creating Multi-Modal Logistics Parks along DFC Rail Network; India

October 26th, 2019 Rail News

An MoU was signed between DFCCIL (Dedicated Freight Corridor Corporation of India Limited) and CRWCL (Central Railside Warehouse Company Ltd) for utilizing the services of the latter for upgrading and creating Multi-Modal Logistics Parks and Integrated Warehousing Complexes along or near DFCCIL rail network.

The MoU was signed on 21th Oct. 2019 by Shri Anurag Kumar Sachan, Managing Director, DFCCIL and Shri Narinder Kumar Grover, Managing Director, CRWC when Shri Arun Kumar Shrivastava, Managing Director, Central Warehousing Corporation was also present.

This synergy between DFCCIL and CRWCL is expected to give a boost to traffic to be carried over through DFCCIL by making the transport over DFCCIL complete and integrated with warehousing, and last-mile connectivity being provided in a seamless manner.

This association is bound to reduce logistics costs and thereby attract more traffic from other modes.

Another Building collapses in Bowbazar, Kolkata, due to Metro Work, Mamata demands Compensation; India

Metro Rail News, October 2019

West Bengal CM Mamata Banerjee interacts with Technicians at Bowbazar Area, Calcutta on Monday, September 3th, 2019. (PTI)

Another building, the second one on Bowbazar Street in central Kolkata, came crumbling down on September 3th, 2019. The first house collapsed on August 31th, 2019 night following the boring for the 16.6 km of East-West flank of the Metro.

Another Building collapses in Kolkata Bowbazar due to Metro Tunnel Boring in Alluvia Water containing Strata

The Metro will run underground for a stretch of 10 km, connecting twin cities of Howrah and Kolkata, before taking the surface.

About 52 houses in the central part of the city developed cracks and 70 families had to be evacuated in the apprehension of further cave-ins. The condition of a dozen of houses is quite bad.
West Bengal Chief Minister Mamata Banerjee held a meeting with Metro officials on September 3., 2019, and asked them to compensate each of the affected families with a minimum of Rs. 5 lakh.
Though the Metro was non-committal on this, it agreed to bear the cost of relocation, rent of the affected people until some permanent arrangements are made.
By announcing the compensation package in front of Metro officials, the chief minister's objective was served. She was able to give the message that she has good intentions of helping people and now the ball is in the Ministry of Railways' court. Describing the incident of collapse as "unprecedented" in the history of metros in the country, Managing Director of Kolkata Metro Rail Corporation (KMRC) said experts from Singapore and Hong Kong will be coming to assess what went wrong. “We have conducted sample soil test of each layer of soil and water pockets. There was no problem with 250 meters of water-bearing layers also," he said.

Comment*: For an Non-Indian expert it is “incredible”, that Kolkata Metro Rail Corporation (KMRC) took the risk in boring a metro tunnel only 14 m below a densely built bazar area through water containing soft ground alluvial strata.*
With the tunnel boring, obviously one looked for a more risky but cheaper way. Before starting such works, the area should have been cleared from houses and the metro tunnel constructed in an open shaft as a cut and cover construction with freeze stabilization of the side walls. The cut and cover method with side walls stabilization by ground freezing or grauted pipe spilling would have been the method of choice or preferred method. But now it is too late. The area has now anyway to be vacated from building structures. The affected dwellers of the Bazaar area are now the suffering victims, which got deprived of livelihood and property without any hope of proper compensation under a situation, which could have been easily foreseen. The legal procedure is in favor of the responsible party. The victims are the losers.
The planners have made a fundamental mistake:
It is a FUNDAMENTAL AND BASIC KNOWLEDGE in SAFETY AND RISK MANAGEMENT:

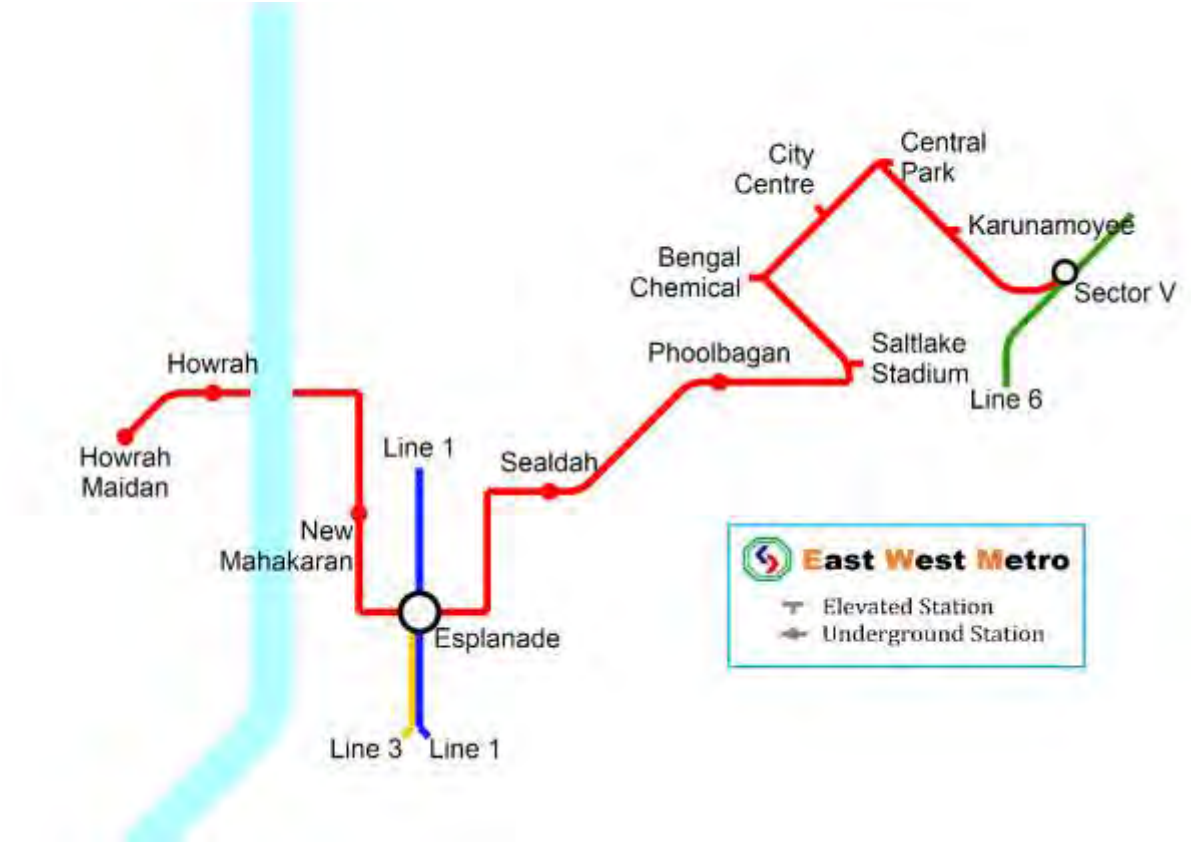
“What did not happen in the past is more likely to happen in the future!”.

“From the NON-OCCURANCE of a bad and unwanted event one cannot make any prediction for the future or regard an operational system as safe!”

Metro Tunnel Construction by Cut and Cover Methodology

For Information (Source Wikipedia):

East West Metro Hooghly River Tunnel is an underwater construction of Kolkata Metro in Kolkata, West Bengal.to connect Howrah with Kolkata. The river tunnel is constructed 30 m underneath the Hooghly River. The tunnel length is 10.8 km (6.7 mi) and the width is 5.5 m (18 ft). A 520 m stretch of the tracks will go through a tunnel under the Hooghly River. The tunnel will be completed in 2021.The tunnel on the Kolkata side will make a turn through the water containing soft alluvial ground 14 m under the buildings of Bowbazar. The tunnel will be first underwater river tunnel in India. The tunnel is used by East West Metro Line for metro rail service and constructed by Kolkata Metro Rail Corporation.



Soft Ground Tunnelling; Global

WSP works in all Forms of soft Ground Tunnelling, from Cut and Cover, Tunnel Boring Machines, Tunnel Jacking, and innovative strategies like ground freezing.

Dave McAlister
Global Director, Transport and Infrastructure; WSP Group

Putting our Experience to Work for you

A tunnel built in soft ground – such as clay, silt, sand, gravel, or mud – requires specialized techniques compared to hard rock, to compensate for the shifting nature of the soil. At WSP, we have extensive experience with soft ground tunnels on every continent and we pride ourselves on developing innovative strategies to deal with even the most complicated soil situation while preserving stability. There are a wide variety of techniques for soft ground tunnelling, and the best fit is ultimately determined by ground type, timeline, budget, and surrounding structures.

In order to select the most appropriate method for a particular tunnel, several factors need to be taken into consideration, including but not limited to ground conditions, length, depth, diameter, alignment geometry, and budget. Another important consideration is the risk and sensitivity of nearby infrastructure and buildings to ground movement.

At WSP we know that an important aspect of soft ground tunnelling is the protection of existing structures and utilities, as many soft ground tunnels are located in sensitive urban environments where settlement caused by tunnelling is a major concern. Protective measures such as dewatering, ground improvement, compensation grouting, and positive pre-support can be used to ensure successful tunnelling in soft ground is achieved. Above all, a comprehensive real-time instrumentation and monitoring system is essential. In Seattle, WSP was heavily involved with the SR-99 Alaskan Way Tunnel project, which was constructed in challenging ground conditions, under more than 150 buildings. The tunnel has a diameter of 17.5 m, and is the second largest tunnel of its kind in the world.

Alaskan Way Viaduct, Seattle, United States; WSP Group

Cut and Cover

Cut and cover tunnelling is a common, well-proven technique for constructing shallow tunnels. This technique consists of an in-situ cast concrete structure in an excavated trench, which is covered afterwards. This method accommodates changes in tunnel width and non-uniform shapes and is often adopted in the construction of underground transit stations. To

minimize surface disruption, cut and cover tunnelling can be accomplished using the traditional bottom up method or as a top-down construction.

Tunnel Boring Machines

For deeper, longer tunnels in urban areas, or for a tunnel crossing major bodies of water, a pressurized-face Tunnel Boring Machine (TBM) is the best fit, because it is capable of handling the full range of expected ground conditions. A single pass, precast concrete segmental lining forms the tunnel behind the TBM. The selection and design of the precast segmental liner is critical for successful application. The segments are equipped with waterproofing gaskets and act as the structural support system and water barrier.

Compared to the cut and cover approach, TBMs significantly reduce the disturbance of traffic and the associated environmental impacts in urban areas. WSP has been a pioneer in the advancement of single pass liners, including its first application in the USA with the use of fibre reinforcement and double gaskets. We also introduced the use of special seismic joints in TBM driven segmental liner tunnel, outside of Japan.

There are two major TBMs used in soft ground tunnelling: Earth Pressure Balanced (EPB) and Slurry Type Shield Machines. An EPB TBM will perform better where the ground is silty and has a high percentage of fines. A slurry TBM is ideal in loose water-bearing granular materials. However, with the application of appropriate ground conditioning agents, the range of ground conditions for each machine can be extended. TBM technology has advanced significantly in the last 15 years, allowing for the construction of larger, deeper, and longer tunnels in more difficult ground conditions.

New Austrian Tunnelling Method

For shorter tunnel sections, non-circular tunnels, or tunnels with variable geometry, the New Austrian Tunnelling Method (NATM) – also known as the Sequential Excavation Method - provides another cost effective, flexible, and safe tunnelling option. The tunnel is sequentially excavated and support is provided by shotcrete, in combination with fibre or welded-wire fabric reinforcement, steel lattice girder arches. **Ground Improvement Methods** such as **Jet Grouting, Dewatering, Ground Freezing and Grouted Pipe Spilling are also available** to stabilize the face.

Tunnel Jacking

Tunnel jacking is a method for constructing monolithic, rectangular concrete box sections under surface areas with critical uses such as railways, major roadways, and airport runways. Due to its expense, it is generally only used when there is no other option, and so examples are rare. This method is generally applied in cases where the underground crossing is relatively short, is located in soft ground, and with shallow cover. Special construction techniques are required to minimize friction, reduce settlement, and maintain the tunnel alignment.

In Boston, WSP applied this approach during the construction of a section of the Central Artery/Tunnel, under a complex network of tracks leading into the South Station Railway Terminal. Three concrete tunnel box sections were jacked successfully under the track network, with typical cross sections of 11.6 x 24 m and lengths of 51 to 115 m.

PART II: GLOBAL ACTIVITIES FOR URBAN MOBILITY AS A SERVICE

Urban Transport News in Brief; Global

18. October 2019; Metro Report International

Photo: Shanghai Keolis

The **Shanghai Pudong International Airport Peoplemover** opened on September 16. Operated by Keolis, it serves terminals 1 and 2 with satellite buildings S1 and S2.
Alexander Dennis is to supply six electric buses to Fullers360 to be operated by its subsidiary Waiheke Bus Co on behalf of **Auckland Transport**.

Melbourne's Yarra Trams has received full certification to the ISO 55001 standard in asset management.
A 5.4 km extension of the Bangkok Blue Line from Bang Wa to Lak Song began revenue service on September 30.
Bangladesh's National Economic Council has approve **Dhaka Metro Lines** 1 and 5.
Tehran Metro Line 6 has been extended by 1·3 km from Shohada Square to Emam Hossein.
Autonomous shuttle manufacturer EasyMile has opened a regional office in Dubai.
The **Częstochowa** tram network reopened on September 21 following refurbishment work.
The EU has signed a 218m lev funding agreement that would go towards the purchase of 25 trams, 30 trolleybuses and 82 electric buses for **Sofia.**
SOR Libchavy is to supply 32 electric buses to **Brašov** and 10 to **Zalău.**
Sakarya Municipality in Turkey plans to build a 2 km heritage-style tram line.
Biprogeo-Projekt is to carry out design work for a 2 km tram line on ul **Rogowska in Wrocław** under a 1·2m złoty contract.
Italferr has announced that planning for a second rubber-tyred tram line in Padova has started. The 5·4 km route would link the railway station with Voltabarozzo.
Trans-Alpha is to supply three low-floor trolleybuses to the **Moldovan City of Bender**.
EC Engineering is to supply pantographs for the 24 trams that Durmazlar is supplying to **Olsztyn.**
The trolleybus network in the **Romanian City** of **Piatra Neamţ** has ceased operations.
Alstom is to supply a Hesop reversible substation to **Hamburger Hochbahn** by the end of the year.
Sweco Consulting is to undertake design work for a 2·5 km tram extension in **Kraków** to the Azory housing estate under a 3m złoty contract.
Latin America development bank CAF has signed a US $ 296m loan agreement with **São Paulo** state for the construction of the Line 17 **Mono-Rail** in the state capital.

Sustainable Mobility Roadmap set out; Global

23th October 2019; Metro Report International

INTERNATIONAL: The Sustainable Mobility for All group of 55 organisations published its *Global Roadmap of Action toward Sustainable Mobility* report on October 23. The launch event took place at the headquarters of the World Bank, a SuM4All member, in Washington DC.

The report aims to help national and city governments to attain sustainable development goals and improve the sustainability of local transport. It does this by identifying the most effective policy measures that governments could take.

The report defines four characteristics of sustainable mobility: universal access, efficiency, safety and green mobility. It stresses that the path to achieving these goals will be different for each country.

'Transport is central to our lives, and it is a key sector in solving the climate crisis and the broader development challenges that the world faces', SuM4All Practice Manager Nancy Vandycke told *Metro Report International*. She added that policy reforms and can often make a bigger difference than infrastructure investment to achieving sustainable mobility.

Regional Variations

The report assesses the performance of 183 countries in meeting each of the four targets, and identifies 182 policy measures that can advance progress. It also includes a methodology to implement the most relevant and effective measures for each country.

SuM4All notes that its *Global Mobility Report* published in 2017 found that no country has achieved sustainable mobility. The current work aims to answer the question of how to move towards the goals.

Developed countries outperform developing countries on all goals except greenhouse gas emissions per capita. Europe and Central Asia perform on average better in the universal access category, whereas Sub-Saharan Africa performs worst on this measure, as well as on efficiency and safety. South Asia, in turn, has the worst air pollution.

Taking all four measures together, Germany is ranked as the best country for sustainable mobility, followed by the Netherlands, Sweden, the UK and France. The only non-European country in the top 10 is Japan, in seventh place. The worst-performing country is Libya, followed by the Central African Republic and Yemen.

Urban Transport

Among the city leaders speaking at the launch ceremony, Mayor of Freetown Yvonne Aki-Sawyerr described sustainable mobility as part of a holistic approach to sustainable urban development, explaining that transport can help with other development goals by providing access to healthcare and education.

Former mayor of Quito Mauricio Rodas stressed the importance of access to financing for urban authorities, as measures taken by cities are a necessary condition for countries to meet their sustainability goals.

SuM4All estimates that an additional 380 million people would have access to sustainable transport if rapid transit networks were introduced in cities of at least 1 million people, that currently lack them.

World Cities Day: Promoting Urbanisation with sustainable Development in Smart Cities; Global

Posted by Expert View on Oct. 31., 2019 ; Smart Rail World

31th October is the United Nations' World Cities Day, which promotes the international community's interest in global urbanisation: encouraging cooperation among countries to meet the opportunities and address its challenges, and contribute to sustainable urban development globally. The general theme of World Cities Day is 'Better City, Better Life'. This year's sub-theme is 'Changing the world: innovations and better life for future generations.' I see this as the United Nations General Assembly throwing down the gauntlet to challenge private and public organisations to raise the bar in how we contribute to and shape urbanisation. BAI and, I believe, the organisations with which we work are certainly willing to take it up.

This year, the World Cities Day goals are to:

1. Increase awareness of how digital innovations can be used for urban service delivery to enhance the quality of life and improve the urban environment
2. Show new frontier technologies that can create more inclusive cities
3. Present opportunities for renewable energy generation in cities
4. Explore how frontier technologies can promote social inclusion in cities.

An international Perspective on Urbanisation

According to the United Nations, more than half the world's population now live in cities. Expected to increase to 68 percent by 2050, urbanisation is one of the world's most transformative and challenging trends.

We help enable economic growth and fast-track development of world-leading connected communities. We do this by designing, building and operating the connectivity and communications infrastructure on which they depend.

BAI's particular perspective is that digital enablement, through connectivity, is changing our idea of what a city can offer its citizens. In fact, we argue that innovative transport systems are a defining feature of 'smart', world-class cities and citizens require continuous connectivity to realise the benefits of living in such cities.

Therefore, continuous connectivity helps transform cities, helping citizens to be more productive and happier, and organisations to be more innovative and prosperous. A decent contribution to urbanisation and sustainable development.

A better life through digital Enablement

A smart transport network contributes to the economy by enabling commuters to get to work and, importantly, spend their travel time productively, whether that's working, studying, or keeping in touch with each other. Games, videos, podcasts and books, among other apps, are the relaxation and entertainment option. It also unlocks potential housing options in (usually) more affordable areas away from city centres.

According to the Moovit Public Transit Index, the average weekday commute exceeds 80 minutes in New York, Sydney, and London. So, it's no surprise that commuters want to make the most of this otherwise idle time. Other than getting more done and being contactable, work-related benefits of connected travel provide an opportunity to change working hours and job location, in support of career improvement.

Being digitally enabled on public transport means that we can achieve more, while leaving work earlier to get home before its late and use that extra time at home to do something for ourselves. Something as simple as being able to work and study or pay bills and watch videos on the train can lead to a more enriched life. At worst, commuters arrive at their destination relaxed and happy in seemingly less time.

In short, a connected and evolved transport network digitally enables commuters, and this improves productivity and contributes to well-being.

Technology Risk and sustainable Urbanisation

In a world, where it is increasingly cities, rather than nations, competing for trade, investment and reputation, a city's smart transport infrastructure contributes significantly to its 'world-class' status. Communications infrastructure is a key consideration for urbanisation with sustained and inclusive economic growth. Thus, city planners are incorporating wireless infrastructure and related innovation into their plans at the outset, as they understand how integral this technology is for a world-class city.

Additionally, with technology advancing at such a rapid pace, city planners, developers, and utility providers, as well as transport authorities, must "future proof" all design and development to reduce the risk of it becoming outdated.

Accommodating the technology of the future is no easy task. It is also important to account for its 'requirements' and factor in space for equipment (such as poles, wires or fibre) that will likely be needed for system upgrades, as well as access to installation sites that will need to be revisited.

This becomes more difficult with extensive projects due to the positive relationship between this risk and the project duration.

Contributing to the Evolution of our Digitally dependant World

The transport industry is in a period of change that is delivering important benefits for commuters and society and transforming our cities. Therefore, there is much more to this change than simply technology's contribution to convenience. Public transport innovation is becoming increasingly important, with users expecting connected, sustainable networks.

BAI's international expertise is in designing, building and operating state-of-the-art communications technology—cellular, Wi-Fi, broadcast, radio and IP networks. Moreover, we are known for being able to do this in confined, complex and challenging environments; BAI Communications connects people, enriches communities and advances economies through its innovative communications infrastructure and technology. Thus, we contribute to the evolution of our digitally dependant world.

As such, we are a catalyst for unlocking new services and revenue streams for our customers. We deliver the connectivity and technology that enables them to provide better experiences for commuters and communities, every day.

We digitally enable more than 4 billion rail passengers annually, across transit systems in New York, Hong Kong and Toronto. In Australia, we own and operate one of the most extensive transmission networks in the world, delivering 59 million broadcasting hours to 99% of the population.

The cellular and Wi-Fi connectivity we deliver includes dedicated public safety bands and connected public safety systems. In times of crisis, broadcasters rely on us to maintain their connection with citizens and emergency services teams rely on us to keep them informed.

Sustainable Urbanisation considers future Generations

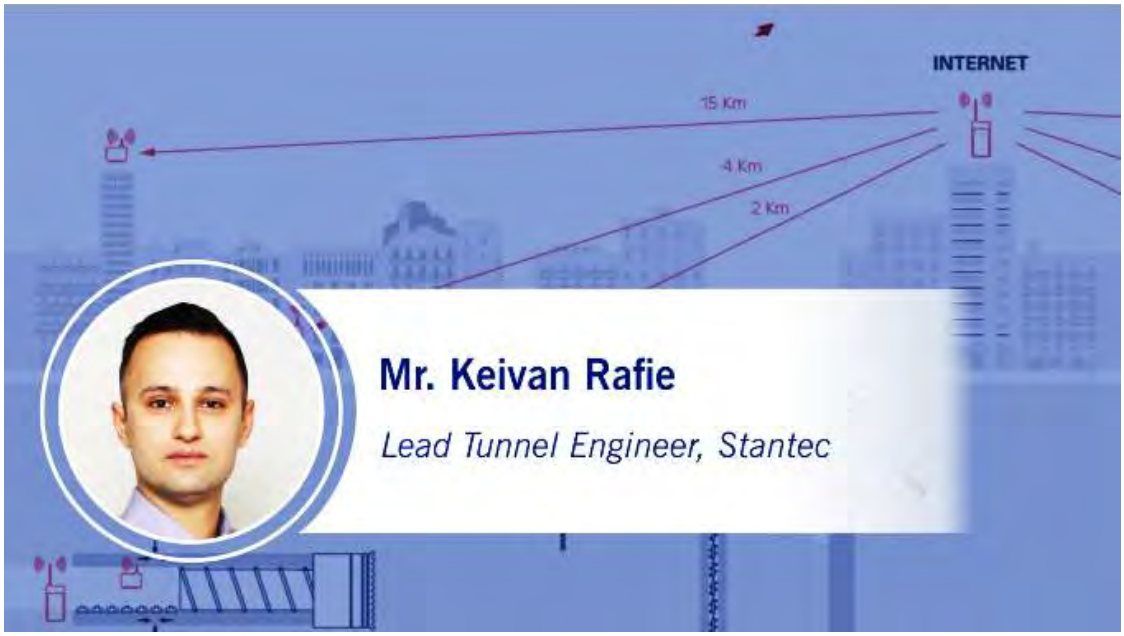
Sustainability is a key issue for many aspects of government; featuring in functions such as city planning, procurement, and waste and utility management. A party's stance on sustainability is under increasing scrutiny on both sides of government. This is also a key election issue in many developed countries. Simultaneously, the private sector is increasingly much more considerate of sustainable practice in its business operations and strategy formulation.

It's also clear to me that private and public sector collaboration is essential to advancing smart cities in the future. Furthermore, government and the private sector must collaborate on a range of considerations and mechanisms, in addition to the financials. This is the way to successfully deliver infrastructure projects that withstand time and measure up to anticipated needs of future generations.

One of World Cities Day's goals this year is to explore how frontier technologies can promote social inclusion in cities. Inclusion – digital, demographic, disability, as well as social – is a notable example of an important consideration for future generations. Collaborating on inclusion will contribute to project outcomes that reflect – and serve – our diverse communities and their diverse needs.

Special Article: Tunnel Geotechnical Monitoring; Global

August 28th, 2019 Articles ; Rail Analysis India



Geotechnical Monitoring in Tunneling and Underground Projects provides data that helps engineers and contractors in every stage of a project. Instruments are used to characterize initial site conditions, verify design assumptions and to monitor the effects of construction.

Each project presents a unique set of **critical parameters**. The designer must identify those parameters and then select instruments to measure them.

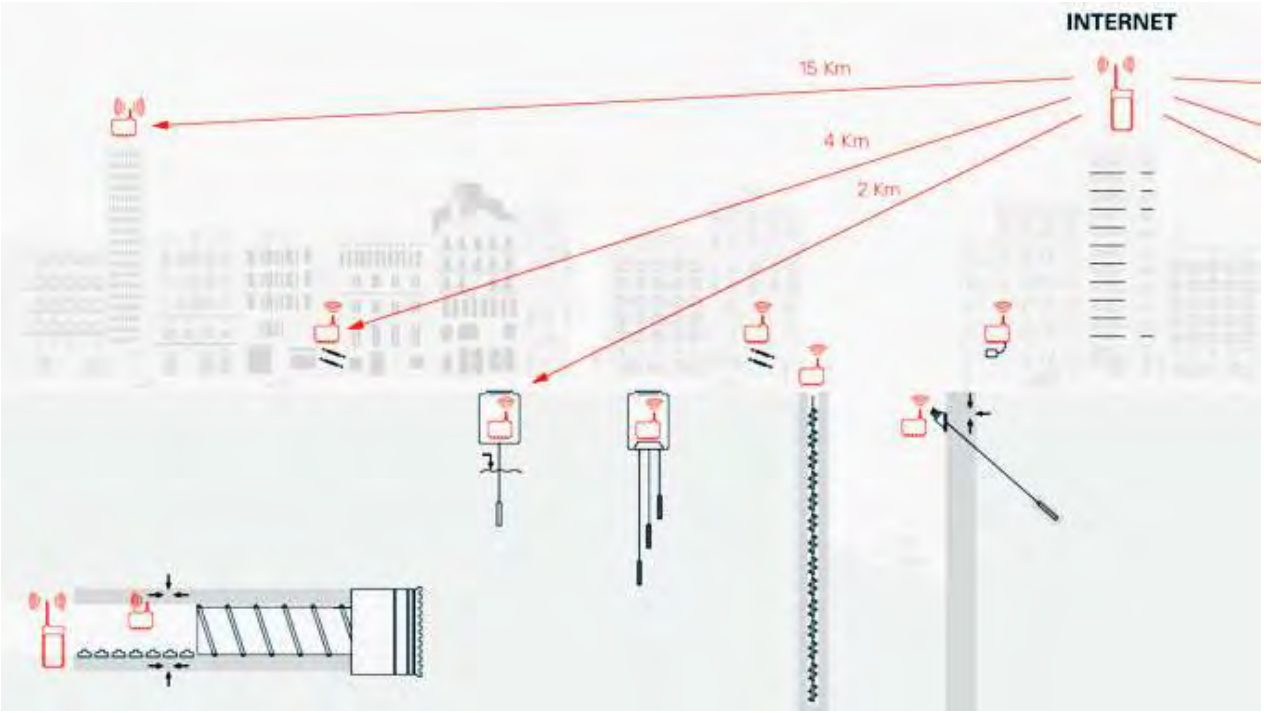
Ground conditions sometimes affect the choice of instrument. For example, a standpipe piezometer is a reliable indicator of pore-water pressure in soil with high permeability, but is much less reliable in soil with low permeability

Some popular Monitoring Parameters and Instruments:

Pore-water Pressure: This parameter helps engineers to: establish initial site conditions; predict slope stability; design and build for lateral earth pressures and monitor the effectiveness of drainage schemes.

Standpipe Piezometers, sometimes referred to as an open-hydraulic piezometer or a Casagrande piezometer, consists of a porous water-intake element connected to a riser pipe. Water enters the riser pipe through the intake element, which is normally sealed in the borehole at a specified depth. As pore-water pressure increases or decreases, the water level inside the standpipe rises or falls. Readings are usually obtained with a water level indicator, which provides a depth-to-water measurement.

Vibrating Wire Piezometers: These instruments consist of a tensioned steel wire, one end of which is anchored and the other end fixed to a diaphragm. The diaphragm deflects in response to applied pore water pressure, changing the tension in the wire and its resonant frequency. VW piezometers are typically used for continuous and long term pore pressure monitoring specifically in fine-grained soils where the use of conventional standpipe piezometers is not recommended.



Lateral Deformation: Measurements of this parameter help engineers to: evaluate the stability of slopes; monitor deformation of laterally loaded pile; monitor the magnitude and rate of movements in rock masses; check for ground movement that may affect adjacent buildings; monitor deformation of soil behind retaining wall and determine the need and timing for corrective measures.

The primary instrument for monitoring **lateral, subsurface deformations** is the **Inclinometer. There are many types but** one of the most commonly used is **The traversing probe Inclinometer** consists of a portable wheeled probe, graduated control cable, and a portable readout. With this system, the operator makes a survey of the borehole, taking tilt readings at two-foot intervals, from the bottom to the top of the casing to the top. The resulting data provides a detailed profile of the casing. If ground movement occurs, subsequent surveys will reveal changes in the profile. These changes can be plotted to determine the magnitude, depth, direction, and rate of ground movement.

Vertical Deformation: Measurements of this parameter help engineers to: verify that soil consolidation is proceeding as predicted; monitor heave in floor of Excavation; monitor settlement due to ground loss or heave outside of excavation; monitor for settlements that may damage buildings or service connections and determine the need and timing for corrective measures.

Some of the most important instruments to measure vertical deformation are: Settlement Cells (used to monitor a single, subsurface point); Settlement Extensometer (used to monitor large settlements in soft ground below fills); MultiPoint Rod Extensometers (provides high resolution multipoint measurements of vertical deformation) and Horizontal Inclinometer.

Single point instruments provide information needed to calculate movement of a single point. These devices include: Settlement cells; settlement points or single-point extensometers and settlement extensometer

An **automatic data acquisition system** may be required when: there is a need for real-time monitoring and automatic alarms; Sensors are located at a remote site or in a location that prevents easy access; there are too many sensors for timely manual readings; qualified technicians are not available.

Author: Mr. Keivan Rafie, Lead Tunnel Engineer, Stantec.

Soft Ground Tunnelling; Global

WSP works in all Forms of soft Ground Tunnelling, from Cut and Cover, Tunnel Boring Machines, Tunnel Jacking, and innovative strategies like ground freezing.

Dave McAlister
Global Director, Transport and Infrastructure; WSP Group

Putting our Experience to Work for you

A tunnel built in soft ground – such as clay, silt, sand, gravel, or mud – requires specialized techniques compared to hard rock, to compensate for the shifting nature of the soil. At WSP, we have extensive experience with soft ground tunnels on every continent and we pride ourselves on developing innovative strategies to deal with even the most complicated soil situation while preserving stability. There are a wide variety of techniques for soft ground tunnelling, and the best fit is ultimately determined by ground type, timeline, budget, and surrounding structures.

In order to select the most appropriate method for a particular tunnel, several factors need to be taken into consideration, including but not limited to ground conditions, length, depth,

diameter, alignment geometry, and budget. Another important consideration is the risk and sensitivity of nearby infrastructure and buildings to ground movement.

At WSP we know that an important aspect of soft ground tunnelling is the protection of existing structures and utilities, as many soft ground tunnels are located in sensitive urban environments where settlement caused by tunnelling is a major concern. Protective measures such as dewatering, ground improvement, compensation grouting, and positive pre-support can be used to ensure successful tunnelling in soft ground is achieved. Above all, a comprehensive real-time instrumentation and monitoring system is essential. In Seattle, WSP was heavily involved with the SR-99 Alaskan Way Tunnel project, which was constructed in challenging ground conditions, under more than 150 buildings. The tunnel has a diameter of 17.5 m, and is the second largest tunnel of its kind in the world.

Alaskan Way Viaduct, Seattle, United States; WSP Group

Cut and Cover

Cut and cover tunnelling is a common, well-proven technique for constructing shallow tunnels. This technique consists of an in-situ cast concrete structure in an excavated trench, which is covered afterwards. This method accommodates changes in tunnel width and non-uniform shapes and is often adopted in the construction of underground transit stations. To minimize surface disruption, cut and cover tunnelling can be accomplished using the traditional bottom up method or as a top-down construction.

Tunnel Boring Machines

For deeper, longer tunnels in urban areas, or for a tunnel crossing major bodies of water, a pressurized-face Tunnel Boring Machine (TBM) is the best fit, because it is capable of handling the full range of expected ground conditions. A single pass, precast concrete segmental lining forms the tunnel behind the TBM. The selection and design of the precast segmental liner is critical for successful application. The segments are equipped with waterproofing gaskets and act as the structural support system and water barrier.

Compared to the cut and cover approach, TBMs significantly reduce the disturbance of traffic and the associated environmental impacts in urban areas. WSP has been a pioneer in the advancement of single pass liners, including its first application in the USA with the use of fibre reinforcement and double gaskets. We also introduced the use of special seismic joints in TBM driven segmental liner tunnel, outside of Japan.

There are two major TBMs used in soft ground tunnelling: Earth Pressure Balanced (EPB) and Slurry Type Shield Machines. An EPB TBM will perform better where the ground is silty and has a high percentage of fines. A slurry TBM is ideal in loose water-bearing granular materials. However, with the application of appropriate ground conditioning agents, the range of ground conditions for each machine can be extended. TBM technology has advanced significantly in the last 15 years, allowing for the construction of larger, deeper, and longer tunnels in more difficult ground conditions.

New Austrian Tunnelling Method

For shorter tunnel sections, non-circular tunnels, or tunnels with variable geometry, the New Austrian Tunnelling Method (NATM) – also known as the Sequential Excavation Method - provides another cost effective, flexible, and safe tunnelling option. The tunnel is sequentially excavated and support is provided by shotcrete, in combination with fibre or welded-wire fabric reinforcement, steel lattice girder arches. **Ground Improvement Methods** such as **Jet Grouting, Dewatering, Ground Freezing and Grouted Pipe Spilling are also available** to stabilize the face.

Central Artery, Boston, United States

Tunnel Jacking

Tunnel jacking is a method for constructing monolithic, rectangular concrete box sections under surface areas with critical uses such as railways, major roadways, and airport runways. Due to its expense, it is generally only used when there is no other option, and so examples are rare. This method is generally applied in cases where the underground crossing is relatively short, is located in soft ground, and with shallow cover. Special construction techniques are required to minimize friction, reduce settlement, and maintain the tunnel alignment.

In Boston, WSP applied this approach during the construction of a section of the Central Artery/Tunnel, under a complex network of tracks leading into the South Station Railway

Terminal. Three concrete tunnel box sections were jacked successfully under the track network, with typical cross sections of 11.6 x 24 m and lengths of 51 to 115 m.

US Hydrogen Train Contract awarded to Stadler; USA/Switzerland

14th November 2019; Railway Gazette International

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USA: Southern California's San Bernardino County Transportation Authority has awarded Stadler a contract to supply a Flirt H2 hydrogen fuel cell powered multiple-unit to enter passenger service in 2024, with an option for a further four units.

Stadler said the contract announced on November 14 was 'a major milestone in bringing zero-emission passenger rail technology to the USA'.

The Flirt H2 unit will have two cars with a total of 108 seats and 'generous' standing room, plus a central power module holding the fuel cells and the hydrogen tanks. It will have a maximum speed of 79 mile/h (127 km/h), the federal limit above which additional signalling systems are required.

It is to be deployed on the Redlands Passenger Rail Project, a 14·5 km passenger service which is being developed on a former Santa Fe freight railway alignment between the University of Redlands and the Metrolink commuter rail station in San Bernardino.

In 2017 SBCTA ordered three diesel-electric Flirt units for the line, which is currently being built by Flatiron Construction Corp. The 'Arrow' branded service is expected to launch in late 2021.

The order for a hydrogen unit 'is an excellent example of how we are demonstrating our commitment to the next generation', said SBCTA President Darcy McNaboe. 'The hydrogen Flirt will help us address the commuting needs of today while preserving our environment for a better tomorrow.'

'Stadler is committed to designing and building green technology for the transportation industry', added Martin Ritter, CEO of Stadler US Inc. 'We have an excellent relationship with SBCTA, and it is a great honour to partner with them to bring the first hydrogen-powered train to the USA.'

Volocopter flies in Singapore; Singapore

22th October 2019; Metro Report International

SINGAPORE: A test flight of a Volocopter air taxi took place in Singapore on October 22th, during the Intelligent Transport Systems World Congress.

The manned flight of a 2X model over Marina Bay took 2 min to cover 1·5 km at an average cruising height of 40 m. The test was undertaken with the support of the Ministry of Transport, the Civil Aviation Authority of Singapore, and the Economic Development Board.

Aerial vehicle developer Volocopter had tested the aircraft in Germany before tests in local conditions at Seletar Airport in Singapore. The electric air taxi, which flies using technology based on drones, can take off and land vertically. It has capacity for two passengers.

'There are three major aspects that need to be in place for urban air mobility to become reality: the aircraft, the infrastructure, and the necessary regulation for both', said Volocopter CEO Florian Reuter. He added that air taxi operations are 'very feasible in the next two to five years'.

The test flight came the day after a prototype 'vertiport' station for air taxis was unveiled by Volocopter and Skyports. The VoloPort on the Float @ Marina Bay 'is an important step towards establishing an entire air taxi solution in Singapore', said Skyports Managing Director Duncan Walker. According to the companies, vertiports could be installed on rooftops, railway stations, car parks and other urban locations.

Skyports opened an office in Singapore last month, and Volocopter has operated a local office since January.

Testing starts on Manchester Metrolink LRT Extension; UK

Nov. 12th, 2019; written by David Briginshaw ; IRJ

THE first LRV has traversed Manchester Metrolink's Trafford Park extension in preparation for opening the £350m line in the first half of 2020.

The first LRV traverses Manchester Metrolink's Trafford Park Extension at walking Speed

This follows the completion of track laying last week by contractors M-Pact Thales on the 5.5 km branch which runs from Pomona through Trafford Park, Europe's largest trading

estate and home to more than 1300 businesses employing over 35,000 people, to the Traffic Centre shopping mall.

Testing is expected to last several months before driver training can start. The line will be operated by Keolis Amey Metrolink, which runs the exiting 93km network using a fleet of Bombardier Flexity Swift M5000 LRVs.

“When the line opens next year, it will provide a major boost to regional regeneration and economic growth by improving access to the large amount of retail, leisure, business and employment opportunities that exist in Trafford Park,” says Councillor Mark Aldred, chair of Greater Manchester Transport Committee. “It will also help towards reducing congestion and tackling air quality as we give people another, more environmentally-friendly alternative to the car.”

St Petersburg tests Hydrogen Fuel Cell Tram; Russia

11th November 2019 ; Metro Report International

Photo: Nikita Fastov

RUSSIA: Dynamic testing of a hydrogen fuel cell tram started on the St Petersburg network on November 1.

The retrofitted single-section LM-68M2 tram has been created jointly by operator Gorelektrotrans and the Central Research Institute of Electrical & Marine Technology. Its interior is divided into three parts: one for the fuel cell, one for the hydrogen tanks and one

for technicians. Eight seats have been left in. The tram's maximum speed is limited to 10 km/h.
It is estimated that it would cost around 30m roubles to retrofit a tram if this were done on a larger scale. The estimated cost of enough hydrogen to provide 1 kWh would be 1·5 roubles, compared with 5·5 roubles for the equivalent in electricity that the operator currently pays.
Once testing is completed, the tram will be restored to its original state and returned to passenger service.

Photo: Nikita Fastov

Hyundai Rotem to develop Hydrogen Fuel Cell Tram; South Korea

11th June 2019; Metro Report International

SOUTH KOREA: Hyundai Rotem has signed a memorandum of understanding with Hyundai Motor's Mabuchi Research Institute for the development of a hydrogen fuel cell tram.

The agreement announced on June 10 would see Hyundai Motor, which already has hydrogen fuel cell cars and buses in its portfolio, supply fuel cells that would be fitted to a Hyundai Rotem low-floor tram. Hyundai Rotem will also be responsible for developing and testing interfaces between the fuel cells and the vehicle.

The prototype due to be completed in 2020 would have a 200 km range between refuelling and a maximum speed of 70 kmph.

Avignon`s Tramway opened to the Public with Citadis X05 Rolling Stock from Alstom; France

Railway-News

Published 21th Oct. 2019

On 19th October 2019 Avignon's first tramway opened to the public. Line 1 has ten stations over 5.2 km. The tram line runs from Jean Jaurès to Saint-Chamand Plaine des Sports.

Elisabeth Borne, the former transport minister and current Minister of Ecological and Solidary Transition, Renaud Muselier, President of Région Sud, Maurice Chabert, President of the Vaucluse Department, Patrick Vacaris, President of Grand Avignon, Cécile Helle, Mayor of Avignon, Jean-Marc Roubaud, President of Técélys and Jean-Baptist Eyméoud, President of Alstom France, all attended the inauguration ceremony.

Lahore Tramway MoU signed; Pakistan

28th October 2019 Metro Report International

PAKISTAN: The Punjab Transport Department has signed a memorandum of understanding with Tong Hao Railway Vehicles Corp for the development of a tramway in Lahore.

The department's Lahore Transport Co would act as project promoter for the proposed PPP scheme that would see a route built along Canal Road from Thokar to Jallo.

Established in 2014, Tong Hao Railway Vehicles Corp is a joint venture of China Railway Signal & Communication Corp (66%), Xiangtan Electric Manufacturing Group Corp (17%) and Inekon Group (17%).

Local media reports that Tong Hao has selected the route and would supply a fleet of 30 two-section trams.

Rio de Janeiro LRT Line 3 opens; Brazil

Oct. 29th, 2019; written by Renata Passos; IRJ

The line opened on October 26 2019.

The line, which shares sections of the route with lines 1 and 2, has 10 stops, including three new ones: Cristiano Ottoni-Pequena África, Camerino-Rosas Negras and Santa Rita-Pretos, which have been named in honour of African cultural icons.

“This is an investment of more than Rs 1 bn ($US 249.8 m) so that we have, in the city centre, a transport system that does not emit carbon dioxide and does not impact global warming,” says Rio de Janeiro mayor, Mr Marcelo Crivella.

The completion of the new line is part of the Rio de Janeiro LRT project, which includes 28km of new lines. According to the municipality, 50 million passengers have already travelled on the 32 LRVs that have been operating on the light rail network since it was inaugurated in June 2016. The new line is expected to carry more than 100,000 passengers a day during the first few months of operation.

A decree, signed on October 15, established a 10-month period during which clauses of the original contract can be reviewed by the municipality and the concessionaire. One of the points to be analysed will be the difference between the daily passenger traffic initially forecast and the actual amount recorded. The original contract stated that the city would guarantee up to 85% of the estimated 260,000 passengers per day, but the municipality understands that this number has proved unrealistic and will damage public coffers.

Because of this, a working group has been set up to present a final report by August 31 2020. Issues such as fares adjustments, 24-hour operation and the withdrawal of some bus lines in central Rio will be on the agenda to encourage greater use of the LRT network.

Battery Trolleybuses delivered to Limoges; France

30th October 2019; Metro Report International

FRANCE: Limoges has taken delivery of two battery trolleybuses made by Iveco and Škoda Electric.

Last year Iveco won a contract for two trolleybuses with an option for four more. The articulated vehicles made to Iveco's Crealis design feature traction equipment from Škoda, which has also undertaken final assembly.

The air-conditioned vehicles use batteries to operate on off-wire sections. These are recharged from the overhead wires and offer a range of up to 15 km.

Iveco presents Battery Trolleybus with Overhead In-Motion Charging; Czech Republic

1st October 2018; Metro Report International

TROLLEYBUS: Iveco presented its Crealis battery trolleybus at the IAA Commercial Vehicles 2018 trade show in Hannover.

Assembled by Iveco in the Czech Republic in June, the 18 m long vehicle uses an Urbanway chassis and bodyshell with electrical equipment from a Škoda Electric's prototype Škoda 35 Tr trolleybus. It is equipped with in-motion charging to charge the batteries while drawing power from overhead wires.

After display at IAA, the vehicle is going to a customer in Italy.

METRO NEWSLETTERS
on Technologies for
"URBAN MOBILITY AS A SERVICE"

PUBLIC MULTIMODAL URBAN, SUBURBAN, INTERURBAN AND REGIONAL PASSENGER TRANSIT TECHNOLOGIES FOR URBAN MOBILITY AS A SERVICE WITH METRO-BUS, BUS RAPID TRANSIT, LIGHT-RAIL, TRAM-TRAIN, METRO-RAIL, METRO-TRAIN, COMMUTER-RAIL, MONORAIL, AERIAL ROPEWAY, BOTTOM CABELLINER, MAGLEV AND HOVERCRAFT TRANSIT/PEOPLE MOVER, WATER-METRO, AUTONOMOUS PEOPLE-MOVER, POD CARS

TRANSPORT TECHNOLOGIES AND ECONOMIC DEVELOPMENTS IN MODERN URBAN/MEGAPOLIS ENVIROMENT

METRO Newsletter by Dr. F.A. Wingler
METRO 93, **December** 2019

Artist`s Impression of "SMART CITY" in India

PART I: INDIAN ACTIVITIES AND INITIATIVES FOR URBAN MOBILITY AS A SERVICE

Metro Rail Transport, MRT, in India; India

By Ar. Apurva Bose Dutta, NBMCW October 2011

India is well on its way to create a world-class MRT system as an integral part of community infrastructure development in the country, reports **Ar. Apurva Bose Dutta.**

Growing cities, growing population and growing traffic has invariably called for a shift from private modes of conveyance to public transport. A glance at the world's developing nations indicates that well planned Mass Rapid Transit Systems (MRTS) exist successfully. India (like many other developing countries) however has lagged behind though its first metro, the Kolkata Metro, started working almost 25 years ago. The reasons could be attributed to lack of funds planning as is known that such projects require huge capital investments, a long gestation period and complex technology. Other reasons could include the lack of integration between various systems of mass transportation and the absence of comprehensive traffic and transportation planning. While researches show that the ideal modal share of public transport should be around 70%, however it is in tune to only 35%–40% in India's metro cities. India is looking to create a world class infrastructure with its existent Kolkata and Delhi Metros with the addition of Mumbai, Bengaluru, Hyderabad, Chennai, Jaipur, and Kochi metros in the next few years while proposals for MRTS for Pune, Chandigarh, Ahmedabad, Kanpur, Ludhiana, Bhopal, Indore and Faridabad are being chalked out.

Key Considerations for MRTS

A metro model for a county would have to depend on its logistics, financial resources and should avoid aping a western modern blindly, rather should concentrate on learning from its shortcomings.

Ar. Jit Kumar Gupta, renowned urban planner states that the planning, construction, designing and management of metros require extensive data, detailed surveys, study of economic structure, profile of settlement topography, travel preference, major traffic corridors etc. He recommends the use of technology that is available within the country or that can be developed since ultimately the system needs to be made self-reliant and self-contained to minimise O&M (operations & maintenance) cost. He advises that technology with low initial cost but with high O & M cost should be avoided. **M Vishnu Vardhan Reddy**, General Manager, Hyderabad Metro Rail adds that during construction time technicalities like proper hoarding, guided traffic signs and safety barriers are also kept in mind.

Cost Factors

Metro projects are meant to cater to cities with more than four million population and the costs in these cases are related to areas which are proposed to serve underground, elevated or at grade alignment. Larger the underground and elevated proposal, larger shall be the cost involved.

Funding process is done through the PPP model (Public-Private Partnership) as in Hyderabad and Mumbaior by DMRC model by the state or the central government as in Bengaluru, Chennai and Kolkata. Mr Reddy is of the opinion that the correct funding process is the PPP model since otherwise if the government has to take up the funding, it would involve additional taxes on people and a lot of subsidies from other organisations which would become a huge burden on the government. He adds, "Generally PPP model is also not financially viable because we can't get all the money from fair box collection. Hence in 1991, the concept of LPG (Liberalisation, Privatisation and Globalisation) was introduced which is an encouragement for private investors like infrastructure developers. Under this, the viability gap funding scheme caters to 60% cost borne by the private investor and upto 40% borne by the government in terms of grants. The Hyderabad Metro is the first metro to be on PPP mode. Though Mumbai is also on the PPP mode but they haven't taken the viability gap fund."

Ar. Gupta feels that the high cost justification of metros has its genesis in its very high carrying capacity of passengers at a very high speed with minimum pollution. He states, "Metros are known to serve the old, congested and thickly built up areas where normal traffic poses greatest challenges due to location of major commercial markets, traffic nodes and residential areas. They are known to provide travel at a very affordable cost." He also recommends the need of a SPV to realise the project due to the huge capital costs involved and adds, "Government could participate through equity or meeting one time viability gap financing after detailed evaluation. For funding metros the government should provide infrastructure but the operating cost and cost of rolling stock must be met by users and beneficiaries. Where private players of repute are involved, the project could be sealed with private participation based on detailed conditions and period of concession specified. Land will be a major issue in realising the project for which the involvement of parastatal agencies will be critical. Sale of air space, advertisement rights, contribution of major commercial whole sale markets which generate huge volume of traffic, levying of external development charges on builders and promoters and a dedicated fund for MRTS can aid in the funding."

The Advantages And Disadvantages

A cheap mode of transport, the MRTS helps in low energy consumption, is eco-friendly (runs on electricity, thus minimising air and sound pollution), averts the number of accidents, is efficient in terms of space occupancy and provides comfort with ultra modern coaches and modern systems like automatic ticketing, advanced signalling systems, automatic train protection system and integrated security systems. Services like ATMs, food outlets, cafés and convenience stores at these stations make the journey more fruitful. Also such stations lead to nearby economic development.

The international standard for MRTS with a maximum speed of 80kmph and average speed of around 34kmph helps in saving of time. Adds Ar Gupta, "With proper designing, the peak hour capacity could be rated at 3-4 lakhs passengers per hour."

Mr Reddy points out that the only disadvantage of metros is the slight congestion on roads at the time of construction which has to be taken care of while Ar Gupta indicates the cost factor as the disadvantage, the solution for which is to integrate metros with others systems considering the volume, structure, availability of space and resources for traffic and transportation.

MRTS in the Country

Kolkata Metro

The only metro service in the country functioning directly under the Indian Railways, the foundation for this was laid as early as 1972. Delays due to non-availability of sufficient funds, shifting of underground utilities, court injunctions and irregular supply of vital materials led to the commencement of services being pushed to 1984, after which progressive construction followed leading to the completion of the services of the entire stretch in 2005.

Kolkata faced a transport problem with only 8% of the land being available for road transport (negligible as compared to the 25%–30% available in other cities) thus diminishing scope for increasing the existing road area. Thus an underground route was envisaged with five rapid transit lines comprising a route length of 97.5 km. While the phase 1 of the North South (NS) axis commenced its services in 1995, Phase 2 and Phase 3 were recently opened in 2009 and 2010 respectively.

The metro has been quite a hit with the residents in Kolkata considering the number of passengers which has expansively increased in the past years.

Large scale expansion projects (covering 87 kms) have now been planned and in its modernisation programme, the existing metro stations would undergo renovation and introduce State-of-the-Art Automatic Fare Collection, Passenger Control system with Radio Frequency Identification based Flap Gates, Integrated Security System, new air-conditioned rakes and Automatic Signalling system.

Delhi Metro

The Delhi Metro Rail Corporation (DMRC) was established to build a metro in two phases serving Delhi, Gurgaon, Noida and Ghaziabad. While the first phase covering 65.11km was opened in 2002 the second phase of 125km was recently completed. The first railway project in the world to be registered for carbon credits by the United Nations, the Delhi Metro achieved this by saving power by using regenerative brakes in the trains, and reduced carbon emissions. The Metro has been designed such that it can be integrated with other public transport. DMRC has also partnered with Google India (through Google Transit) to provide train schedule and route information to mobile devices with Google Maps.

The Rapid Metro Rail Gurgaon (to be completed by 2013) is an under–construction rapid transit system in Gurgaon, linked with the Delhi Metro. As part of phase 2, subway facilities in all the underground metro stations and bicycle rentals in some are being provided.

The popular Delhi Airport Metro Express rail from the Indira Gandhi International Airport to the city centre takes less than 20 minutes as opposed to one hour by road. Its LCD screens equipped coaches imported from Spain are entirely different from the trains on this line and have in-built noise reduction features, padded fabric seats and provide flight information for convenience of air travellers. The trains are fitted with an event recorder which can withstand high levels of temperature and impact. The metro has been promoted as an integral part of community infrastructure, and community artwork depicting the local way of life at the stations in the form of decorative murals, panels and a gallery showcasing artwork and handicrafts from across India.

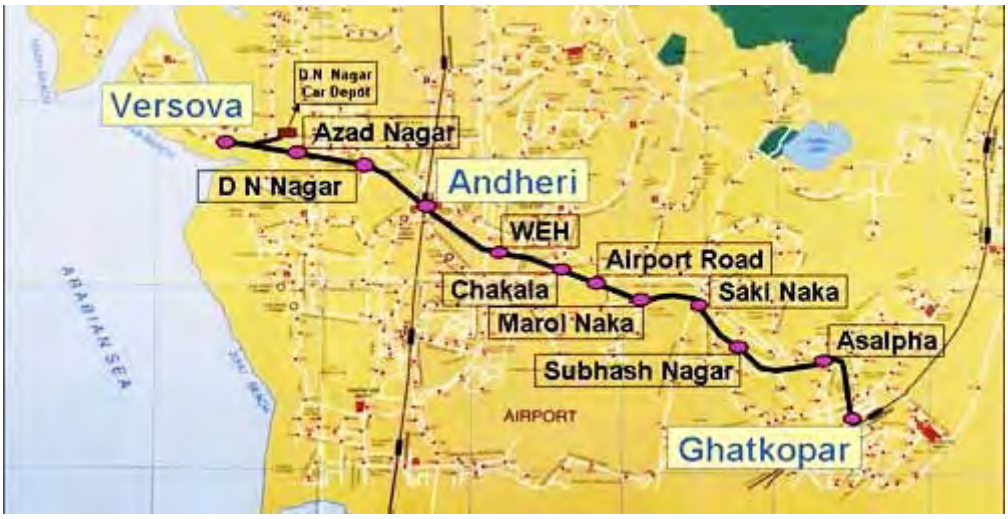
The Delhi Metro though plagued by controversies in the form of technical snags, overcrowding and accidents at the construction sites has proved as a model for the other metros in the country to follow. Phases 3 and 4 will expand the total journey to 413.8km and are scheduled to open in 2016 and 2020 respectively. With such a great pace of work, the Delhi metro will soon become one of the fastest expanding metro networks in the world.

Mumbai Metro

Mumbai's existing Suburban Railway and BEST bus system have not been able to compete with the rapid population growth. The Mumbai MRTS is going to see a completion of the first phase {a partnership between Mumbai Metro politan Region Development

Authority (MMRDA) and Reliance Infrastructure and Veolia Transport (France)} in 2012 and will entail a 12 km elevated metro with 12 stations enroute. Mumbai Metro One Private Limited is a Special Purpose Vehicle (SPV) to implement this corridor.

While the Suburban Railways provide a NS connect, this corridor will provide the relief in the East West (EW) connectivity, covering the journey in 21 minutes. Phase 2 and Phase 3 would be totalling to a length of 146 km. Plans are on for a nine-line network by 2021 in its three phases of development costing Rs.36,000 crore.



Skywalks have also been provided to connect the metro and suburban railways stations. The air conditioned coaches that are being imported from China with a 1500 accommodation capacity each, will feature an advanced passenger-driver communication system.

Right from the construction stage, initiatives have been on to make the Mumbai Metro Asia's first green metro. In order to get the best hands on experience, a number of executives were recently sent to China and South Korea to gain some hands-on experience in managing a metro system.

Bengaluru Metro

Though a MRTS has been in consideration for long in the Garden City, the foundation stone was finally laid in 2006. Being operated by the Bangalore Metro Rail Corporation Limited (BMRCL), a detailed project report of two double line corridors with a total length of 33 km (elevated and underground) with 32 stations has been prepared by DMRC and RITES, the general consultants for the project: EW and NS corridors as part of Phase I of the project which is estimated to complete by 2013. The travel time from end to end on the EW corridor will be 33 minutes, and on the NS corridor will be 28 minutes. The second phase comprising 51km would involve the extension of both the first two lines and the construction of an additional line.

While the stations are contemporary keeping in mind Bengaluru's erstwhile architecture and materials, there have been competitions floated for developing communication concepts for the interior space of some stations too.

Though at present 43 stations are being constructed which would get completed by 2015 but the DBR (Design Basis report) issued by BMRCL shows an approval for 162 stations which means that in future, there would be tributaries on the NS and EW corridors. The only complaint that could possibly be related to this metro is the lack of transparency and the shirking of public involvement in the project.

Chennai Metro

Chennai has already a well established suburban railway network; however with no connectivity to Central and South Chennai, a MRTS was planned. The Chennai MRTS being an elevated line of the urban mass transit system was completed in 2007 and was designed as an elevated extension of the Suburban Network. It was not exactly a Metro System since the trains were normal EMU's (Electric Multiple Units) without automatic doors. Phase 2 and Phase 3 are presently under construction. Due to poor maintenance, lack of security and no connectivity options with other transit systems, the MRTS has been quite unpopular leading to a lower ridership.

To overcome this lapse in MRTS, the Metro was conceptualised and hence the Chennai Metro is being constructed simultaneously. With the physical works in process, the phase 1 is going to be completed by 2014–2015. Two corridors with a total of 45km and 32 stations have been planned in which 19 would be underground and 12 would be elevated. The developers, Chennai Metro Rail Limited (CMRL) have appointed DMRC as the Prime Consultant for Phase 1 of the project. The Chennai Metro seems the most expensive considering the rising and dropping costs over the years.

The MRTS operated by the Southern Railway is proposed to be taken over by CMRL so as to bring all the elevated and underground tracks under one organisation.

Hyderabad Metro

Spanning over 71 km, the phase 1 would include three traffic corridors covering a total of 72 km and 66 stations. A completely elevated system, the detailed project reports and traffic survey reports are being prepared by DMRC. Designed to cater to 50,000 people in one hour in one direction for Corridors I and III and 35,000 for Corridor II, the cost of the project is Rs.12,132 crores. Hyderabad Metro Rail Ltd (HMR) is the SPV set to look after the project which has been allotted to L&T in PPP mode.

Sadly, the Hyderabad MRTS which is the country's first two-track elevated city transit system, has been much delayed since 2008 when the contract was awarded to Maytas Metro Ltd. after which fresh bids had to be invited. Also, more recently questions on the feasibility of the Secunderabad-Hi-Tec City Corridor from an engineering point of view have risen. Discussions are umpteen about the metro rail set to throw the traffic and city life out of gear by acquiring thousands of private properties. With the pre- project activities

in full swing, the physical work is going to start in October 2011 and the HMR is confident that by 2015 the entire project would finish.

The travel time for the metro rail is 45 minutes for Corridor I, 22 minutes for Corridor II and 39 minutes for Corridor III. The metro stations are being designed keeping the local architecture in mind. The Metro that will rest on massive concrete pillars along the central median of the roads will prove a boon for the city's MMTS (Multi-modal Transport System) which is collapsing under the burgeoning population and has slower speed. It is also being hoped that the enormous material requirement of the metro will result in establishment of many ancillary industries and machinery manufacturing and servicing units.

The Future

MRTS is the best way to decongest traffic. However, a number of considerations should be kept in mind in order to run a successful MRTS. "Viability of metro projects depend upon correct defining of traffic corridors, technology adapted, availability of land, volume of traffic carried, capacity utilisation and acceptance of the mode by the commuters," Ar Gupta maintains.

Conclusively, transport needs to be made an integral part of urban design/master plan of the city as it cannot be delineated to a separate entity. A multi-modal transportation system would ensure the use of MRTS to its best potential.

The uncertainty about MRTS, which has plagued the importance of such systems in India seems to be resolving. Though the Kolkata metro was designed without a rule book and the Delhi Metro was designed on international norms but now India has a set of rules being adopted for metro constructions. The National Mass Transit and Training Research

Institute (NMTTRI) in Mumbai (established by MMRDA), is one of its kinds in Asia imparting training and research on mass transit systems. The annual training courses cater to key issues like Public Transport Security, Safety and Emergency/Disaster Management, Noise Pollution & Abatement Measures for Urban Transportation, Integrated Ticketing, seamless Travel across Modes and Intelligent Transportation System.

The MetroRail Asia – Asia's premier rail event (with a special focus on India) proves to be a high-value networking and knowledge-sharing of key metro authorities and operators with discussions over India's extensive metro growth. In its third year now, this year it is being organised in Delhi from 8-10 November.

NBMCW October 2011

European Train Control System (ETCS) for India; India

Cover Story from Metro Rail News India, November 2019

ETCS is the core signalling and train control component of ERTMS, the European Rail Traffic Management System. ETCS continuously calculates a safe maximum speed for each train, with cab signalling for the driver and on-board systems that take control if the permissible speed is exceede. Initially designed to allow trains to cross borders without the need to change locomotive or driver, the European Rail Traffic Management System (ERTMS) is now being adopted globally. ETCS trackside equipment and train borne systems need to be standardized according to the different ETCS levels. This will give the foundation for a later to be defined automatic train operation. Trackside equipment aims to exchange information with the vehicle for safely supervising train circulation. The information exchanged between track and trains can be either continuous or intermittent according to the ERTMS/ETCS level of application and to the nature of the information itself. The need for a system like ETCS stems from more and longer running trains resulting from economic integration

Levels of ETCS

Level 0: ETCS-compliant locomotives or rolling stock do not interact with lineside equipment, i.e. because missing ETCS compliance. Level NTC (former STM): ETCS - compliant driving cars are equipped with additional Specific Transmission Modules (STM) for interaction with legacy signalling systems. Inside the cabs are standardised ETCS driver interfaces. With Baseline 3 definitions it is called National Train Control.

Level 1: ETCS is installed on lineside (possibly superimposed with legacy systems) and on board; spot transmission of data from track to train (and versa) via Eurobalises or Euroloops.

Level 2: As level 1, but eurobalises are only used for the exact train position detection. The continuous data transmission via GSM-R with the Radio Block Center (RBC) give the required signalling Information to the drivers display. There is further lineside equipment needed, i.e. for train integrity detection.

Level 3: As level 2, but train location and train integrity supervision no longer rely on trackside equipment such as track circuits or axle counters.

Train-borne Equipment

All the trains compliant with ETCS will be fitted with on-board systems certified by Notified Bodies. This equipment consists of wireless communication, rail path sensing, central logic unit, cab displays and control devices for driver action. ETCS – Man-Machine-Interface as part of driver cab Man Machine Interface The Man Machine Interface (MMI) is the standardised interface for the driver, also called "Driver Machine Interface" (DMI). It consists of a set of colour displays with touch input for ETCS and separate for GSM-R communication. This is added with control devices specific for the train type.

Specific Transmission Module

The Specific Transmission Module (STM) is a special interface for the EVC for communicating with legacy Class B ATP systems like PZB, Memor and ATB. It consists of specific sensing elements to lineside installations and an interface for hardware and logic adapting interface to EVC. The EVC must get special software for translation of legacy signals to unified internal ETCS communication. The driver is using standard ETCS cab equipment also on non ETCS lines. The STM enables therefore the usage of the ETCS equipped driving vehicle on the non-equipped network and is today essential for interoperability.

Balise Transmission Module

The Balise Transmission Module (BTM) is an set with antennas and the wireless interface for reading data telegrams from and writing to eurobalises.

Odometric Sensors

The odometric sensors are significant for exact position determination. In ETCS Level 2 installations are rare installation of eurobalises as definite milestones. Between such milestones the position is estimated and measured relative to the last passed milestone. Initially it was tested, that in difficult adhesive conditions axle revolution transmitters would not give required precision.

European Vital Computer

The European Vital Computer (EVC) also called Eurocab is the heart of local computing capabilities in the driving vehicle. It is connected with external data communication, internal controls to speed regulation of the loco, location sensors and all cab devices of the driver. Euroradio The Euroradio communication unit is compulsory and is used for voice and data communication. Because in ETCS Level 2 all signalling information is exchanged via GSM-R, the equipment is fully doubled with two simultaneous connections to the RBC.

Juridical Recording Unit

The Juridical Recording Unit (JRU) is part of the EVC for recording the last actions of the driver, last parameters of signalling and machine conditions. Such a train event recorder is functionally equivalent to the flight recorder of aircraft. Train Interface Unit The Train Interface Unit (TIU) is the interface of the EVC to the train and/or the locomotive for submitting commands or receiving information. Lineside equipment Lineside equipment is the fixed installed part of ETCS installation. According to ETCS Levels the rail related part of installation is decreasing. While in Level 1 sequences with two or more of eurobalises are needed for signal exchange, in Level 2 balises are used for milestone application only.

It is replaced in Level 2 by mobile communication and more sophisticated software. In Level 3 even less fixed installation is used. In 2017 first positive tests for satellite positioning were done.

Eurobalise

The Eurobalise is a passive or active antenna device mounted on rail sleepers. Mostly it transmits information to the driving vehicle. It can be arranged in groups to transfer information. There are Fixed and Transparent Data Balises. Transparent Data Balises are sending changing information from LEU to the trains, e.g. signal indications. Fixed Balises are programmed for a special information like gradients and speed restrictions.

Euroloop

The Euroloop is an extension for Eurobalises in ETCS Level 1. It is a special Leaky feeder for transmitting information telegrams to the car. Lineside Electronic Unit The Lineside Electronic Unit (LEU) is the connecting unit between the Transparent Data Balises with signals or Signalling control in ETCS Level 1. Radio Block Centre A Radio Block Centre is a specialised computing device with specification Safety integrity level 4 (SIL) for generating Movement Authorities (MA) and transmitting it to trains. It gets information from Signalling control and from the trains in its section. It hosts the specific geographic data of the railway section and receives cryptographic keys from trains passing in. According to conditions the RBC will attend the trains with MA until leaving the section. RBC have defined interfaces to trains, but have no regulated interfaces to Signalling Control and only have national regulation.

Major Benefits include:

Interoperability and cross-border operations Ability to supervise every train according to its optimum characteristics Higher line speed and shorter headways between highspeed trains

Increased line capacity Greater safety and efficiency for passengers Improved revenue earning potential for operators Lower maintenance and lifecycle costs.

Future

GSM is no longer being developed outside of GSM-R, the manufacturers have committed to supplying GSM-R till at least 2030. The ERA is considering what action is needed to smoothly transition to a successor system such as GPRS or Edge.

Deployment

National Capital Region Transport Corporation has decided to equip European Train Control System (ETCS) on its Sarai Kale Khan hub in India's First Rapid Rail corridor-Delhi Meerut RRTS Route.

Major Solution Provider

1. Thales

In December 2016, Indian Railways inaugurated its 68 km Basin Bridge - Raikkonen section equipped with European Train Control System (ETCS) Level 1 solution deployed by Thales. Southern Railway had awarded this signaling contract to Thales in September 2014. As part of the contract, Thales supplied ETCS 1 solution and was also responsible for the design, supply, installation and commissioning of track- side equipment.

Thales has led the deployment of ETCS right from the start. The company delivered the world's first commercial ETCS Level 1 project back in 1999. It also delivered the first cross-border ETCS implementation in Europe and the first ETCS in the Americas. Today, Thales' ETCS solutions are deployed in the world's most prestigious and demanding rail projects. Among these are Switzerland's Lötschberg and Gotthard tunnels beneath the Alps and Saudi Arabia's North-South Railway across the uninhabited An Nafud desert.

2. Bombardier

Bombardier developed the Eurobalise technology, which was chosen to be at the heart of ERTMS in 1995, and pioneered the world's first commercial ERTMS Level 2 solution in operation in 2001.

Today, over 3600 vehicles are equipped with Bombardier's **INTERFLO ERTMS** onboard systems, over 60,000 Eurobalises have been installed, and over 32,000 km of track has been equipped with its ERTMS wayside technology.

Ongoing projects include for major lines in Algeria, Brazil, Chile, Morocco, the Netherlands, Poland, Spain, Sweden and Turkey.

Other notable achievements for Bombardier include equipping the highest speed, longest line ERTMS system in 2009 in China and the world's first ERTMS Regional system in 2012 in Sweden.

3. Siemens

As ETCS pioneers, Siemens offers you mature, proven systems and products for individual applications as well as a scalable portfolio of lineside, on-board, and communication equipment. Ensuring that you are ready for what the future will bring.

The Siemens Solution for ETCS – the European Standard.

The Trainguard system meets the most stringent safety requirements and complies with the Technical Specifications for Interoperability (TSI). Trainguard is based on a highperformance platform that provides reserves for future applications – offering you various functional configuration options in line with the various ETCS levels.

Trainguard features:

· Interoperable

· Futureproof

· High operational reliability

· Low lifecycle costs

· High availability

· Compact design

4. CAF

In order to provide an answer to the European Rail Traffic Management System (ETCS), we at CAF Signalling offer our **AURIGA** integrated solution.

AURIGA ensures high-performance ETCS solutions both for Level 1 (AURIGA L1) and for Level 2 (AURIGA L2). And also for hybrid systems in which both levels exist simultaneously, thus ensuring interoperability (technical and functional) and providing significant benefits in the area of operation and maintenance.

Both AURIGA L1 and AURIGA L2 are validated and certified by Certification Bodies and tested on-site, are compliant with the Functional Requirements of the ERTMS/ETCS (FRS), Technical Specifications for Interoperability (TSI), Specifications for Requirements of the ERTMS/ETCS (SRS) system and the specifications defined by the UNISIG standard.

Additionally, we at CAF Signalling offer our on-board system platform AURIGA OBS that provides an answer to ETCS Levels 1 and 2 and enables interoperability further beyond our national borders. It is compatible with systems of different manufacturers and carries out a monitoring of the train's movement with high availability and safety rates. Thanks to our wide know-how of rolling stock existing in CAF Group and our experience in integrating diverse solutions of on-board equipment in rollick stock of any kind, we at CAF Signalling provide (in addition to proprietary on-board ETCS technology), strong capabilities in signalling integration engineering and in tests for rolling stock rehabilitation projects.

5. Hitachi

Hitachi On-board ETCS has been formally endorsed through the rigorous assessment process demonstrating compliance with relevant TSI and EN norms at the highest Safety Integrity Level. Hitachi is now embarking on train fitment implementation for IEP: Intercity Express Programme and other programmes around the world, in order to realise the benefits of a radio based cab signalling system with a reduced trackside infrastructure. its On-board ETCS (European Train Control System) solution has been successfully certified by a Notified Body in accordance with the Control Command and Signalling TSI (Technical Specification for Interoperability).

New Towns and planned Communities in India (waiting for smart and innovative Transport Technologies); India

Post by: Jatin Patel - on November 19, 2013; URBAN NEWS DIGEST

Naya Raipur planned City

The term new town refers to planned communities of the new towns movement in particular, mainly in the United Kingdom. This term has its roots in the Garden City Movement, founded by Ebenezer Howard in the late 1800s, as an alternative to the over-crowded, polluted, chaotic, and industrial cities that had appeared in Britain.

Such planned communities or cities/ townships, are carefully chalked out from their inception and are typically constructed in a previously undeveloped area. In such developments land use conflicts are less frequent since they are planned carefully. So, in the past few years developers have been cashing on developing integrated townships in the suburban areas. A McKinsey Global Institute report, Indias urban awakening: Building inclusive cities, sustaining economic growth, says that India would need 25 new townships to house about 590 million people by 2030. Even Charles Correas Urbanisation Commission Report expounded the need for the creation of 500 GEMs (Generators of Economic Movement) and SPURS (Spatially Prioritised Urban Settlements) as new towns.

In recent times, India has seen a spurt in such planned townships and a significant number of consumers living in major urban centres are becoming interested in the idea of living in the number of planned townships that are being built away from major urban hubs and chaos. Let us have a look at some of these new towns, which are redefining the way people live in our country.

Navi Mumbai

Navi Mumbai is a planned satellite township of Mumbai on the west coast of Maharashtra. After it was created in 1971, City and Industrial Development Corporation (CIDCO) was the only authority that looked after the development and maintenance of the city. It was CIDCO which prepared the developmental plan for Navi Mumbai covering 95 villages. In 1991, Navi Mumbai Municipal Corporation (NMMC) was constituted by the Maharashtra government for maintaining some of the developed nodes of Navi Mumbai, namely, Belapur, Nerul, Turbhe, Koparkhairane, Ghansoli, Airoli and Vashi.

Navi Mumbai is home to many software companies of Maharashtra, located in various parks. These include the Millenium Business Park in Mahape, the International Infotech Park at Vashi, and the Belapur railway station complex. It is also home to major commodity markets as well as a major steel market. One of the important business landmarks is the shipping port of Jawaharlal Nehru Port in the Nhava Sheva – Dronagiri nodes. The major business hubs in the city are CBD Belapur, Vashi, Nerul, and Mahape.

The Navi Mumbai Special Economic Zone (SEZ) located in the nodes of Dronagiri and Kalamboli is planned to provide commercial growth and employment to the city. Positioned enroute the proposed Navi Mumbai Airport, this megaproject has attracted investments close to Rs 40,000 crores.

New Town, Kolkata

New Town, formerly known as Rajarhat, is a fast emerging satellite township in Kolkata Metropolitan Area (KMA) and it is expected that it will be able to absorb additional population growth and help in easing the burden on Kolkata. The West Bengal Housing and Infrastructure Development Corporation (HIDCO) plans and executes development projects in the entire 6,000-7,000 hectare area in New Town. In order to render the various civic services and amenities within New Town, the New Town Kolkata Development Authority (NKDA) was constituted under the New Town Kolkata Development Authority Act, 2007.

New Towns master plan envisages a township at least three times bigger than the neighbouring planned Salt Lake City. The entire area is still under the process of development. As aA? planned township, New Town has been divided into three key areas: Action Area I, which mainly consists of malls, a sub Central Business District (CBD) and planned residential and commercial plots. Action Area II is to have a planned main CBD, institutional plots, IT Business Parks like DLF and Unitech, and plots for large apartment complexes. Action Area III mainly consists of high rise residential complexes and mini sub-townships like Uniworld City and Sukhobristi.

Various green initiatives have been undertaken to provide a healthy life to the inhabitants of New Town. The NKDA is working on plans to set up a dedicated green walkway stretching several kilometers in the township for people to walk and breathe fresh air without having the trouble to avoid cars and other polluting vehicles coming their way. A master plan, which has been approved by the Centre, has also been prepared for developing New Town as a solar city. It mentions ways to reduce the projected energy demand from conventional power sources by following two strategies one is by use of solar and renewable power sources and another is by using more energy efficient devices. Already, a long stretch of the main arterial road in Action Area I has been illuminated with LED streetlights and more such lights will be installed on various roads in the township.

Recently, West Bengals Transport Department and HIDCO came up with a plan to jointly set up a state-of the- art international bus terminus at New Town, the first of its kind in the state. The terminus will have cafes and rest rooms and services for inter-city, inter-state, and international bus routes will be operated from there. New Town is also witnessing a

major real estate boom. This year, a 2.5-acre plot in the township fetched HIDCO a whopping Rs 57.33 crore. It amounts to Rs 23 crore per acre. Lately, HIDCO has been reaping rich harvest by auctioning off plots in the township for commercial purposes.

Other New Town Initiatives

Along with the initiative for development of Navi Mumbai, many interesting initiatives have been taken for new town development like Maraimalai Nagar and Manali by Chennai Metropolitan Development Authority (CMDA) outside Chennai; Yelahanka, Hoskote and Kengeri outside Bengaluru by Karnataka Housing Board; and Noida, Greater Noida and GurgaonA? outside NCR. Based on pioneering efforts to create green field state capitals like Chandigarh came efforts to create Bhubaneswar, Gandhinagar and now Naya Raipur.

The Delhi-Mumbai Industrial Corridor has plans for seven economically vibrant townships linked with the freight corridor. Closely following this are plans for Chennai-Bengaluru Corridor and Bengaluru-Mumbai Corridor. The whole concept is to develop new towns with economic drivers, employment generation and planned development of new towns to accommodate the new urban resurgence.

On the same vein, are efforts for creating new towns under SEZs as joint initiatives of Government of India, state governments and entrepreneurs. There have also been initiatives from private sector to develop new township projects. In Gurgaon, DLF, Ansal and UNITECH have shaped up the new city. Similarly on the Yamuna Expressway there are many townships planned by the Jaypee Group. Similarly in Bengaluru-Mysore Corridor the NICE group is developing few hub towns. Lodhas have ambitious plans for new township at Kalyan-Shil area. Apart from these, some of the other private sector initiatives are given below:

Magarpatta City

Magarpatta was originally multiple plots of land owned by a community called Magar. Some 120 farmer families pooled 400 acres before requesting architect Hafeez Contractor to draft a private township plan, which was submitted to the concerned departments of the state administration for approval.

Magarpatta City is developed as an SEZ. It is a part of the Magarpatta City with residential, commercial, and IT development along with proper emphasis on environment, education, healthcare, fitness, recreation, and security. Buildings are designed as per international norms, state-of-the-art amenities are provided, such as multiple Internet Service Providers and telecommunications providers, 100% power back-up, ample parking space, high-end security system, etc.

Through its sustainable development model, Magarpatta City introduced ecofriendly development. There is a central garden of 25 acres along with separate internal gardens for every neighbourhood. Hence, almost 30% of the area has been kept reserved for greenery. Implementation of waste management system, solar energy system ensures further enhancement of the environment. Magarpatta has become home to one of the largest residential solar water-heating systems in the country. The solar panels have been put in all the residential apartments comprising of about 3,500 flats in the Phase-I & II. Family healthcare needs are met by a 200-bed multi-specialty hospital in Magarpatta City. This ultra-modern hospital will provide the best healthcare by eminent medical professionals.

The Destination Center in the township is the internal Amenity Center which offers space for shops, food courts, and leisure activities. One great advantage of Magarpatta City is its location.
The city is 7 kms from the Pune Railway station and 5 kms from the citys business centre.
Magarpatta City has won accolades in the 2008 Sydney World Congress of Metropolis.

Lavasa

Lavasa is a private, planned city being built near Pune by the Hindustan Construction Company (HCC). Among the first planned hill cities of India, Lavasa is approximately 1/5th of the land area of the Municipal Corporation of Greater Mumbai. Located near the Mumbai-Pune economic corridor, along the Warasgaon Lake, Lavasa optimally balances nature and urban infrastructure.

The master plan of Lavasa is based on the principles of New Urbanism which makes life easy for its residents by placing all essential components of daily life within walking distance of each other. Besides this, architectural considerations such as land character, building frontage, and other design guidelines have also been taken into consideration while making the master plan.
The landscape and architectural design of Lavasa is based on the transect model, i.e. development is denser near the town centre, gradually reducing as one moves uphill. The master plan has been inspired by Biomimicry the science that learns from nature and adapts these learnings to planning, design and architecture.

Lavasa city has five towns as of now, Dasve, Mugaon, Dhamanohol, Sakhari-Wadavali, and CBD (Central Business District). Lavasa explores an array of architectural themes, from new-age Portofino- inspired studio apartments and luxurious Goan-Mediterranean four bedroom villas to affordable starter homes, rental housing, workforce, and retiree housing. It has a robust social infrastructure, 24 hour water and power, and e-governance.

Developments at Lavasa are well on schedule, and the Dasve town center is currently under an advanced stage development. While the Dasve Town Centre is already functional, all structures in education, hospitality, and leisure are fast-nearing completion. Mugaon, is 6 kms from Dasve and is being developed as a centre for residential, educational, business and commercial activities. This town has shops, cafes, cultural institutions, spiritual centres, schools, and colleges.

Lavasa will have a dedicated City Management Services team to deliver a unique value proposition to its citizens and visitors with an enhanced quality of community living, delivery on governance and emphasis on public safety & security including law and order services, fire and disaster prevention, etc.A? The highlight is the Citizen Contact Centre, which differentiates Lavasa from other cities. A citizen has access to this call centre which at any given time will be a one window information access for all sorts of information on amenities, queries, billing, etc.
It is also Indias first city to use a 3D-enabled Geographic Information System (GIS). Thus, combining GIS with Global Positioning System facility managers carry out maintenance and operations proactively.

Mahindra World City, New Chennai

Mahindra World City, spread across 1500 acres, is promoted by the Mahindra Group and Tamil Nadu Industrial Development Corporation (TIDCO). It is located on the Golden Quadrilateral (NH-45); 45 minutes away from the Chennai International Airport and 55 kms from Chennai Seaport and it also boasts of an on-campus railway station. Conceptualised as an integrated business city, Mahindra World City has attracted around 60 best-in-class companies from across the world including BMW, B Braun, Capgemini, Infosys, Fujitec, Lincoln Electric, Mecaplast, NTN Corporation, Parker Hannifin, TVS Group of companies, Ingersoll Rand, Wipro, etc.

The city has a current working population of 28,000 and is expected to reach 100,000 in the next 10 years. The Residential Zone is master planned in close proximity to the Business Zone with varied social amenities built into the master plan comprising residential units, schools, medical centres, retail malls, a business hotel, recreation and leisure facilities.

Mahindra World City has a CBSE school (Mahindra World School) managed by the Mahindra World School Education Trust and it currently has around 400 children. There is also a day care center from Amelio for infants and toddlers.

The township has a commercial complex that provides for various everyday basic needs , such as banks/ ATM, food court, restaurants, medical centre, a department store, forex counter, travel agency, and laundry services. Mahindra World City has also partnered with JSP Hospitals to set up a multi-specialty hospital within Mahindra World City.

Hiranandani Gardens Powai

The Hiranandani Groups first flagship project was the sprawling Hiranandani Gardens in Powai an integrated residential cum commercial township. Sprawled majestically over 250 acres, Hiranandani Gardens has redefined the standards of elegant living. Created from barren land, this luxuriantly green and grand township is a tangible expression of a vision to create better communities. Hiranandani Gardens, Powai is strategically located with the International Airport just 5 km away and Domestic Airport 12 km away.

The complex hosts a business park, an ICSE School managed by Hiranandani Foundation Trust, Dr L H Hiranandani Hospital, shopping complexes, food courts, hotels, and entertainment centers in lush green settings. This project is also environmentally responsible with 5 million litres of water being recycled every day and being used for flushing water and gardening.

Palace Gardens, Oragadam

Creation of an integrated contained township with premium residential properties and other facilities has been a major effort from HIRCO.

The Oragadam SIPCOT (State Industries Promotion Corporation of Tamil Nadu) area is one of the largest high growth manufacturing corridor for automobile companies, telecom and ancillariesA? and IT/ITeS firms. Oragadam owes its strategic advantage located between GST Highway and Bangalore Highway with established infrastructure and multi-modal connectivity.

Oragadam will become the central point of a massive industrial revolution. It is estimated that Oragadam and Sriperumbudur region will offer employment opportunities for 3,00,000 people and this would certainly have a positive demand and impact on the residential market and township amenities.

As an integrated township, it will provide the best living experience and envisages a wide choice of 1 to 4-BHK apartments suiting various socio-economic brackets.

Palace Gardens stands testimony to its world-class architecture and state-of-the-art amenities. It is the only integrated township outside Chennai and provides state of the art infrastructure with all amenities and offers a 9-hole resort golf course.

Integrated townships are the new hopes when a city is already saturated, then outward movement is a better option compared to the congested vertical growth. Palace Gardens, offer a safe, practical, healthy solution for modern living and provide an interesting counterpoint to the congestion, chaos and frantic experience of city life.

Built on Sustainable Development principles, Palace Gardens has received IGBC Gold pre-certification from the Indian Green Building Council and awards such as the Environment, Health and Safety Award from CII South.

From these developments it is evident that in the two decades of 2011-2030, India will be witnessing the growth of many integrated and self-contained townships.

Colaba-Bandra-SEEPZ Metro: Know all about Mumbai Metro-3 Project; India

By Mannat Batra; 01/07/2019 ; Urban Transport News

Mumbai Metro-3, also called as the Colaba-Bandra-SEEPZ metro line, is an ongoing project being implemented by the Mumbai Metro Rail Corporation Limited (MMRC). When completed, the 33.5 km-long line will be the first underground metro line in Mumbai. The 33.5 km long corridor is marked with 27 key stations out of which 26 will be underground.

The original deadline for Line 3 (Colaba-Bandra-SEEPZ) of Mumbai Metro Rail project was 2016 but owing to various legal disputes and environmental issues arising out of its construction, it is now expected to be completed in 2021.

Connectivity and Routes

The metro line will connect Cuffe Parade business district in the extreme south of the city to SEEPZ in the north-central. Under the original plan, there was no connectivity to the airport. However, chief minister Devendra Fadnavis directed MMRCL to provide direct access from the metro, to the airport and Mumbai Central railway station.

On St. Valentines Day 2019, the MMRCL declared its fifth tunnelling milestone at the Chhatrapati Shivaji Maharaj International Airport (CSMIA)-T2 on Line 3 of the Mumbai Metro.

Project Cost and Funding

The Mumbai metro-3 project is expected to cost Rs 30,000 crore though the earlier estimate, based on a detailed project report (DPR) from 2011, was Rs 23,136 crore.

“There is a gap between the approved cost and the actual completion cost. There is a provision to allow for revised costs, and we have already initiated that process,” said Ashwini Bhide, Managing Director, Mumbai Metro Rail Corporation.

The project is being financed through a mix of debt from Japan International Cooperation Agency (JICA), equal equity contribution from the central and state governments, and additional subordinate debt.

Influence on the Real Estate Market in Mumbai

There’s a positive plausibility that the development of the metro rail in Mumbai will bring about a transformation and boost the real estate sector.

“Developers’ interest in projects near the metro routes, has been rising and there is an upward pressure on prices. The micro-markets that are likely to benefit are central business district, secondary business district (SBD), north and the western and eastern suburbs. Moreover, residential developments in Thane and Navi Mumbai are likely to receive a boost, due to improved connectivity with the commercial hubs in the western suburbs and SBD north,” explains the senior associate director of Colliers International.

Environmental Impact

The construction of Line 3 has been mired by several environmental issues, including the felling of trees and noise pollution complaints.

MMRC Managing Director Ashwini Bhide had stated that the metro was designed in a way that would minimise the cutting down of trees and that three times more trees would be planted to make up for the loss. She further stated that if all the trees that needed to be cut were saved, it would reduce carbon dioxide in the air by 6,100 kg. However, the metro would help cut CO2 emission by 9.9 million kilograms, by significantly reducing the number of vehicles on the road.

Current Status

In barely 19 months of tunnelling work being started on the Metro 3 (Colaba-Bandra-SEEPZ line), the Mumbai Metro Rail Corporation (MMRC) has completed construction of 50% of the tunnels of the city’s only underground line. The MMRC has constructed 28 km of the 56 km of tunnels, which will make up 33.5km line. The tunnelling work started in November 2017.

Tata Projects start Tunneling Work on Pune Metro Underground Line; India

By Narendra Shah; 09/12/2019 : Metro Rail News

Tata Projects Lowering TBM for Pune Metro Underground Project

PUNE (Metro Rail News): TATA Projects Limited, one of India's fastest-growing infrastructure companies, has announced that the company has recently commenced work on the Pune Metro Underground line. The work commenced with the gigantic Tunnel Boring Machine being flagged off to start execution of its task from Agriculture College grounds, Pune.

The event commenced with "Pooja" and a traditional ceremony to mark the momentous occasion. It was witnessed by top officials of MahaMetro and Tata Projects along with their respective project execution teams. This event also witnessed the first casting slab being signed by top-level officials before it being placed on site.

"We are proud to be executing the third underground metro package after Lucknow Metro and Mumbai Metro. This is also our seventh overall (underground and elevated) Metro package. Hence, we have garnered unmatched experience and expertise in the metro rail segment. Our execution teams are confident of overcoming all challenges and successfully delivering the project", said Vinayak Deshpande, Managing Director – Tata Projects Ltd.

The gigantic Tunnel Boring Machine that has commenced work will dig at an approximate depth of between 65-feet to 100-feet below the surface. This gigantic tunnel boring machine has a huge length of about 279-feet, including back-up gantry. While the cutter head does the boring and machine moves ahead – it has multiple hands that simultaneously place C shaped concrete sections throughout the tunnel.

The Pune Metro Underground line runs from Shivajinagar to Swargate or about 8.2 kilometers and includes 5 stations. Package one of this underground line comprises two stations while package two includes three stations.

Speaking about the project, Rahul Shah, COO – Urban Infrastructure, Tata Project Ltd, said that the commencement of work on this prestigious project that runs through one of the most densely populated areas of Pune is a landmark moment. Our teams are highly skilled and possess the vast experience to undertake a challenging project of this magnitude. We are certain that this project will transform the intracity transportation scenario upon completion by bringing it on par with global standards.

Last month Australian designer and manufacturer of Tunnel Boring Machine, TERRATEC has delivered two first Tunnel Boring Machines (TBMs) to Gulermak-Tata Projects Limited JV.

Three "METROLITE" Corridors proposed for Bengaluru; India

Three Metrolite Corridors under Phase 3 of Namma Metro, which are Magadi Road Toll Gate to Kadabagere (13 km), Whitefield – Domlur (16 km) and Katamanallur Gate (near Hoskote) to Sarjapur Road-Hebbal (52 km).

By Narendra Shah; 08/12/2019 Metro Rail News

Image is used for Representation only

BENGALURU (Metro Rail News): Metrolite is a light urban rail transit system with small coaches and cheaper than the regular Metro network, could be operational Bengaluru soon. The Infrastructure Development Corporation (Karnataka) Ltd. prepares a Comprehensive Mobility Plan for three Metrolite corridors under Phase 3 of Namma Metro, which are Magadi Road Toll Gate to Kadabagere (13km), Whitefield – Domlur (16 km) and Katamanallur Gate (near Hoskote) to Sarjapur Road-Hebbal (52 km).

A 34 km underground corridor along the Inner Ring Road and 30 km Hebbal to JP Nagar (ORR-West) is also proposed under this phase additionally. While ORR-West and Magadi Road Toll Gate is old corridors proposed under Phase 3, the other two are a new corridors.

Although it is doubtful that the earlier Phase 3 corridors like Gottigere to Basavapura, Nagawara to Aerospace Park, Kogilu Cross to Rajanakunte, Iblur to Carmelaram and Bommasandra to Attibele will be dropped or executed.

A Senior BMRCL official said that each project suggested in CMP will have to go through the process of alternative investment analysis, appraisal and approval. The Centre has been encouraging cities to go in for Metrolite Systems as it's less cost-intensive i.e almost 50% cheaper compared to the normal Metro network.

It can be built on the surface as well as elevated tracks. "Metrolite is suggested as the rail-based public transport system has a cost-effective mobility solution for the likely ridership. The inner ring Metro suggested as the underground system as an elevated system is not feasible due to smaller road width," the CMP says.

It also suggested, "to plan new Metro lines aligned with the master plan of the city and its areas of growth, keeping in mind the development of economic centres and residential layouts; the focus must also be ensured on core areas, where construction may be difficult".

Metrolite for peripheral Ring Road (PRR) and NICE Road

A Bus Rapid Transport System (BRTS) or Metrolite has been suggested for Peripheral Ring Road and NICE Road.

The CMP Says that the selection between BRTS or Metrolite will need to be done based on detailed ridership assessment and analysis. The total length of BRTS / Metrolite on NICE road and proposed PRR is 107 km.

"PRR of 78 km length and 80 m width is proposed on the northwest periphery of the city with complementary connectivity to NICE Road on the south-east periphery and provision in the middle for BRTS or traction guided at-grade," it added.

"The overall public transport network of 803 km within Bangalore Metropolitan Area is envisaged under different modes — dedicated rails, roads, road lanes, traction-guidance, i.e. Metro, suburban rail, priority bus corridors, BRTS or Metrolite in addition to augmentation of public bus transport services," it adds

AC Buses to boost Delhi Metro Rail Corporation Feeder Service; India

From Metro Rail News November 2019

This will be the first interchange facility of its sort in the Delhi Metro network where passengers will change trains.

down from the platforms and take the walkway to finally reach the concourse area of Punjabi Bagh West," DMRC tweeted.

DMRC has been planning a major overhaul of its feeder bus services and that is why it had floated tenders last year to introduce air-conditioned feeder buses that will be electric and CNG-run. The earlier tenders, however, were discharged and DMRC has now floated tenders again and plans to induct only electric buses.

Though DMRC plans to induct 422 feeder buses, at the moment, it has floated tenders for 100 electric buses. The 100 buses will be divided into two clusters — east and north — with 50 buses each. The successful bidder will have to procure, operate and maintain these midi AC electric buses. The tender also includes the development of bus depot infrastructure for repair and maintenance of buses on land or plot provided by DMRC. The depot for east cluster will be created at Shastri Park and the one for north at Majlis Park.

The rickety feeder bus service of Delhi Metro is soon going to be replaced by a fleet of air-conditioned electric midibuses. Delhi Metro Rail Corporation has floated tenders for 100 electric buses, for which it will receive assistance under the Centre's Faster Adoption and Manufacturing of Electric Vehicles-2 (FAME-2) scheme

Centre suggests running Metro with Rubber Tyres in small Cities to cut Cost; India

From Metro Rail News India, November 2019

Metro trains in smaller cities could run on rubber tyres. The Ministry of Housing and Urban Affairs is bringing a policy to run a metro with rubber tyres, instead of steel wheels, to reduce costs. The move follows the Ministry's Metrolite initiative that entails trains with lesser number of coaches.
A committee has been formed to draft a set of standards and specification for the metro on rubber tyre-wheels. Such a metro is running successfully in many countries including Paris and Hong Kong. This metro also runs on railway tracks, but wheels are used in tyres. It was first used in Paris.
Union Housing and Urban Affairs minister Hardeep Singh Puri on Friday said, "When the committee comes out with its report there will be a process of approval and then it will be presented in public domain for states to adopt. We have not frozen on the standards and specifications for it yet."
This is much cheaper than both the Metro Rail and **Metrolite**. While the per kilometer cost of metro rail is Rs 300 crore, **Metrolite** is Rs .100 crore and metro on tyres will cost Rs 60 crore.

The minister said that the **Metrolite** has been approved by the ministry and the Board of the Directors of Delhi Metro has also given its not for its use in a 20 km stretch from Dwarka sector 25 to Kirti Nagar. Now, the ministry will await the proposal to come from the Delhi government to use the **Metrolite**. The maximum operational speed of the **Metrolite** is 60 km per hour... In any case, even with the failure of onboard signalling, the speed is restricted to 25 km per hour. The train is to accommodate around 300 passengers.

A similar process, he said will be followed in case of the **Metro on Tyres**.

In August this year, the Maharashtra cabinet cleared the mass transport system 'Metro Neo' for better connectivity across Nashik. However, Nashik will have to wait for the report of the committee, and the final approval from the union ministry before it begins building, the Union Housing and Urban Affairs Secretary Durga Shankar Mishra said.

As per the Nashik model, the **metro on tyres** will like all lines have an elevated corridor and its coaches will operate on electricity and battery and ply on elevated viaducts with state-of-the-art terminals. "Nashik are the prime movers in this case and it's from there that we got the idea. However, they have to wait for the standards and specifications," said Mishra.

Delhi-Meerut RRTS Train Coaches to make under 'Make in India' Initiative; India

From Metro Rail News India, November 2019

Animation of Regional Semi-High Speed Rail Car for NCRTC Rapid Transit; Delhi–Ghaziabad-Meerut Regional Rapid, NCRTC/RRTS, Transit Corridor Semi-High Speed EMU

Delhi-Meerut RRTS Rapid Rail Transit System Train coaches to make under 'Make in India' initiative. The RRTS trains will have an operational speed of 160 kmph, an average speed of 100 kmph will be available at a frequency of every 5-10 minutes on the RRTS network.

The rapid rail trains which will operate on the Delhi-Meerut regional rapid transit system (RRTS), will boast of semi-high speed 'Make In India' coaches. and will be The National

Capital Region Transport Corporation (NCRTC), which is the executing agency of the RRTS project across Delhi-NCR, has stated in its global tenders that the rapid rail coaches will have ‘Make In India’ symbol mark.

Pune Metro Terratec Tunnel Boring Machines, TBMs, delivered; India

14th November 2019; Metro Report International

INDIA: The first two tunnel boring machines for the Pune metro have been delivered to the city.

Terratec is supplying three 6·61 m diameter earth pressure balance TBMs from its Chinese factory via the port of Mumbai. The TBMs, named *Mutha* and *Mula*, are to be tested on-site in mid-December.

The first two machines are to be used on the north-south Line 1. A joint venture of Gülermak and Tata Projects was awarded both contracts covering the underground section of Line 1 earlier this year.

The 16·.6 km north-south Line 1 will connect PCMC and Swargate, serving nine elevated and five underground stations. The 5 km underground section between Shivaji Nagar and Swargate is to be built with twin-bore tunnels lined with 1 400 mm wide and 275 mm thick pre-cast concrete rings.

The first two lines of the Pune metro are due to be completed in 2022. Titagarh Firema is supplying 51 two-car trainsets and Alstom is supplying CBTC signalling.

Mahim Building tilts due to Metro Work in Mumbai; India

By Kanika Verma; Metro Rail News, 12/11/2019

Mahim Building tilts due to Metro Work in Mumbai

MUMBAI (Metro Rail News): On Monday 19-11-19, a building located on Mahim (West)'s LJ Road has tilted to one side and developed cracks. This had reportedly happened due to construction work at the Colaba-Seepz-Metro-3.

According to the source, Mumbai Metro Rail Corporation (MMRC) said on Monday that a structural audit would be carried out to understand the extent of the damage. Other residential societies in the area have expressed concerns regarding the safety of their buildings.

The incident took place on November 9, when metro work was going on. Around midnight, the residents of Laxmi Niwas, which also has four commercial establishments inside it, felt their beds shaking and doors and windows rattling.

Later, ceilings started developing cracks too. One of the building's residents said as per a Mumbai Mirror report that they heard a crash at night. In the morning they saw that the building had developed cracks after which the residents were told to vacate the building by November 10.

The members of all the 25 odd families staying at Laxmi Niwas have been temporarily moved to a nearby hotel by the Mumbai Metro Rail Corporation Limited (MMRCL).

The residents of other nearby buildings such as Saman Taj and Meher Manzil were also affected by the tremors due to the ongoing Metro work. Other residents of Laxmi Niwas have expressed displeasure with the incident.

An MMRCL spokesperson told the Mumbai Mirror, “Work on the Sitaladevi underground station is on. There was leakage and our team is on the job now, trying to plug it.”

Another Building in Mumbai Mahim tilts due to Metro Construction; India

By Baliga Linah; Mumbai Mirror, November 20. 2019, page 4

RITES to prepare DPR for Jammu and Srinagar Light Metro Project; India

RITES Ltd to provide Consultancy Services for Preparation CMP, AAR and DPR. The updated CMP and AAR in light of the new Metro Policy 2017 is a Prerequisite for Approval of the final DPR of Metro Rail Project by the Central Government..

By Narendra Shah 27/11/2019 ; Metro Rail News

Artist`s Impression of Light Metro for Jammu and Srinagar

Jammu (Metro Rail News): JKERA (J&K Economic Reconstruction Agency) and RITES Limited-a Government of India Enterprise have signed a memorandum of undertaking (MoU) to preparation and updations of Comprehensive Mobility Plan (CMP), Alternative Analysis Report (AAR) and Detailed Project Report (DPR) as per new Metro Policy 2017 and Metrolite Policy 2019 in cities of Jammu and Srinagar on Monday.

The agreement was signed between Ms. Avny Lavasa, IAS & Chief Executive Officer, JKERA on behalf of the Government of Jammu & Kashmir and Piyush Kansal, Executive Director, RITES Limited.

The Government of Jammu and Kashmir has decided to engage RITES Ltd to provide consultancy services for preparation CMP, AAR, and DPR. The updated CMP and AAR, in light of the new metro Policy 2017 is a prerequisite for approval of the final DPR of Metro Rail Project by the Central Government.

In July 2019, Shri Dheeraj Gupta, Principal Secretary, Housing and Urban Development Department, said that the first priority is getting the approval of the metro rail project from the Central Government. Options are open for multilateral funding agencies to be part of the project, apart from central assistance. The central government is pushing for such mass rapid transport corridors as part of futuristic vision so funds would not be a problem.

Kumar Rajiv Ranjan, Managing Director of Mass Rapid Transport Corporation Jammu and Srinagar; Sanjay Gupta, Director Land Management, Jammu Development Authority (JDA); Bachan Lal Bhagat, Director ERA Jammu; Anil Raina, Senior Town Planner, Jammu; PP Arora, TO to CEO ERA; Lokesh Gupta, Incharge Deputy Project Manager, ERA; Raman Sharma, Senior Architect, JDA; Tarun Jain, Deputy General Manager RITES Ltd and other officials were also present during the signing of the agreement.

PART II: GLOBAL ACTIVITIES FOR URBAN MOBILITY AS A SERVICE

Rapid Strides in Urban Transport and Mobility; Global

From the Desk of Maniging Editor; Metro RAIL News, November 2019

With rapid urbanization, the pressure is mounting on the public transport system from the people living in cities and towns across the country. Mass Rapid Transport System, MRTS has emerged as one of the most effective means of mobility for the citizens in tier-1 and tier-2 cities and Metro has been a major player.

Metro Projects have not only added to connectivity, it has reduced the travel time and hence enhanced the ease of living substantially in the urban areas. It has also led to creation of direct and indirect employment opportunities. It is expected that with the expansion of Metros in the cities, local and intercity travel will be easier, mobility and connectivity will be enhanced giving a fillip to local business as well.

Urban Transport News in Brief; Global

21. November 2019 Metro News International

Uraltransmash is testing a prototype 71-411 tram on the metre-gauge network in **Yevpatoria**. Series production could begin in 2020.

A 4·8 km metro line with three stations opened in **Wuhan** on November 6. This would eventually form the southern end of Line 8, whose initial section opened in 2017.

Delhi Metro Rail Corp took over operations of the **Gurgaon** metro from October 22.

Tbilisi plans to purchase 10 four-car metro trainsets to increase capacity on Line 1. The US$60m order is to be financed by the European Bank for Reconstruction & Development.
Heliopolis station on **Cairo** metro Line 3 was officially opened on October 22.

UTTZ is to supply two battery trolleybuses to **Novokuznetsk** for 35·9m roubles.

The **Bratislava** city authorities have decided to build a 1·2 km tram extension from Starý most to Miletičova ulica following the completion of a feasibility study. The project is expected to cost €18·4m and would be completed in 2024.

Balzola has been awarded a 67m złoty contract to build a 1 km extension of the **Warszawa** tram network to Winnica.

Kiepe Electric is to modernise electrical equipment and HVAC on 30 **Schwerin** trams supplied by DWA Bautzen in 2001-03.

The European Investment Bank has signed a €100m loan agreement with the city of **Graz**, part of which will be used to upgrade tram infrastructure. A Bombardier Flexity tram from Wien was tested on the city's network from two weeks in October, and a Siemens Avenio from München is also due to be tested.

Sole bidder **Solaris** is to supply 20 electric buses to ZTM **Lublin**. The 62·5m złoty contract includes charging infrastructure.

Trans-Alfa has won a 165m rouble contract to supply 15 low-floor trolleybuses to **Kirov**.

Incumbent Ruhrbahn has been directly awarded a contract to operate the **Düsseldorf** light rail network for a further 22½ years.

Tramwaje Szczecińskie has taken delivery of a Volvo track maintenance road vehicle for use on the tram network in **Szczecin**.

Government funding has been approved for the construction of a second tram line in **Bergamo**. The national government will provide €125 m, with a further €40 m coming from Lombardia and €13·5 m from the commune.

A 4·3 km extension of the **Saint-Étienne** tram line T3 opened on November 16 from Gare de St Etienne Chateaucreux to Geoffroy Guichard.

Unibuss has ordered 23 12 m electric buses from BYD for use on routes in and around **Oslo**. Deliveries are scheduled for the second quarter of 2020.

Alstom and **Zaragoza** transport operator CTAZ have carried out a pilot project to improve bus network management using big data and machine learning.

First Group has started a pilot of NFC ITSO-on-mobile ticketing with Google Pay on its buses in **Glasgow**.

The Port Authority of **New York & New Jersey** has authorised $4·1 bn for the development of two airport connectors. Half of the funds are being put towards AirTrain LaGuardia, and the other half is going towards a rebuild of the AirTrain Newark to replace the existing monorail.

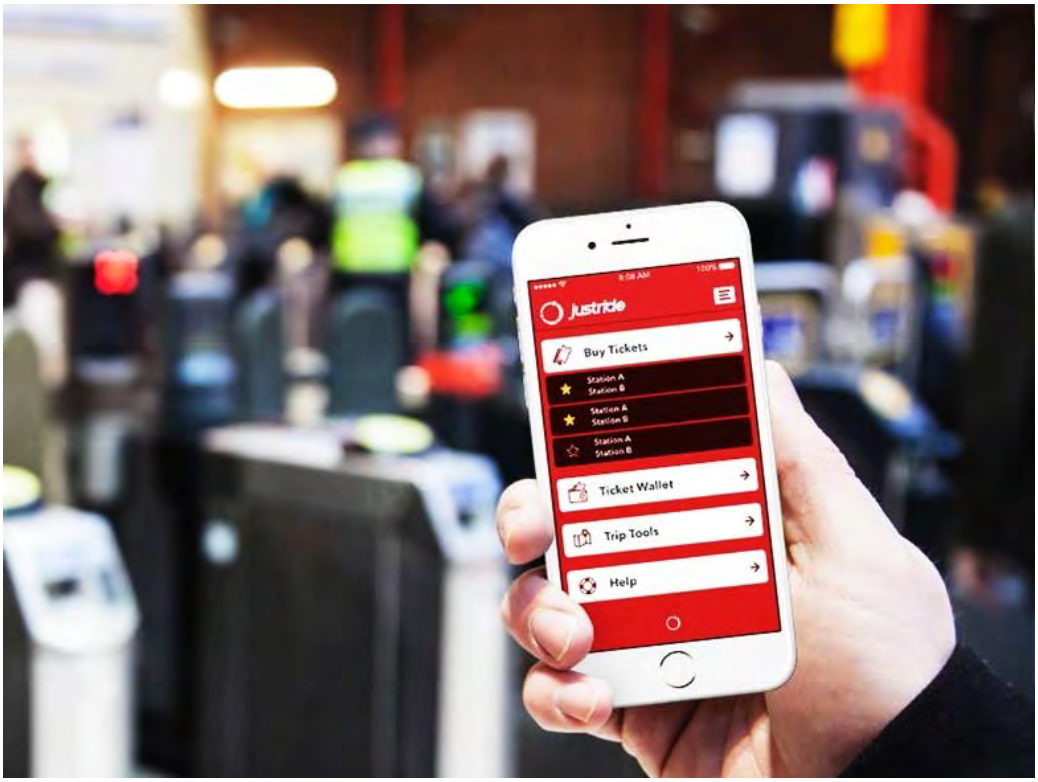
Services on CPTM suburban rail Line 7 in **São Paulo** have been extended from Luz to Brás.

Atlanta metro authority MARTA has signed a $600m contract **with Stadler** for the supply of 127 metro trains. Stadler was selected as preferred supplier in March.

The Role of Ticketing Technology in enabling Mobility as a Service, MaaS; International

By James Gooch 13th November 2019; Metro Report International

As more Transport Operators look to adopt Mobility as a Service Business Models, traditional Fare Collection Technology could be holding them back.



Mobility as a Service is gaining ground around the world, and already offers a flexible approach to enhancing traditional public transport provision in several cities. MaaS can be defined as the integration of different transport modes into a single service accessible on demand. Users can plan and pay for the whole door-to-door journey based on what and how much they use.

The MaaS concept brings together route planning, real-time vehicle data, ticketing and payments across transport modes. Such a multimodal offering could encourage people to make fewer journeys by private car, helping to reduce traffic congestion. But while this approach can lead to a seamless experience for passengers, it is about more than simply offering multiple modes. Embedded payment and ticketing represent a fundamental part of enabling public transport within MaaS, and must not be forgotten.

However, for all but the largest cities that have both the budgets and time to invest, the MaaS vision has remained distant. Part of the problem is caused by ageing bespoke ticketing systems, whose maintenance takes away resources from investment elsewhere. One way to overcome this problem could be Fare Payment as a Service.

FPaaS moves agencies away from bespoke ticketing systems to a third-party fare payments platform configured to a specific agency's requirements. This enables operators to reduce the cost of fare collection, as the costs are shared between all users of the platform and regular updates are available for all to use. Furthermore, once functionality is ready, the platform can be deployed quickly. The right fare payments platform will also be MaaS-enabled, facilitating operators of traditional public transport to offer complementary options.

Technological hurdles

Research carried out by Masabi in its *State of Fare Collection* report, published in September, showed that 43% of public transport agencies have operated their core automatic fare collection systems for more than a decade. Technology has advanced

rapidly during this time, but mobile and account-based ticketing are still beyond the reach of many small and medium transport agencies.

The main reason is the cost of acquiring, deploying and maintaining existing systems. Only 30% of survey respondents believed that they had received value for money. While 34% of agencies said that they are paying less than 10% of their fare revenue to run their fare collection system, 35% reported paying between 10% and 20%. These statistics explain why 59% of agencies stated that updating the system was ‘hard’ or ‘very hard’, with updates occasionally or hardly ever implemented.

Agencies tend to use a design-build-operate-maintain model for fare collection systems, with the result that the technology implemented is unique to a given operator. The disadvantage of this approach is that it takes time to deploy and to update, and is expensive. Furthermore, traditional fare collection is not designed for MaaS, and innovating on these platforms is a slow and costly process.

Fare Payments as a Service Potential

Despite all this, *The State of Fare Collection* found that agencies are receptive to MaaS-friendly technology, with 84% of respondents researching or actively interested in a MaaS-based offering. To overcome the technology constraints of traditional fare collection, they are exploring the possibilities of cloud computing and Software as a Service, which have transformed other sectors that have introduced them.

One of the main benefits of FPaaS is that agencies do not need to purchase, manage and update their own fare collection system. They just subscribe and pay as they go. FPaaS enables rail operators to easily integrate fare payments into white-label MaaS apps from providers like Kisio Digital, Gertek and Moovit, as well as consumer-branded MaaS apps such as Uber, or journey planners such as Transit and Jorudan.

An example of a MaaS-enabled fare payments platform is Masabi’s Justride, which includes a software development kit used by more than 20 agencies to integrate an operator’s ticketing options into a MaaS offering. This does not cost transport operators anything beyond the usual fee for a ticket, and avoids costly and time-consuming custom development, not only accelerating time to deployment but also significantly de-risking MaaS initiatives.

By adopting a pay-as-you-go model and utilising a fare payments platform, agencies can avoid the upfront capital investment, which has been a barrier to innovation for many. Thus they can free up both time and finances to invest in delivering the best MaaS experience and transport service for passengers.

CRRC *SigThemis* ETCS and CBTC share common Architecture; International

Nov. 6th, 2019; written by IRJ Staff; International Railway Journal

CRRC subsidiary Zhuzhou CRRC Times Electric showed its SigThemis ETCS signalling system at Messe Berlin’s MES Expo transport electronics exhibition which was held in Berlin on November 5-7.

SigThemis ETCS and tSafer-UC1000 CBTC signalling and train control systems have the same system architecture and share software and hardware resources, which CRRC says should improve reliability and allow the use of unified platform resources for multiple products on board and on the ground. As a result, CRRC says this should reduce operating and maintenance costs, as well as the cost of spare parts, and facilitate remote maintenance and diagnosis.

Zhuzhou CRRC Times Electric says SigThemis conforms to the latest standard of ETCS Baseline 3 B3R2, which is compatible with Baseline 2, and can fully support the system application of ETCS-NTC/0/1/2. “The TSI index of the whole system is more than 90% of the match mark,” the company says.

The tSafer-UC1000 CBTC system conforms to the IEEE1474 standard. In addition, the system meets the interconnection standards issued by China Association of Metros (Camet) and supports the requirements of Grade of Automation levels GoA2-GoA4.

Allianz pro Rail, the German Pro-Rail Alliance, has issued an Award for a World Premiere: Hydrogen Refuelling Stations for Trains; International

Published 19th Nov. 2019 by Railway News

The ‘innovation prize for shaping mobility 2019’ has gone to 28-year-old Saskia Schulz for her contribution to environmentally friendly transport. The Alstom employee and her team developed the concept for the world’s first hydrogen refuelling station for trains. It will become operational in Bremervörde, Germany, in December 2021. This will coincide

with Alstom delivering 14 additional Coradia iLint hydrogen trains to Landesnahverkehrsgesellschaft Niedersachsen (LNVG).

Hydrogen Refuelling Stations for Trains

Alstom, together with its partners Eisenbahn- und Verkehrsbetriebe Elbe-Weser, the Landesnahverkehrsgesellschaft Niedersachsen and fuel gas provider Linde, will celebrate the second world premiere in the small town of Bremervörde in Lower Saxony in December 2021. The company's pre-production Coradia iLint hydrogen trains have been in operation on the regional rail network between Bremervörde, Cuxhaven and Bremerhaven since 2018.

Alstom's Coradia iLint at InnoTrans 2018 © RAILWAY-NEWS

The refuelling station would deliver hydrogen in its gaseous, not liquid state. At the moment, the iLint in Bremervörde is refuelled via a mobile refuelling station. This is a 40-foot steel container that pumps the hydrogen into the train.

Saskia Schulz said:

"Two pioneering technologies are coming together here – local passenger rail transport and hydrogen as an energy source. This allows us to offer emission-free rail services on routes, where electrification is not possible because it either is not cost-effective or because there are authorisation issues.

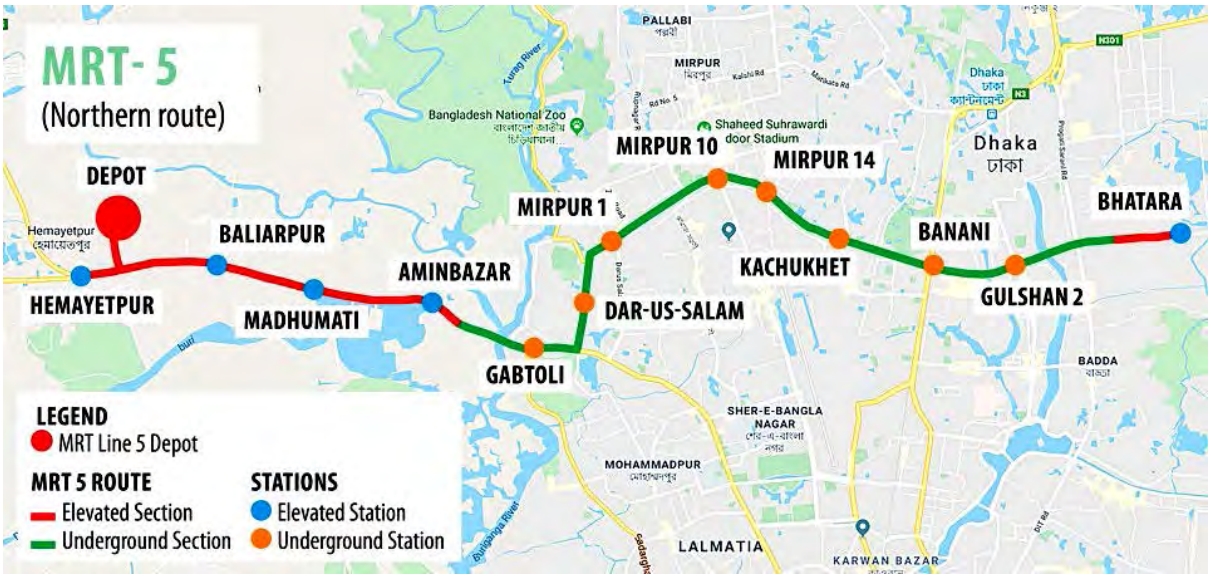
This innovation makes the environmentally-friendly diesel alternative even more attractive.

Saskia Schulz completed a degree at DHBW Mannheim in engineering while also working at Deutsche Bahn as first a student apprentice and then as a project manager. She then went on to do her M.Sc. at the Beuth-Hochschule für Technik in Berlin in business administration & engineering / mechanical engineering. Having joined Alstom in 2017 as Project Manager Infrastructure Fuel Cell Trains, she is now Business Development Manager at Alstom.

Every year the Pro-Rail Alliance celebrates women, who shape and redesign mobility with their innovative ideas.

Bangladesh approves two additional Metro Lines; Bangladesh

IRJ, December 2019



BANGLADESH'S Executive Committee of the National Economic Council (ECNEC) has approved two large Mass Rapid Transit (MRT) projects in Dhaka worth Taka 940bn ($US 11bn), which it says will radically transform the capital's transport system.

MRT Line 1 and MRT Line 5 (Northern Route) are among 10 projects worth Taka 1 trillion, which were approved during a weekly ECNEC meeting held on October 15.

The government will cover Taka 304.6bn of the project costs, while Taka 690.4bn will come from international agencies such as the Japan International Cooperation Agency (Jica) and Asian Development Bank (ADB). The remaining Taka 5.16bn will be funded by the transport agency.

The 31.24 km Line 1, which is expected to be completed by 2026, will run from Hazrat Shahjalal International Airport to Kamalapur Railway Station, and will be the country's first underground metro line, with an elevated branch running from Notun Bazar to Purbachal Depot.

The 20 km Line 5 (Northern Route) will run from Hemayetpur to Bhatara via Gabtoli, Mirpur and Gulshan. The line will also consist of underground and elevated sections, and

is expected to be completed in 2028. Jica will provide up to Taka685.67 billion for the projects.

Foshan welcomes Hydrogen Fuel Cell Tram; China

2th December 2019 ; Metro Report International

CHINA: A hydrogen fuel cell tram has started test running on the Gaoming Line in Foshan, ahead of opening of the city's first tram route later this month.

The 17.4 km Gaoming Line on the west bank of the Xijiang River, is intended to serve 20 stops when completed. The first phase will serve 10 stops on a 6.5 km section of the route.

CRRC Qingdao Sifang is supplying eight trams powered by hydrogen fuel cells developed with Canadian company Ballard Power Systems under a C$6m agreement. The three-section low-floor trams have capacity for 285 passengers and a maximum speed of 70 km/h. Six hydrogen storage cylinders give the vehicles a range of 100 km.

Foshan is investing heavily in the technology, having reportedly already put 768 hydrogen powered vehicles into service by the end of October. It has a network of six refueling stations, with another 12 expected to come on line by the end of this year.

Fuel cell trams are already in service in Qingdao and Tangshan.