15 –ാം കേരള നിയമസഭ

6 –ാം സമ്മേളനം

നക്ഷത്ര ചിഹ്നം ഇല്ലാത്ത ചോദ്യം നം. 1999 **01-09-2022 - ൽ മറുപടിയ്ക്ക്**

സിൽവർ ലൈൻ പദ്ധതിയുമായി ബന്ധപ്പെട്ട ആർ.ഐ.റ്റി.ഇ.എസ്. റിപ്പോർട്ട്.

ചോദ്യം		ഉത്തരം	
ശ്രീ. അൻവർ സാദത്ത്		**ശ്രീ. പിണറായി വിജയൻ (മുഖ്യമന്ത്രി)**	
(എ)	സിൽവർ ലൈൻ പദ്ധതിയുമായി ബന്ധപ്പെട്ട് റെയിൽ ഇന്ത്യ ടെക്നിക്കൽ ആന്റ് ഇക്കണോമിക് സർവീസ് ലിമിറ്റഡ് സമർപ്പിച്ച എസ്റ്റിമേറ്റ് ഓഡിറ്റ് റിപ്പോർട്ടിന്റെ പകർപ്പ് ലഭ്യമാക്കുമോ;	(എ)	റിപ്പോർട്ട് അനുബന്ധമായി ചേർത്തിരിക്കുന്നു.
(ബി)	പ്രസ്തുത റിപ്പോർട്ട് പ്രകാരം എന്തെല്ലാം നടപടികളാണ് നാളിതുവരെ സർക്കാർ സ്വീകരിച്ചിട്ടുള്ളതെന്ന് വ്യക്തമാക്കാമോ?	(ബി)	നടപടിയൊന്നും സ്വീകരിച്ചിട്ടില്ല.

സെക്ഷൻ ഓഫീസർ

FINAL OBSERVATIONS OF RITES

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
1.2 OBSERVATIONS ON CHAPTER - 5 BASIC PLANNING PARAMETERS			
1.	**SELECTION OF SPEED:** The design speed is prescribed to be 220 km/h and operating speed is 200 km/h. While it is accepted that to wean away the people from the road mode of transport, particularly the personal car, it is especially important that travel time differential should be very lucrative and therefore, the speed is especially important parameter. However, the proposed ruling gradient is 1 in 60 and some of the curves are having sharp radius which will permit maximum design speed of only 200 km/h. Keeping in view the maintenance tolerances, particularly on ballasted tracks, the operational speed on these curves cannot be permitted to be more than 180 km/h. The project is conceived to be mixed traffic corridor i.e. freight train and passenger train both. The freight train speed is proposed to be 120 km/h but it is a well-known fact that freight trains operate at much lower speed then the maximum permitted sectional speed on account of poor acceleration and deceleration of loco hauled trains as compared to the EMU trainsets, poor haul ability on the steep gradients and poor curving due to longer train. In view of these factors the max operating speed of freight trains cannot be more than 100 kmph. The system with operating speed of 200 km/h for the passenger and 100 kilometres per hour is unsustainable on account of speed differential being too high. Moreover, there is a trade-off between the speed, capital cost and O&M costs. While the capital cost will go up in direct proportion of speed, O&M cost is likely to go up in proportion of square of speed.	Passenger trains are proposed to be operated at 200 Kmph and RO-RO trains at 110 Kmph and hence speed differences is only 90Kmph. • Noted • For SHSR, speed shall not be reduced.	It is agreed that corridor can be designed with operational speed of 200 Kmph for passenger traffic and 110 kmph for RORO traffic. However, following may be kept in view: • While design speed may be 220 kmph but superelevation on curves shall be limited to 200 kmph only. • The axle load for freight trains may be limited to 22.5 tons.

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	The argument given in favour of 220 km/h design speed is the transit time between Kasaragod and Thiruvananthapuram to be brought within four hours, good enough to facilitate same day return of a business commuter. However, it is also mentioned in the report that average passenger lead is only 200 km and through ridership from Kasaragod to Thiruvananthapuram is less than 10%. There are sharp curves, steep gradients and station approaches where the speed of 200 km/h may not be achievable. The train simulation will reveal that 10% reduction in the top speed will result in hardly 5% increase in the travel time, meaning thereby that the travel time from Kasargod to Thiruvananthapuram will go up by only 10 to 12 minutes and for an average traveller travel time will be affected only by five minutes. The 10% reduction in the top speed will also result in similar reduction in the O& M costs and a slight reduction in the capital cost. Under such scenario it may be worth considering that design speed is brought down to 200 kmph.		
2.	***As per page no. Page No. 5-268 of Chapter 5 BASIC PLANNING PARAMETERS 5.1 General (iv) Technical Memorandum: Alignment Standards for Shared Use Corridors TM 1.1.6*** which permits the mixed traffic condition at such speeds but perhaps the purpose of this memorandum is to mandate the interoperability between different European railway systems. The memorandum does not comment on the desirability or sustainability of mixed traffic operations at such speeds. It only certifies that it is possible to safely operate freight trains and passenger trains on the same corridor by adopting extreme values of can't excess, can't deficiency and designing the passenger rolling stock capable of withstanding exceptionally higher cant deficiency like tilting coaches. In this context it may also be noted that this speed of 200 km or higher being adopted in Europe on the mix traffic condition is basically out of the	• Internationally, over 7 numbers of HS consider, freight trains are also being run. Since Kerala has number of cities spread over at 60 – 600 Km spacing average speed over 200 Kmph is essential for commuters and long-distance travellers. • Loading standard is same for speeds upto 250 Kmph and since track & structures are designed for this speed, it is better to run at 200 – 220 Kmph.	It is true that internationally particularly in Europe even new high-speed corridors are being designed for mix traffic condition but the purpose of freight traffic is only to provide network connectivity. Silverline being standalone corridor, it is not necessary to design it for mix traffic. However, on consideration of the core objective to be wean away the traffic from road to rail, it is logical to plan for RORO traffic also. RO-RO traffic being lighter axle load and short lead, there is no conflict. In view of the above, it is agreed that Corridor can be designed for mix traffic

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	necessity of upgrading the speed of passenger trains on existing mixed traffic corridors. In India also on the mix traffic corridors we have been able to achieve the maximum speed of 160 kilometre per hour for the loco hauled trains and will be able to safely achieve maximum design speed of 180 km/h for the EMU train sets. While planning greenfield railway, the more appropriate is to study the Chinese railway system. China has aggressively planned new high-speed corridor 's and depending on the traffic demands has standardized three types of speeds: a. Dedicated passenger High speed corridors of design speed of 350 km/h generally operated at 300 to 320 km/h. b. Dedicated passenger high speed corridors of Design speed of 250 kg operating speed of 230 km/h. c. Mix traffic corridors for a top design speed of 200 km/h and top operating speed of 200 km/h. It may be noted that the high-speed mixed traffic corridors are planned for only light cargo to ensure that the axle load remains within the same limits as of the passenger train. It is a different matter that most of these mixed traffic corridors are being operated predominantly only as a dedicated passenger corridor with hardly any freight traffic. Going by the Chinese example, if we are planning a mix traffic corridor the maximum design speed shall be restricted to 200 km/h **Conclusion:** In view of the above it is recommended that either the project should be redefined as dedicated passenger corridor or the top design speed brought down from 220 km/h to 200 km/h.		without compromising on passenger train speed. It is techno-economically viable.
3.	**SELECTION OF GAUGE** The recommended gauge is standard gauge which in the opinion of review consultant, is appropriate considering the	Noted. This project will provide connectivity to the existing Railway's BG network at few stations and by	Agreed.

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	project objective. It is also noted that Ministry of Railways has given 'in principle' approval to the project, with the presumption that it is an elevated, standalone corridor on the viaduct. It is important to note that most of the reasons given in the DPR in support of selection of gauge, are not technically sustainable. For example: It is a standalone corridor- The major justification for not adoption of national Gauge i.e. Broad Gauge is corridor being stand-alone without any connectivity with the national network. ***However, As per paragraph 5.5 b, of the Detailed Project Report, opposite has been justified as it reads that connectivity to the national network maybe desirable. This gives an impression of flip-flop.*** **For standard gauge the requirement of elevated structures will be lighter** This statement is fundamentally incorrect because the cost of formation or structures or for that matter cost of any other component except Rolling rolling stock, does not depend on the gauge. The cost of bridges and elevated structures will depend on the axle load and loading density which in turn depends on the size the coach the coach articulations, train lengths and bogie configurations and not on the choice of Gauge. **Broad gauge is not suitable for speed is higher than 160 km/h** This argument is not acceptable as Russian gauge is wider than the standard gauge and they are running SAPSAN at 200 to 250 km/h on the conventional Russian gauge under mixed traffic condition. The Spanish broad gauge is almost similar to Indian broad gauge and they are also running trains up to 250 KMPH on the Spanish broad gauge.	changeover /transit passenger can travel over long distances. Intensity of local / m^2 over the formation is little higher in SG track due to close spacing of rails. Also dynamic augment is higher in SG and hence design loads are generally more than BG. Noted. BG stock is not yet proven to be fit for speeds of more than 160 Kmph in India.	

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	The adoption of standard gauge need not be justified on the basis of speed potential alone as there are several other factors which are in favour of adoption of a standard gauge which have not been mentioned in the report, such as: • Adoption of a standard gauge will open up the possibility of the leasing of rolling stock because standard gauge is predominant gauge worldwide. • Adoption of a standard gauge will facilitate deployment of proven rolling stock design and save on the developmental efforts of the train sets. Broad gauge train sets, for speeds up to 180 kmph, are only in the developmental stage. • At present be corridor is being planned as a standalone corridor without any heavy freight. There is no possibility of any freight, having origin or destination within Indian railway network, to switchover on this corridor as IR line is running almost parallel. The freight being planned is only RO-RO, which is in line with the project objective of decongesting the road. • Even in future if this line is to become part of the national network it will be networked with HSR which is being planned on Standard Gauge.		
1.3 OBSERVATIONS ON CHAPTER - 6 ALIGNMENT DESIGN			
4.	Alignment design is an incredibly involved process, and it is not possible to make specific comments. It is presumed that keeping in view the constraints the most appropriate alignment would have been selected. However, there are few issues which need to be investigated carefully: • The alignment is along the coastline in the Western Ghat. Going by the experience of Konkan Railway, the Western Ghats are prone to extremely high rainfall intensity, of the order of 50 cm in 10 hours. Moreover, because of steep	Hydrological Study is proposed to be carried out & all the bridge vent ways will be designed adequately to cater to the flood discharge. Slope stability analysis will be carried out once soil strata at the location of cuttings are known.	Noted.

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	slopes of the ghat, time of concentration is very low and velocity is very high and alignment cuts across the natural drainage. This will require proper design of bridges, culverts, and drainage. Slope stability analysis will be necessary for cuttings and high banks. In case of open cuttings the length shall be restricted to not more than 400 m to ensure the stability and sustainability.		
5.	• Vide para 6.1, Volume II- Main report- Part A, there is a location where proposed rail level is only 5 m above MSL. This needs to be re-examined as location will be prone to submergence in case of high tide coupled with rainfall.	Will be verified again after hydro study.	Noted.
6.	• It appears from the report that alignment has been firmed up within the city limits. Slight modification in alignment in the city limits may result in substantial deviation in the cost estimates.	Noted. No change in the alignment is foreseen.	Noted.
7.	• Ruling gradient is 1 in 60 and the longest continuous length of this gradient is for 3 km. This needs to be reviewed, unless the corridor is designated to be operated exclusively with train sets or EMU type of rolling stock. 1in 60 gradient will require banking for loco hauled trains and keeping in view the longer monsoon period in Kerala, operation and may result in wheel slips and Rail damages. This will adversely affect the overall throughput of corridor.	Loco hauled trains are proposed with one Loco in the front and banker Loco rear for efficient hauled at longer and steeper grades.	Apart from Banker Locos other safety measures such as Slip Control device, automatic emergency brakes, loco-tral etc. need to be installed to ensure safe operations against train Parting, train buckling and train becoming out of control on down gradient. RDSO approval for not providing catch siding may be required.
8.	• RO-RO stations have been planned, which are some distance away from the National Highway. As the objective is to wean away the vehicles from the road, it is necessary to plan bi- directional road connection from the highway to the RO-RO station as a part of this project itself.	Noted. For all the RORO loading/ unloading points adequate width of roads & platforms for quick mobility are proposed.	Noted.
9.	• Kasargod is not a natural termination. If the corridor is extended up to Mangalore, only 50 kms away, which is a Port and terminal station of Konkan Railway, substantial	This suggestion may be considered at a later date when Government of Kerala	Noted.

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	passenger traffic may switchover to this corridor. The corridor is being planned as state JV project and is being substantially funded by Government of Kerala, it is not practicable to extend it to Mangalore as the project will have to be structured differently. However, the yard and terminal arrangement at Kasargod should be planned, taking into consideration the possibility of extension into Karnataka.	& Government of Karnataka comes to an understanding over the same.	
1.4 OBSERVATIONS ON CHAPTER - 7 STATION AND AREA DEVELOPMENT			
10.	Stations and station facilities are planned according to contemporary international best practices, however, at this stage this can be used for the costing purpose only. The detailed design as well as planning may change substantially at the detailed design stage.		
11.	Following comments are made for consideration: • Report mentions that initially only nine car rakes will be operated and as per traffic forecast augmentation is proposed after 20 years. However, stations and yards are planned for 480 M length at this stage itself. It may be pointed out that the capital cost and O&M costs of elevated stations and underground stations are very high and therefore this expenditure can be avoided at this stage. It is recommended that the length of a station should be kept restricted to only 250 m while yards can be kept for a longer length. Station can be extended in future, as and when traffic materialises.	After review and discussions, it has been decided to continue with 410m length of platform.	Noted.
12.	• According to experts in the field, yards should be kept limited to 9 car rake and further augmentation, if necessary, can be achieved by increasing the frequency of operation which Signalling permits. Signalling, in any case, may require upgradation within 20 years' time frame.	Few special trains such as tourist trains, sleeper trains. etc need longer loop and hence 580m loop length is planned for the yard.	Noted.

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
13.	• It is noted that major stations are planned with eight lines i.e., two main lines and six running loops, three on either side. Without going into the detailed analysis, it can be commented upon that first loop, second loop and then third loop, will neither be operationally efficient nor required from the viewpoint of train operation plan.	After review, the number of loop lines have been deleted and at few stations, loops are provided common for RORO trains & express trains.	Noted.
1.5 OBSERVATIONS ON CHAPTER - 8 CIVIL ENGINEERING			
14.	Following remarks maybe considered: • Design is proposed to be fit for upgradation to 250 KMPH. This is unnecessary because at 250 KMPH there will be several requirements such as higher dynamic augment, larger kinematic profile of tilting coaches, effect of sonic boom etc. Sonic boom effect will require platform screen doors, transition in X-section at entry and exit of tunnels and modification to the fittings and fixtures at Station platforms. In any case upgrading to 250 KMPH will not result in much benefit in transit time on account of restrictive curvatures and gradients, ballasted track on poor subsoil conditions, curves at the approach of the stations and corridor being parallel Indian railway.	As per BS 5400 – 2: 1978, loading standards prescribed as RU loading standards in para 8.2.1 consists of 250 kN concentrated load with UDL of 80 kN/m. Dynamic effects have been calculated so that in combination they cover the effects of slowly moving heavy and fast moving light vehicles. Heavy wagons are taken to run at speeds upto 120 kmph, pass. Locomotives at speeds upto 250 kmph and high speed trains at 300 kmph. The above loading has been considered in the design of P.Way and all the supporting structures. As per Economic Commission Europe in ECE/TRANS/63 Rev. 3 (Page 26) in Para 5, authorized mass per axle: - "For new mixed or combined traffic lines a wagon mass per axle of 22.5T upto 100 kmph has been adopted in conformatory with recent UIC	It is desirable to follow one set of standards without any tinkering. If we are following UIC standards, then we should limit the axle loads to 22.5 tons and speed of freight trains to 100 KMPH.

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
		decisions. The mass per axle limits of 20T for a speed of 120 kmph and is tonne for a speed of 140 kmph are those set by the UIC regulations."	
15.	• Review consultants are not making specific comments at this stage as these are indicative. There is lot of scope of optimisation in the yard plans, particularly on viaduct and underground stations.	Yard plans have since been reviewed based on the pattern of train services proposed and yard lines have been reduced considerably.	Noted.
16.	• Height of platform and distance of the edge from the centre line of the track should be treated as tentative because these can be finalised only after finalisation of the rolling stock design and dimensions. The rolling stock design for this corridor may be substantially different then what is adopted for Mumbai- Ahmedabad high-speed because of substantial length being at grade and possibility of flooding cannot be ruled out.	Noted.	Noted.
17.	• CWR through points and crossings- At one location it is written that it is not proposed to extend the CWR through points and crossings while at other locations location it is written that switch rail should have creep anchor implying that CWR is being carried through points and crossing. In any case it is strongly recommended that CWR should be carried through points and crossing which is very important for sustainability of modern rolling stock.	For semi high speed, for smooth run at the approach and over the P&C, it is proposed to carry the track through all the main line points.	Noted.
18.	• Loop lines need not be provided with head hardened Rail to save on the cost of grinding in addition to capital cost. Keeping in view the lighter traffic density, even on Main line, in the tangent sections, 90 UTS rail can be considered.	Since, ordering & handling of 60 kg HH rail and _____ rails separately are difficult and may also get mixed up, for the entire loops, HH rails are proposed. However, for depths, only 52 kg rails are proposed to be used.	Noted for 60 kg HH rails. The context of 52 kg rail is not understood. It may be noted that 52 kg rails are not being rolled anywhere in the World now.

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
19.	• Report mentions the various strategies for soil stabilisation and construction of embankment in poor subsoil conditions. These need to be refined because things like under-reamed pile with plain concrete apron as formation have not been found to be successful on Indian Railways in washable aprons. In any case the entire formation design will have to be looked into I at the detailed design stage.	Formation design have to be carried out elaborately during Detailed Design stage.	Noted.
	• It is noted that substantial portion of the corridor is running parallel to the Indian Railways. existing corridor it. This will involve several constraints during construction and operation stage. These issues have to be examined in greater detail.	Noted and preliminary method of working in the parallel territory is being worked out by developing station cross sections, common ROBs, eliminating LCs etc.	Noted.
	• It is mentioned in the report that Rail over Rail flyover has to be in steel. Keeping in view the aggressive coastal climate it may not be desirable. It is better left to be examined at the detailed design stage.	ROR/RFO are planned with either composite steel/concrete (or) as bowstring arch girder and NOT as entirely as steel structures.	Noted.
	• 8 It is mentioned in the report that Rail over Rail flyover has to be in steel. Keeping in view the aggressive coastal climate it may not be desirable. It is better left to be examined at the detailed design stage.	ROR/RFO are planned with either composite steel/concrete (or) as bowstring arch girder and NOT as entirely as steel structures.	Noted.
	• 9 For ballasted section it is proposed ballast size is 50 MM well graded. This is required to be explained being at variance with IR standards of 65MM gap graded.	It is understood that IR has not yet switched over to 65mm gap graded ballast and is continuing the current practice of 50mm size ballast. Hence is SilverLine also 50 mm size ballast is proposed, which may be reviewed during Detailed Design.	Noted.

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	• 10 Rail is proposed to be 250 m long head hardened imported rail. According to the best of our knowledge handling facilities for 250 m long Rail are not available at any port in India. In any case UIC 60 KG 350HT rails are available indigenously in the lengths of 260 m and therefore no import is necessary.	With 2 rail panels (26m long), at site depots by Flash Butt weld, 250m long welded panels are proposed to be formed and thereafter taken over the sleepers for in-situ welding by FW at every 250m.	It is not desirable to do the welding of shorter rails when longer rails are available. In any case, under "AtamNirbhar Bharat" Policy, there is hardly any possibility of getting permission to import the rails.
1.6 OBSERVATIONS ON CHAPTER - 9 ROLLING STOCK & DEPOT			
20.	Following are the comments for consideration: • No details have been given for standard gauge rolling stock for operating RO-RO trains at 120 km/h operational speed. As has been pointed out during the video conference that it is not possible that infrastructure designed for 200 Kmph speed with 16-ton axle load can be certified fit for 22.5-ton axle load at 120 Kmph speed. The infrastructure for 22.5-ton axle load will certainly be much heavier and will also result in higher maintenance costs.	The operational speed proposed now in the DPR (latest revision) is 110 kmph. This has been covered in chapter 9, para 1.15.	Noted.
	• Report also does not talk of the specifications of RO-RO rolling stock with regard to the capability to withstand cant excess.	As per EN standard 13803-1, the maximum value of the can't deficiency/cant excess is 130 mm. There are many freights Rolling Stock running in Europe and Asia under the cant deficiency/excess varying from 92 mm-130 mm.	Agreed.
	• 3 Vide table 9.3, listing advantages of EMU, has mentioned several points but one of the important points is missed out i.e. EMU type rolling stock is far more energy efficient because of regenerative braking is effective even at very low speeds. While in case of loco hauled operations, airbrakes need to be applied and that energy goes waste.	Noted. We have mentioned benefits of regenerative braking on EMU type of trains for passenger operation in Table 9.3 of DPR.	Noted.
21.	• Para 9.1.6.4 the DPR consultant have justified 3.4 m width of coach to facilitate 3+2 layout. While DPR Consultant	Noted. In the revised version of DPR (Ver 3.0), this coach width has been	Noted. Although, 3.4 m coach width is possible to be adopted as the stability does

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	concede that as per UIC, the maximum coach width permitted is 3.150 and the prevalent Coach width in Europe is 3 m only. Review consultants are of the view that all other prescribed technical specifications are in line with the European standards, but exception is being made for the coach width only, which is not desirable. It is the considered view of experts that 3.4 m coach on standard gauge, particularly on the ballasted track, increases the dynamic augment and is not desirable. In DMRC and MMOPL Mumbai, 3.2 m wide coach has been adopted on standard gauge and therefore, coach manufacturing facility of 3.2 M is available in country. It may be pointed out that standard IR coaches are 3.25 m wide with 3+2 layout. Review consultant is of strong opinion that 3.4 m wide coach shall not be adopted and maximum coach width shall be restricted to 3.2 m only. Vender feedback may also be taken with regard to the domestic manufacturing of 3.2 m wide coach or else we may go for the European sources and try to adjust 3+2 layout within those dimensions. If the rolling stock this to be imported from Japan as condition under STEP loan, it will not be difficult for them to supply 3.2 m wide coach.	changed to 3.2 m. We are preparing the technical specification and SOD considering 3.2 m wide car body. However, the following points are listed based on which 3.4 m car body width was proposed in FR and DPR old versions. • Existing high-speed trains across globe uses it, e.g. the upcoming projects such as Mumbai Ahmadabad, California High Speed Rail project has prepared their gauging documents based on 3.4 m wide car body. • As per UIC 505/EN 15273 series, European Union has standardised car body width which is applicable to Europe in view of cross-country movements. However, UIC 505/EN 15273 series is essentially a guideline to derive different gauges. • 3.4 m wide carbody trains such as CRH2A, CRH380A, N700, E5 series are running on China and Japan. These trains are operating at a speed of 350 kmph.	not depend on the car body width alone but also depends on the height of centre of gravity. Incidentally, the comment on the coach width was in the context of Axle Load as it is not possible to design 3.4 m wide coach of 22-25 m length within 16 ton axle load.
22.	• Para 9.1.6.6, about double Decker coaches, the DPR consultants have rejected the option of double Decker coaches primarily on the considerations that there are limited number of suppliers, thereby limiting the competition and increase in axle load. Review consultants	Even though double decker trains provide more passenger capacity for same length of train, the following points are to be considered before selecting double decker trains.	

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	are of the opinion that this has to be re-looked because Silver line is not a intercity corridor but is in the nature of "string of pearls" with many origin and destinations. According to the DPR the average passenger lead is only 200 km, meaning thereby journey time of about 1.5 hour. The experience of Indian Railway operation shows that double Decker, for this kind of journey distance or journey time, is extremely popular among the daily commuters. Therefore, double decker coach configuration offers a win-win situation for the operator as well as commuters as just about 10% increase in axle load gives 40% more seating capacity within the same train length. • In view of the above review consultants are of strong opinion that all infrastructures should be designed, keeping in mind the possibility of introduction of double-decker coaches.	• Today in market, Alstom and Hitachi manufacture double decker trains. In this Alstom is manufacturing, double decker trains which are Loco hauled not EMU trains. Hitachi manufactures EMU type of double ducker trains which are feasible to run on Silverline corridor, but competition will not be there in bids. • It is also observed that most of the upcoming high speed trains projects are opting single deck trains. • Currently the height of the contact wire and platform heights are designed to accommodate EMU type of double decker trains if required at the procurement stage.	• It is a fact that Alstom and Hitachi are manufacturing double decker trains but it is also a fact that outside China they are the dominant players in Rolling stock market. • No comments • This precisely is the reason of recommending double decker trains. As we are going in for RORO operations, we have to have higher vertical clearances as compared to most of the high-speed projects, including Mumbai-Ahmedabad HSR. Therefore, double decker rolling stock can be adopted without any extra infrastructural cost.
23.	• DPR mentions that most of the equipment should be mounted in underframe to keep the centre of gravity low. However, the Review consultants are of the opinion that in view of that while mounting the equipment in under frame, it should be kept in mind that these EMU's will operate in the predominantly at-grade corridor with ballasted track and the possibility of track flooding.	• By the inherent technology of EMU trains, most of the equipment are distributed on the underframe providing sufficient and comfortable space to the crew and passengers. Para 9.1.8.8 of DPR covers the aerodynamics effect of train in which it is mentioned that the underframe will be protected for the aerodynamic effects by providing	Noted.

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
		covering to underframe equipment. The at grade alignment level has been fixed on considering the HFL occurred in 2018 flood level in Kerala which is 100 years plus history and major challenges expected.	
24.	• Maintenance of RO-RO stock: DPR has not specifically discussed the machinery and equipment required to be installed in the depot for the maintenance of Ro-Ro wagons and standard gauge locomotives. Review consultants are of the opinion that substantial investment will be required in providing the space and equipment for maintenance of standard gauge freight wagons and locomotives, which will remain underutilized, as the RO-RO traffic is pegged at certain level and rolling stock holding will be low.	The depot machineries and facilities have been planned in such a way that the same lines and machinery will cater to most of the maintenance of EMU trains and RORO trains. In addition to these two specific lines are ear marked for the RORO trains maintenance with additional machinery required for major RORO activities and two specific stabling lines are also provided in the depot. The explanation to this query is already provided on reply to query number-1.2 (3)	No further comments.
25.	• Report is silent about the Rolling stock requirements for maintenance purposes, for example ballast hoppers, material trains, wiring trains. Report is also silent about the inspection & maintenance machines for track, bridges, cuttings and tunnels.		
1.7 OBSERVATIONS ON CHAPTER - 10 POWER SUPPLY AND OVERHEAD TRACTION			
26.	Comments are as follows: • EMU type of train is envisaged that 9 car formation will have consist of 2 DMC + 4 MC + 3 TC with 66% motoring as conceptualized so in 15 car formation it shall be 2 DMC + 8 MC + 5 TC.	The tentative configuration has been given in the DPR. However, this will be finalized at the detailed design stage as per the proposals to be received from manufacturers.	Noted

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	• Ballasted track at high speed has potential danger of damaging the under frame equipment which would have adverse effect on the weight and material of the body shells of various equipment fitted under frame so as to avoid damage by the flying stone chips at high speed.	Noted. We have considered this in the section 9.1.8.8 of DPR covering the aerodynamic effects of train where it is mentioned that the underframe will be protected for the aerodynamic effects by providing covering to underframe equipment.	Noted.
	• In operation plan it is observed that trains are terminated/ originating at stations Kozhikode and Kannur in addition to the terminal stations. The Coach maintenance depot are envisaged at Kasargode and Kollam. But in order to start the services in the morning and for stabling and conducting daily inspection for safety checks etc, satellite depots at stabling points with minimum necessary infrastructure may necessarily be required at the terminal of Thiruvanantpuram, Kozhikode and Kannur as the other terminal of Kasargode can be serviced by the depot planned there itself.	Noted. However, such facilities are not even there in IR suburban sections where there are many originating stations. Even established metros also these additional facilities are not there and trains are platform returned. In many high speed/main line services, the satellite deports are not planned in the originating/terminating stations. We have planned for adequate stabling lines at terminating and originating stations. Modern mainline/high speed rolling stock requires a daily onboard inspection to start the revenue operation and doesn't require any specific infrastructure to support the daily inspection. Rolling stocks are required to send to depots once in three days for waste disposal and cleaning etc. The maintenance practices to be suggested by the Rolling Stock supplier will also be taken into consideration.	Agreed to

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	• Rolling stock with 16 T axle load, 3.4 m wide and 4.5 m high is envisaged for standard gauge 1435 mm. It is pointed out that with gauge of 1435 m, even for RRT having max speed of 120 Kmph, rolling stock width is going upto 3.2 m only. At high speed of 200 Kmph and more, stability and air resistance of coach body will be a challenge for coach width of 3.4 m. Rolling stock/ RO-RO consignment of height of 4.5 m has been envisaged. It may require additional clearances for existing power line crossings and involve large scale infringements.	As we clarified in other related paras, we have already decided to have 3.2 m wide coaches only and is being incorporated in the latest version of DPR. Clearances stipulated as per latest ACTM and Indian Electricity Act and SOD for powerline crossings will be followed.	Noted.
	• A nine-car formation the total weight of rake would be appx: 24*16(MC)+12*13(TC)=540 T, the power required would be in the range of 20-24 kW/T for higher acceleration i.e 10800 kW. This mean the capacity of TM taking a 4-wheel independent driven axle to be 675 kW. Need detailed study.	Observation is noted. For the proposed SilverLine Rolling Stock, considering 16 Ton axle load in all cars and initial acceleration of 0.6 m/sec2, the maximum tractive effort is arrived at 400 kN. It will lead to maximum power of approximately 5.4 MVA per train (9 kVA per Ton). For reference, the following high-speed trains and their power output listed have also been taken into consideration. i. Trenitalia ETR460 (6M3T-250 kmph)-5880 kW ii. Pandelino Virgin- (6M3T-220 kmph)-5500 kW. Accordingly, the traction motor is sized to 250 kW considering regeneration capacity.	Noted.

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	• The proposed implantation of 2.836 m noticed from the cross-section diagrams for coaches width of 3.4 m at very high speeds of 200 kmph. IR at speed of 130-140 kmph and coach width of 3.250-meter, Implantation is 2.8 m. This need to be rechecked.	Width of the Rolling stock has been reduced to 3.2 mtr. Minimum horizontal implantation proposed inside the curve is 2.75 mtr for Radius <350 mtr as per the draft SOD of K-Rail. The implantation proposed is outside the structural gauge only at the designed speed and sharpest curve. This will be finalized at the detailed design stage.	Noted.
	• Considering the use of Green energy system, 100 % use of solar energy is envisaged. In order to make the power available for operation during night-time and even during day time in rainy season as well as non-effective generation time of power in solar system i.e. early morning hrs and sun downing time, either alternate system would be required or there has to be large battery backup which has got its associated issues of maintenance, space, cost etc.	K-Rail has plans to run the system by adopting 100% on Green energy, which can be Solar, Wind & Hydro. For availing RE power, we have plans to enter into power purchase agreements with Renewable energy producers. In Kerala, bulk generation is hydro based. For 24 hrs service, a combination of these will be deployed may be through a single or multiple agencies. No battery backup has been envisaged for Traction.	Noted.
	• Switching type Neutral Section have not been successful on IR and seems not essential for proposed traffic operation. Need detailed Study.	Noted. Automatic Switched Neutral Sections have been provided in several High-Speed lines globally. In IR, there is no pressing need for the nor tried in large nos adequate to establish its efficacy. The point will be studied during detailed design stage and discussed with Rolling stock bidders also. PTFE type of neutral sections are also now available in operation at speeds of 200kmph & above	Noted.

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	• VRF has been proposed for air conditioning even for stations, may be reviewed at the detailed design stage.	At all stations including UG stations, air-conditioning has been planned for operational and equipment rooms only. In underground stations, air-conditioning may be provided for public also. VRF type air-condition system are energy efficient, fewer breakdowns/less downtime and multiple indoors can be connected with single outdoor ,which will be provided in redundancy mode to cater for better availability.	VRF type air conditioning system may be energy efficient but in a public utilities space, leakage of refrigerant may have safety related issues. However, the technology is being upgraded continuously and appropriate decisions can only be taken at detailed design stage.
1.8 OBSERVATIONS ON CHAPTER - 11 SIGNALLING & TRAIN CONTROL AND COMMUNICATION SYSTEM			
27.	**1. System Parameters** • The system parameters are mentioned in para 4.3 of the DPR that Signalling & Train Control, Communication, Power Supply, Ticketing and Fare Collection and other systems are adopted from the International high-speed Railways as there are no equivalent specifications or standards available in our country.	Noted.	Noted.
	• The details of the costing of capital cost and O&M cost and the concepts adopted for estimation are not given in the report to examine the adequacy of various components and their redundancy levels. The standards which are not available in country for the high speed and have to be adopted from international Railways. However, except ETCS-2 for Signalling & Train Control and Communication and Ticketing and Fare Collection system rest all are either available in the country or in the processes of being made in India. For the indigenous equipment, the specifications,	Noted- The capital cost has been worked out in detail, however only the abstract summary values given in the DPR.	Noted.

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	execution and maintenance practices adopted on IR to be followed as the "Atma Nirbhar Bharat" policy of the Govt.		
	• DP Report has also mentioned about 4 sanctioned projects of IR for ETCS-2 with LTE for Signalling & Train Control and Communication. But now planned to be provided with Train Collision Avoidance System (TCAS) as the "Atma Nirbhar Bharat" policy of the Govt. But TCAS is a non-vital and non-signal system. Aim of this system is to prevent train collisions in block sections and on running lines at stations.	Noted- the Detailed estimate for the ETCS Level-2 with LTE has been prepared on the basis of sanctioned projects for similar works on IR. We have not considered TCAS as it will not suitable SilverLine requirement.	Noted.
	• SilverLine Stations are proposed at Thiruvananthapuram UA, Kollam UA, Chenganoor, Kottayam UA, Ernakulam UA, Trissur UA, Tirur, Kozhikode UA, Kannur UA, Kasaragod UA and Kochi Airport. Continuous track circuiting through axle counter is proposed to meet the designed headway of 3 minutes, which cannot be achieved with TCAS alone without throughout line side signals and automatic signalling. Also because of long braking distance of high-speed trains, it is not possible to protect high-speed trains by using conventional Line side signals. Therefore, these are inadequate for High-Speed Rail and Automatic Train Control System is required, as TCAS will not be able to meet the requirement of proposed high speed corridor of 200 KMPH.	Noted-The signalling system envisaged is ETCS Level-2 with LTE. Line side signals at suitable intervals have been considered as fall-back options.	Noted.
28.	**2. Observations on Recommendations given in DPR** • There is no clarity in the DPR about the recommendations for signalling and communication and different recommendations are given and repeated in various paras deferring from each other. The recommendations should have been consolidated for better visualisation of the proposed scheme, rather than making a theoretical report like a sort of lecture hand out.	Recommendations for Signalling & Communication to be adopted for the Silverline project are given at para no 9.7 and 9.8 of Executive summary. Since this is the First Semi High-Speed line being considered in India, before making the final recommendations, it is necessary to examine the relevant EN	Noted.

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
		specifications and UIC standards which are adopted globally for such systems and these have been mentioned in the chapter no -11 and also brought out in the executive summary at para no 4.3 (system parameters).	
	• It is also mentioned in the DPR that "The more equipment and transmission required for movement authority, the more probable it is to have system delays and errors. Hence, there is an increased risk of having problems in train traffic caused by signalling systems, which needs to be considered in the system design phase."	Noted- These are discussions on, how better reliability can be achieved.	Noted.
	• Delays on account of equipment failures are known and for failure action directions have been given to Field Supervisors & Officers to spread out and restore the Fail Safe Signalling System in the shortest possible time, which is the only action field units can take. Reliability is built in Design of any System. On account of various external interfering factors like cables/ relays damaged by Miscreants. Heavy rain and water logging compounded with lightning, environmental conditions etc, the Fail Safe Design ensures Signal to remain at Red, which is classified as an Incidence.	Noted.	Noted.
	• It is not clear what meant by "Error" as mentioned in the DPR, on account of signalling system and if it indicating to unsafe failures by equipment, then it is only an imagination without going through the deep experience of Indian Railways which is using various technologies of Signalling and Communication equipment's up to ETCS 1 with speed up to 160 KMPH, since many decades without having any such imagined errors. Prompt attention by Operation Staff	This is a generic term. Any deviation in performance from the expected desired one is normally treated as "error" and mentioned so in the DPR.	Noted.

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	which is available Round the Clock is required to ensure expeditious movement of Trains in the case of Signal Incidence, which is a Safe Permissive Procedure.		
	• We need to change the philosophy of Signal Design from "Fail Safe" to " Fault Tolerant & Safe Enough" by providing Redundancy in Design, a concept which is followed World Over. This supported with On Line Signal Equipment Monitoring System and Mobile Maintenance Teams equipped with Mobile Phones& Spares, is the concept of Zero-Defect Regime.	Noted- Suitable provision have been catered in the DPR.	Noted.
	• Anyway, ignoring the nescience type statement, the recommendations for signalling and communication system given in the various paras of the DPR are summarised and considering the observations given in para 1 above, the following system of signalling and communication proposed in the DPR are considered as adequate.	Noted.	Noted.
29.	**3. Summary of Recommendations given in DPR for Signalling & Train Control, Communication and Ticketing & Fare Collection System**		
	3.1 Signalling System & Train Control ERTMS/ETCS Level-2 with LTE 3.1. ETCS level-2 System with LTE/5G (or GSM-R if frequency spectrum is not given by WPC) –	Noted.	Noted.
	3.1.2 Automatic Train Supervision (ATS)	Noted.	Noted.
	3.1.3 Centralized Traffic Control (CTC) located in Operation Control Centre (OCC) with Train Management System (TMS) for train control and Passenger Information System.	Noted.	Noted.
	3.1.4 Integrated Operation Control Centre (OCC) equipped with ATS, CTC & TMS, LTE-R/5G or GSM-R, Radio Block Centre (RBC), Evolved Package Core (EPC)/Main Switching Centre (MSC) of LTE-R/GSM-R and Supervisory Control and Data Acquisition System (SCADA)	Noted.	Noted.

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	3.1.5 Back-up OCC (BCC) with full compliments as above provided in OCC, to provide working back up with complete redundancy and hence availability. In case of failure of main OCC due to any problem/emergency. The Backup Control Centre (BCC) equipment will provide a high level of availability of the Signalling & Train Control system. With LTE-R/5G or GSM-R and RBC being fully redundant, the probability of Signalling Train Control system going to be totally shut down will be remote. The BCC will be similar to main OCC with full redundancy of all Systems. The Main OCC and Backup (BCC) to be provided at different locations.	Noted. Different locations for OCC & BCC have been envisaged in the DPR.	Noted.
	3.1.6 Interlocking System at stations and yards (Depots) - Electronic interlocking system (EI), line side signals, Track Vacancy Detection of complete yards & Track KMs through Axle counters in full redundancy mode for each track sections and local control for operation of Signalling system. All EIs to be interconnected and also with CTC through OFC laid with redundancy of Route Diversity exclusively for CTC and both the OFCs provided with fibre monitoring system. This will help in operation of local movements within the yards and shunting operations and can also work as a Fallback system in case of failure of ETCS 2, although the probability of failure of ETCS 2 will be very less with complete back being provided.	Noted. These are all part of the ETCS Level-2 system proposed.	Noted.
	3.1.7 Fall-Back Block System as proposed in the DPR is not required as all EIs of stations will be interconnected and to CTC and complete track circuiting through axle counters. Last Stop signal for station-to-station movement can be cleared with this and there is No need of fall-back Block system. It is written in the DPR that "If the fall-back system is complex and equipment-intense, this shall reduce overall reliability due to the increase in hardware. This could also reduce the availability as fall-back system equipment failures can impact the availability of the	Noted. A fall-back system is always needed any mission critical application and is catered for in all ATP system inspite of redundancies. The inter station distances in SilverLine are in 50-80 Kms range and hence a fall-back system is considered necessary for keeping the train movements through. Line side signals with Axle counter	Noted.

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	prime ATC system under certain circumstances." It seems there is confusion in proposal about fall back system. The interlocking at station would be required in any case to manage movements in and out from depots/yards, which work when control is transmitted by CTC to stations for local operations. Also, when ETCS 2 would be working the stations interlocking as fall back will be non-operative and non-functional mode, therefore there will be no reason it will affect ETCS2.	controlled Automatic Signalling/ IBS has been envisaged for the degraded mode of operation. This will be finalised at the details design stage.	
	3.1.8 MIS for predictive maintenance and records of Signalling system be included as from the DPR is not clear whether it is part of the estimate.	Noted. This is part of the specification /system envisaged.	Noted.
30.	**3.2 Communication System** 3.2.1 Long Term Evolution (LTE-Mobile Radio Communication System). LTE-R/5G or GSM-R can be provided with ETCS 2, depending upon current technology available and implementable at the time of tendering and execution and availability of the frequency spectrum for LTE-R/5G. It is mentioned in the report that Indian Railway (IR) has requested to reserve 15 MHz (paired) in 700 MHz band and initially assign 10 MHz (paired) for LTE based communication corridor along their network for Train-ground and Train-Train Communication. In case it is not possible to get frequency spectrum from WPC/DOT for LTE-R/5G, the fall back option is be available to go for GSM-R and tender documents be made accordingly.	Noted and the DPR provision exists like that in the recommendation para no 11.2.23. However now RRTS has already awarded the Contract of signalling System with LTE and it is expected that in the next couple of years this will be more established.	Noted.
	3.2.2 Evolved Package Core (EPC)/Main Switching Centre (MSC) for LTE-R/GSM-R is required to be established in OCC for independent working of the network and not being dependent on Railways MSC and connectivity to them through Railways OFC network. So far IR does not have EPC therefore it has to be provided with LTE. It is not clear from the DPR whether it has	The LTE- EPC /MSC is envisaged in the SilverLine OCC/BCC and LTE system is proposed with full redundancy. No sharing of infra structure with Indian Railways has been envisaged as SilverLine is a standalone system with much advanced features over IR.	Noted.

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	been catered in estimate with back up EPC/MSC in BCC also for complete redundancy.		
	3.2.3 OFC provided with fibre monitoring system dedicated for various controls communication, data transmission and MISs. 2 OFCs laid for EIS & CTC will be available as back for communication systems also.	Noted.	Noted.
	3.2.4 Backbone Transmission Network (SDH)	Noted.	Noted.
	3.2.5 Supervisory Control and Data Acquisition (F-SCADA)	Noted.	Noted.
	3.2.6 The other recommendations given in DPR like Telephone system (IP PBX exchange system), Centralised Digital Recording System (CDRS), Passenger Address System (PAS), Passenger Information and Display System (PIDS), GPS Clocks, Closed Circuit Television System (CCTV) are considered to be appropriate.	Noted.	Noted.
	3.2.7 Emergency control and Emergency telephone system has been recommended in DPR for passenger use in tunnels and in an emergency, connected with Operations Centre (independent of train radio or mobile phone). But its details are not available to comment up on. However, it is mentioned that the Emergency Communication is built in feature of LTE-R/GSM-R and with 100% redundancy through complete back up equipments, it should be adequate to provided highest availability. In addition to this communication like station control can be provided at strategic locations like tunnels & bridges in closed locations, stations, maintenance depots, mid-section signalling huts, TSS, Sub-stations and yards etc. to work on OFC, independent of Radio network to give another backup system of communication in emergency.	Noted- This has been envisaged in the DPR. These minor details will be worked out at the details design stage.	Noted.

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	3.2.8 It is also mentioned in DPR that the safety/surveillance equipment should be installed online side, suitable for local environment and installation criteria of high-speed rail line. The High-speed train shall use an array of hazard detectors. The Signalling & Communication system communicate the data from field unit of hazard detector directly by OFC network to Control Centre (OCC). The hazard detector types may include: • Track monitoring system • Broken Rail detection system • Earthquake detection system. The details of these systems mentioned in DPR and whether these have been included in the estimate are not available; therefore, no comments can be given.	Signalling system only interface with Safety system as mentioned in Para 11.2.17. The hazard detectors will be provided by the civil /track wings and the communications network will extend this to the OCC. The cost of safety system is included in the estimate.	Noted.
	3.2.9 Installation of fire, smoke and gas detectors in tunnel. These be provided with remote alarm and monitoring.	Noted	Noted.
31.	**Ticketing & Fare Collection System** 3.4.1 Automatic Ticketing system and Fare collection system with components of Central Computer System (CCS), Smart Card (EMV based), Mobile Apps/ Mobile Application, Station Computer System (SCS), Ticket Office Machine (TOM), Ticket Vending Machine (TVM)/ Self- Service Ticketing KIOSKS with facility to generate pre-paid cards, Mobile Ticket Counter (MTC), Portable Processing unit (PPU) and Automatic Gate (AG) are considered adequate.	Noted.	Noted.
32.	**4. Headway** 4.1 Signalling Headway using the technical assumptions for 200 KMPH is (36 + 6.4 + 4 +6+2+ 7+40.5) = 102 seconds. Axle counter Track section of 1600 meters and 400 meters overlap is taken and the time for the first train of maximum length to traverse a standard track section and then to clear it is 36seconds (1600m+400m).		

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	4.2 With the above assumptions the maximum number of signalling paths per hour is then 3600 / 102 = 35.3 and the maximum operational capacity is 35.3 x 0.75 = 26.47 (26) paths per hour.		
	4.3 Installation of Axle Counters with the opening of corridor at Track detection at every 1600 mtrs, would add up to the maintenance efforts in many fold. By increasing the track section by 3 times and installing axle counter detection points at every 4.8 +0.4 KM in block section would change the variable of 36 seconds to 93.6 seconds giving signalling path of 3600/159.6 = 22.5 operational capacity by multiplying with 0.75 to about 17 paths per hour. The life of electronics equipment is 10 – 15 years and it may be considered that by the time maximum operational capacity of 26 paths per hour is required, this equipment will be due for replacement and that time track sections can be reduced as required. In the DPR it is not clear whether Axle counters recommended for track detection are with redundancy for each track section or not. If the proposal to have track section of 4.8+0.4 KM is considered, with the cost saving axle counters can be provided with redundancy to increase availability, as is being done on IR.	Noted. Axle counters have been planned with redundancy. The spacing of axle counter detection points will be finalised during the design finalisation stage.	Noted.
33.	**5. POWER SUPPLY ARRANGEMENT FOR SIGNALLING AND COMMUNICATION SYSTEM** 5.1 The power supply arrangements proposed in the DPR are adequately covered, however DG supply backup be extended to all Signalling and Communication installations concerned with train operation.	Noted. Provision for the reliable power supply two sources of AT supply, one source of local supply and UPS of at least 4 hours back up has been envisaged, DG set exclusively for signalling is not considered necessary. However, provision will be made for extending the station DG set supply to signalling also in emergency.	Noted.

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	5.2 Following are the power supply arrangement suggested in DPR: • To provide auxiliary supply to signalling equipment's in the wayside, a separate auxiliary transformer of single phase, 25kV / 230 V is to be provided and a 415/ 230V connection to be obtained from KSEBL, standby supply. • Diesel Generator Set A DG set of suitable capacity shall provide the back-up power to emergency & essential categories of loads. This shall include Signalling and Communication installations. • DG set supply shall be extended to essential Power Panel (EPP). • The power supply for track side equipment of signalling & communications system shall be required at every 7-8 km (Approx.) on the track side. Such equipment shall be radio system, Axle counter, Interlocking equipment, communication equipment, safety systems and power supply etc. • The power supply equipment shall be provided with redundancy of main equipment. • Air Conditioning System 24-hour air conditioning shall be provided to critical equipment rooms such as signalling, and telecommunications. • The following rooms of the stations and Depot will be generally air-conditioned ➢ Station Station Control Room, Ticket office Room, Excess fare Control Room, Signal & Communication maintenance Room, and UPS room ➢ Depot Operation Control Centre, All S&T equipment room		

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
34.	**6. Maintenance Infrastructure** 6.1 Engineering maintenance and 4 OHE depot are proposed in the DPR and later on in a para a depot for rolling stock and signal & communication is proposed that Rolling Stock and S&T maintenance workshop along with depot will be set up at Kollam to undertake maintenance of Rolling Stock as well as S&T. A sub depot at Kasaragod will also be set up.	Noted.	Noted.
	6.2 Multi skilling is the most adopted concept for efficient and economical maintenance and operation of a system. It is suggested that integrated depots of Engineering, Electrical, Signalling & Communication with common tools & plants, machinery, tower wagons and vehicles be established for all the disciplines.	Noted.	Noted.
35.	**7. Maintenance Plan** 7.1 Lot of suggestions have been given in the DPR regarding maintenance plan extract of which are given below: • Operation and Maintenance organization need to be set up. • The organization will consist of engineers, skilled staff and managerial personnel. Some unskilled staff will also be there for manual labour-intensive work. • The maintenance team shall be trained in multidisciplinary skills for all systems on section. • The maintenance of major systems may be in-house, and maintenance of minor systems may be outsourced. • Annual maintenance contract must be given for sophisticated sub systems like computer network, S&T equipment modules. • The work done by the private parties must be strictly monitored by the SilverLine staff. • The spare items of each subsystem as per OEM (Original equipment manufacturer) shall be provided at central	Noted Minor details will be worked out while preparing the detailed maintenance plan.	Noted.

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	maintenance store at each depot and local maintenance room on the section. • The maintenance team shall be equipped with fully spare equipment-like cards, modules of each system for regular maintenance. • The maintenance transport vehicle shall be provided to each maintenance team on section with maintenance tool kits. • Maintenance of different assets will be done on a preventive and proactive maintenance principle which includes direct maintenance. • The maintenance practices for the SilverLine must follow the best international practices, suitably modified for Indian local conditions and constraints of the SilverLine. • Timelines for Maintenance The time slot for the maintenance of mainline track, OHE, S&T equipment and other equipment in mainline is allocated during the night-time. • The maintenance shall be carried out as per the specified maintenance documentation. The preparation of the operation and maintenance manual and catalogues is the most important activity in the whole maintenance planning. • Maintenance Plan Details Computerized Maintenance Management Systems (MMS) have to be developed for the SilverLine. • The remote Maintenance Diagnosis System (MDS) shall be provided at OCC to allow the monitoring of essential wayside and subsystems equipment. Maintenance Diagnosis System is used to monitor Signalling and communication subsystems & equipment.		

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	• Record all events, alarms, and faults Record in real time at least all input data used by the interlocking, Signalling systems. • Record spare part material management to ensure easy availability. • Local Maintenance Diagnosis System (LMDS) for the Interlocking (IXL) and Axle counter are the independent system that supports and allows the maintenance personnel tasks in the local mode.		
36.	7.2 It is also mentioned in the DPR that the methodology of maintenance will very much depend on the item of equipment. The strategy will depend to a large extent on the maintenance needs specified by the supplier of the equipment that is purchased and the contractual terms of the purchase – whether maintenance by the supplier will be a part of the contract, what will be the free warranty replacement period etc. **Therefore, a detailed maintenance plan cannot be made at this stage. However, the key issues and the broad principles for maintenance can be decided and these are discussed in the following sections.** • Asset Management Plan - An Asset Management Plan for the Silver Line will be prepared. This is a plan to maintain, operate and upgrade if required, the physical assets of the Silver Line cost effectively. Assets are designed, constructed, inspected, maintained and replaced in accordance with these policies. Asset management plan is a systematic goal and performance-driven management and decision-making process of operating, maintaining and upgrading transportation assets cost effectively. This requires a high degree of computerization on the SilverLine where asset condition data will be continuously fed into the computer and reports generated will be available to all	Noted. DLP obligations will be part of the EPC contract. Maintenance schedules and practices for various equipment's will be developed on the basis of OEM's recommendation.	Noted.

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	maintenance staff. Computerized Maintenance Management Systems (MMS) are now available or can be developed for the SilverLine -------already available. Renewal of assets must be done after their economic life is over. The time of renewal will depend on the condition, the stated life of the asset as per the manufacturer, intensity of use etc. • Signal Maintenance Plan - These procedures have to be extended to cover all the Signalling & Train Control, Communication and Ticketing & Fare collection system sub-systems and other equipment etc. The routine inspection and maintenance as per schedule recommended by the original equipment manufacturer (OEM) will be carried out for the systems. • Maintenance requirement during design phase • Maintenance requirement during construction phase • Maintenance requirement during testing phase- Before opening the line, a number of tests are to be performed; in this respect, please refer to the requirements of the different specifications for interoperability contained in "Guidelines for homologation of high-speed lines" published by the UIC and the specific requirements of the contract. • Schedule of maintenance of system - The maintenance of system will consist of basically monitoring their functioning and taking corrective action whenever a fault is detected. The routine inspection and maintenance as per schedule recommended by the original equipment manufacturer (OEM) will be carried out of the systems. • Due to rapid advances in the development of electronic devices, the maximum life cycle of electronic components		

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	in signalling and communication systems is now 10- 15 years. • After the first 10 years or so there will be an increasing requirement like replacement and renewal as heavily used equipment falls out due to overhaul and replacement, to prevent deterioration in performance levels. The actual maintenance will be depending on the design of system manufacturer and maintenance team		
37.	7.3 Indian Railways is pioneer in Maintenance and operation modern technology equipments in all fields. Here except ETCS 2 and High speed point machines all the equipments of signalling and communications are being maintained since decades and practices have been well established. With the induction of new technologies and gradual reduction in manpower with increase work load, AMC is given for all the equipments like EI, GSM-R, OFC equipments and jointing, IPS, and Axle Counters etc. and even contracts are being given for additional labour requirements. With this maintenance of only field gears is left with available maintenance staff. • It is suggested that the codes and manuals of IR as applicable in this project be followed. • ii) Maintenance schedule of the IR be customised including the equipments to be installed in this project. • MIS for predictive maintenance of signalling system have been developed and are successfully working on North Central Railway since about 2/3 years with IOTs for measurements of field equipments parameters. MIS of Depot inventory system is also working; these can be considered for adoption here. • The tenders for signalling and communication may include maintenance of the complete system including AMC of the equipments for 10 to 15 years and their maintenance	Noted	Noted.

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	activities can be monitored through the MIS as mentioned above. This will obviate the need to go for AMC of individual equipments and dealing with many vendors. • Multi-disciplinary team may be for all disciplines to discharge the functions of maintenance and operation by the same agency. • Considering the outsourcing as suggested above, minimum Technical staff may be indicated for basic supervision and carrying out Testing, construction and maintenance activities. • vii) It has been mentioned in the report that Accesses to the different parts of the line shall be provided; they should be situated close to "significant points". But it has not been highlighted in report, this may be considered. • Yard lighting be provided adequately to facilitate night maintenance by all disciplines.		
1.9 OBSERVATION ON CHAPTER - 12 TICKETING AND FARE COLLECTION			
38.	There are rapidly changing technical developments in the field of ticketing. Although the report has proposed the latest state of art and contemporary practices with regard to ticketing and fare collection system however, it may have to be updated at the time of implementation of the project	Noted.	Noted.
1.10 OBSERVATION ON CHAPTER - 13 TRAIN OPERATION & MAINTENANCE PLAN AND SAFETY			
39.	Comments are as follows: • Train operation plan should be designed in a manner that weekly maintenance time slot is available during the day time because in case of ballasted tracks and deep cuttings, there are quite a few maintenance operations and	• Detail maintenance schedules will be covered in detail in the O & M program. • RS required for material trains etc will be worked out and will be provided in O & M manual	• Noted • Noted

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	inspections which are preferred to be done during the day, at least occasionally. • There appears to be some mismatch in the figures in the train operation plan, for example table 13–9 on page number 398, gives the number of daily trips in each Loop A,B and C as 37,20 and 18 respectively. This makes total 75 departures from Thiru Ananthapuram every day. As per train operation chart, these departures are taking place in less than 18 hours, implying that average departures per hour will be more than 4. Peak hour departures should be even more but the table says maximum departures 3 trains per hour. • The maintenance and safety plans are general in nature and do not capture the specific issues of relevance to this project. For example, it does not talk of inspection and maintenance of cuttings, tunnels bridges and viaducts. • Disaster management plan does not talk of the disaster management infrastructure such as Breakdown crane, Accident Relief and Medical Van etc. • Report is silent on the requirement of maintenance rolling stock like Ballast hoppers, material trains, shunting locos etc		
1.11 OBSERVATIONS ON CHAPTER - 14 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT			
40.	The environmental impact and social impact is according to the laid down guidelines. The required mitigation measures as stipulated in the as per statutory requirement or the requirement of the Bank/ Funding agency will have to be Incorporated in the cost estimates	Detailed comprehensive EIA study is proposed to be carried out and mitigation measures will be considered. The study will be in accordance with the requirements of funding agencies.	Noted.
1.12 OBSERVATIONS ON CHAPTER 15 DETAILED PROJECT COST ESTIMATES			

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
41.	Cost estimates have been prepared as per standard format. The review consultants have examined the project cost estimates in detail and also consulted several experts on each component. The first step of the cost estimation is to make a broad estimation by comparison with similar projects under implementation or recently implemented. The overall cost, which has been assessed including the cost of the land, utilities, right of way, rolling stock, taxes and duties and interest during construction (IDC) works out to 63,940 crores i.e. an average of 120 crores per kilometre. For the sake of proper comparison, if this project cost is compared with NCRTC's Delhi -Meerut corridor, it will appear to be on the lower side while it compares favourably with the Metro's under construction on viaducts or at grade. Review consultants are of the opinion that both these comparisons are not valid because Metro corridor or intercity regional rail corridors are fundamentally than high-speed mainline corridor. Proposed semi high speed corridor is predominantly at-grade, without CBTC, predominantly ballasted track, sharing right of way with Indian Railways and stations at average 50 kms interval. Stations are the cost centres in any urban transport system as in Metro Rail the stations are at every kilometre and in NCRTC stations are at every 8 to10 kms. The proposed Ahmedabad -Mumbai high speed corridor cannot be used for the purpose of comparison because cost benchmarking is yet to take place. In fact, DFCC corridors will provide more appropriate benchmarking. The per kilometre costs have been worked out which are as follows: • Overall cost including everything but excluding the cost of government land- 120 crores per kilometre. • Overall cost excluding land, ROW, IDC, consultancy charges but inclusive of everything else 63.44 crores per kilometre.		

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	• Overall cost also excluding rolling stock and taxes is 54.33 km per km. The nature of the project is such that it will compare more favourably with DFCC projects because It runs parallel to the Indian railway track sharing the right of way for substantial portion, the station yards are at 50 km on an average which is same as DFCC. The only variance could be that stations will be more elaborate but then DFCC Station yards are far more elaborate. However, Silver line project will have substantial costs because unlike DFCC, alignment has to pass through congested city's and some portions are 'cut & cover', tunnels and viaducts which will have additional costs as compared to DFCC projects. However, the mere contractual cost the DFCC for civil, electrical and S&T is less than 20 crores per kilometre on overall basis. *Therefore, the estimated cost of the project @ 54.33 crores per kilometer. excluding the cost of land, right of way, IDC, Consultancy, contingency and rolling stock, compares favorably with contemporary projects.* *However, there are certain cost elements which are underestimated and certain cost elements which are over estimated. On overall basis the positives and negatives cancel each other and the estimated project cost is considered reasonable.* The comments on the various cost components:		
42.	1. Land costs: Experts are of the opinion that the cost of land is underestimated. In all probability the project will be funded by bilateral or multilateral funding agencies, involving robust social impact assessment and mitigation measures, resulting in substantial compensation towards encroachers and settlers. The land prices are also likely to go up in the vicinity as a result of announcement of this project.	1.. Land cost Temporary land may be acquired for miscellaneous works limiting to the bare minimum. For this purpose, funds are kept in para 2.8.2 miscellaneous.	Noted

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	Consultants are also of the opinion that assessment of the quantum of land is on lower side and during implementation the requirement of land and structure acquisition may go up. There will also be need of temporary acquisition of land required for construction depots etc. If this responsibility is left on the contractors, the cost may go up. It is advisable that bare minimum land is acquired for this purpose which can subsequently be utilised for the property development to pay back at least the cost of acquisition. **It is noted that no land acquisition is considered for the tunnels while for construction depot and various ancillary facilities, some extra land will be required to be acquired at the tunnel faces.** **It is also noted that cost of government land has not been considered while calculating the project cost. Consultants are of the opinion that the cost of government land may also be worked out at this stage itself and may be treated as 'subordinate debt' from government of Kerala because non-inclusion of this cost in the project cost at this stage may create complications if at some point of time in future it is decided to privatise or monetise this project.**	Government land involved is poromboke land at approach of rivers, back waters. etc and if the Govt insists for payment, it will be adjusted against subordinate debt.	
43.	2. Cost of RO-RO facilities has been estimated at 675 crores plus cost of land, there are no detailed calculations done but appears to be on lower side.	2. RORO facilities are planned only at 4 stations and at 156 Cr/ each station is considered adequate. **SYSTRA comment** Cost has been worked out considering the cost of i) 12 nos. of locomotive ii) 240 nos. of flat wagons (6 trains) [pl. see 7.2 at chapter 15]	We still feel that cost estimation are on lower side. It is important to work out the additional cost of RORO operations with reasonable accuracy so that cost benefit analysis is possible to be done.

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
		iii) 4 stations to have wider platforms for side loading/unloading facilities.	
	3. Cost of underground station estimated at 200 crore is on lower side.	3. Only one floor / level is proposed out of the project funds and the balance upper floors are proposed for construction as a part commercial development. For only one level floor system, Rs 200 Cr excluding P way, tunnels. etc is considered adequate. **SYSTRA comment** Only one U/G station is planned at Kozhikode with 2 mainlines and 2 looplines, in the available Railway land at app. 36m depth. Except the bottom level required for train operations, further floors are planned to be constructed on PPP mode for commercial exploitation, since this city has large potential. For the above, Rs 200 cr provided in the cost estimate is reasonable when compared to Rs 187.5 cr provided in RRTS estimate for Delhi-Meerut	Noted
44.	4. Cost of machine: vide para 4.4 cost of machinery including rail grinding is on lower side.	4. Only essential track machines for routine maintenance is proposed and the total cost of 900 Cr towards the same is considered adequate. **SYSTRA comment** Towards the cost of machinery,	Total cost of Rs 900 Cr for the details of equipments given by SYSTRA is on the lower side. The rail grinding machine in itself will cost about 100 Cr. If there is breakdown crane as a part of accident relief train, then 100 Cr is gross under estimation. Since it is a mixed-traffic project, breakdown crane is absolute necessity.

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
		i) Track recording car, USFD rail testing car, Ril grinding machine, catenary installation car etc.- Rs 125 cr ii) Accident relief Train and other equipments- Rs 175 cr iii) Track machines & track maintenance including sidings- Rs 200 cr iv) Safety & rescue and relief in tunnels and viaducts, including tunnel ventilation- Rs 135 cr v) Automatic River water level monitoring system, rain fall monitoring system and wind speed monitoring system- Rs 25 cr vi) Small track machine and satellite depots- Rs 80 cr vii) Continuous Track monitoring by Fibre technology- Rs 20 cr Sub Total Rs 900 cr is provided Based on market enquiry and data available in other DPR, Rs 900 cr is considered reasonable.	
45.	5. Contingency of 3% is on lower side.	5. Noted. Only the standard Prescribed percentage as per Railway Board's circular is adopted as for PMC . **SYSTRA comment** Agreed to Design at 2% of project cost ____ PMC at 4% are as per the standards/morms being followed in Railways & other infrastructure projects	Whenever a project is planned where no previous benchmark is available, higher contingency needs to be provided. Standard stipulation of engineering code will not serve the purpose. Contingency has no relation with design and general consultancy.
46.	6. Design and PMC charges appear to be on higher side. 7. Table 15–4	7. Table I5 .4 • Noted.	Noted.

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
	• Para 1.3.2 and Para 1.3.3- the construction methodology may be left to the designer and maybe different than what is prescribed in these paras but the cost estimates are okay. • In the table 15.4- there is a mismatch between the various columns i.e. Rate, Units and Quantity for some items. para 1.7.6 -cost of ROB modifications is on lower side	• Since corrected and updated in row version of DPR. • After detailed rate analysis only, the cost of ROB modification has been worked out. **SYSTRA comment** Table 15-4 • Accepted • Noted & is being corrected in 4 lines in the new version of DPR • Para 1.7.6 An innovative method of modifying the existing ROB by inserting precast RC box using heavy duty cranes as per the schematic plan at Fig 8-17 of DPR (Page 8-481) and by cutting open and resloping of existing roads have been suggested. For this system with mass production of 39 nos of RC box, Rs. 1.31 cr/each is considered reasonable.	
47.	8. The cost of elevated stations is on substantially lower side.	8. For each elevated station, Rs 73 Cr / each is provided and is reasonable for 4 platform lines. **SYSTRA comment** Cost of elevated station is app Rs. 85 cr/each (Para 3.2) which is much reasonable compared to Rs. 53.3 cr/each provided in the RRTS estimate.	Agreed to.

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
48.	9. Para 3.4 -cost of depot machinery taken as 125 crores appears to be on lower side.	9. Noted and after re study has been considered reasonable. **SYSTRA comment** Cost of depot machinery is taken as Rs. 170 cr (Para 4.2) (and not Rs. 125 cr) which is considered reasonable	Agreed to.
49.	10. Para 3.5- the cost of accident relief and other equipment is on lower side, if we include the requirement of heavy Rail mounted breakdown Crane for freight operation. For only emu type operation cost is okay.	10. Noted. **SYSTRA comment** Noted.	Agreed to.
50.	11. The cost of the ballasted track and the ballast-less track are slightly on the lower side keeping in view the requirements of high speed i.e. double elastic fastening and noise & vibration mitigation measures.	11. Cost of BLT is Rs.9.4 Cr / Km and is reasonable. **SYSTRA comment** Noted. 11. After rechecking the cost is considered reasonable. **SYSTRA comment** DPR provides for Rs. 5.81 cr/km towards the cost of ballasted track and Rs. 9.20 cr/km towards BLT, which is considered reasonable when compared with Rs. 3.58 cr and Rs 9.4 cr/km provided in RRTS estimate.	Noted.
51.	12. The number of points and crossing is not given, only Lumpsum cost is given as 150 crores. It is not possible to comment unless the total number of points and crossings are tabulated.	**SYSTRA comment** 12. Number of P&C required (Tentative) are as under: 1 IN 18 on PSC layout – 147 nos 1 IN 9 on PSC layout – 238 nos TOTAL 385 Nos	Noted.

Sl. No.	Observations from RITES	Reply from K-RAIL	Final Observation from RITES
52.	13 Cost of viaducts has been taken as it one uniform average cost while the cost of viaducts in paddy fields will be substantially lower than the viaduct on the median of road.	13. Towards the cost of viaduct, separate rates for 4 different heights have been adopted. **SYSTRA comment** Cost of viaduct is taken for 4 different heights - upto 8m, 10m, 15m & 20m (pl. see 2.2.1 to 2.2.4 of DPR) ranging from Rs 33.5 cr to Rs 50 cr.	Noted.
53.	14. While calculating the track costs, the main line is given in RKM i.e. route kilometres but loop lines should have been given in TKM (track kilometre). In the tabulation the loop lines also are given in RKM, therefore, it is not possible to comment on the reasonableness of cost.	14. Noted. The standard practice of RKM and TKm has been followed. **SYSTRA comment** Noted.	Noted.
1.13 CHAPTER 18 PROJECT IMPLEMENTATION PROGRAM AND SCHEDULE			
54.	The comments are as follows: • Civil works- 33 months is in adequate. • The implementation schedule shows the completion of 'station and area development' before the completion of linear project. This is not practicable. as in reality stations are the last item to get commissioned. • 3 It is indicated that construction materials and ballast of appropriate quality is not available in the state of Kerala and will have to be imported from Karnataka and Tamil Nadu. This puts project implementation under considerable risk because the construction materials and ballast is sensitive to environmental issues of local regulation. It is opined that effort should be made to develop the availability of construction materials locally or adopt innovative designs to reduce the requirement of imports.	The 3 observations are noted for guidance.	Noted