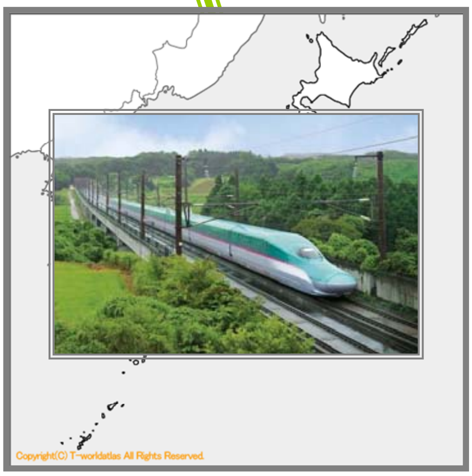
Review on Operations and Maintenance Report of California High-Speed Train

California High-Speed Train Project

November 2010

East meets West

East Japan Railway Company's knowledge meets the needs of CHSRA in West coast



CALIFORNIA High-Speed Rail Authority

JR-EAST EAST JAPAN RAILWAY COMPANY

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1. Introduction

Under the leadership of the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), specialists of JR East reviewed the documents on the concepts and procedures of operations and maintenance of the California High Speed Rail project, based on the Memorandum concerning Cooperation in the field of High-Speed Rail Transportation between MLIT and the High Speed Rail Authority of the California Government on September 28, 2005 for the purpose of sharing information related to the high-speed rail transportation systems.

1.1 Outline of Review

Specialists of different fields engaged in the planning and management of Shinkansen system operations and maintenance were assigned and reviewed the entire project documents. This report summarizes the reviewers' questions and notes on the document contents.

Regarding the numeric contents of the project, the specialists made calculations by using the planning techniques and tools of JR East under the conditions defined in the provided project documents and evaluated the results by comparing with the service plan of the project.

Reviewer's impression for the documents is as follows:
1. Essential prerequisites for O&M planning are not fully defined.
2. Integrity of O&M plan has room for improvement in order to achieve practicability.

1.2 Reference Documents

The five documents below were reviewed. The reference document numbers from [1] to [5] are used hereinafter.

[1] Operations and Maintenance Peer Review: Introductory Material (October 1, 2010)
[2] Technical Memorandum: Phase 1 Service Plan: TM 4.2 (November 22, 2008)
[3] Technical Memorandum: High-Speed Train Service Plan - Full Build Network with Links to Sacramento and San Diego (December 1, 2009)
[4] Technical Memorandum: Terminal and Heavy Maintenance Facility Guidelines: TM 5.1 (August 25, 2009)

[5] Technical Memorandum: Summary Description of Requirements and Guidelines for: Heavy Maintenance Facility (HMF), Terminal Layup/Storage & Maintenance Facilities & Right-of-Way Maintenance Facilities: TM5.3 (August 25, 2009)

1.3 Contents Description

Chapter 2 and later describe the following contents:

Service Plan

For accurate high-density transport service as scheduled in a timetable, it is necessary to elaborate various factors in advance and develop a train schedule reflecting the contents of study. The points of consideration and the reasons are described.

Passenger Station Operation

To operate trains as is designed in the Service Plan, it is important to ensure smooth passenger boarding and alighting and train cleaning during the turnover. What to be considered for the purpose are mainly described.

Rolling Stock Storage and Maintenance

When planning facilities and train crew for rolling stock inspection, it is very important to consider the inspection cycle and contents. Concerns about the project documents are noted.

Maintenance of Way

The draft plan was compared and collated with JR East case.

Train Dispatching and Control

The Operations Control Center is an important division to support recovery from a disaster or abnormality. Therefore, what to be considered are explained on the basis of JR East case.

Operational Assumptions

[1] Nine items on page 33 were viewed and assessed.

Questions and Issues

[1] Twenty-nine items on pages 34 to 40 were answered.

2. Comments and Proposals on California High-Speed Train Project

In accordance with the configuration mentioned in 1.3, this section gives the reviewer's comments.

2.1 Service Plan

2.1.1 Demand Estimation to Set the Number of Trains

2.1.1.1 Determination of OD

All plans start from this estimation. At JR East, transportation demand after the new line opening is predicted by "New Network Model" which is developed by ourselves based on Four-Step Forecasting Procedure or making conjectures from the past experiences. Since the past data indicates gradual growth of demand for new lines, it is necessary to make prediction by looking 5 to 10 years ahead. Actually, it is preferable to make assumptions by rough classification into weekdays, holidays, and seasonal on/off-peak. The estimation method of the potential traffic volume is also important since the new line openings will produce new transportation demand in travel, business, and private purposes.

[Corresponding section]
[2] P.11: Phase 1 Service Plan - Table 8

2.1.1.2 Ridership Peaking Factors

Hourly OD ridership is derived by multiplying the estimated daily OD with hourly peaking factors. Whether the peaking factor describes that of average weekday or seasonal peak should be specified, and directional peaking factor should also be considered.

At JR East, peak factor is 8.3% for the single hour of morning peak and 2.7% for the midnight. The morning peak is greater but shorter than the evening peak. The evening peak factor is smaller but longer than the morning peak.

Since OD allocation by hours was unknown from the project documents, we recommend to specify the peak factor that sums up to 100% from 05:00 to 24:00.

[1] P.4: The operation…

[1] P.6: Full Build Network…
[2] P.11: Table 9
[3] P.31: Table A5.2

2.1.1.3 Transportation Capacity Planning

The hourly OD ridership is converted into traffic volume between stations. The number of trains is determined based on the ridership of the section where the traffic volume is the greatest.

JR East policy is to enable all passengers to be seated even during the peak hours since the competing aircraft provides seats to all passengers. During the seasonal peak period and/or regional peaks due to some events, special trains are planned to serve the increased passengers.

2.1.2 Train Timetable Development

Train timetable is developed based on the number of trains derived above. This process is very important since the number of fleets and crew are determined by the timetable. In addition, a prototype for the future train schedules should also be derived from this timetable.

A train schedule is created by mainly considering the following items:

- Rolling stock performance/specification
- Network structure
- Track layout (station/curve/tunnel/grade)
- Safety equipments (Signal/Train Protection System)
- Yard operation
- Rolling stock operations
- Maintenance Hours
- Patternized train schedule

For the improvement of user convenience, the following is important:

- Direct operation between each station pair
- Setting an express train appropriately
  - Determining stop stations
  - Maintain certain frequency to compete with the airline

Other recommendations are described in below.

2.1.2.1 Important Aspects to Develop a Feasible High Density Train Schedule

Detailed planning at the design stage is crucial for a high-density train schedule that operates as is planned in the timetable. The essential aspects that should be taken into account to plan the feasible train timetable include follows:

- Signaling and Safety Equipment
- Track layout at the terminal station and rail arrangement
- Block length
- Power facilities

At least seven other aspects should be also considered.

If a 5-minute head is necessary, the layover time needs to be shorter or the terminal station should have additional tracks. To realize a 5-minute headway patternized train timetable, 25 minutes or less turnover time at the teriminal station is required. In addition, track layout at the terminal station should be considered in particular. To enable 5 minutes headway with 25 minutes turnover time, we need a station of three platforms and six tracks or two platforms and four tracks with two storage/lay-up tracks that the trains could enter smoothly at certain speed. Since such stations as S.F.-Transbay may be shared with the existing lines, the combination of train schedule and track layout at terminals should be studied deliberately.

[Corresponding section]

[1] P.18: Train Layover Times at Terminal "1.Revenue to …"

It might be better to consider conducting the cleaning at a storage/lay-up track, which a train could enter in the same direction after unloading passengers instead of switching back to enter the depots. Avoid level junction to the storage/lay-up tracks so that the other train schedules will not be disturbed.

[Corresponding section]

[1] P.5: Table 5

[2] P.5: Table 2

2.1.2.2 Accurate Service by Train Schedule of Frequent Overtakes

It is necessary at the stage of planning to set a robust train schedule that will not be disturbed by small delays, such as planning trains with sufficient schedule pad running at certain intervals and times. In addition, well-planned timetable and well-trained crew will enable the stable operation. Dispatchers' capability as well as reliable operation management system supports the operational recovery whenever the operation trouble occurs.

2.1.2.3 Recovery Time (Schedule Pad)

In general, the recovery time depends on the trains - long for some trains and short for others. However, CHSRA's assumption (3.5% of the running time for most of the trains and 1% for limited expresses) is challenging since the recovery time will absorb fluctuating dwelling time at stations. We believe that the proposed dwelling time is insufficient. The recovery time should be at least 3% or more even for limited expresses. For stable operation, approximately 5% is preferable for recovery time ratio especially in the early stages to enable stable operation.

In JR East, crews are required to recover the delay as far as they operate within the speed limit and maintain safety.

[Corresponding section]

[1] P.11: Table3 Note:

[1] P.14: "The Express…"

[2] P.4 3: Assumptions and general principles "3. Train running.."

[3] P.5 3: Assumptions and general principles "3. Train running.."

2.1.2.4 Three-Minute Headway Capability

A three-minute interval is possible enough and seems to have no problem. However, whenever an operational disruption occurs, route conflict at the terminal station will make it difficult for trains to depart on time thus difficult to maintain the planned three minute headway. In addition, aforementioned system described in 2.2.2.1 is expected, such as high-level safety equipments.

[Corresponding section]

[1] P.29: "The hypothetical…"

[2] P.43: Assumptions and general principles "6. The minimum.."

2.1.2.5 Impact of Overtake at Intermediate Station on Headway and Transport Capacity

Regarding the installation of a side track at the station, if a turnout is installed on appropriate location that enables the train could operate at a speed low enough to enter and stop at a platform, an overtaking station can be efficiently used without redundant space. However, we recommend planning as many overtaking stations as possible. Considering the scale of California High-Speed Railway, all stations other than Norwalk should be designed to allow overtaking at Phase 1 planning. When there are insufficient overtaking stations with many train type with different stopping patterns running under a substantially high density timetable, insufficient overtaking stations will affect transport capacity and fragile timetable that is affected by small delay. At JR East, one express train on Tohoku Shinkansen line have 2 to 5 overtakes from Tokyo to Shin-Aomori (about 455miles）.

For JR East Shinkansen system, stations where the express trains and limited express trains stop have the overtaking line. Stations that only all-stop trains stop and thus the train frequency is low do not have the overtaking line. Furthermore, at the overtaking station, the time interval between the stopping train and the passing train is 3 minutes, and the time interval for the stopping train to depart after the passing train is 2 minutes.

2.1.2.6 Mixed Service with Other Rail Carriers

Based on JR East's experience of operating conventional train and Shinkansen train on the same track, following three aspects should be carefully considered.

First, the timetable should be carefully planned. The shared operation segment is likely to be the bottleneck of the high speed train timetable since delay in the conventional line will affect the entire high speed trains network. Therefore, if transport capacity is required, 'parallel' timetable (that is, High Speed Train and conventional train operate at the same speed) or increase the capacity of the commuter trains and reduce the frequency will be the solution. To establish a more flexible timetable, additional facilities will be required both in high speed train and the conventional lines. For example, siding tracks are required in stations in this segment, commuter train vehicles with good acceleration should be implemented, speed restrictions on curves should be reduced, more signals should be allocated, etc.

Second, rolling stock should be taken account. If the High Speed Train vehicle width is different from that of conventional trains, platforms must be trimmed, and/or boarding steps must be installed either on the high speed train or on the commuter train. These boarding steps may exceed the loading gauge at some areas, so they should be stowed away while the train is running. The difference in height of the doors of the rolling stock should also be taken into consideration.

Finally, compatibility of Automatic Train Control system for high speed train and conventional train should be considered. Since the safety equipment is indispensable for either train, multiple safety equipments must be installed on the rolling stock, and radio communication system must also be shared. These must be switched at the border station. Preventing malfunction both on the wayside and on-board is also important.

2.1.2.7 Yard Track Layout at San Francisco Station

To ensure robust and flexible operation around San Francisco station, several measurements should be taken into consideration: install flying junction to avoid route conflict (at level junction), shorten the turnover time to utilize platform as much as possible, enable every platform to accommodate high-speed trains, etc. JR East operates 4 minute headway at Tokyo Station that has only 4 tracks and 2 platforms.

2.1.2.8 Maintenance Hours and Customer Demand at Midnight

It is necessary to separate train operation time and maintenance work time to ensure safety. To conduct sufficient maintenance and security check prior to operation, it is not favorable to operate trains between 00:00 to 05:00. Therefore, trains should be left overnight on relief tracks at stations and minimizing deadheading to the rolling stock centers wherever possible to give top priority to maintenance. However, we believe the maintenance time of 0 - 5 o'clock is tight considering the distance between the maintenance yards of 50 miles is similar to that of JR East, since our maintenance time is 0-6 o'clock.

2.1.3 Rolling Stock Operations Plan

2.1.3.1 Rolling Stock Storage Place

The arrangement of storage facilities should be considered so that the deadheading distance and other factors will not affect profitability adversely. Some storage track is basically necessary near a loop terminal for turning not merely because land acquisition is limited. Without such a track, a train schedule meeting the passenger demand cannot be created.

2.1.3.2 Train Schedule and Working Hours Early in the Morning and Late at Night

If a train to run throughout a line is set early in the morning or late at night, its departure time at the first station must be early. Therefore, it is reasonable to set a train starting from or terminating at Merced or Bakersfield. Similar cases could be observed in JR East HSR system. To secure the maximum maintenance time, the train schedule should be devised by making trains not cover the total lines but stop before a rolling center early in the morning or late at night. Depending on the case, it may be considered to suspend early or late train runs for track maintenance work.

2.1.3.3 Dwelling Time and Turning Time at Terminal

Dwelling time at intermediate stations of 1.25 minutes and 1.50 minutes might be sufficient, but efforts to encourage smooth boarding and disembarking is expected, and adequate recovery time is required.

Furthermore, shorter turnover time is better. Specifically, turnover time must be shortened to 25 minutes; otherwise 5 minute interval operation during Peak hours will be difficult. Thorough KAIZEN activities should be conducted on the train operation and sales. It may also be necessary to guide the passengers to the platform quickly by using electric bulletin boards and announcements so that they can wait in front of each door of the car.

2.1.3.4 Planning of Two-trainsets for Peak Hours

It is necessary to consider two trainsets/single trainset operation according to demands, however coupling/de-coupling should be conducted at limited stations because coupling/de-coupling requires special signals, facilities and staff, and takes time. For example, when coupling the car, the approaching trainsets must "Stop" in front of the other trainsets, needs to be "Guided" to proximity of other train and then "Coupled." The procedure takes time other than preparing for departure. Furthermore, if coupling/de-coupling is conducted at terminal stations, then the platform is occuplied during the procedure and thus it would be better to be done at the rolling stock center at stations with relatively less trains (such as Merced).

2.1.3.5 Turning Time at Terminal

Keeping a train for 15 minutes is possible enough. To save time, cleaning staff should wait on a platform at the train arrival, enter the train and start cleaning immediately after all the passengers alighted from the car (not waiting till the platform becomes free of passengers).

2.1.3.6 Rolling Stock Spare

It is better for estimation of necessary fleet spares to accumulate categorized demands rather than to roughly multiply by a coefficient, since investment to rolling stock has large impact on the cost of railroad business.

Spare estimation should be based on three kinds of fleet spares: inspection spares, demand fluctuation spares, and accident spares. Inspection spares are necessary for the periodic inspection of rolling stock. Demand fluctuation spares are prepared for setting seasonal trains or chartered trains for groups. Accident spares are necessary for the troubleshooting of rolling stock. The spare ratio cannot be estimated uniformly as 10% but should be determined by consolidating three spare categories.

It is recommended that the rail carrier should carefully review the idea in order to decide the number of demand fluctuation spares, which depends on the characteristics of demands in each operational area.

It is necessary to calculate the number of inspection spares by considering fleet mileage, inspection cycle, and duration of inspection. Estimation of inspection spares is indispensable because long-term inspection like Level 3 or 4 makes a fleet accommodated at TSMF or HFM even during transportation peaks.

Spare ratios in the U.S. can be referred to define the number of accident spares, but it is significant to choose accident spare ratio under the conditions similar to those of CHSTP. For example of repairs included in the inspection Level 5, HSR rolling stock in JR East is rarely damaged because it runs on a long section of dedicated tracks. It requires confirmation but HSR trains that run mostly on non-dedicated tracks are said to often suffer from damage requiring repairs at a maintenance facility.

It is recommended the estimation based on aggregation of three category spares. In addition, we think that the spare ratio should be in the range between 10% and 15% for the smooth operations of California High-Speed Railway. It seems very risky to apply the spare ratio in an environment of low transportation density as it is because irregular events can be absorbed in such environment. We have long history in realizing high-density and punctual operation, which is close to the CHSTP planning.

[Corresponding section]

[1] P.21: "The allowance of 10 percent spares is the mid range of spare ratios for U.S. and intercity and high-speed rail fleets. A lower spare ratio could be justifiable if aggressive preventive maintenance program is adopted, …"

[1] P.26: "26. Spare ratio of 10 percent - …"

[2] P.19: "All sixty five train set consists are forecasted to be in active revenue during both the morning and afternoon peak periods."

[3] P.20: "All 107 train set consists are projected to be in active revenue during both the morning and afternoon peak periods."

2.1.4 Planning of Train Crew

Train crew should be planned on the basis of the Labor Act and agreements by considering the procedures and items below.

2.1.4.1 Number of Train Crew

The number of a crew presented in the project documents seemed appropriate.

At JR East, the crew size is calculated as follows:

After the transport planning is somewhat established, the number of staff is calculated by finding the average duty time, considering the number of trains and working hours. Additionally, the number of workplaces (crew depots) and distribution of crews are derived from the rolling stock centers' location and the number of rolling stocks at each center. After deriving the number of staff at work per day, the number of staffs considering stand-by and vacation is calculated. It is important to keep in mind to secure time for the regular staff training, as well as keeping the staff to pull-out/move the vehicle from/to the rolling stock centers. The same idea basically applies to staff for sales on trains.

If no ticket carriers are required at stations but conductors issue and check tickets, more crews will be necessary.

[Corresponding section]

[1] P.29: Table 11

2.1.4.2 Crew for Train Entry and Leave

At JR East, conductor is not always necessary for train that enters and/or leaves from a rolling stock center if safety equipments are installed. At JR East, no conductors are on trains that are deadheading or entering a maintenance depot.

[Corresponding section]

[1] P.28: "Typical yard…"

2.1.4.3 Organization at Train Crew Office

The organization of a train crew office with about 300 staff will be as follows:

3 office administrators, 20 managers, 15 instructors (operators and conductors), 10 clerks

In particular, the role of the Instructor is the key factor for the safe, reliable, and comfortable HSR service.

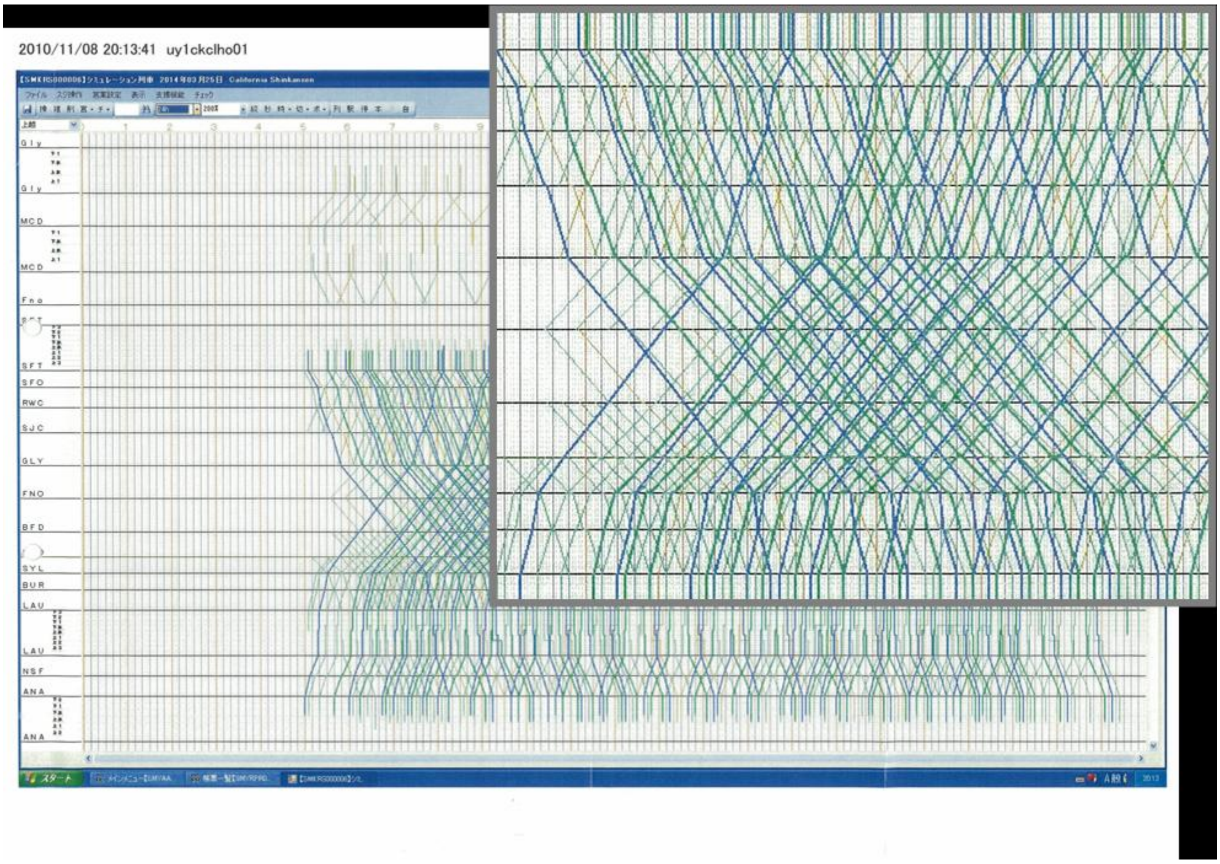

Fig.1 Trial train schedule by simulation

2.2 Passenger Station Operation

2.2.1. Design of Passenger Boarding and Alighting at Station

When passengers board a train at a station, they do not tend to gather at doorways because a train has many doors, unlike an airplane. However, smooth boarding and alighting are necessary. Since the dwell time is set short, the time required for passenger boarding and alighting is an important factor that determines whether trains can run on time, especially during the peak hours. In addition, to shorten the dwelling time is easier than shortening the running time.

Passengers' corporation for smooth boarding and alighting is also necessary. To enhance passengers' corporation, installation of sufficient guidance equipment is recommended. In addition, passengers who are not used to travel on trains tend to be slow in boarding and alighting, thus announcement and instructions prior to boarding and alighting are also necessary. For the boarding and alighting of disabled passengers, it is better to offer support by train staff or security guards.

In addition to the above measures, JR East rolling stock has car doors close to passenger room doors to reduce the boarding and alighting time by smooth access to coach.

Planning the ticket inspection at the single location such as gate at the concourse just before the boarding time is not realistic for the HSR system which expects about 1,000 passengers boarding at once. Passengers should be allowed to wait on the platform at least before the train arrives. Since passenger guidance is very important, guiding facilities (departure timetables and boarding platform signs as is described in Fig.2) should be installed. At the stations of JR East, ticket gates allow only passengers with valid Shinkansen boarding tickets to enter the Shinkansen platform.

There are no platforms that are only for departure preparation or servicing in the Shinkansen station.

[Corresponding section]

[1] PP.16-17: "Passenger Boarding"

Fig.2 Case of passenger guidance at station

2.2.2. Rolling Stock Cleaning Program

Cleanliness inside railcars will relate closely to customer satisfaction. The quality level of cleaning should be worth customers' fare payment.

The project documents define "Normal cleaning" to be performed about once a day. This is the same as cleaning by JR East. However, JR East also performs high-level "General Cleaning" about once a month to keep inside the rolling stock clean.

Since this depends on the requested level of service quality, it is important to clarify assumed quality criteria first. Then rails carriers using rolling stock aged 10 years or longer are investigated about their work statuses and rolling conditions. This is one of the methodologies to determine a policy.

[Corresponding section]

[1] P.17: "Normal (Lay-up) Cleaning" "Soft (Pick-up) Cleaning"

2.2.3. Cleaning Staff at Station

"16 of 31 members" is within a rational range of calculation because it is an intermediate value between major urban and regional stations of JR East.

For the cleaning time requested in CHSTP's plan, however, the number of a staff is slightly less because the cleaning time is rather close to that at major urban stations of JR East (cleaning time: 7 minutes at major urban stations and 40 to 60 minutes at regional stations).

According to the comparison of actual situations between major urban and regional stations of JR East, there is no simple relationship of inverse proportion between cleaning time and the number of a staff. At a station of high transportation frequency and short cleaning time, the number of a staff is great for the volume of work because many people cope with work in a short time.

In addition, you should keep in mind that adequate training is necessary for efficient work since the cleaning staffs at major urban stations work very efficiently. JR East and subsidiary companies have made long-range effort to achieve highly efficient cleaning work at a Tokyo terminal.

[Corresponding section]

[1] P.20: "Table 4 (1) (2)"

2.2.4. Placement of Dispatch Office

JR East has also dispatch offices for maintenance at terminals and junctions of transportation networks. Basically, they are placed at important stations near each TSMF.

The actual work by dispatched staff is mainly to replace lighting instruments, repair seats, and maintain toilets and pipes. The dispatch offices are directly contributing to the maintenance of reasonable service levels for the charges. JR East positions the dispatch offices as an important function because they maintain equipment not used frequently but directly related to train service to ensure safe and stable transportation.

It is often important to move a faulty train to a repairing site out of the main track for succeeding trains rather than to restore it on the spot. Since different inspection and repairing abilities from ones requiring time are expected under high-density runs, inspector training and education are very important.

The usual fault notification route is "train crew → command → dispatch office." For the monitoring of subsequent action as required, an IT system is implemented and assigned to information control between related sections. JR East also has a system to send inspectors and materials from the dispatch offices for abnormalities of some levels. A network needs a batch control system with an operation command and HMF site at the center.

[Corresponding section]

[1] P.18: "… minor equipment repairs that can be accomplished during the layover period will be addressed."

[1] P.40: "28. … these unplanned events can and do occur … consideration is being given to defining the number of a staff and how best to locate them around the system in order to

respond to these events in an expedient manner and maintain the highest levels of on time performance."

2.3 Rolling Stock Storage and Maintenance

2.3.1. Placement of Rolling Stock at TSMF (Terminal Storage/Layup and Maintenance Facility)

The management style in JR East is to allocate fleets to each TSMF, which is in charge of Level 3 inspection in the CHSTP plan. While it is important to leave flexibility so that inspection can be made other than at TSMF of rolling stock placement, determining TSMF of rolling stock placement has an advantage.

The fleet allocation to TSMF can make facility planning clear and easy. This also leads to the perfect management of train operations, inspection records, and inspection period limitation because responsibilities are clarified. Additionally, creating a system of sharing information within the whole transportation network can promote sense of responsibility for non-assigned trains at every maintenance facility.

This may depend on the great difference between freight and passenger trains. While freight trains run in all directions throughout the country or even outside the country in some cases, passenger trains run repeatedly in limited directions within predetermined line sections. Our endorsement for passenger HST is to make train set routing flexible but to make responsibility of fleet management clear, which is based on JR East experiences.

[Corresponding section]

[3] P.18: "The HST fleet will not be captive to a particular service territory or storage and maintenance facility. Train schedulers will be able to route individual train sets to particular overnight and mid-day yard locations, "

2.3.2. Placement of TSMF

Although land acquisition is restricted, the idea of "creating a storage track as close to a terminal as possible to prevent a deadheading loss" is theoretically correct.

As to an actual draft plan, the HMF construction position between Merced and Bakersfield seems to be unclear and fluctuate depending on the place of description. If Merced is the site of HMF construction, the definition of "the center of the entire network" in CHSTP documents cannot be satisfied.

There is no problem if "Merced" describe in Table 8 is TSMF different from HMF (Heavy Maintenance Facility). Otherwise, the construction of a storage site near Downtown Merced should be considered at Phase 1. Since other TSMF's can cover Level 2-5 inspection, one at Merced should have capability to cover just Level 1 inspection and train storage.

[Corresponding section]

[1] P.35: "6. Storage yard facilities generally will not be located immediately adjacent to the

terminal stations, …"
[1] P.22: "Train Storage and Maintenance Facilities"
[1] P.23: "Table 8"
[1] P.24: "Terminal Storage Maintenance Facilities are required for the terminus stations or end points of the system at San Francisco, Los Angeles, Anaheim, and Merced for Phase 1 …"
[1] P.25: "Estimated spatial requirements"
[2] P.17: "Overnight storage of these three train sets is assumed to be provided at the planned maintenance facility near Merced."
[3] Drawing TM5.1-A

2.3.3. Layout of Storage Facility

Since every TSMF is expected to keep certain ratio of 400 meter train sets at both Phase 1 and Full Build, it is better to unify TSMF designs to one based on storage of 400 meter sets although land acquisition is limited.

First, if a 400-meter train must be uncoupled, brake testing at train formation and yard shunting will make operation efficiency remarkably lower. This is one reason to recommend adopting the design of all 400m long tracks.

Second, there is an advantage of making it possible to cope with any change if all the TSMF tracks are 400m long. The ratio of 200 meter train sets and 400 meter train sets at each TSMF may differ from the initial estimate in accordance with a population change along the lines and/or changes of the service plan required in the future.

JR East has already experienced demerits of utilizing tracks that needs uncoupling at some TSMF's. The merit cannot be found in the other design like 400 meter and 200 meter combination or 200 meter unification.

[Corresponding section]

[1] P.23: "Table 8"
[2] P.18-19: "Table 11" "Table 12"
[2] P.17: "Train storage yards can be configured in several different ways. … Or, yards could comprise a combination of 400m and 200m long tracks. "
[3] P.20: Same as above
[3] P.20: "Table 9" "Table 10"
[3] Drawing TM5.1-A/B/C/D/E/F/G

2.3.4. Rolling Stock Maintenance Program

Further analysis of advantages and disadvantages seems necessary for this part because equipment maintenance program is very crucial to almost all the other planning part about rolling stock storage and maintenance. In particular, running gear inspection is the safety core for high-speed railway service and requires careful check and study. If a fatal accident or a critical incident happens, it shall be required to stop HST service entirely, making great impact on HSR business.

The adoption grounds of TGV maintenance system are not clear in the CHSTP documents. No technical comparison with other country systems like ICE system is stated, in addition.

It is important to clarify the contents and cycles of inspection on the main components of running gear - bogie frame, wheel, axle, bearing, and driving device. The estimation of running gear maintenance is indispensable to plan the capacity of facilities and the number of a staff, because it requires more staffing than other maintenance work does.

Bogie inspection for Shinkansen seems to attract attention as large-scale work in appearance because a bogie is taken into the shop together with the body at the time of *bogie inspection*. However, we strongly recommend confirming actual inspection cycle for bearing, wheel axle, and other running gear components.

The inspection cycle of running gears cannot be different widely among the maintenance systems in other countries though brief appearance of the system differs. The CHSTP documents say "Level 3: replacement of bogies if necessary" , but the replacement shall be necessary before 8 or 9 years for Level 4 inspection. Rolling stock maintenance system for TGV seems classified by device more in detail than the system for Shinkansen. If inspections of Levels 1 to 4 are noted only from the viewpoint of the car body maintenance, the actual inspection system may be misunderstood.

As long as the number of a staff and the scale of facilities in CHSTP documents are concerned, there seems scarce advantage in adopting a system other than “aggressive preventive maintenance”.

Both in-house and outsourced maintenance work should be considered for the further analysis. The percentage of inspection inside own facilities is great in the case of JR East. The management should make judgment by considering costs and MOT strategy about rolling stock maintenance. If outsourced, the examination should be indispensable for O&M planning about spare preparation of wheelsets and/or bogies, and logistics of the exchanged ones between TSMF and maintenance places outside TSMF

As prerequisites for the planning of rolling stock maintenance facilities and staffs, the contents and cycle of inspection should be clarified in more detail about main devices. Running gear maintenance becomes a very essential part for HSR business because it is impossible to recover the business after the worst case scenario occurs.

[Corresponding section]

[1] P.23: "Rolling stock maintenance program"

[3] P.19: "A lower spare ratio could be justifiable if an aggressive preventative maintenance program is adopted, which invests in the facilities spare parts inventories and labor force needed to progressively replace train set components on a regular schedule before component failure occurs or life expectancy is reached."
[4] P.32: "5.1. Facility Types and Functions"
[5] P.1: "2.0 Summary - Concept of Rolling Stock Maintenance Program"

2.3.5. TSMF Capacity of Level 2 Inspection

TSMF capacity seems sufficient for Level 2 inspection. However, shift work should be considered for planning at Full Build.

If the cycle of Level 2 inspection is assumed as two days and the spare ratio of 10% and the number of 200 meter train sets in the plan is reflected, Level 2 inspection becomes necessary to be executed for 43 train sets per day at Phase 1 and 96 train sets per day at Full Build in the entire network.

In the Full Build plan, at least 94 train sets are drawn out to TSMF in the daytime. Therefore, almost all train sets can be inspected during mid-day train storage. In the Phase 1 plan, however, 27 train sets are drawn out to TSMF in the daytime and the remaining 40% must be inspected at night. This affects the number of a staff and the requirements of night facilities.

[Corresponding section]
[2] P.19: "Table 12"
[3] P.21: "Table 10"
[4] P.32-34: "5.1 Facility Types and Functions"
[5] P.1: "2.0 Summary - Concept of Rolling Stock Maintenance Program"

2.3.6. TSFM Capacity of Light Level 3 Inspection at Phase 1

TSMF capacity seems sufficient for Level 3 inspection at Phase 1.

"Light" Level 3 inspection that requires no bogie/wheelset replacement, corresponding to "*monthly inspection*" in JR East with some inspection items, is assumed here. The inspection cycle is set to the shortest among 30, 45, 60, and 90 days and the annual number of working days is set to 249. Also, actual losses in rolling stock operations are taken into account under these conditions.

Inspection capacity of six 200 meter train sets per day in total is enough for two sites. This endorses the plan for five inspection tracks for Level 3 each at LA and San Francisco, which equals to the capacity of five train sets per day multiplied by two TSMF's. The plan sets the capacity of three TSMF's, however. HMF needs not be used at this phase because of an equipment transportation loss between Bakersfield and Merced.

[Corresponding section]

[1] P.22: "The terminals in San Diego, Anaheim and Sacramento will be limited to overnight layup facilities. One periodic inspection facility is located in northern California (San Francisco), one in southern California (Los Angeles), …"

[2] P.17: "Revenue Train sets"

[4] P.32-34: "5.1 Facility Types and Functions"

[5] P.1: "2.0 Summary - Concept of Rolling Stock Maintenance Program"

[3] Drawing TM5.1-C/G

2.3.7. TSMF Capacity of Light Level 3 Inspection at Full Build

TSMF capacity seems sufficient for Level 3 inspection at Full Build.

Under the same conditions described in 2.3.6. with the number of fleet requirements at Full Build, the necessary capacity for Light Level 3 inspection becomes twelve 200 meter train sets per day in total. This endorses the plan for facilities capable of coping with daily demand of eighteen train sets in total, since the plan has five inspection tracks at LA, five at San Francisco, three at Bakersfield-Merced, and five at San Diego.

The above trial calculation is based on the assumption that the annual number of working days should be 249. If the number of working days is increased by adopting a shift work system, the number of inspection tracks can be reduced. It is a matter of trade-off between staff employment and facility investment, therefore either one needs to be selected by cost-profit calculation.

[Corresponding section]

[1] P.22: "The terminals in San Diego, Anaheim and Sacramento will be limited to overnight layup facilities. One periodic inspection facility is located in northern California (San Francisco), one in southern California (Los Angeles), "

[1] P.22: "Table 7"

[4] P.32-34: "5.1 Facility Types and Functions"

[5] P.1: "2.0 Summary - Concept of Rolling Stock Maintenance Program"

[3] Drawing TM5.1-A/C/F/G

2.3.8. TSMF Equipment for Level 2 Inspection

The particular equipment such as roof-top stands and inspection pits should be added to consideration.

The number and installation locations of roof inspection decks should be studied, while the CHSTP materials do not state at present. Electric railcars need to have its pantographs and other roof equipment be checked by Level 2 and 3 inspections at a TSMF. It makes a roof inspection deck necessary. Considering the daily mileage mentioned in the documents, the replacement of pantograph contact slip may be necessary every one or two months. This cycle is just rough estimation because it depends on the actual conditions of catenaries on the line.

A pit structure is preferable for inspection of undercarriage and drainage of toilet sewage at the standpoint of working efficiency. Though the same tracks are drawn for inspections of Levels 1 and 2 on the drawings in the materials, it is necessary to distinguish tracks designed for each inspection level. Pits must be prepared for Level 2. On the contrary, drainage equipment should be prepared at all storage tracks for inspections of Levels 1 and 2, which will reduce train shunting and enhance working efficiency.

JR East often lays tracks at height on the level ground where undercarriage comes to the eye height of maintenance staff for the purpose of inspection pits. Mezzanine "service decks" are prepared for inspection and cleaning inside and outside cars, as mentioned at the part of HMF facilities in the CHSTP documents. It should be noted that wide space becomes necessary between tracks in this case.

JR East Shinkansen facilities for higher-level inspections than Level 2 are prepared indoors by considering working efficiency and the influences of rain and snow. Meanwhile, cleaning and inspecting pantographs for non-HSR rail cars may be done outdoors in JR East.

The CHSTP documents say "If possible, it had better be prepare a passage for special repairs using such large equipment as a forklift." At least one track for temporary repairs should be prepared at each major TSMF. Minor failures should be remedied quickly at TSFM whereas the train encountered a serious accident needs to be deadheaded to HMF for large-scale repairs.

In addition, though the rolling stock storage has draw-out tracks on both sides in the drawings of TSFM's at LA/Anaheim, San Francisco, and San Diego, the advantage of constructing draw-out tracks on both sides is not obvious in terms of function. TSMF of JR East has draw-out tracks only on one side and the tracks have dead ends.

As described above, necessary facilities should be discussed after defining the contents of Level 2 inspection.

[Corresponding section]

[3] Drawing TM5.1-B/C/F/G

[4] P.34: "Level 1, 2 & 3 Facilities"

[4] P.35: "Level 1, 2 and 3 Inspection and Maintenance Tracks"

2.3.9. Wheel Re-profiling Facilities

Wheel re-profiling is very significant to HST operation because of the prevention of derailment and conservation of riding comfort. Since often re-profiling capacity can be overflowed and introduction of a wheel-tread cutting machine is quite investment, cautious planning is recommended.

If the average wheel re-profiling cycle is assumed to be 200,000 km on the JR East operational bases and the train mileage stated in the CHSTP materials is used, wheel re-profiling demand at Phase 1 becomes eight cars per day. The re-profiling facilities at two TSMF's has enough capacity whereas the facilities at three sites have four cars per day in total. The capacity is based on the assumption that the facilities should be operated for 365 days a year. If the facilities are operated for 249 days a year, all the facilities at three sites will have to work almost fully.

If the re-profiling demand at Full Build is calculated in the same way, the demand is fourteen train sets per day in total. The total capacity of the re-profiling facilities at the four sites, above three plus San Diego, will be appropriate for this demand. If the annual number of operating days is changed from 365 to 249, the work will overflow.

All the facilities should be tandem lathes because aforementioned calculation is based on the ability of four cars per day at one site. The calculation is based on the data of both single-axis and tandem wheel re-profiling facilities in JR East.

When installing re-profiling facilities, the length of back and forth draw-out tracks should be noticeable. For re-profiling without changing the formation of a set, sufficient space before and after the re-profiling machine is necessary for the rest railcars of a trainset under re-profiling. If such space cannot be secured, cars must be uncoupled or coupled for re-profiling. This may affect the daily re-profiling capacity.

[Corresponding section]

[2] P.10: "Table 7"

[3] P.16: "Table 6"

[3] Drawing TM5.1-B/C/F/G

[4] P.34: "Level 1, 2 & 3 Facilities"

[5] P.1: "2.0 Summary - Concept of Rolling Stock Maintenance Program"

2.3.10. Level 3 Inspection Items and Facilities

As mentioned in 2.3.4. mainly on running gears, Level 3 inspection in the CHSTP materials covers a much wider range of maintenance works than inspections of JR East system. The inspection items should be defined more precisely. However, we show rough analysis on practical assumptions like below

As "Light Level 3 inspection" we described in 2.3.6. and 2.3.7., it is necessary for facility capacity planning to estimate the volume of work by defining Level 3 inspection separately into "Light Level 3 inspection" and "Heavy Level 3 inspection". For "Light Level 3 inspection", which corresponds to *Monthly Inspection* in JR East, a train set is inspected as is without car body lifting. For "Heavy Level 3 inspection", bogies and/or wheelsets are replaced (or whole cars are taken into HMF as in JR East). Heavy Level 3 inspection will be needed in approximately one year, no matter which country of a HSR system be adopted.

According to the average train mileage written in the materials and 600,000 km of JR East standard as benchmark hereby, Heavy Level 3 inspection cycle will be about 10 to 13 months.

Under the assumption of one-year inspection cycle of high Level 3 and a spare ratio of 10%, the inspection demand will be 105 train sets (as 200 meter train sets) per year at Phase 1. There are two inspection tracks capable of lifting car bodies each at TSMF's in LA and San Francisco. One track at each TSMF can be used always for Heavy Level 3 inspection to exchange bogies and/or wheelsets. Such track should be equipped with bogie and/or wheelset interchange devices or jacks to lift all the cars of a train set simultaneously. If the inspection time is assumed to be two days and the annual number of working days to be 249, the total capacity at two sites becomes 249 train sets per year. If the assumed conditions are correct, one site will be enough.

Under the same conditions at Full Build, the demand is 236 train sets per year and the total capacity at three TSMF's, above two and San Diego, 373 train sets per year. If the assumed conditions are correct, the capacity of two TSMF's will be sufficient for the demand.

Regarding Heavy Level 3 inspection, there seems no choice in the current draft plan but to transport bogies and/or wheelsets from a TSMF to HTMF when in-house maintenance are selected. Efficiency should be well considered for the bogie/wheelset transportation.

Under the conditions described above, maintenance work becomes necessary for 3,360 wheelsets per year at Phase 1. (This is based on the adoption of non-articulated bogie design.) The area of the planned HMF bogie shop will not be enough, when compared with 4,000 wheelsets annually into JR East HMF.

[Corresponding section]

[3] Drawing TM5.1-A/C/F/G

[4] P.32-34: "5.1 Facility Types and Functions"

[5] P.1: "2.0 Summary - Concept of Rolling Stock Maintenance Program"

[4] P.34: "Level 1, 2 & 3 Facilities"

[4] P.41: "In addition, the bogey shop should accommodate bogies that may be undergoing repair and inspection for additional train-sets not yet assigned for this cycle in the heavy maintenance facility, but were 'changed out' in one of the two periodic inspection facilities and ship to the HMF for overhaul."

2.3.11. HMF Equipment for Level 4 and 5 Inspection

HMF capacity seems sufficient but some assumption should be more explicit for planning.

The size of shops and their arrangement become insufficient under rough estimation as shown below.

Three concepts are proposed about input of newly-manufactured rolling stock. Concept 1 is impractical because it necessitates wide space at first and also has a problem about inspection plan. At the usual opening of a new line in JR East, a certain quantity of rolling stock is simultaneously put into service and it will make inspections and overhauls come almost at the same timing in the future. Low-level inspections with a short period duration can be absorbed by vehicle schedulers' devises. Level 4 inspection with a long period duration, however, will exceed the HMF capacity if many inspections become necessary at the same time. JR East often levels the shop-in timings for adjustment. As the usage of average value of annual inspection demands is described in the CHSRA documents, a mileage loss between inspections due to leveling should be considered.

The CHSRA documents discuss Level 4 inspection as "at least the capacity of inspecting 15 train sets per year at the inspection cycle of 8 or 9 years is necessary." This approximately corresponds to 94 train sets (200-meter train sets) at Phase 1. Meanwhile, if assumed that the number of train sets is 212 and the inspection cycle is 8 years at Full Build, the annual demand will be 30 train sets, which is doubled to the demand at Phase 1, requiring HMF capacity of two times.

When maintenance work of running gears is not outsourced but done all inside HMF, "Truck/Wheel Shop" of HMF, which stated to be 5,000m^2 in the plan, is obviously small. Regarding the reference TGV/KTX system, the prerequisites had better be checked again, such as outsourcing ratio, inspection cycle of each running gear component, and so on.

The percentage of inspection at *Bogie Shop* is approximately equal between *General Inspection* and *Bogie Inspection* in JR East HMF. On the contrary, the ratio of working on bogies and/or wheelsets removed and sent from TSMF's becomes larger under the draft plan. In this case it seems better to construct a bogie shop not beside an inspection track as stated in the draft plan but separately within HMF because of the necessary shop capacity and the shop-in/out efficiency.

"Support Shops" of HMF stated to be 7,000m^2 in the plan is also small as the workshops for various parts. It is recommended to check prerequisites well, such as the degree of outsourcing. While JR East uses the second floor for HMF, the draft plan says the second floor will be used as a command room. The restriction in vertical site use of site should be noticed for planning.

In the CHSRA plan, inspection tracks of HMF are arranged in parallel with shops in between. This arrangement is very inefficient because a car body must be moved to the yard after each process ends. Since traffic control for movement generates wait time at each process, the number of shop-in days may be affected. If the current plan is adopted, at least car body movement should be briefly studied and reflected in the facility planning of intersections at interchange tracks.

It is necessary to attach temporary bogies to car bodies for movement or to lift car bodies by crane for transverse movement. The former method will affect efficiency in similar manners described in the previous paragraph. The latter method will limit the running speed to move the car, thus inspection time will be affected. The latter method has disadvantages of not only long preparation for lifting but also of ceiling height limit, which will influence construction costs. JR East uses the former method of temporary bogie attachment. To avoid a movement loss, we try to minimize the distance of movement by using traversers and/or constructing facility buildings to facilitate in series.

It is basically not very preferable in terms of working efficiency that the shops in HMF are arranged in parallel with an inspection track in between. This is because not only the aforementioned problem of car body movement but also the logistics of removed parts and components must be considered. When there is a train on an adjacent inspection track, parts and/or components have to be detoured in great distance.

[Corresponding section]

[4] P.39-40: "Storage Requirements"

[4] P.40-41: "Capacity of Maintenance Building"

[3] Drawing TM5.1-A

[1] P.26: "Operations Control Center"

[5] P.2: "Operations Control Center"

2.3.12. HMF Equipment for Rolling Stock Decommissioning

Facilities for decommissioning rolling stock are different from ones for their maintenance. It should be studied in detail although this is a matter of rather far future with uncertainty.

JR East often uses outside parties but makes them to disassemble vehicles inside HMF or TSMF. Since wide room is necessary beside tracks for placing materials and heavy-duty machines, decommissioning and retirement for equipment should be considered at facility design if the function is to be discussed.

[Corresponding section]

[1] P.25: "The HMF would also be used for decommissioning ore retirement from the system to make way for the next generation of rolling stock."

[5] P.2: "3.0 Commissioning of Rolling Stock"

2.3.13. Staffing for Rolling Stock Maintenance

In general, the number of a staff for rolling stock inspection seems greater, compared with those in other divisions.

The number of a staff for "Heavy Maintenance (Level 4&5)" is not greatly different from the result number of trial calculation this time. However, the number of a staff for "Car Inspectors/Cleaners (Level 1&2)" and "Inspection (Level 3)" is very different. We assume some conditions not clarified in the project documents.

[Corresponding section]

[1] P.26: "Table 9"

2.3.14. Description about Shinkansen

The document says "Pre-departure inspection will be made every two days. Actually frequency of the inspection depends on the train set usage, mileage, and condition." Unless there is no due reason such as a natural disaster, this inspection must be made every 48 after the start of run.

Although the document says "In addition, wheels on the train set are re-profiled during inspection.", this description is wrong. The typical re-profiling cycle is 200,000 to 300,000 km (depending on the car type) and re-profiling is planned apart from regular inspection. In addition, the tread of each wheel is inspected at regular inspection.

The document says "There are no mandatory walking brake tests required at the terminal stations." When a train is turned at a station, brake function is checked by using a monitor screen in the cab. In addition, the train crew checks the brake function at *pre-departure inspection* that corresponds to Level 1 inspection in the CHSTP documents.

The document says “Since the Japanese implemented the system with multiple power units with an electrically commanded braking system developed in the early stage of railroad's development, they are not suitable for frequent coupling and uncoupling." This is wrong, nevertheless. The coupling and uncoupling function was not necessary for Tokaido Shinkansen in the early stage because of non-fluctuated demand. There is no direct technical relationship between the adoption of electrical command brake and EMU, and the performance of coupling. Mini-Shinkansen trains continue being coupled and uncoupled repeatedly a day since 1992.

[Corresponding section]

[4] P.17: "Pre-Departure Inspection … Actually frequency of the inspection depends on the train set usage, mileage, and condition."

[4] P.17: "Fundamental Inspection … In addition, wheels on the train set are re-profiled during this inspection."

[4] P.18: "Brake Test There are no mandatory walking brake tests required at the terminal stations. Since the Japanese implemented the system with multiple power units with an electrically commanded braking system developed in the early stage of the railroad’s

development, they are not suitable for frequent coupling and uncoupling."

2.4 Maintenance of Way

The Shinkansen operating distance of JR East is about 659 miles. The number of a staff for maintaining ground facilities is about 800(450 for civil engineering and track facilities, 350 for electrical facilities). The staff is mainly in charge of facility management, inspection, work planning, and temporary repairs. Actual maintenance work is commissioned to outside parties.

The ground facilities are divided into civil engineering facilities, tracks, signals and communication facilities, and electrical facilities for separate management. The following system, as Track Maintenance Technology Center, Civil Engineering Technology Center, Signals & Communication Technology Center, and Electrical Technology Center are placed every 60 to 70 miles of business line for the maintenance of ground facilities.

Regarding 500 miles of the first phase between Anaheim and Los Angeles, the appropriate number of a staff is considered basically 634 and not more than 761. In Japan, we use facilities reducing maintenance costs, such as Slab tracks and SCADA for remote monitoring, maintain our facilities by 800 employees.

[Corresponding section]

[1] P.25: "Maintenance of Way"
[4] P.45: "5.2.7. Right of Way Maintenance"
[5] P.2: "4.0. Right-of-Way Maintenance"

2.5 Train Dispatching and Control

Operation Control Center (OCC) is crucial for safe and reliable transportation service and thus careful consideration is required to plan the OCC facilities.

OCC may be placed anywhere as far as command/direct and equipment remote control/supervision function properly between top administrator/OCC General Manager (HQ), dispatchers, operator, field staff, etc. However, the OCC facility buildings require backup power supplies and strict security control.

In addition, the following aspects should be taken into consideration:

- Logistical support easily available in case of large accident/trouble or natural disaster
- No failure in case of lightning or earthquake
- Sufficient space for machinery room (power supply, signals and communication, and air conditioning
- Space for future extension

At JR East, OCC is typically installed in the branch office building or on its neighboring building so that the branch office staff could support the OCC dispatchers in case of large transportation troubles or natural disaster. This is due to the job cycles of dispatchers – the transportation planning staffs at the branch office usually experience the dispatchers at JR East.

At JR East, route control is centralized at OCC, since route control at a station requires much time for schedule adjustment. Route control at the station has another disadvantage of high communication costs because close communications increase significantly between stations and between station and OCC.

[Corresponding section]

[1] P.26: "A provision for a train operation control has been assumed …"

[5] P.2: "5.0 Operations Control Center"

2.6 Operational Assumptions

Please see attached Appendix 1

2.7 Questions and Issues

Please see attached Appendix 2

3. Conclusion

In this Peer Review documents, following aspects are introduced.

- Operation is the key factor that affects the service quality.
- Infrastructure planning affects Service Plan thus should be planned in details.
- Planning in details is indispensable to achieve the service level as expected
- It is necessary to plan and create a 'robust' timetable that will not be affected by small problems

California High Speed Rail Project is a challenging project, since the potential passengers are one of the most experienced passengers who already know the convenient/luxury transportation services of the other modes. In addition, the project requires demanding specifications to maintain the competitive edge of CHST, such as terminal station in the densely populated center of the city and mixed operation with the existing conventional lines.
We believe that the detailed operation plan by skilled and experienced operator is indispensable to lead such competitive project to a success, thus JR East did our best within the limited time to review the CHSRA's Operational Plan.
However, we believe that more efforts should be taken to achieve the service quality as planned. JR East is a ‘unique’ operator that offers various and flexible Shinkansen services based on passengers' demand, in addition to contributing the safety record of zero fatalities since 1964 with the proven reliability of average delay per train is less than one minute. We believe that we contribute to the success of California High Speed Rail project and are more than happy to play the important role.

Appendix 1 Comment for Operational Assumptions

1. ***The HST system is assumed to operate on dedicated tracks, independent of any other passenger or freight rail services, except in the following locations:***
   a. ***Peninsula Corridor – approach tracks leading to the two terminals at Transbay and 4th and King Streets (shared between CHST and Caltrain commuter trains)***
   b. ***LOSSAN Corridor – between the south side of Los Angeles Union Station and Anaheim (shared by CHST, Amtrak intercity corridor trains and Metrolink commuter trains)***

   Basically, no other transportation is superior to that on dedicated tracks, but its combination with existing tracks is possible and there are case samples also in Japan.

   But, in the case, mainly there are 3 matters in the co-operation system.

   Primarily there is a problem with diagram. This section has a high possibility to be a bottleneck in entire diagram setting for high-speed trains so that measures to increase transport capacity should be considered, such as parallel diagram (to schedule in accordance with the slowest train) or raising capacity and/or decreasing frequency of commuter train services. To arrange a diagram with little restriction, measures become necessary to deal with the existing track as well as with the high-speed train. For example, the following actions are necessary: specializing the station structure in the section allowing train passing; introducing commuter train with good acceleration; reducing curve limits; and/or installing more signals.

   The second concern relates to train cars. When a train car has a different width from conventional train car, platforms need to be cut, or boarding steps may be required for high-speed or commuter train cars. Such boarding step may exceed a limitation of the train car in other section so that a function is needed to confirm that the step is stored while running. Attention needs to be paid also to the difference in the door height of the train cars.

   The third concern relates to safety installations. In order to install safety system in individual section, a train car has to be equipped with multiple safety installations and a common radio. These devices require to be switched over on a boundary. In addition, consideration is needed to prevent such devices from malfunctioning both on the ground and on the train.

   Comments on the corridors a and b are listed below:

   a. Peninsula Carridor

   A six-track terminal with three island platforms is required in a terminal station for placing dedicated tracks on the assumption of 5-minute headway service during peak period and allocation of 25 minutes totally to one train for pendulum operation. If San Francisco-Transbay shares track with Caltrain, it is necessary to allocate four-track with two island platforms to CHSR and two-track with an island platform to Caltrain, and arrange two tracks in the back of the terminal. The platform where CHSR stops is better to be designated in consideration of level crossing in terminal station for departure and arrival, the works for pendulum operation (train cleaning, water feeding, food service re-stocking and others), and facilities and preparations for such works.

   b. LOSSAN Corridor

   It would be possible, but the upper issues should be considered.

   Our company has experiences in operating Shinkansen and existing tracks with using the same rail track as well as a variety of know-how including abovementioned ones.

2. ***Train sets are assumed to comprise units of 200 meters (m) in length, either singly (200 m train with 500 passengers) or operating as pairs (400 m train with 1,000 passengers).***

It is preferable for train sets to be capable of splitting/merging to flexibly respond to the complex network, fluctuation in demand and efficient equipment inspection at maintenance facilities. Therefore, the assumption herein is a good measure. According to the specifications for Shinkansen train cars, 80 passenger seats (four line arrangement) per car can realize. Such arrangement involves toilets and boarding decks, which suggests that it is possible to easily assign a nominal accommodation capacity of 500 passengers by forming a train set of 8 train cars with total 200 meters in length. As this formation includes some room of a little less than 2 cars, there is no problem in planning to include a restaurant car and/or additional luggage spaces.

3. ***The schedule features "clock face" service patterns and regular intervals between trains (headways), which can be easily remembered and is markedly customer friendly.***

   We agree with your assumption herein and it is preferable to arrange diagram with regular pattern. It provides not only an appeal to the customers, but also facilitation for the enterprise to rearrange operation in its traffic control.

4. ***The schedule features service patterns that repeat every hour, as opposed to patterns that differ somewhat from hour-to-hour providing for more simplified operations – this makes the service more regular and predictable and reduces the number of different types of overtakes required.***

   We agree with your assumption herein and it is preferable to arrange diagram with regular pattern. Another benefit is to facilitate rearrangement in case of time lag.

5. ***Express trains are given the highest priority in terms of their schedule paths; limited stop trains and those that travel a longer distance along the network have the next highest priority, and all-stop local trains generally have the lowest priority and, therefore, the highest incidence of overtakes.***

   We agree with your assumption and it is preferable to give the arrival speed of express train the highest priority also from a competitive strategy point of view with aircraft. All-stop local train should expect frequent overtakes by necessity; therefore facilities and plans are vital for these overtakes. For the user using station where only local trains stop, we may plan to give a fair accommodation as a special delivery service up to his/her destination such as providing a convenience in making connections with express train.

6. ***The service plan assumes that all mainline junctions where branches of the HST network join together (e.g., the junctions south of Merced, in the Redondo Junction vicinity south of Los Angeles Union Station, and at the approach to the two San Francisco terminals) are fully grade separated, avoiding the need for head-on opposing train movements at the junctions.***

   In regards to passenger service, a guide becomes complicated since the first class locations and passenger car numbers are reversed and there are other influences. As for train car maintenance, for example, facilities for water feeding and inspection may need on both sides of the car. In order to avoid such influences, the service between San Francisco and Merced needs to be operated with limited formation, switching car cabs halfway of the route, or transfer by passengers.

7. ***Both the Phase 1 and Full-Build Service Plans address projected conditions on a typical busy weekday in the year 2035. Estimated passenger loads were calculated for a peak day (busier than average month and busier than average day of the week, at approximately the 90th percentile level). Explicit service plans for weekends and holidays were not prepared.***

Though valuation of the relative merits in OD estimation method is difficult, our company primarily estimates weekday average demand. The number to operate is determined by calculating the sectional traffic and setting an occupancy rate to a certain constant value, according to the estimation result, where the constant value was obtained from data analysis of the past occupancy rates to provide almost all passengers with seating service even with seasonal fluctuation.

8. ***Equipment cycles - Trains arriving at a terminal station are assumed to lay over at the platform for a certain period of time, for passenger alighting train servicing/inspection and passenger boarding, then depart in the opposite direction as the next available departing revenue train. This analysis generally adhered to the minimum terminal layover times presented in Table 2. In certain cases, shorter layover times were assumed in order to keep the number of trainsets to a reasonable minimum and to avoid inordinately long layovers, which would occupy terminal station or yard tracks for extended periods of time. Except during the late evening time period, train sets are generally available at the San Francisco and Anaheim terminals to provide "protection" for short connections from potentially delayed trains. These additional equipment sets would be culled from the 400 meter local and limited trains operating during the morning peak period that continue during the mid-day period as 200 meter trains. The train turns at the endpoint terminals are balanced during the mid-day and late evening off-peak hours. During the peaks, additional directional service is offered, so a relatively small number of trains are designated for mid-day yard storage in lieu of making a revenue turn.***

   Our company reserves an average of one spare train set for immediate business operation all day long at its terminal stations.

9. ***Daily equipment utilization – Most trainsets are able to make 3-4 (single, one-way) trips between the Bay area and Los Angeles basin over the course of a service day. Selected trains (one per hour each way) operate to and from Merced. At Merced, these trains then turn for the next available train operating towards the alternate terminal (i.e., a San Francisco-Merced train will lay over at Merced and turn for a Merced-Anaheim train).***

   This is not favorable since an event described in item 6 above is generated, but operation seems to be possible by the deployment of facilities to cover a trouble in changing directions, and/or guiding devices.

Appendix 2 Questions and issues

1. ***Density of train service and variety of stopping patterns – The CHST operating and service plans are based on a high level of utilization of the two-track high-speed rail line. The high volume of trains is required based on estimated ridership demand, along with the customer service objective of operating a robust mix of express, limited-stop and multi-stop trains to serve point-to-point ridership demand in the most effective manner. Creating a train schedule and operating procedures that allow reliable day-to-day operation of a dense high-speed rail line is a challenge. The current planning assumptions, cited below, will be tested by means of detailed computer*** *simulations:*

   a. Nominal capacity of 12 trains per hour per direction (based on uniform stopping patterns and operations at a nominal practical headway of five minutes)

   b. Peak operations at up to 10 trains per hour per direction, with variable stopping patterns, and with some express or non-stop trains overtaking stopping trains at intermediate stations

   It is possible to secure the frequency that is envisioned. In order to realize a high density timetable into operation, detailed planning at the design stage is crucial. For example, below points must be taken into consideration at the design stage.

   * Signal (safety equipment)

   * Track layout at terminal station (track structure)

   * Block length

   * Electric facility

   There are 7 other aspects that should be taken into consideration. Among them, track layout at the terminal station must be given special attention. To realize a 'patternized' timetable with 5 minute headway and 25 minute turnaround time, a 6 track terminal with 3 platform or a 4 track terminal with 2 platform and 2 layover tracks in the back will be necessary. Close examination of the track layout and timetable at the terminal station should be considered, especially those where the tracks might be shared with conventional lines such as San Francisco Transbay Station.

2. ***The operating and service plans for Phase 1 and the Full Build network provide for a mix of various types of train service and a variety of station stopping patterns:***

   Express service

   Limited-stop service

   All-stop service (with up to two scheduled overtakes per train between San Jose and Los Angeles)

   The density of train service, particularly during the weekday morning and afternoon peak periods, will require the express trains to pass (or "overtake") the all-stop trains and some limited-stop trains as they make station stops en route. Similarly, some limited-stop trains will need to overtake the all-stop trains. These overtakes will need to be carefully scheduled – and operated with discipline and precision by the train dispatchers, train crews and station personnel – in order for the required density of overall service to be delivered and high reliability performance to be maintained.

   It is necessary to plan and create a 'robust' timetable that will not be affected by small problems (a timetable that can recover the delay). For example, a timetable with enough interval between trains and/or timetable with sufficient schedule pad would be desirable. In addition, perfectly planned timetable and well trained crew will enable the stable operation. Dispatchers' capability as well as reliable operation management system supports the operational recovery whenever the operation trouble occurs.

3. ***Schedule recovery time or pad – Train running times were obtained from computer-simulated train performance calculations, with an additional time factor added to these times. This added time, sometimes referred to as "schedule pad" or "recovery time" accounts for operator performance, external conditions and minor delays, which result in minimal day-to-day fluctuations in train performance – the additional time factor assumed in this analysis is common in passenger train scheduling, permits trains to recover from time lost due to minor causes, and provides an allowance for the system to maintain a high degree of overall on-time performance when operations are normal. The additional time factored into this service plan assumes a recovery time of three and one-half percent for most trains. However, certain "premium" services, such as express trains during peak periods were assumed to operate with a recovery time allowance of as little as one percent.***

   In general, the recovery time ratio depends on the trains, but CHSRA assumption seems too tight for us(1% for rapid type and 3.5% for most trains). At JR East, recovery time ratio is higher since it is expected to absorb the fluctuation of station dwelling time. The dwelling time set by CHSRA is so short - 1.25 or 1.5 minutes thus higher recovery time is recommended - at least 3% for a rapid type, and 5% would be better in the early stages to enable stable operation.

   In JR East, crews are required to recover the delay as far as they operate within the established speed limit and maintain safety.

4. ***Practical headways for train scheduling purposes – The minimum spacing between trains following each other past a given point (commonly referred to as headway or frequency of service) was assumed to be three minutes for the development of the Operations and Service Plans. These practical headways actually will vary, depending upon whether trains are stopping or operating non-stop, the maximum line speed through intermediate station locations, whether or not overtaking occurs at intermediate stations, and the design attributes of the signal and train control system.***

   3 minute headway is very much possible. However, whenever an operational disruption occurs, route conflict at the terminal station will make it difficult for trains to depart on time thus difficult to maintain the planned headway. Additionally, sophisticated safety device and systems listed in Question 1 are required.

5. ***Train overtakes are arranged to utilize station (siding) tracks for express trains to pass local trains making a station stop, while maintaining consistency and reliability in the service stopping patterns. The siding tracks are assumed to be sufficiently long to enable diverging and merging movements from and to the mainline tracks to be made at high speed, with the bulk of deceleration and acceleration for stopping trains occurring on the sidings and not on the mainline tracks. This allows for relatively close spacing of trains approaching overtake locations, reduces delays associated with overtakes, and maximizes overall system capacity and train scheduling flexibility. More work is needed to define the practical upstream and downstream headways for overtake operations at stations. These practical headways are assumed to vary, depending upon the maximum line speed at the station. More information on the location, frequency, capacity impacts and other characteristics of overtaking operations on international high-speed rail systems would be valued.***

   As a pre-condition to setting up relief side track at the stations as in the question, a turnout that is passable with the speed that is slow enough to be able to stop once entering the platform should be set at the crossing between the main track and the side track. By this, space can be saved and at the same time, overtake space can be secured that will lead to efficient use of time. Additionally, there should be as much space as possible to wait for the train to pass.

For the California High Speed Train Phase1 network, all stations except the terminal stations and Norwalk station should have overtake(siding) lines. When there are insufficient overtaking stations with many train type with different stopping patterns running under a substantially high density timetable, insufficient overtaking stations will affect transport capacity and fragile timetable that is affected by small delay. At JR East, one express train on Tohoku Shinkansen line have 3 to 5 overtakes from Tokyo to Hachinohe (395miles）.

For JR East Shinkansen system, stations where the express trains and limited express trains stop have the overtaking line. Stations that only all-stop trains stop and thus the train frequency is low do not have the overtaking line. Furthermore, at the overtaking station, the time interval between the stopping train and the passing train is 3 minutes, and the time interval for the stopping train to depart after the passing train is 2 minutes.

6. ***Storage yard facilities generally will not be located immediately adjacent to the terminal stations, due to property availability constraints. Reliable operations will be easier to maintain if these storage and maintenance facilities can be located in proximity to the terminal stations, thereby minimizing the quantity of deadhead train-miles that must be operated over the main line tracks. Future operations analyses and computer simulations will be developed to measure the extent to which deadhead train movements are required, or can be permitted, over the main line to reach storage yard facilities – for various yard location alternatives.***

It is as stated to consider the arrangement for storage facilities in order to avoid any effect on profit due to deadhead distance, etc.,. There may be limitations with land acquisition, however there should be some kind of storage tracks near terminal stations where turnaroud will be done. If that is not possible, there is a disadvantage that it will be impossible to create a timetable that meets passenger needs.

7. ***Overall viability of shared operations – What are the requirements for a successful operation with shared use of tracks by both high-speed trains and commuter trains? What are the equipment compatibility requirements (trainset performance including maximum speed, acceleration and braking, and car dimensions including door/platform height)? Also, what issues exist with respect to shared operations with electrified high-speed rail equipment and commuter or conventional intercity passenger trains hauled by diesel locomotives?***

Based on JR East's rich experience of operating conventional train and Shinkansen train on the same track, following three aspects should be carefully considered.

First, the timetable should be carefully planned. The shared operation segment is likely to be the bottleneck of the high speed train timetable since delay in the conventional line will affect the entire high speed trains network. Therefore, if transport capacity is required, 'parallel' timetable (that is, High Speed Train and conventional train operate at the same speed) or increase the capacity of the commuter trains and reduce the frequency will be the solution. To establish a more flexible timetable, additional facilities will be required both in high speed train and the conventional lines. For example, siding tracks are required in stations in this segment, commuter train vehicles with good acceleration should be implemented, speed restrictions on curves should be reduced, more signals should be allocated, etc.

Second, rolling stock should be taken account. If the High Speed Train vehicle width is different from that of conventional trains, platforms must be trimmed, and/or boarding steps must be installed either on the high speed train or on the commuter train. These boarding steps may exceed the loading gauge at some areas, so they should be stowed away while the train is running. The difference in height of the doors of the rolling stock should also be taken into consideration.

Finally, compatibility of Automatic Train Control system for high speed train and conventional train should be considered. Since the safety equipment is indespensable for either train, multiple safety equipments must be installed on the rolling stock, and radio communication system must also be shared. These must be switched at the border station. Preventing malfunction both on the wayside and on-board is also important.

8. ***Current system planning is being conducted assuming the allocation of HST trains and Caltrain commuter trains between two different terminal facilities in San Francisco: Transbay, and the existing Caltrain station at 4th and King Streets. Train operations at the San Francisco end of the network will be complex, linking the two terminal stations, each with mixed HST and commuter traffic, with the San Francisco-area storage and maintenance yard, as well as the four-track main line that has high-speed trains on two dedicated tracks and commuter trains on the other two tracks. Detailed operating plans for the San Francisco terminal area, based on network simulations, currently are being developed.***

To ensure robust and flexible operation around Sanfrancisco station, install flying junction to avoid route conflict (at level junction), shorten the turnover time to utilize platform as much as possible, enable every platform to accommodate high-speed trains, etc., are important. JR East operates 4 minute headway at Tokyo Station that have only 4 tracks and 2 platforms.

9. ***HST service is assumed to be operated during the period between approximately 5:00 AM and 12:00 Midnight. Given the length of the Full-Build HST network, the service plan includes a few trains that operate outside of this window to ensure balanced service across the entire network. How are competing interests reconciled between the demand late-night passenger trains and the desire to have longer overnight windows for maintenance of way activities?***

It is necessary to separate train operation time and maintenance work time to ensure safety. To conduct maintenance and security check prior to operation, it is not favorable to run the trains between 0 and 5 o'clock. Maximum care for the maintenance work should be provided by placing the trains in the relief tracks of each station and minimizing deadheading to the rolling stock center, etc. However, we believe the maintenance time of 0 - 5 o'clock is tight considering the distance between the maintenance yards of 50 miles is similar to that of JR East, since our maintenance time is 0-6 o'clock.

10. ***Service tapering at the start and end of the service day, reflecting the relatively lower level of demand during the very early morning and late evening hours – Two equipment cycles begin in the 5:00 AM hour at Merced rather than Sacramento, providing the first train in the morning to both San Francisco and Los Angeles. Similarly, an early morning train is assumed to start from Bakersfield and operate north to San Francisco. Overnight storage of these three train sets is assumed to be provided at the planned maintenance facility near Merced. The Bakersfield train would operate as a non-revenue or "deadhead" train between Merced and Bakersfield. To balance the daily equipment cycles, the last three trains out in the late evening would run Los Angeles-Merced, San Francisco-Merced and San Francisco-Bakersfield, with these three trains ending up at the Merced maintenance facility for overnight storage. In addition to providing early morning and late night service to intermediate stations on the HST network, these trains can be used by the HST system operator to cycle different train sets on a daily basis to and from the major maintenance facility at Merced, where heavy scheduled maintenance, repair and overhaul will be performed on the HST fleet on a periodic, rotating basis.***

When setting trains in the early morning and in late night, departure time from the initial station will become early for trains running through the entire lines. Therefore it is reasonable to consider the setup of the trains that will depart and terminate at Merced and Bakersfield stations. There are similar cases in Japan as well.

11. ***The Operations and Service Plans for the Phase 1 and Full Build networks include passenger train movements that are balanced across the entire network throughout the day, providing service in both the early morning (by 6:00 AM) and night-time (around midnight) hours. This provides a full array of train choices to passengers and provides an estimate of daily trainset mileage that is at the high end of expected values, though it tends to minimize the amount of time available overnight for maintenance of way activities that require track outages. As more detailed operating and service plans are developed, and as maintenance of way requirements become better know, the passenger train service patterns at the beginning and end of the day will need to be optimized, making tradeoffs between customer service demands and the costs associated with right-of-way and equipment maintenance.***

It is best to create a timetable to secure maximum time for maintenance by not using the entire line during early morning and midnight, operating up to the rolling stock center, etc. It may be good to consider conducting track maintenance by not operating parts of midnight or early morning operation to secure time.

12. ***The analysis assumed intermediate station dwell times of 1.25 to 1.50 minutes and minimum terminal layover (turnaround) times of 30 to 40 minutes, as described previously. Terminal layover time is defined to be the time between the scheduled arrival of a train set at a terminal and the scheduled departure of the same train set in the opposite direction of service. During layover, sufficient time must be allocated for passenger unloading, train servicing and light maintenance activities such as interior cleaning, inspection and brake testing, provisioning and re-stocking of food service supplies, and passenger boarding. The minimum times provided in Table 3 were used as a guideline; the service plan assumes slightly faster (turnaround) times in a limited number of individual cases where necessary to maintain the smooth flow of trains at a terminal.***

Dwelling time at intermediate stations of 1.25 minutes and 1.50 minutes might be sufficient, but efforts to encourage smooth boarding and disembarking, and enough recovery time wil be required.

Furthermore, shorter turnover time is better. Specifically, turnover time must be shortened to 25 minutes, otherwise 5 minute interval operation during Peak hours will be difficult. Thorough KAIZEN activities should be conducted on the train operation and sales. It may also be necessary to guide the passengers to the platform quickly by using electric bulletin boards and announcements so that they can wait in front of each door of the car.

13. ***Estimated fleet requirements are based on the assumption that the HST operator implements a consist management plan to set train lengths based on ridership and adjusts trainset lengths at the terminal stations as necessary to efficiently deploy equipment. Train sets are assumed to be modular, comprised of either one or two 200 meter long units. Trainsets that must be 400 meters long to handle peak period passenger loads but which require only one 200 meter unit for off-peak operations are assumed to be able to trim or add units while stationed at the terminal platform during the layover period. The detailed operations of the terminal areas, incorporating these equipment manipulations as well as non-revenue or "deadhead" moves to and from train storage yards, has not yet been modeled or analyzed in detail.***

It is necessary to consider combined/independent operation according to demands, however coupling/de-coupling should be conducted at limited stations because coupling/de-coupling requires special signals, facilities and staff, and takes time. For example, when coupling the car, the approaching trainsets must "Stop" in front of the other trainsets, needs to be "Guided" to proximity of other train and then "Coupled." The procedure takes time other than preparing for departure. Furthermore, if coupling/de-coupling is conducted at terminal stations, then the platform is occuplied during the procedure and thus it would be better to be done at the rolling stock center at stations with relatively less trains (such as Merced).

14. ***Train crew size – operating personnel (engineers and conductors – single job classification with all staff fully trained and qualified for all train operations positions); number of On-Board Services staff***

At JR East, the crew size is calculated as follows:

After the transport planning is somewhat established, calculate the number of staff by finding the average duty time considering the number of trains and working hours. Additionally, from the number of rolling stock centers and their number of rolling stocks held, find the number of work places and distribution rate. After deriving the number of staff at work per day, calculate the number of staffs considering stand-by and vacation. It is important to keep in mind to secure time for the regular training of staffs, and that staff is required to enter the rolling stock centers. Wagon service staffs should be considered the same.

15. ***Ticketing and Fare Collection – CHST passengers are expected to obtain tickets for their trip in one of three ways: staffed ticket windows at the station, ticket vending machines at the station, and off-site prior to the trip (e.g., e-tickets). The trend in U.S. rail and air travel over the past decade has been away from the use of staffed ticket windows, in favor of TVMs and pre-printed e-tickets. This trend is expected to continue, but the customer service objectives of the CHST system call for the staffing of ticket offices and information kiosks to provide personalized service to those passengers who want it. Ticket office facilities are intended to have a modular design that permits flexible allocation of the ticketing and associated queuing spaces among staffed windows and TVMs. At this point in time, clear direction has not yet been established with respect to the type and required performance capabilities of ticket media (i.e., whether or not tickets need to be electronically-readable or possess embedded microchips), and whether or not boarding passes separate from actual tickets will be required.The long-range vision for high-speed and regional transportation services in California is that a universal farecard and fare payment system is available to passengers and able to be used on any of the modes and routes serving the stations at which CHST trains operate. Plans for such a system are in the early stages of development at several of the regional transit systems, but full implementation requires substantial challenges to be overcome and remains many years away. To the extent that fare media and fare collection systems can be consolidated and standardized, passengers will be better able to have a "seamless journey" experience. However, as a practical matter, stations will need to be able to operate successfully in the short to medium term with multiple fare collection procedures and systems in place, with each operator able to collect fares in the way best suited to its operations.Fare collection can occur on-board the vehicle, at the entry to the vehicle, or off-board within the station environment. Public spaces within stations will be designated as either "paid" or "free" areas. Free areas are open to the general public. Paid areas are zones within which all persons are expected to be in possession of a valid ticket or pass. Clear lines of demarcation will exist between free and paid areas. Paid zones can either be controlled by barriers and arrays of fare collection devices such as turnstiles or they***

can be part of a barrier-free "proof of payment" system where there are no fare control arrays, but people within the paid area can be asked by fare inspectors to produce their ticket or pass and are issued a summons for a fine if they do not have a valid ticket. Station planning is based on barrier-free fare controls, although the facility would be able to accommodate fare control arrays for CHST if the CHST operator were to choose to implement a barrier-type system. CHST passengers would have their tickets checked upon entry to the CHST paid or secure area.

It is basically OK to operate the same as an air flight. For example, there is a system where a passenger can reserve on-line and print out the reservation sheet, and scan the barcode on the automatic ticket gate. It is not recommended to implement a barrier free system where it will become necessary to check the tickets on various occasions and it will not be fair that fare cheating can occur.

16. ***Passenger Security Screening and Access Control at Stations – Station security will be commensurate with station security on existing high speed rail networks in the USA, Europe and Asia. Unless otherwise exempted, the CHST System will conform to the current Federal requirements regarding transportation security as developed and implemented. The rail platforms and bus loading bays are considered secure zones, which are able to be cordoned off by security personnel when necessary – with passengers entering the zone subject to either random or comprehensive security screening, depending on the threat condition. The normal mode of operation at CHST stations is assumed to be barrier-free, with access to and from the rail platforms and bus gate areas without the need for security screening. However, the physical configuration of facilities needs to be able to accommodate portable screening equipment, should screening prove to be requirement at some point in time. The same lines of demarcation will be used for both fare collection/control and security screening. Since security screening would not be a normal operating procedure, such screening would be undertaken using portable equipment (magnetometers and baggage screening devices) and portable pedestrian channelization barriers that could be deployed when needed at these screening locations but normally stored at a remote location within the terminal.***

At our stations, we do not conduct safety checks of carry-on baggage as it will hinder the flow of our numerous passengers. However, we do place security officers and have them patrol and we also monitor through security cameras.

17. ***Baggage-Handling – Most CHST passengers are expected to carry their own baggage to and from the train. The CHST project has not yet made a final decision concerning the handling of checked baggage on CHST trains. At the time of this writing, the CHST system is assumed to not offer checked baggage service, like most of the existing European and Asian high-speed rail systems. Should a determination be made that checked baggage is to be handled on CHST trains, baggage check-in, baggage claim and back-of-house baggage handling facilities would need to be provided at all stations, and the stations would have to be designed accordingly. A porter service (red cap) is assumed to be available at major stations to assist passengers with transporting their luggage to and from the trains. Porters would be stationed at the curb frontage of the CHST stations and also on the CHST platforms as trains arrive at the station. Luggage trolleys (e.g., Smarte Cartes) are assumed to be prohibited from station platforms, because of the potential safety hazard posed by trolleys falling from the rail platforms onto the tracks. Passengers are assumed to carry their own luggage through stations or retain the services of a porter.***

We do not offer check-in baggage. There is also no porter service. There are no carts for passenger baggage. There was a time in the history of Japanese railway when there were porters, however there is no longer a need for this and it has been eliminated. Passengers are to carry their own baggage.

18. ***Bicycle-Handling – California (particularly the San Francisco Bay Area) has a well-developed bicycle-riding culture and a higher proportion of the population that regularly rides bicycles. The policy with respect to handling bicycles on-board CHST trains has not yet been formally established. Options include prohibiting bicycles, permitting only folding bicycles that can be stored in the regular luggage racks provided throughout the train, or permitting bicycles to be stored in a portion of the front or rear power car, in a zone of the train where passenger seating is not provided. In the latter instance, the number of bicycle storage positions would be limited, so passengers would be expected to reserve bicycle storage space at the time they make their seat reservation. Regardless of whether/how bicycles are accommodated on-board CHST trains, all CHST stations will have convenient and secure facilities for the storage of bicycles. At major stations, private concessions may operate "bicycle stations" comprising storage racks/lockers and bicycle rental and repair facilities within or adjacent to the station building.***

* It is necessary to review how much needs there are to carry on bicycles.

* We allow bicycles to be brought on-board when the bicycles used for cycling and sports events are dismantled and placed in a special bag or foldable bicycles are folded and placed in a special bag. (There is a fee for cyclist bicycles but others are free.) However, as with any carry-on baggage, it must be carriable, baggage's total length (sum of length, width and height) must be within 2.5 meters (length must be within 2 meters) and within 30kg in weight. There is no dedicated storage space for bicycles in the train. Additionally, if there is a possibility that it will hinder other passengers or the train is very crowded, we may decline the carry on of the bicycle.

19. ***Passenger Boarding Process, General – The following diagram depicts the typical passenger boarding process and the way finding and station facility usage decisions that will be made by passengers from the time that they arrive at the station:***

The process is similar at our stations. However as mentioned earlier, we do not have check-in baggage and we do not conduct baggage check. Additionally, there is no lounge for frequent customers.

20. ***Passenger Boarding Process, Intermediate Stations – Boarding passengers will wait within the station building up until approximately five or six minutes in advance of the train's scheduled departure time. At this time, passengers will be instructed to proceed to the platform, by means of information posted on variable information signs and announced on the public address system. Assuming a policy of reserved seating in specific cars, passengers will follow signage and proceed to a designated point along the platform adjacent to where the car they will board will stop. When the train arrives at the station, the alighting passengers will be discharged from the train and will walk to the platform exit points. The waiting passengers will than board the train, either carrying their luggage or being assisted by a porter. The car interiors are assumed to be designed to permit relatively rapid boarding, circulation within the car by passengers and stowing of luggage.***

Yes

21. ***Passenger Boarding Process – Terminal Stations – The boarding procedure for passengers at terminal stations is expected to be different from that at intermediate stations. The train will occupy the platform track for a longer period of time (for its full layover time) if it is continuing as a revenue train, or for a somewhat shorter period if it is a train that is originating or terminating its revenue service and is connecting to or from a nearby storage yard. Arriving passengers will first alight from the train and proceed to the exits. Once the platform has been substantially cleared of passengers (approximately five minutes from the train's arrival time), train servicing will begin. Cleaning crews will clean the car interiors and rest rooms. Food service personnel will restock the train's food service supplies, equipment maintenance engineers will make any minor repairs or maintenance checks that may be required, the incoming train crew will hand over control of the train to the outgoing crew, and the outgoing crew will perform the required pre-departure safety checks. When these servicing activities have been completed (for which 20 minutes is allotted at all terminals except San Francisco-Transbay, where 10 minutes is programmed), passenger boarding begins. If the incoming train has arrived exactly on time, a total of 15 minutes will be available for boarding. If the incoming train has arrived late, then the boarding time interval would be shortened accordingly.***

    15 minute pool time is very much possible. Cleaning staff await the train at the platform and enter the car when all the passengers have disembarked instead of waiting for the passengers to clear out from the platform to start their cleaning to minimize time.

22. ***Passenger Access to Platforms – The CHSTP station plans are being developed based on the concept that all station platforms used by CHST passengers will be within a controlled zone where passengers will be expected to have a valid ticket prior to entering the onto the platform. Current plans for the CHST system do not call for the provision of separate platforms for train servicing and for use by maintenance personnel at either intermediate or terminal stations. Though such platforms would be desirable to separate passenger flows from maintenance and servicing activities, right-of-way constraints will not permit these additional platforms to be provided at most locations.***

    * Set up of a platform dedicated for maintenance staffs will be difficult due to limitation of land.

    * At our stations, Shinkansen (bullet train) platforms are exclusive areas for passengers holding a valid Shinkansen (bullet train) ticket. Additionally, there are no platforms at Shinkansen (bullet train) stations specific for departure preparation nor for maintenance.

23. ***Access to Platforms Served by High-Speed and Non-High-Speed Trains – At certain station locations, particularly in the shared use corridors south of Los Angeles and north of San Jose, stations may need to be configured in a way that allows tracks and/or platforms to be shared by both CHST and commuter or Amtrak trains and passengers. If the Operating Plan and passenger-handling procedures allow for simultaneous occupancy of platform zones by CHST passengers and the passengers of other railroad operators, then track and platform configurations could be kept relatively simple – such as island platform configurations with HST trains operating on one side of the platform and other trains on the track on the opposite side of the platform (a possible configuration in the Caltrain Corridor), or simple side or island platforms serving tracks where HST and other trains operate one after the other (a possible configuration in the corridor between Los Angeles and Anaheim). On the other hand, if CHST security, fare control and passenger-handling procedures require that platforms be dedicated to the exclusive use of***

CHST passengers, then more complex track and platform configurations might be required at certain stations to provide the appropriate level of physical separation between CHST and other rail passengers. Sharing of platform tracks and platforms by multiple train services becomes significantly more difficult if the trainset types have either different car widths or door heights. Standardizing these rolling stock dimensions is highly desirable for shared operations.

* Our Shinkansen (bullet train) run on tracks specific for high-speed trains, except for those that have a through service to conventional lines. At stations with tracks specific for high-speed trains, Shinkansen (bullet train) platforms and conventional line platforms are clearly separated, and regardless of the shape of the platform, it is physically impossible for the conventional line trains to enter the Shinkansen (bullet train) platform and vice versa. In the station, conventional line concourse and Shinkansen (bullet train) concourse are physically separated with a ticket gate for the Shinkansen (bullet train).

* For stations where the Shinkansen (bullet train) has a through service to the conventional line, platform for the Shinkansen (bullet train) is fixed and in general, it is separated from the conventional line concourse with a dedicated ticket gate. However, in rural stations where the number of passengers are less, there are stations where the Shinkansen (bullet train) and conventional line trains stop and depart from the same platform.

24. ***Service Access to Platforms – Service access to the CHST platforms, via elevators or ramps, separate from the routes used by passengers is required at terminal stations.***

Barrier free accessibility to the platforms using elevators is important. However, at our stations, unless there is a physical limitation, there is no dedicated barrier free route and it is shared with other passengers.

25. ***Dwell Times at Intermediate Stations are assumed to be in the range of 1.25 to 1.50 minutes. These times are relatively short by international standards and are based on highly-disciplined passenger-handling operations at the station platforms. The current plans assume that boarding passengers are pre-positioned on the platform at or close to the car where their reserved seat is located, prior to the arrival of the train – based on car numbering information displayed on variable message signs along the platform. As a matter of policy, dwell times should be kept as short as possible to minimize running times. However, dwell times need to be sufficiently long to allow sufficient time for alighting and boarding of passengers carrying extensive luggage, to accommodate passengers who are in wheelchairs or otherwise mobility-impaired, and to minimize the potential for trains to be delayed due to excessive station dwells. Dwell times, in part, will be a function of the volume of passengers to be unloaded or loaded at a station. The configuration of door openings, vestibules, aisles and luggage storage racks on the trains will influence the passenger alighting and boarding process and potentially could affect the dwell times at stations. Future refinements of the operating and service plans will test alternative trainset interior and door configurations, alternative passenger-handling procedures and a range of possible alighting/boarding volumes – in order to verify the appropriate dwell times to assume at intermediate stations.***

In contrast to air planes, there are multiple doors so many people will not concentrate on one particular door; however it is necessary to verify for a smooth boarding and disembarking. When a delay occurs, work to recover the delay using the operational recovery time (allowance time), etc. It is good to assume assistance by the station staff and/or security personnel in the boarding and disembarking of disabled persons. Additionally passengers that are not acquainted can be late in boarding and disembarking, therefore it is necessary to pre-inform them or have interaction ahead of time. Also as an idea from the Japanese rolling stock, the doors of the rolling stock and the passenger cars are close to each other so that the passengers can enter the passenger cars more smoothly and this shortens the boarding and disembarking times.

26. ***Spare ratio of 10 percent – The fleet maintenance philosophy, maintenance plan and terminal operating plans, which drive the number of spare equipment sets needed to allow for periodic and non-scheduled maintenance and repair activities, and to protect reliable operations at the major terminals. The spare fleet requirement is assumed to be 10 percent of the revenue fleet requirement, which is in the mid range of spare ratios for U.S. and international intercity and high-speed rail fleets. A lower spare ratio could be justifiable if an aggressive preventive maintenance program is adopted, which invests in the facilities, spare parts inventories and labor force needed to progressively replace train set components on a regular schedule before component failure occurs or life expectancy is reached. Conversely, a decision in favor of a more traditional maintenance philosophy that undertakes more limited periodic inspections and relies more on reactive repair and replacement of components as they wear out, would tend to increase the required spare ratio – as would the desire for spare ready equipment sets to ensure a very high level of equipment availability. The fleet requirement numbers will need to be modified as the operating plan, demand projections, and maintenance plan are refined. The figures presented in the Service Plan technical memoranda serve as placeholders for preliminary sizing and planning of HST storage and maintenance facilities.***

* There are 3 types of stand-by rolling stock, which are maintenance and repair stand-by, fluctuation stand-by, and accident stand-by. Maintenance and repair stand-by is stand-by required for the regular inspection of the rolling stock. Fluctuation stand-by is stand-by for seasonal trains or charter trains for groups. Accident stand-by is stand-by to deal with failure of the rolling stock.

* Number of stand-bys cannot necessary be estimated at 10%, but rather should be set by considering the distance covered in kilometer, inspection period of the rolling stock, etc. Additionally, for the number of train sets for fluctuation stand-by and accident stand-by, this depends on the specific situation of the line section, therefore, it is better for the operating company to review this matter. We believe that for a smooth operation of the California High-Speed Train, maintenance and repair stand-by should be about 13.7%. This is the very minimum amount of stand-by and if considering fluctuation stand-by and accident stand-by, the number of stand-bys will increase.

27. ***Infrastructure maintenance plan and asset management system – There has become increasing emphasis on rail systems to implement an asset management system as an integral part of the overall infrastructure management philosophy. The physical plant and rail system elements, and their condition, are inventoried and documented in a data base. Routine inspections at specified intervals are then conducted to monitor and update the information associated with the condition of each element of the system, comparing the current inspection results with previous observations and with the required specification (of that particular element of the system i.e. a section of track etc.). This approach provides on-going, real time diagnostics, identifying corrective action when necessary. It provides a snapshot of the condition of the physical plant. In addition, and in the case of the CHSTP, it provides the owner (i.e. California High Speed Rail Authority) of the property, a method of insuring that the assets are being properly maintained. It would be helpful to know what asset management and maintenance philosophy is employed on existing high speed train systems.***

As you have pointed out, we agree that by systematically managing the facilities database and regular inspection data in detail and putting them to good use towards the maintenance plan will lead to an efficient maintenance structure. Another point to note is to establish a maintenance structure (maintenance method and inspection period, etc.) of railway tracks, overhead contact lines and signal facilities which are essential for safety. For example,

1. Measurement items and measurement period by test cars for the railway tracks and overhead contact lines.
2. Implementation of rail grinding and grinding period which will lead to lengthening of rail life by reduction in noise and prevention of rail defects.
3. Tools (inspection equipment and maintenance car) used for inspection of railway tracks, overhead contact lines and signal facilities.
4. Maintenance cars and machinery used for maintenance work of facilities.

It is best that the results of the inspection of facilities by the above methods and record of maintenance work be automatically entered into the system and that they can be viewed at any time.

28. ***Maintenance resources may be deployed around the high speed train system during the normal service day to respond to situations such as a malfunction of an element of the physical plant (i.e. a switch or signal) or an equipment breakdown (with a trainset). Although somewhat dependent on the effectiveness of the overall maintenance programs for the infrastructure and rolling stock, these unplanned events can and do occur. In developing the overall maintenance plans (for both infrastructure and rolling stock) consideration is being given to defining the number of staff and how best to locate them around the system in order to respond to these events in an expedient manner and maintain the highest levels of on time performance.***

In JR East, as a front line branch for rolling stock maintenance, there are "outposts" at major stations. Staffs are stationed there to deal with inspection and repair in times of irregularities. There are also set limited amount of materials stocked at these outposts. Nonetheless, system is in place to send inspectors and materials from the main maintenance facilities depending on the level of the irregularity. It is important to have an intra-network management structure centered around strategic points such as OCC and HMF. Same applies to wayside facilities; materials for recovery and restoration are available at MOW bases to deal with the anomalies. Communication system is also established with the outsourced construction companies.

29. ***Contracting and outsourcing services – provision of "commercial" services in terminals and stations; on-board food and beverage services etc. Are these or any other support services subject to outsourcing on high speed train systems in other countries?***

S.S Attendants, wagon service staffs, security personnel, parts of cleaning, track maintenance, facility, electric and rolling stock maintenance as well as part of station staffs are outsourced.