Californian High Speed Train Project
Operation & Maintenance Peer Review

The French Transportation Department (called hereafter MEDDTL) was officially asked to review the CAHST project's Operation and Maintenance Plan issued October 1st 2010. MEDDTL is highly honored to have the opportunity to share its HST experience for the benefit of CAHST Project.

1. Introduction

This experience and know how relies not only on French nationwide operations, but also on international experiences gathered in Korea, Taiwan, Spain, were the French design applies to a large extent, and on careful observation of and exchanges with Japanese operators since 40 years.

It is obvious that the position of MEDDTL as Railway Public Controller as such does not encompass the operator position. Nevertheless:

i) The comprehensive document produced by CAHST enables to highlight some points to be further carefully investigated by the Authority along the tender process (RFP).

ii) The document refers to prior market studies data of which are essential to provide grounded opinion on rolling stock fleet size, as well as service proposed.

iii) Further to this point, the fare policy needs to be explicitly described, along with the targeted load factor.

iv) The Public (Federal and State) regulations related to maintenance (rolling stock and infrastructure) are also vital to assess, as well as the processes to let them evolve according to field experience (learning curve).

Absent this set of documents, our peer review should be considered as a tentative effort only.

As a conclusion, the French Transportation Department considers the CAHST document as highly useful to manage the first step of the bidding process, enabling to initiate a phase of competitive dialog with the bidders.

2. Analysis

As suggested, MEDDTL focused its peer review on Introductory Material, using the Technical memoranda only as references. This review therefore follows the wording of the later, referring to paragraphs, table and paging accordingly.

High Speed Vision:

As expressed in page 1, the Vision of a statewide backbone capable of a 220 mph operation appears realistic. Such operational speed corresponds to 2.40 hour trip time from San Francisco to Los Angeles.
Meanwhile, as today no railway is operating at such speed in the USA, it should be assessed technically, before the opening of Phase 1. In this respect this Phase 1 could be partially envisaged as a demonstration of the performance of the system.

Service plan:

i) French experience is in line with "clock face patterns" service strategy, which is of course the most readable for the customer and simpler to operate from an operator's point of view. On another hand, this way of timetable management enhances the available capacity of a given line.

ii) The service patterns proposed in pages 4 & 5, Figures 3 & 4 – Table 2 need to be explained in conjunction with the fare policy. The peak/off peak ratio is closely related to the fare range as yield management practice demonstrates in airline and railway operation. As an example the yield management was successfully implemented by French railway in 1983, with continuous refinements since then.

iii) These considerations will most probably lead to provide timetable adjustments as forecasted for the time being with likely consequences on the overtaking facilities. In this respect, it remains to confirm whether cross over facilities as designed do fit operation purposes or if additional sidings are needed, in order to fix train sets failures and to enable rescue trains to load passengers.

iv) The forecasted recovery time would be quite an achievement. It would be a major improvement over current observed levels of service (Japan, Korea, Taiwan, France). According to MEDDTL knowledge, French operations usually provision 5 minutes per 60 miles, less than Japanese do.

Passenger Station operations

i) Intermediate Station: Figures 7 & 8 (page 15) do not call for any observation and could serve as a basis for bidders who will have to evaluate it.

ii) Terminal Stations: Passenger Boarding requirements do affect the design of stations and platforms, taking into consideration physical and legal constraints (ADA) as well as passenger-handling procedures.

- The “advance staging” (page 17) refers to Korean procedures for instance, which in turn require wider concourses.
- The platform width depends on previous decisions (passenger-handling) and has severe consequence on the time required for turnaround operation. The most impressive achievement in this field is the Japanese one, with platforms 12 meters or more wide in terminal stations, with an outstanding organization of operations (alighting, cleaning, boarding, technical preparation), which lead to a 12-minute turnaround time for a sixteen cars train set (worldwide record).
- In particular the cleaning procedures have to be set rigorously, while the train safety preparation mentioned in page 18 ought to be established according to safety regulations in course in order to perform them in the mean time.
- In this respect, the critical path shown on Figure 10 Table 4 represents a sound basis. French Railway adopted this interval of 40 minutes (in page 20) at the beginning of HST operations in 1981, but over the years has demonstrated that it was worth optimizing after the outcome of the learning curve. A “reasonable” target (that could be used for simulations) could be 20 – 25 minutes in some cases, in particular for the optimization of rolling stock fleet size.

Rolling Stock storage and maintenance

The fleet figures are likely to be based on traffic forecasts which are not restated in the Memorandum. The Full Build Service Plan requires 107 train sets for off-peak periods. An additional 85 sets will serve both limited express services and peak ridership.
As mentioned earlier, this needs to be contemplated and simulated according to the ridership estimates update as well as the fare policy.

TGV fleet availability ratio for off peak periods and for peak periods rely on equipment maintenance/spare parts optimizations. Therefore, it could be considered to increase the number of spare parts in order to reduce the number of spare train sets. This leads obviously to save a significant amount of CAPEX in Rolling Stock.

MEDDTL agrees with the statement in page 21 that [at the end of the day] the fleet requirement figures will be modified as demand projection, operation and maintenance plans will be refined.
Our suggestion therefore, would be that before undertaking costly refinements, to simply figure out the key parameters variations impacts (peak /off peak ratio, train set mileage per year…) on a CAPEX / OPEX model. This will be rephrased hereafter (paragraph 2.9).

Rolling Stock maintenance: The levels of maintenance mentioned in pages 23 & 24 meet the commonly agreed international standards.
According to French experience (benchmarked in Korea and Japan) great care should be devoted to levels 1 & 2 operations checklists, which represents around 50 % of total (levels 1 to 5) maintenance cost.
The Public regulations and in this framework the possibility granted to the operator to take advantage from the learning curve will have a dramatic impact on maintenance cost and staff requirement. These assumptions should be explicitly defined in the RFP.

The “typical concept” in page 22 Figure 11, depends on the shaping of land parcel available and should be adapted to physical possibilities.
As far as facility location is concerned it seems wise to avoid any maintenance in terminals (other than cleaning) whilst to locate the depots as near as possible from them, in order to avoid deadhead train movements [as said in page 23]. Two reasons: cost and reliability (possibility to replace a faulty train).
Special inspections must be performed on roofs (pantograph) and wheels (bogies), dedicated tools (scaffoldings and pits respectively) are needed, possibly in open air if weather conditions do permit.
These facilities areas [in page 25] should not be oversized, leaving the operational experience to determine the exact footprints. The two Phases provided will give this opportunity.

Commissioning of Rolling stock:

Page 25 rightly mentions the importance of testing, acceptance and commissioning facilities.
A key point also lies in the possibility to train efficiently staff with the minimum extra costs. Driving simulators will be a great help and will have to be provided in sufficient number in each driver’s depot.

Rolling Stock Maintenance Staff:

Page 25 states the ratio of around 10.5 - 12 staff per train set. This ratio could vary largely according to maintenance (public) regulations and operator’s checklists (see above).
Another key factor is the annual mileage of rolling equipment.
Anyway, the “learning curve” processes mentioned above could result, if carefully pursued, in significant savings (up to 30 or 40 %). This remark will be repeated for the infrastructure maintenance.
The testing and commissioning procedures can be also a great help to reduce the LCC (Life Cycle Cost). In this respect, MEDDTL strongly suggests to rely on proven design and devices, taking advantage from the tests period to eliminate the common “teething troubles” of any new Rolling Stock or more generally speaking, technology.

Maintenance of way and infrastructure:

It is hard to issue a sound statement about infrastructure maintenance resources (equipment and staff) required in absence of assumptions concerning track (ballasted or slab one) and signaling / telecommunication design.

The proven or not type of devices used, the way of acceptance and commissioning to be decided could have also a great impact on LCC.

According to available benchmark, and anticipating the possibility of regulations evolution, an optimization could reveal cost savings (staffwise) at least around 30 or 40 % of the figures shown in pages 26 & 27.

No maintenance window is provided during the day. All maintenance cannot be performed during night off revenue period (even lasting 5 hours). It must be provided something like 1 hour off (maintenance window) to perform accurate verifications in broad daylight.
On an other hand, the 75 miles right of way maintenance facilities in each direction from a maintenance facility appears a little too optimistic to fix properly a failure in appropriate time. It would be preferable to stick to 40 miles, to be able to reach any point from maintenance base within 1 hour.

Manpower staffing - train operation

One has to devote special attention to train staffing (engineers, train crew, SS attendants) described in page 29 Table 11, so far it represents 7 out of 8 of the transportation operating staff.
MEDDTL is in particular surprised by the composition of road crew: compulsory 1 assistant conductor for a 200 m train set. The role of SS s is not entirely obvious and the onboard catering staff appears not to be counted.
Moreover, the labor organization needs to be assessed in detail.

Comments on Project Status

Limitation of analyses performed to date: MEDDTL fully agrees with the description of current project status and with the limitations of analyses performed to date. Some currently too simple assumptions have to be sophisticated further.
Nevertheless, prior to undertake complex studies with the risk to be useless, the complexity of a HST system needs to sort out the key parameters having an impact on (as a tentative list of business priorities):

- Ridership
- Life cycle cost
- Reliability
- Punctuality
- Passenger amenities

Hence, the scope of analyses to be further performed could be revisited that way, in order to concentrate the efforts only on major issues [pages 30 - 33].

3 Operational Assumptions

1. The track sharing between freight, commuter, and HS trains in some (limited) locations raises safety and priority management issues, which seems to be perfectly solvable as there are in France on "conventional lines".
2. Train length OK (international standards)
3. Clock face service OK [as said 2.2 i)]
4. Id
5. Id
6. Grade separations where provided greatly enhances the operational reliability
7. OK, but the detailed background ought to be known
8. Equipment cycles should be analyzed in detail rather along with the local facilities
9. The precise way of train usage and resulting mileage will be an outcome of detailed operation study to be rather performed by the bidders. The annual mileage was underlined in paragraph 2.6 as having a great impact on maintenance cycles and costs.

4 Questions and issues:

Some of items raised here have been addressed above along with the detailed analysis. Additional comments are listed hereafter:

Service Plan

1. Service patterns: the clock face service is viewed as sensible and robust. Likewise the service patterns are in accordance with the traffic estimates. The nominal capacity relies on the signaling system.
2. Only detailed analyses under the responsibility of final bidder could provide an accurate time table associated with the risk analysis concerning quality and performance. In the RFP, these performance criteria should be defined and scored. In other words, the financial criteria should not be the only one.
3. Recovery time as provided in the Memorandum [1%] is considered (2.2.4 iv) very ambitious. 3.5 % is more realistic.
4. The headway could be estimated 22 - 24 trains per hour per track by means of modern signaling devices. But the theoretical capacity has to be reduced practically to 20 – 21. The observation of European experiences (Spain, Germany, France, Italy…) should provide very soon sound conclusions.
5. It refers again to operational studies to be presented by the bidders.
6. The aim to reduce the dead-head train miles thanks an optimized location of storage is sensible.
7. It is hard to make a firm statement how the mix of different trains (commuter, freight, HS) has to be managed, without a case by case study. Mixing trains should be avoided for efficiency reasons but when unavoidable, all trains

sharing the same infrastructure should be equipped with compatible safety devices. Diesel and electric haulage mix does not raise a special issue.

8. The paragraph describes extensively a case study.
9. The optimization of track maintenance window was addressed in paragraph 2.7. A day maintenance window is certainly to provide. Concerning late trains, some can be operated during no maintenance week end periods (Saturday/ Sunday or Sunday / Monday nights for instance). The same issue (tradeoff between customer service versus maintenance costs and constraints) is mentioned in paragraph 11 hereafter.
10. Same type of issue as raised in paragraph "Operational Assumptions" item 9 above. The wording gives here a solution, which has to be checked further in detail.
11. Please refer to remark paragraph 9.
12. Turnaround time issue was addressed above in paragraph 2.4.
13. OK with these assumptions. Please refer to item 5 above.
14. Issue addressed in paragraph 2.8.

Station operation and Passenger handling

15. Ticketing and Fare collection: the issue described here is absolutely critical. From the client's perspective to ease his access to railway, from the operator's point of view to reduce costs (which is commonly around 10 % of the revenue, depending on the sales channels used). The "seamless journey" experience should be a challenge proposed to the bidders in the RFP. Fortunately, the evolving technology will likely provide breakthrough solutions.
16. Passenger Security Screening and Access to the station: should be precisely defined by the Authority in the RFP.
17. Baggage – no comment.
18. Bicycle handling: matter of policy to be defined by the Authority or / and by the bidders and then weighted in the final judgment.
19. to 25 Passenger Boarding Process, Accesses to platforms (Passenger, Service…), Dwell times: all items and constraints comprehensively described. The impact on stations design is obviously huge and has to be taken carefully into account by the operator.

Rolling stock and Infrastructure Maintenance

20. We agree with the remarks issued about spare ratio. This issue was addressed in paragraph 2.4. MEDDTL stresses the need of a realistic maintenance policy based on rigorous observations and experience collection. The mandatory regulations should be designed as evolutionary.
21. Maintenance plan is today obviously linked to an Information System which allows real time knowledge of all components of a system, thus monitors the routine inspections, forecasts in due time the replacement of faulty devices, insures the quality of assets maintenance and enables an efficient Public

control. This remark encompasses of course Rolling Stock and Infrastructure maintenance.

Contracting and Outsourcing Services

22. In France and in most other countries, operators outsource the commercial services in terminals, the on-board catering, the food and the beverage services. This allows benefiting from special facilities and specialized staff.