CALIFORNIA HIGH-SPEED TRAIN PROJECT

BUSINESS PLAN 2008 — ENGINEERING ELEMENTS
SYSTEM DESCRIPTION, PROJECT DELIVERY, AND CAPITAL AND O&M COSTS
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1.1 TECHNOLOGY

California's high-speed train technology is based on state-of-the-art electrified, steel-wheel-on-steel-rail train systems capable of speeds of up to 220 miles per hour in revenue service similar to those today in Asia and Europe. The line, of which the vast majority will be on a dedicated high-speed track, will consist of new infrastructure that is fully grade-separated, providing a very reliable and extremely safe travel environment. In developing California's high-speed train system, the California High-Speed Rail Authority (Authority) has taken full advantage of the many decades of research, development, and regular everyday operations of safe and reliable high-speed train service throughout Asia and Europe. Adapting existing and proven high-speed train technology to meet U.S. requirements eliminates the risks associated with unproven technology and lowers the costs of design and construction. Additionally, providing that Federal Railroad Administration (FRA) safety requirements can be satisfied, high-speed train systems like these can share track at reduced speeds with existing conventional passenger trains giving high-speed train access to central business districts in heavily urban areas, or making use of existing corridors where right-of-way is highly constrained.

1.2 SYSTEM DESIGN AND SAFETY

High-speed train safety and reliability is achieved by a system design approach where the technical elements, or subsystems, are designed to work with each other to optimize and ensure the safety and reliability of the overall system. Consistent with international practice, the development of the California High-Speed Train Project is divided into the following technical elements, or subsystems: Infrastructure, Electrification, Train Control, Rolling Stock, Operations, and Maintenance. These subsystems are then developed in an integrated process to deliver the safety and reliability inherent in modern high-speed train systems throughout the world. A few examples of how system safety and reliability are achieved by integration of the subsystem design elements are as follows:

- Collision avoidance is provided with modern fail-safe in-cab signaling systems combined with automatic train-stop capabilities of the rolling stock.
- Design of steel-rail profiles are partnered with steel-wheel profiles and vehicle truck design for efficient and smooth running, reducing wear and tear of the infrastructure and the rolling stock.
- Maintenance regimes for the infrastructure, electrification, train control and rolling stock subsystems are coordinated and developed as a proactive system of works geared towards meeting safety and reliability goals of the system.

Although compatible, there are significant differences in the approach to safety and technical requirements between modern high-speed train systems and the state and federal regulations that govern existing railroad equipment and operations in California. The responsible regulatory agencies include the FRA who seeks assurance that the same or greater level of railroad safety is provided as required in the U.S. Code of Federal Regulations (CFR), and the California Public Utilities Commission (CPUC) who is responsible for the safety and reliability of the state's electrical system, and for public railroad safety. The requirements within the Code of Federal Regulations are planned to be addressed by an FRA Rule of Particular Applicability (RPA) specific to the California High-Speed Train System. The RPA will address both dedicated high-speed routes and shared-track conditions. CPUC requirements regarding electrical system safety is anticipated to be addressed via their waiver process. It is important to note that the fully grade-separated feature of the California High-Speed Train alignment addresses many of the public safety concerns of both agencies.

One of the key technical differences between successful high-speed train technology and current U.S. regulatory requirements governing passenger trains is the trainset specification. Current U.S. trainset regulations are based more on a “crash worthiness” approach to safety, while a “collision avoidance” philosophy is used to design high-speed train systems in Asia and Europe. Due to this differing approach to system safety, the Code of Federal Regulations currently requires all existing U.S. passenger trains to be at least twice as strong than the lightweight vehicles used in European and Asian high-speed trains. In order to meet this strength requirement, high-speed train manufacturers would have to structurally redesign their trains, adding significant development time and cost, resulting in higher costs to the Authority, but with uncertain effect on the ultimate safety of the operation. Such a redesign would make high-speed rolling stock heavier, require more energy for the same speed, and jeopardize the low axle loadings that effectively enable the high speeds, low operating and maintenance costs, and positive cash flows enjoyed by high-speed train operations in Europe and Asia. In addition to being more costly to purchase and operate, heavier equipment will likely cause changes in other system components such as track or bridges and result in higher maintenance costs and shorter replacement cycles. In summary, it is unlikely that high-speed trainsets meeting current U.S. standards can be economically built and successfully operated at the 220 miles per hour speed targeted for the California High-Speed Train system.

Trainset concerns are higher where the relatively light-weight high-speed trains might share track with much heavier conventional U.S. passenger trains. Shared track is being considered where existing tracks are available and a dedicated high-speed line is prohibitive due to environmental impacts, right-of-way impacts, and costs. Similar to railway systems in Asia and Europe, the California High-Speed Train System includes two short segments (Los Angeles to Anaheim in Southern California and Caltrain in the Bay Area) which are currently expected to share track with conventional rail providing a cost-effective way of bringing high-speed train service directly into major metropolitan business centers. In both segments, the high-speed trains will operate at reduced speeds no greater than 125 miles per hour. Passenger safety on high-speed systems, both dedicated track and shared-track, is achieved by a train signaling system that provides positive train control and separation, and automatic train-stop capabilities to monitor train traffic and avoid collisions. Crash-energy management components are also incorporated into the high-speed train design in the unlikely event of low speed collisions. It should be noted that high-speed train travel is the safest form of transportation in the world and that proven systems in Asia and Europe have been operating safely in shared-track conditions for over 40 years.

2. THE LINE

2.1 HIGH-SPEED LINE INFRASTRUCTURE AND SYSTEMS

The majority of the California high-speed train system will be at-grade alongside existing railroads, roads and highways. Smooth transitions and grades will assure a comfortable and safe ride at high speeds. Mountainous and hilly areas will require viaducts, trenches, and tunnels to meet high-speed train grade standards. Also, in areas with many consecutive at-grade road crossings or freight railroad sidings, viaducts and trenches may be used to separate the high-speed line rather than building numerous bridges over or under the rail line. The line will be fenced and equipped with intrusion detection equipment that can detect persons, animals or debris entering the right-of-way and linked to a central train control center. Seismic and weather conditions throughout the system will be monitored and connected to the train control system, providing automatic train-stop features in the event of severe and unsafe conditions. In rural areas, the path required is a nominal 100 feet wide. In developed areas, the minimum path required for the two-track rail line is about 50 feet wide, or about the space required for a new two-lane highway with shoulders and a small median.

The trains will draw electricity from a traction power system connected to the commercial power grid. Supply stations, switching stations and paralleling stations will be regularly spaced adjacent to the rail corridor to regulate and control the power to the trains. An overhead contact system primarily supported by masts and cantilever arms will bring power via a contact wire to the train pantograph.

A Central Control Center for tracking train status and movements, monitoring security and climatic conditions, and providing centralized communications will be located adjacent to the line, possibly with the Heavy Maintenance Facility. High-speed train control systems will provide positive train control and separation, and cab signaling will automatically stop trains if necessary. Small signal control structures will be placed along the line adjacent to cross-overs and turn-outs. Communication systems include wireless train communication, connections between the Central Control Center and all stations, and a fiber-optic backbone. Wireless communication will be supported by regularly spaced communication towers adjacent to the line.

Trains will be regularly inspected at terminal stations and rolling stock maintenance will be performed at several new facilities throughout the state, whose detailed locations will be determined during the project-level environmental work. It is currently envisioned that a single, centrally located Heavy Maintenance Facility for major vehicle repairs and rehabilitation be constructed adjacent to the line. Train Storage and Daily Maintenance facilities will be located at or in close proximity to the terminal stations. Maintenance of the train infrastructure is supported by Maintenance-of-Way facilities placed throughout the system with roadway and material access points regularly spaced along the line.

2.2 HIGH-SPEED TRAIN STATIONS

Stations have been identified based on their ridership potential, opportunity to connect with other modes of transportation, and distribution of population and major destinations along the routes. Preferred station sites will be multi-modal transportation hubs with links to local and regional transit, airports and highways. It is assumed that parking at the stations would be provided at market rates with no free parking. Existing and new transportation hubs will be served, such as Union Station in Los Angeles, Santa Fe Depot in San Diego, Diridon Station in San Jose, Transbay Terminal in San Francisco and the Anaheim Regional Transportation Intermodal Center (ARTIC). The precise location, configuration, and number of stations are not confirmed at this time, and would be determined during the project-level environmental review. Possible station locations under consideration are shown in Figure 2.1.

The high-speed train facilities at each station will consist of tracks, controlled access platforms, full access for disabled passengers, including platforms with level-boarding, and ticketing/waiting/ passenger service areas. All intermediate stations along the line will have platform tracks off the main high-speed line to allow express trains to pass unimpeded. In urban centers where trains would routinely terminate their runs, larger and more complex track and platform arrangements are required. These terminal stations will provide sufficient passenger traffic to create new opportunities for shopping, business meetings, and provide offices and other development not primarily dependent on the automobile for mobility.

Stations providing travelers with access to high-speed trains can be strong focal points for transit oriented community development supporting higher density, mixed-use, pedestrian-oriented development around the station. As the project proceeds to more detailed study, local governments will be engaged to discuss planning and zoning for transit-oriented development around high-speed train station locations and to review opportunities to finance (e.g., through value capture or other financing techniques) and maintain the public spaces needed to support the pedestrian traffic generated by hub stations.

Figure 2.1 California High-Speed Train Network and Proposed Stations

3. PROJECT DEVELOPMENT AND IMPLEMENTATION

3.1 OVERVIEW

Project development for the California High-Speed Train system adheres to a prescriptive regulatory process to ensure that issues are assessed, impacts are identified, and mitigation is included in the final project. The major milestones in this process are:

- Program EIR/EIS, Conceptual Engineering
- Draft Project Specific EIR/EIS, Preliminary Engineering (15% Design)
- Final Project Specific EIR/EIS, Preliminary Engineering (30% Design)
- Record of Decision (ROD)
- Procurement Documents
- Permitting

Following receipt of the Record of Decision from the FRA, implementation activities will begin culminating in the start of revenue service for the California High-Speed Train, including:

- Land Acquisition and Right-of-Way Preservation
- Design and Construction
- Testing, Commissioning and Training
- Revenue Service

3.2 PROGRAM-LEVEL ENVIRONMENTAL IMPACT REPORT/ENVIRONMENTAL IMPACT STATEMENT, CONCEPTUAL ENGINEERING

For this very large infrastructure project, conceptual engineering and program level environmental studies addressed the question of “What is the best long term solution for California’s transportation needs?” Conceptual engineering efforts identified the magnitude and costs for expanding highway and airports to meet the future demand. For the high-speed train option, conceptual engineering efforts generated a range of potential rail corridors for evaluation. Based on the engineering data, an environmental assessment and evaluation was performed to determine which alternative mode provided the best solution for California. The conclusion was that the high-speed train option was the least environmentally damaging and practicable alternative in addressing the long-term transportation needs for California. These findings are documented in the Final Program EIR/EIS for the Proposed California High-Speed Train System approved in 2006, and Final Bay Area to Central Valley High-Speed Train Program EIR/EIS approved in 2008.

3.3 DRAFT PROJECT-LEVEL ENVIRONMENTAL IMPACT REPORT/ENVIRONMENTAL IMPACT STATEMENT, PRELIMINARY ENGINEERING (15% DESIGN)

Similar to the Program-Level effort, the Project-Level EIR/EIS will adhere to the applicable state and federal regulatory requirements and processes for transportation projects. To facilitate state and federal review of these more detailed studies, the Authority has divided the San Francisco and Merced to Anaheim High-Speed Train (HST) network into six segments for conducting the more detailed project-level preliminary engineering and Environmental Impact Report/Statement (EIR/EIS) work. The geographical limits of the six segments are:

- San Francisco to San Jose
- San Jose to Central Valley Wye
- Merced to Fresno
- Fresno to Palmdale
- Palmdale to Los Angeles
- Los Angeles to Anaheim

The Program Manager develops the system technical requirements and design criteria that results in the system level performance objectives and also meets state and federal regulatory requirements. The technical studies and draft environmental document for each segment is being prepared by a Regional Engineering/Environmental Consultant team with direct oversight by the Program Manager to ensure consistency in the design and the environmental process across the high-speed train network, compliance with the California High-Speed Train system requirements, and adherence to Authority quality, schedule, and budgets.

3.4 FINAL PROJECT-LEVEL ENVIRONMENTAL IMPACT REPORT/ENVIRONMENTAL IMPACT STATEMENT, PRELIMINARY ENGINEERING (30% DESIGN)

A preferred alternative will be selected based on the findings of the Draft EIR/EIS and the public and agency comments. Preliminary engineering at the project-level (i.e., for each segment) to support the Final EIR/EIS, which constitutes a nominal 30 percent of the total final design effort required for a segment, will be prepared. This level of engineering will also support the permitting, land acquisition, and right-of-way preservation efforts. Preliminary engineering documents will be camera-ready so as to support the procurement process during the next phases of the project, including the various project program delivery options of design-build, design-build-operate, design-build-operate, maintain, or any other public-private partnership (P3) arrangement.

3.5 RECORD OF DECISION (ROD)

The Record of Decision and Notice of Determination (NOD) marks the completion of the studies and acceptance of the environmental analysis and recommendations by the federal and state government sponsors, respectively. The project specific EIR/EIS process has begun on all segments. However, completion dates will vary due to annual funding constraints over the past several years and the unique nature of each segment.

Upon receipt of the ROD and NOD for a given segment, permitting activities, right-of-way negotiations, land acquisition, and design and construction for that segment can begin

3.6 PROCUREMENT DOCUMENTS

Procurement documents will be prepared and used to secure final design, construction, operations, and maintenance services in a competitive bid process. Procurement documents for a given segment can be issued upon receipt of a ROD. Project delivery strategies under consideration by the Authority are further explored in 3.9 Design and Construction. In general, procurement documents will address the legal, commercial, financial, and technical requirements and responsibilities for both the Authority and the selected contractor.

It is important to note that the Authority is seeking private investment in the project and is therefore specifically interested in using P3 and other project delivery alternatives. Private sector involvement can support many aspects of the project's development, including civil works, equipment supply, operations, maintenance, and financing. In April 2008, a "Request for Expressions of Interest", or RFEI, was issued for private participation in the development of a High-Speed Train system in California. The RFEI served as a structured means by which to receive private sector comment in order to inform the Authority's public policy decisions, identify the level of interest of private firms to enter into contracts under a P3 arrangement, gain useful perspectives on risk allocation and deal structure, and to solicit input on several key factors that might drive private investment, including:

- Earliest possible completion of the Project;
- Geographic and/or functional segmentation of the Project;
- Private financing for a portion of the Project including non-recourse project debt and equity investment;
- Transfer of significant ridership, construction and technical risk to private parties.

Private Sector responses to the RFEI will be used to assist the Authority in determining appropriate public-private partnership (P3) structures and to confirm and refine construction staging concepts. As the Project continues to move forward, the Authority will incorporate P3 opportunities in the procurement documents, as is appropriate.

3.7 PERMITTING

The environmental commitments and mitigation measures included as part of the Project-Level Final EIR/EIS, ROD, and NOD will be the basis of the permitting needed for the final design approvals and construction of each segment. All environmental commitments, permits, approvals, and resource agency agreements needed for construction will be acquired by a team of Authority staff and private contractors and included in the Projects final plans, contract specifications and procurement provisions.

3.8 LAND ACQUISITION AND RIGHT-OF-WAY (ROW) PRESERVATION

Specific land acquisition by segment can begin upon receipt of the project-level ROD and NOD. Right-of-way acquisitions will conform to the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended, and other state and federal provisions required at the time of acquisition.

The Authority can currently protect rights-of-way and preserve land for the future high-speed train alignments using the Program EIR/EIS approvals, as available funding permits. This might be considered in areas where development is rapidly occurring or where potential changes in land use could significantly increase construction costs.

As part of the right-of-way process and where shared use with existing railroad corridors is confirmed, the Authority will negotiate terms of access for shared rights-of-way with railroad owners and operators on issues such as shared maintenance and operating costs, mitigation of existing operations to allow high-speed train operations, liability indemnification, insurance requirements, and other legal and operational matters.

3.9 FINAL DESIGN AND CONSTRUCTION

Due to the system approach that is necessary for the development and delivery of high-speed train systems, the procurement of final design and construction services will also need to take into account the overall strategy for eventual operation and maintenance of the system. A variety of procurement strategies will be assessed and evaluated for how best to deliver the various components of the high-speed train system while meeting the objectives of the Authority. Where revenue sharing can be incorporated with any of the delivery strategies, a financial component (i.e., private investment) will also be part of the procurement process. As will be further explained, it is possible to employ a variety of delivery strategies depending on the breakdown of the system components. Typical procurement strategies used for high-speed train projects include:

- Design/Build (D/B)
- Design/Build/Operate (DBO)
- Design/Build/Operate/Maintain (DBOM)
- Public-Private Partnerships (P3)

Procurement documents will be prepared and used to secure final design, construction, operations, and maintenance services in a competitive bid process. The Design/Build approach integrates the design and construction functions into one contract. D/B will generally be the most appropriate approach for the large civil works construction contracts. Final design and construction will be based on the preliminary engineering prepared by the Regional Consultants, requirements of the Final Project-Level EIR/EIS, and design standards and criteria prepared by the Program Manager as issued with the procurement documents. DBO, DBOM, P3 initially are similar to the D/B option but continue with added functions of operations, maintenance, and private finance. While the Authority has determined it may be impractical to enter into a single franchise contract for the implementation of the entire high-speed system, there is the possibility, for example, of entering into a single contract for the systems (signaling, communications, track and electrification) and train technology for the entire project. This option may provide one of the best opportunities for private sector financing, risk sharing and clear accountability for the performance of trains and systems.

Although the Authority will utilize all contracting mechanisms, the Authority believes that the design/build procurement strategy will likely be preferred for the major, high-value construction contracts. Likewise, the Authority believes that one of the best procurement strategies for the train technology and systems will include design, construction/supply/installation, maintenance and operations in a single contract because it best supports the integration of high-speed train systems and offers the possibility of leveraging public-private partnership opportunities. In some projects, operations and maintenance of the train service have also been included with provision of train systems and, in others, maintenance and operations have been kept separate. Further discussions with technology providers and high-speed train service operators as well as further detailed analysis will be needed to determine if a DBOM for the systems and train technology is financially feasible and preferable.

In any of these approaches, a single operator would be responsible for providing a variety of services (local, regional, express, premium, etc). The Authority believes that a single high-speed train operator would better ensure integration of services, accountability, reduced risk, effective coordination and communication, and would simplify Authority oversight.

3.10 TESTING, COMMISSIONING AND TRAINING

Once the construction is complete, the systems, processes, high-speed trains, and operation must be tested, commissioned and certified that they are ready for use in passenger service.

Testing and commission of the system will need to satisfy the regulatory requirements of the federal and state regulatory agencies, principally the Federal Railroad Administration (FRA) and the California Public Utilities Commission. Federal requirements are expected to be codified in a Rule of Particular Applicability (RPA) issued by the FRA specific to the California High-Speed Train system.

One of the key components to undergo testing is the trainset and how it interfaces with the infrastructure and systems. Design, construction, final assembly and shop testing of the prototype trainset is scheduled to require two and one-half years. Field testing and commissioning of the prototype trainset for reliability, performance and compliance with FRA and other requirements is assumed to take one year. After testing of the prototype, delivery of the first trainsets is planned to arrive six months later and are then delivered at the rate of one or two per month. Upon the arrival of each trainset, they are inspected, tested and commissioned to be certified for passenger service.

As the trainsets are delivered to the Authority, each will require static testing to ensure all features work as designed. Once that is complete, they will undergo dynamic testing which involves evaluating the train while underway where track construction is complete, powered and available for train operations under a testing scenario. System interfaces such as pantograph interface and wear, automatic train control, electrical clearances between the train and static physical structures, signaling, communications etc. throughout the entire testing section will be checked and confirmed. The trainset itself will have the software for propulsion and braking tested and optimized specific to the California High-Speed Train system. Other systems such as doors and air conditioning will be checked for proper function and operation.

The Authority is introducing an entirely new system of transportation in the United States. Personnel for crews, stations, maintenance, security, operations, etc. will be hired and trained to work with these new systems and processes in preparation for passenger service. Hiring and training will be staged over time, increasing staff incrementally to the required number of personnel in advance of opening day to provide a first-class and safe operation.

3.11 PASSENGER AND REVENUE SERVICE

High-speed trains will offer Californians a new way of traveling. Combining the benefits of moving from one part of the state to another quickly with the freedom to plug in your computer or talk on a cell phone or get up to get a cup of coffee, high-speed train travel promises Californians a relaxing, productive trip. Tables would be available for group seating, with the possibility of conference rooms available for business meetings en route. Because they travel over new dedicated infrastructure, trains traveling at high speeds provide an extremely safe, smooth and comfortable ride. High-speed trains are also the most reliable way to travel, not hampered by rain, fog, or interstate delays in completing their scheduled runs.

As the high-speed train system will be constructed in segments, service between city pairs within a completed segment such as San Francisco-San Jose, Los Angeles-Anaheim, Fresno-Bakersfield, etc. will be evaluated to determine if pre-revenue service in these segments are feasible.

4. PROGRAM MANAGEMENT — CONTROL AND IMPLEMENTATION

4.1 INSTITUTIONAL STRUCTURE

The Authority's legislative mandate to develop a high-speed train system includes broad powers to enter into contracts for any of the stages and activities of planning, design, construction, operation and maintenance. To date, the Authority has used this power to conduct its planning work with a small staff directing numerous consultant teams under contract.

The Authority has transitioned into an agency capable of handling much larger workloads and ensuring that the public interest is met during all phases of the project. The agency staff provides continuity and institutional stability and oversees private sector contractors. At the same time, the Authority's permanent agency staff remains small enough to be flexible, innovative and efficient during the various phases of the project.

The Authority examined successful large high-speed train and related infrastructure projects, both overseas and in the U.S. to identify the institutional structure that would best meet its objectives. Organizational alternatives ranged from established government-owned railroads to small new government agencies that issue large, long-term franchise contracts to major private sector conglomerates. Each of the projects investigated had very dynamic staffing needs. Large numbers of specialized engineering and construction personnel were needed over a relatively short design and construction period. Subsequent long-term operations typically required yet a different group of specialized personnel. All of these projects used contractors to some extent to meet these changing personnel needs.

The specialized expertise needed to oversee implementation and operation of a high-speed train system does not currently exist in California state government, although the related expertise of state agencies could be tapped for some functions. Personnel needs would vary during implementation (e.g., to support the construction effort, staff would be needed for limited terms varying from two to 10 years). Current state personnel hiring processes typically lead to regular long-term employment when what is needed is the flexibility to bring on specialists until that task is complete. This also provides the Authority with the ability to bring on specialized expertise as needed to manage, build and launch the new system and end those working relationship when the work is complete keeping costs down and preventing the State from taking on long-term employment agreements that are not needed. While train operations and maintenance functions will be ongoing, the capability to carry these functions out is more readily available in the private sector. Competitive private sector bidding is increasingly used by California's public transit agencies and for high-speed train operations in Europe and Asia.

The Authority has determined that the best approach for the California high-speed train is a hybrid institutional structure which relies upon an expert core public sector staff using competitive contracting to the greatest extent possible. Private sector contractors have been determined to be the best fit to provide the majority of personnel needed to implement the high-speed train system. This structure would allow for competitive bidding and targeted recruitment to meet the ebbs and flows of expertise and labor needed to implement and operate the proposed system.

The success of this approach is already evident on the California High-Speed Train Project where highly qualified and experienced private sector staff working under consultant contracts completed detailed research and reports that guided routing, system design and procedures resulting in federally approved programmatic environmental documents for the largest infrastructure project in the U.S. The Authority currently has ten private sector contracts in place providing expertise in the areas of engineering design, finance, public outreach, and project delivery to guide and advance the California High-Speed Train Project into construction and then to revenue service. The Authority can also utilize the services of Caltrans for certain project design and engineering services, including construction inspection services for those elements of the project affecting the state highway system, with the exception of projects that are delivered in larger design-build contracts. In addition, a separate program management contract provides direct support to the Authority to help guide, implement and manage the delivery of the project, and give access to technical expertise in the areas of scope management, scheduling, regulatory processes and approvals, major infrastructure delivery strategies, and high-speed train system design and integration, operations, and maintenance. Finally, a Program Management Oversight consultant provides the Authority with independent reviews of the Program Management Team and other contractors.

4.2 PROGRAM MANAGEMENT — CONTROL AND IMPLEMENTATION

Bringing a complex project like the California High-Speed Train Project to completion requires thoughtful planning, timely execution, regular monitoring, and pro-active management. The challenge for the Authority is to consider and manage a number of separate, often concurrent, activities for different parts of the system—planning, environmental review and permitting; preliminary engineering, land acquisition, negotiations with existing railroads and public entities, and procurement documents; design, construction, testing and commissioning; and finally, revenue service operation and maintenance of the train system.

Management of the overall program becomes increasingly difficult as delivery activities overlap and schedules compress. The foundation for the project has been set with the approval of the Program EIR/EIS documents and Board decision on a project phasing approach. The more detailed Project-Level EIR/EIS work currently underway will identify specific mitigation requirements, further define right-of-way requirements, and confirm achievement of system performance objectives. Concurrent with the project-level studies, delivery strategies will be evaluated and procurement documents will be prepared. As design and construction progresses, Authority and project management responsibilities grow along with implementation of project controls, quality control and construction inspection work. Train and system suppliers and future operators will have a formal role as partners in the development and oversight of those system installations. The demand and need for varying technical and commercial expertise increases and decreases as the project evolves and problems arise. In addition, rolling stock (trains) warranty and construction project wrap-up continues beyond the start of passenger service.

To address the management challenges, the Authority has established a matrix organization structure consisting of a Program Management Consultant (PMC) and multiple Regional Consultants (RC) to guide and support delivery of the California High-Speed Train Project. The PMC has responsibility for establishing system-level requirements that ensure quality and consistency across all the Regional Consultants that are preparing the project-level environmental and preliminary engineering studies for the six regions that make up the 520-mile long high-speed route that connects San Francisco, Merced and Anaheim. A system approach to design is necessary for those elements that cross geographic boundaries, such as signaling and traction power, to ensure consistency and is essential to delivering a safe and reliable high-speed train service. Dividing the 520-mile long route into six segments is needed to have manageable projects that support timely regulatory review, assessment and approvals. Areas of responsibility for the PMC and RC through receipt of a ROD are as follows:

- Program Management Consultant
  - Environmental Agency Review Protocols
  - Program-Level EIS/EIR
  - Project-Level EIR/EIS Oversight and Management
  - System-wide Train Simulation Modeling

- Preliminary Operations Plan
- Preliminary Maintenance Plan
- Traction Power System Modeling and Design
- Train Controls and Communications System Design
- Rolling Stock Specifications
- System Integration
- High-Speed Train Design Criteria and Manual
- High-Speed Train Standard Drawings
- Regulatory Approvals including FRA Rule of Particular Applicability
- Preliminary Construction Cost Estimates
- Program Risk Management and Quality Assurance
- Overall Program Schedule
- Final Design and Construction Delivery Strategy and Procurement Documents

- Regional Consultant
  - Local Agency Coordination
  - Local Public Outreach
  - Environmental Technical Reports
  - Project-Level EIS/EIR
  - Preliminary Engineering – 15% Design
  - Procurement Documents – 30% Design
  - Preliminary Construction Quantities and Costs
  - Project Risk Management and Quality Assurance
  - Project-Level Schedule

One of the more critical responsibilities of the PMC is securing the regulatory approval from the Federal Railroad Administration which includes development of the project Safety Case and submission of the Petition for a Rule of Particular Applicability (RPA). As envisioned, the RPA will include all of the requirements to meet the applicable U.S. Code of Federal Regulations (CFR) for railroad safety. It is expected that the RPA will be issued specific to the California High-Speed Train system addressing all current and applicable sections of the CFR with additional requirements to address safety requirements unique to high-speed trains.

Project delivery strategies currently under discussion will be further assessed and procurement documents will be prepared and ready for distribution when the project-level Records of Decision are received. Procurement documents will be compiled by the PMC and will reflect a coordinated effort by the Authority staff, legal and financial experts, design and construction management consultants, and technical specialists. Due to the size of the program, procurement documents will likely include a range of contract types (D/B, DBO, DBOM, etc.) depending on the overall delivery strategy and schedule. For example, civil works may be let out on a D/B basis by segment while systems works such as trains and signaling may be let out on a system-wide basis as part of a larger operating agreement. Regardless, the contracting strategy will reflect the needs of the delivery schedule and operations and maintenance of a safe and reliable high-speed system.

At more than $2.4 billion, right-of-way costs are a significant cost item that will be closely tracked for impacts due to changes in the economy, local development and land use planning. Right-of-way acquisition, if not proactively planned and managed, can also cause delay in the project schedule. The Authority, with assistance from the PMC, will identify at-risk segments and develop a right-of-way preservation program consistent with state and federal requirements and available funds.

Following receipt of the NODs/RODs and issuance of the procurement documents, projects will progress to the design and construction stage. At this point, the role of PMC will focus on oversight of the Design and Construction (D&C) contractor to ensure compliance with the design criteria, standard drawings, and preliminary engineering documents. During this phase, the D&C contractor will likely bring forward alternative approaches and designs that provide economic benefits to the Authority. The PMC will evaluate requested design variations against the published California High-Speed Train design criteria and standards to confirm any impacts to safety, reliability, and overall achievement of the system performance objectives. The PMC will also monitor and manage project progress, budgets, schedules, quality, and compliance with standards and specification to ensure an on-time delivery for revenue service, including development of schedule recovery plans as needed.

With construction of a segment completed, testing and commissioning of the segment will begin to ensure a safe and reliable high-speed train system and to certify that it is ready for use in passenger service. A testing and commissioning plan will be prepared by the PMC, constructors, manufacturers, and operators to confirm compliance with the applicable state and federal regulatory requirements, including the Rule of Particular Applicability. Once certified, the segment can then be brought into regular revenue service.

5. PHASING AND STAGING OF THE PROJECT

5.1 PROJECT PHASING AND STAGING

At 520-miles long, the sheer scale of the California High-Speed Train system San Francisco and Merced to Anaheim segment makes it impractical to construct and initiate revenue service all at once. Construction of such a transportation network is an enormous undertaking, the like of which has not been seen in this state or country, and it must be carried out with great care and considerable thought. Building a network of this size will tax the state's resources, such as its financial, human and material needs, and the Authority must deal with both environmental and engineering challenges. Like all the other high-speed train networks implemented throughout the world, the California system must be built in stages.

In May 2007, the California High-Speed Rail Authority Board approved a Project Phasing plan that identified the "Anaheim to Los Angeles to Merced and the San Francisco Bay Area" route as the initial phase. This plan took into account many factors including: potential for early utilization of segments; local and regional participation in the early construction and funding; ability to serve many regions; significant operating surplus to encourage private partners in the construction and operation; development of a high-speed segment of around 100 miles, for building, testing, and commissioning the high-speed trainsets, equipment and systems; and potential to complete the initial phase within 12 years.

As previously indicated, the Authority will be pursuing project delivery alternatives that involve private investment under a public-private partnership (P3) arrangement. Construction staging will be subject to these alternative delivery strategies particularly as to how it can address and improve cash flow, safety, reliability, operations, and maintenance from the perspective of a private investor.

5.2 PROJECT STAGES AND SEQUENCING

Construction stages have been initially divided into manageable size segments and based on logical termini. An example segment construction sequence is presented herein and is based in part on target dates for the Records of Decision for the segments as well as the physical and financial feasibility. However, on the question of staging and sequence options, all the 520 miles between San Francisco and Merced to Anaheim are open for discussion depending on the private sector input. Although the overall implementation of construction for the high-speed train system will be divided into segments, it is expected that multiple segments will be in construction concurrently to meet the initial phase opening schedule by the Year 2020. The segment length for each San Francisco and Merced to Anaheim stage is listed in Figure 5.2 below and is subject to change based on completing preliminary engineering.

Figure 5.1 Phase 1 Map

FIGURE 5.2 PROJECT STAGING SEGMENTS (ROUNDED TO THE NEAREST 5 MILES)

San Francisco and Merced to Anaheim	
San Francisco to San Jose	50 miles
San Jose to the Central Valley Wye	120 miles
Merced to Fresno	60 miles
Fresno to Bakersfield	115 miles
Bakersfield to Palmdale	85 miles
Palmdale to Los Angeles	60 miles
Los Angeles to Anaheim	30 miles
Cumulative Miles	520 miles

For the San Francisco and Merced to Anaheim alignment, there may be segments that can be completed and open to service before construction is completed on the entire length. Ridership and revenue forecasts identified which routes and segments best serve the future public demand and may guide staging concepts. Selection of operable segments and the order in which they may be staged will take into account these considerations:

- Availability of capital to construct the segment and procure the train systems;
- Ridership and revenue potential and the ability of the segment(s) to be operated without state subsidy;
- Trainset access to a suitable facility for testing, service, and maintenance;
- Distribution of construction resources and potential for independent service in both Northern and Southern California.

Sequencing of the stages is currently based on the schedule for receiving a Record of Decision, and the physical requirements for construction. The sequencing of the stages for San Francisco and Merced to Anaheim alignment is included in Figure 5.2. Capital costs are provided for the construction effort and are inclusive of all delivery costs for that segment. Vehicles costs are provide for two HSR fare structure scenarios, 50% and 77% of projected airfare.

Figure 5.2 Sequencing by Construction Stage and Vehicle Procurement for San Francisco and Merced to Anaheim

(Costs shown in millions, Aug 2008 dollars)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	TOTAL
SAN FRANCISCO TO ANAHEIM Total Construction Costs for 77% and 50% Airfare HSR Fare Structure Scenarios not including Vehicles																		
SAN FRANCISCO - SAN JOSE				83	351	697	1,025	965	730	311	49							4,210
SAN JOSE TO CENTRAL VALLEY WYE				367	791	733	789	1,022	790	459	159	65						5,175
MERCED TO FRESNO				227	341	333	377	380	305	96	33							2,093
FRESNO TO BAKERSFIELD				461	692	677	765	772	620	195	68							4,249
BAKERSFIELD TO PALMDALE				248	881	872	726	590	431	104	39							3,892
PALMDALE TO LOS ANGELES			138	819	932	1,029	936	855	429	267	33							5,438
LOS ANGELES TO ANAHEIM			93	114	336	317	397	355	223	146	12							1,994
TOTAL CONSTRUCTION			230	2,320	4,324	4,660	5,014	4,939	3,528	1,578	394	65						27,051
PROGRAM IMPLEMENTATION	121	201	303	189	161	261	281	281	255	226	149	84	15	15	15	15	15	2,584
TOTAL W/O VEHICLES	**121**	**201**	**533**	**2,509**	**4,485**	**4,921**	**5,295**	**5,220**	**3,783**	**1,804**	**542**	**149**	**15**	**15**	**15**	**15**	**15**	**29,635**
Total Costs for 77% Airfare HSR Fare Structure Scenarios																		
VEHICLES -- 77% AIRFARE						63	126	315	630	630	315	221	221	221	221	189		3,150
TOTAL - CONST & VEHICLES	**121**	**201**	**533**	**2,509**	**4,485**	**4,984**	**5,421**	**5,535**	**4,413**	**2,434**	**857**	**369**	**235**	**235**	**235**	**204**	**15**	**32,785**
% OF TOTAL	0.4%	0.6%	1.6%	7.7%	13.7%	15.2%	16.5%	16.9%	13.5%	7.4%	2.6%	1.1%	0.7%	0.7%	0.7%	0.6%	0.0%	100.0%
Total Costs for 50% Airfare HSR Fare Structure Scenarios																		
VEHICLES -- 50% AIRFARE						80	160	399	798	798	399	279	279	279	279	239		3,990
TOTAL - CONST & VEHICLES	**121**	**201**	**533**	**2,509**	**4,485**	**5,000**	**5,455**	**5,619**	**4,581**	**2,602**	**941**	**428**	**294**	**294**	**294**	**254**	**15**	**33,625**
% OF TOTAL	0.4%	0.6%	1.6%	7.5%	13.3%	14.9%	16.2%	16.7%	13.6%	7.7%	2.8%	1.3%	0.9%	0.9%	0.9%	0.8%	0.0%	100.0%

NOTE: Vehicle procurement schedule provides 2/3 of the total train sets needed by the Year 2030 to be delivered by Year 2020. These are the train sets required to start the Year 2020 service. The remaining train sets are planned for delivery from 2020 to 2025.

6. CAPITAL COSTS

6.1 CONSTRUCTION, VEHICLE, SYSTEMS, FACILITIES, AND PROGRAM DELIVERY COSTS

Total capital expenditures (Figures 6.1 and 6.2) to bring the this phase of the California High-Speed Train System into revenue service is estimated to cost $32.7 to $33.6 billion (in 2008 dollars) depending on fare structure.The cost per mile for the system varies according to the difficulty of the terrain and constraints on right-of-way and ranges from $34 million per mile in the Central Valley to $90 million in some urbanized areas. These costs reflect the preferred alignments identified the Final Program EIR/EIS for the Proposed California High-Speed Train System approved in 2006, and Final Bay Area to Central Valley High-Speed Train Program EIR/EIS approved in 2008.

The total capital cost estimate for the San Francisco and Merced to Anaheim alignment includes the costs to bring the system into revenue service and consists of rail network construction, rolling stock, systems, facilities, and program implementation. Construction of the rail network, the bulk of which is performed within California stimulating local economies, is $21.1 billion (~64% of the total costs) and includes utility relocations, earthwork, tunnel and viaduct structures, grade separations, track work, buildings, signals and communications infrastructure, electric power supply and distribution, final design, and environmental impact mitigation. Right-of-Way costs are approximately $2.4 billion (~7% of the total costs). Rolling stock ranges from $2.8 to $4.0 billion (~10% to 12% of the total cost) depending on the fare structure and could be partly manufactured and assembled in California generating additional stimulus for the state's economy. A centrally located heavy maintenance facility and light maintenance facilities located near the terminal stations as well as the base stations themselves make up the supporting facilities which total $3.5 billion (~11% of the costs). Program implementation costs total $2.6 billion (~8% of the total costs) and includes agency staff, public education and outreach, environmental planning and preliminary engineering efforts, program management, and construction management.

Some of the specific items of note in the cost estimate include fencing along the entire right-of-way and barriers where necessary for separation from incompatible rail and roadway traffic. The cost estimate also includes a contingency, calculated at 30 percent of the construction costs including force account work, as well as an allowance for environmental impact mitigation, calculated at three percent of the construction cost.

The cost estimates reflect the unique aspects of the latest high-speed rail alignment recommendations included in the Program environmental documents and the current global market conditions. Many of the cost components involved, such as electrification, signaling, and track are quantities well known from rail projects around the world. Vehicle unit prices represent an approximately 650-foot trainset with capacity for about 450 to 500 passengers, and are estimated based on discussions with manufacturers as well as recent large scale orders for trainsets similar to those envisioned for the California High-Speed Train system. The costs for major civil works, including tunneling and structures are specific to California's geology, seismic conditions, and labor markets are taken from previously completed civil projects in California, including freeway construction, major water projects, and urban rail projects.

Figure 6.1 Capital Costs by Segment (Costs shown in millions)

SAN FRANCISCO - SAN JOSE	$	4,210	50	84.2
SAN JOSE TO CENTRAL VALLEY WYE	$	5,175	120	43.1
MERCED TO FRESNO	$	2,093	60	34.9
FRESNO TO BAKERSFIELD	$	4,249	115	37.0
BAKERSFIELD TO PALMDALE	$	3,892	85	45.8
PALMDALE TO LOS ANGELES	$	5,438	60	90.6
LOS ANGELES TO ANAHEIM	$	1,994	30	66.5
PROGRAM IMPLEMENTATION	$	2,584	na	
TRAINSETS (50% - 77% Airfare HSR Fare)	$	2,835 - 3,990	na	
TOTAL	$	32,785 - 33,625	520	

Figure 6.2 Capital Costs by Cost Item (Costs shown in millions)

CONSTRUCTION ITEM			
Environmental Mitigation	$	669	2.8%
Rail and Utility Relocations	$	579	2.5%
Earthwork	$	3,614	15.3%
Structures	$	6,004	25.5%
Grade Separations	$	4,222	17.9%
Track	$	1,412	6.0%
System Elements	$	2,004	8.5%
Electrification	$	1,539	6.5%
Buildings	$	3,504	14.9%
TOTAL CONSTRUCTION	**$**	**23,547**	

OTHER COSTS			
Program Implementation	$	2,584	
Final Design (4.5% of Construction)	$	1,060	
Right-of-Way	$	2,444	
Vehicles	$	3,150 - 3,990	
TOTAL CAPITAL COSTS	**$**	**32,785 - 33,625**	

7. OPERATIONS AND MAINTENANCE

7.1 SERVICE PLAN

Traveling at speeds of up to 220 miles per hour, the California High-Speed Train service will be very competitive with air travel times for many intercity travelers and will be faster than all but the shortest intercity trips by car. The high-speed train will not only save passengers' time, but will reduce the increasing peak demand and congestion expected to grow by 2020 on existing transportation systems and benefiting those that choose to continue to use the airlines and roads.

The currently proposed operating plan takes advantage of the high-speed infrastructure's capacity and flexibility and offers a wide variety of service options. A mix of express, semi-express, regional and local trains would serve both intercity passengers and long-distance commuters. The basic service pattern provides most passenger service between 6:00 a.m. and midnight.

In 2030, a total of 256 weekday trains in each direction are planned to serve the statewide intercity travel market. One hundred and eighty-eight of the trains will run between Northern and Southern California and the remaining 68 trains will serve shorter distance markets.

7.2 OPERATING AND MAINTENANCE COSTS

The operating and maintenance (O&M) requirements for high-speed train systems are well known from the many decades of revenue service in Asia and Europe. The largest O&M components are train operations and equipment maintenance. Both of these are very labor intensive and depend highly on the number of trains and the operating schedule. Maintenance-of-way and replacement costs for infrastructure and trainsets are included in the O&M costs. The O&M costs also include a variety of long-term costs, including advertising, reservations, station services and general support. Electric power consumption accounts for the remaining major component of O&M costs. The O&M cost for this phase of revenue service between San Francisco and Anaheim is estimated at $1.1 to $1.3 billion per year for a high-speed train fare structure that is 77% and 50% of projected airfare, respectively.

As this would be the first high-speed train system operating in the U.S., a variety of sources was used to generate a realistic and reasonable operating and maintenance cost. To estimate O&M costs for a system in California, many of the components, particularly labor and energy costs, were based upon recent local operator experience in the U.S. Labor and material costs for maintaining vehicles, tracks and systems (including power systems and signaling) were based on rail experience in the U.S. but also considered foreign experience as the trainsets, infrastructure, and systems would likely be based on Asian or European technology. Operating and maintenance costs are also directly related to the train service plan and the physical make-up of the high-speed train system. Estimated O&M costs for the system took into account the following physical characteristics:

- System length
- Number and type of stations
- Number of train sets
- Operating scenarios
- Capital costs of major infrastructure components
- Labor rates
- Electrical power rates

The O&M cost model output is dependent on key input data, including ridership volumes and vehicle-miles-traveled, both of which are sensitive to fare structure. Two fare structures were assessed, high-speed train fares set at 50% and 77% of projected airfare. The O&M Costs for the two fare structure scenarios is presented in Figure 7.1 in the following main categories: Maintenance of infrastructure; Maintenance of rolling stock; Operations; and Insurance.

Figure 7.1 O&M Costs* for San Francisco and Merced to Anaheim
(Costs shown in millions)

O&M Cost Item	O&M Costs HSR Ridership Fare Structure - 50% of Airfare (millions)	O&M Costs HSR Ridership Fare Structure - 77% of Airfare (millions)
Infrastructure Maintenance	$139	$139
Rolling Stock Maintenance	$485	$435
Operations	$556	$491
Insurance	$104	$93
TOTAL	**$1,284**	**$1,158**

*** O&M costs are based on the 2008 Competitive Conditions for Air and Auto (+8% higher than 2006) and HSR Fares at 50% and 77% of Air fare as described in the Ridership and Revenue Forecasting section.**

8. CASH FLOW FOR SAN FRANCISCO AND MERCED TO ANAHEIM SEGMENT

8.1 ANTICIPATED EXPENDITURE PLAN

A phased-funding scenario assumes no delay in the project schedule or the initiation of revenue service. Rather, the strategy focuses on securing the funds necessary to complete the discrete phases and stages of the project and support a possible revenue service roll-out in segments. The specific timing for funds is generally driven by the project schedule for the key cost items of right-of-way, construction, and vehicles.

With the Program EIR/EIS phase successfully completed, the Authority has started the Project-Level environmental technical studies and preliminary engineering efforts on all segments. The Project EIR/EIS activities are targeted for completion by 2012 with some variations in completion dates depending on the segment.

Bringing the San Francisco and Merced to Anaheim section of the California High-Speed Train system into revenue service will follow a sequence typical of large public infrastructure. Purchase of right-of-way for this phase, which is estimated to be approximately $2.4 billion, would begin in earnest soon after receipt of the Project-Level Records-of-Decision. Right-of-way acquisition, along with the estimated $24 billion in construction, would require around 10 years and take into account the delivery strategy and opportunities for both federal, state, local participation and private investment. Finally, the delivery of the rolling stock is planned to begin in the Year 2014 in accordance with the roll-out plan for revenue service for the San Francisco and Merced to Anaheim segment, taking into account train testing and commissioning requirements, start-up train service levels by the Year 2020, and ridership demands and growth in the ensuing years.

Figure 8.1 Capital Costs by Item
(Costs shown in millions)

ITEM	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	TOTAL
PE / Environmental	92	154	246	123														615
Program Implementation	28	47	57	66	161	261	281	281	255	226	149	84	15	15	15	15	15	1,969
Final Design			14	188	212	212	204	106	61	53	11							1,060
Right-of-Way			216	1,012	1,006	210												2,444
Environmental Mitigation				46	144	157	134	129	59									669
Rail and Utility Relocations				89	152	180	92	55	12									579
Earthwork				351	975	980	741	388	178									3,614
Structures				417	1,179	1,373	1,272	1,111	472	179								6,004
Grade Separations				216	656	1,252	1,193	655	206	43								4,222
Track						81	251	405	405	189	66	16						1,412
System Elements						121	328	542	541	266	174	32						2,004
Electrification						93	247	416	462	184	121	17						1,539
Buildings							553	1,133	1,133	664	22							3,504
Total Construction w/o Vehicles	**121**	**201**	**533**	**2,509**	**4,485**	**4,921**	**5,295**	**5,220**	**3,783**	**1,804**	**542**	**149**	**15**	**15**	**15**	**15**	**15**	**29,635**
Total Costs for 77% Airfare HSR Fare Structure Scenarios																		
VEHICLES -- 77% AIRFARE						63	126	315	630	630	315	221	221	221	221	189		3,150
TOTAL - CONST & VEHICLES	**121**	**201**	**533**	**2,509**	**4,485**	**4,984**	**5,421**	**5,535**	**4,413**	**2,434**	**857**	**369**	**235**	**235**	**235**	**204**	**15**	**32,785**
% OF TOTAL	0.4%	0.6%	1.6%	7.7%	13.7%	15.2%	16.5%	16.9%	13.5%	7.4%	2.6%	1.1%	0.7%	0.7%	0.7%	0.6%	0.0%	100.0%
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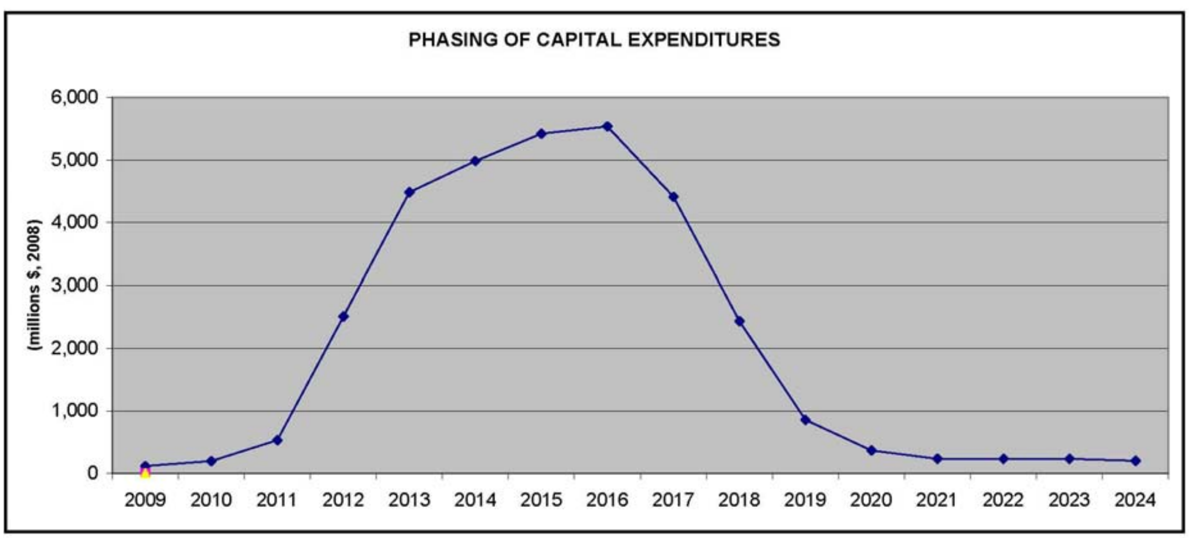
VEHICLES -- 50% AIRFARE						80	160	399	798	798	399	279	279	279	279	239		3,990
TOTAL - CONST & VEHICLES	**121**	**201**	**533**	**2,509**	**4,485**	**5,000**	**5,455**	**5,619**	**4,581**	**2,602**	**941**	**428**	**294**	**294**	**294**	**254**	**15**	**33,625**
% OF TOTAL	0.4%	0.6%	1.6%	7.5%	13.3%	14.9%	16.2%	16.7%	13.6%	7.7%	2.8%	1.3%	0.9%	0.9%	0.9%	0.8%	0.0%	100.0%

Figure 8.2 Program Expenditures by Year
(Costs shown in millions)



9. RISKS AND MITIGATION

9.1 RISK OVERVIEW

A project as large and complex as California's High-Speed Train will convey a number of risks to both the Authority and other participants. The key risks identified to date include:

- Construction Risk
- Technology and Operations Risk
- Legislative Risk
- Ridership Risk
- Completion Risk

9.2 CONSTRUCTION RISK

Construction risk is associated with delays in construction and increase in construction costs. There are a number of steps that the Authority can take to limit the state's exposure to future construction cost increases, which focus on transferring this risk to a private partner through innovative contracting methods, like design-build. These contracting methods should ensure on-time delivery at a high level of performance by contractors by connecting a large amount of their compensation to meeting project completion performance standards, with cost overruns and delays in completion subject to significant penalties. Design-build contracts have been very effective delivering projects on time and within budget.

The Authority will also use more traditional performance bonding to create incentives for its contractors to fulfill their contract obligations. If such obligations are not fulfilled, then the Authority would seek payment for damages under the performance bond.

Risk associated with increasing price of materials is not transferable to a third party and can be managed in two steps. The first will be to work closely with the engineering team to maintain the Project budget through efficient design and value engineering where appropriate. Secondly, the Authority must factor contingencies into its cost estimates to ensure that sufficient resources are available in the event that projected costs do increase. Such contingencies have been included in all cost estimates to date, and will continue to be incorporated until the Authority has price certainty as each segment progresses through its development.

9.3 TECHNOLOGY AND OPERATIONS RISK

Technology and operations risk are the associated with the high-speed train technology and future system operations. Due to the size of the California High-Speed Train project, it is possible that private participation will be split amongst several companies or consortia. Because of this, there is the potential for integration issues to arise between the various pieces of operating and communications equipment necessary for a high-speed train system.

The Authority can work to mitigate this risk by entering into contracts and providing incentives that encourage project participants to achieve seamless integration. For example, the Authority could choose to contract with one firm or consortia responsible for the systems operations, or work to provide incentives for project participants to share in the long-term success of the system. The Authority will also choose from existing and proven high-speed technology and provide for a testing period before system opening.

Operations risk deals more specifically with the performance of the future system operator. In order to have certainty that its operator will perform to the highest standards, the Authority will select a system operator with extensive experience in high-speed train systems or related transportation modes. The Authority will also require its operators to provide security for the Project (through performance bonding or similar methods) in the event that it needs to seek damages for non-performance. Lastly, any concession or operating agreement will contain rigorous standards that, if not met, will result in penalties or the right to transfer operations to another, more qualified operator.

9.4 LEGISLATIVE RISK

Legislative risk is the risk that future action taken by federal or state lawmakers could restrict or delay necessary funding for the project by adding additional requirements or conditions. In order to mitigate this risk, Authority staff has been and will continue to communicate fully with the California High-Speed Rail Authority Board and Legislature regarding the project's objectives and the support needed from lawmakers. The Authority will work diligently to comply with the requirements of AB 3034 and any other legislation passed by state or federal lawmakers affecting the project.

A key step that can be taken to mitigate the impacts of future legislative action is to protect and clarify the powers granted to the Authority in its enabling legislation to enter into public-private partnerships for the construction and operation of the high-speed train system. The clearer the ability of the Authority to procure and select private partners as well as negotiate and enter into contracts and commit to the full range of activities needed for completion and operation of the system, the lower will be the perceived risk by the private sector. Lower perceived risk will serve to increase the quantity and quality of bids received in a procurement process, resulting in a better value to the State.

Having a transparent streamlined process for the disbursement of state bond proceeds also will be an important step to securing competitive bids for any private sector participation. Private participants that expect even a portion of their payment from state bond funds must have confidence that any allocation and disbursement process will not delay or reduce payment for services or they will increase their bids to compensate for this additional risk.

Federal legislative efforts are also important to ensure that projected federal funding will be available as planned. The Authority will need to work closely with state and federal lawmakers in the coming years in order to secure the level of federal participation necessary. The best way for the Authority to limit its risk of not obtaining adequate federal funding is to develop a federal strategy that targets both existing federal programs as well as opportunities for new legislation that are best for California as well as the federal government. In addition, construction of any given segment will be commenced only when the targeted federal funding has been committed and a timely schedule for draws on those funds has been agreed by both parties.

9.5 RIDERSHIP RISK

Ridership risk is the risk of projected ridership and revenues falling short of current projections. As currently envisioned, private funding is expected to be backed largely by the projected operating surplus of the California High-Speed Train system. If ridership or revenues were to be lower than forecast, the project could suffer from constrained private funding.

Although there is no one policy to mitigate the risk associated with future ridership, there are steps that the Authority can take to lower the future risk. The Authority could limit future ridership risk to the state through partial transfer of this risk to the private sector via an innovative public-private partnership. The Authority's Request for Expressions of Interest (RFEI) in the spring of 2008 confirmed that there is substantial private sector interest in California's high-speed train. RFEI participants confirmed that they would be willing to accept a portion of their payment for services subject to ridership risk.

The Authority can also mitigate future ridership risk by promoting state policies that encourage high-speed train ridership. This can be achieved through well-placed stations in large urban centers, with adequate connections to the existing and planned transit, air, and road networks. The state can also work to market the high-speed train to future riders. This marketing also may be carried out by the private partner responsible for system operations, particularly if a portion of the private partner's payment is dependent on ridership. Lastly, the state should adopt a future transportation plan that encourages high-speed trains as a viable alternative to intra-state travel using air and interstate highways.

9.6 COMPLETION RISK

Due to the Project's size and the duration of the expected construction period, full funding for the Project is not expected to be available when the Project commences. This risk could arise if full funding does not materialize even after state, federal, and local monies have been spent to begin construction, resulting in an incomplete system. This risk applies to both federal and private funds. Private funds may not materialize for several reasons, including lower than expected ridership, delays in the development of the project, or a downturn in the financial markets.

In order to mitigate this risk, the Authority has a phasing plan that promotes maximum utility throughout the construction period. Smaller segments in and around the Los Angeles Basin and the San Francisco Bay Area would provide immediate benefit to commuters in those regions. At that stage, if further funding was not to materialize, California would be left with improved commuter rail service and not require operating subsidy beyond what is currently provided to local entities. Following these initial segments, segments linking the Central Valley with a major metropolitan area would provide an immediate benefit to communities underserved by current air or rail services. In many cases, such segments are projected to be "self supporting" over time, and not require an on-going operating subsidy.