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## Transmittal Letter

September 28<sup>th</sup>, 2015

**Ms. Rebecca Harnagel**

California High-Speed Rail Authority  
770 L Street, Suite 620 MS 2  
Sacramento, CA 95814

Dear Ms. Harnagel,

The Chinese high speed rail delivery team ("Chinese Team") led by China Railway International Co., Ltd. ("CRI") is pleased to submit its response to the California High-Speed Rail Authority's RFEI dated July 10, 2015 related to IOS-south or IOS-north or both segments of the California High-Speed Rail ("the Project").

This response represents our preliminary analysis and understanding of the Project and our comments/suggestions for its moving forward based on limited information available to us. We look forward to the opportunity to share with the Authority of our team's significant worldwide experience in development, design, build, financing, delivery, operation and maintenance of more than 10,000 miles of high-speed rail projects similar to the Project.

The Chinese team is composed of the following six companies:

- (1) China Railway International Co., Ltd. (CRI)
- (2) China Railway Group Limited (CREC)
- (3) CRRC Qingdao Sifang Co., Ltd. (SIFANG)
- (4) China Construction America, Inc. (CCA)
- (5) CRSC International Company Ltd. (CRSCI)
- (6) China Railway Eryuan Engineering Group Co., Ltd. (CREEC)

which exceeds the world's (other than China) combined high-speed rail experience.

As the leader of the team, CRI has assembled this team integrating engineering design, construction, rolling stock manufacturing, equipment procurement, system integration and project operation & maintenance. Meanwhile, as a close partner of the 6 companies, the Export-Import Bank of China also expressed interest in providing financing to the Authority for the purpose of the Project.

Should you have any question regarding to the response or the team, please feel free to contact the person at the following:

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We sincerely hope to cooperate with the California High-Speed Rail Authority on the Project on a mutually-beneficial basis.

Sincerely,

YANGYidong



**Response to  
the Request for Expression of Interest for the Delivery  
of an Initial Operating Segment of  
California High-Speed Rail**

**China Railway International Co., Ltd. (CRI)  
China Railway Group Limited (CREC)  
CRRC Qingdao Sifang Co., Ltd. (SIFANG)  
China Construction America, Inc. (CCA)  
CRSC International Company Ltd. (CRSCI)  
China Railway Eryuan Engineering Group Co., Ltd. (CREEC)**

**September 28<sup>th</sup>, 2015**

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## **1.0 Firm Experience and Team Structure**

### **1.1 Name of Member Companies**

In recent years, rapid development has been witnessed in high-speed rail sector of China, with its HSR system becoming the one with the most cutting-edge technology, the strongest integration capacity, the longest operation mileage, the fastest running speed and the largest construction scale in the world. Technical standard and operation management experience of 250-350km/h high-speed rails are accumulated, and high-speed rail development plan for standards no less than 400km/h is under study. By the end of 2014, total operating mileage of high-speed rails in China surpassed 17,000km, accounting for 60% of HSR operating mileage of the world's total. High-speed rail in China also boasts the busiest HSR system in the world. It possesses over 1800 sets of EMUs with over 3000 trains under operation every day, carrying passengers of more than 3 million person times. Sustainable, safe and stable operation has been kept for a long period of time. According to statistics of UIC, the casualties of Chinese railway per 1 billion people·km is only 0.02 in the last decade, the lowest in the world.

The Chinese team submitting this response is composed of the following six companies, all of which are richly experienced in high-speed rail projects and are interested in California High-Speed Rail project.

- (1) China Railway International Co., Ltd. (CRI)
- (2) China Railway Group Limited (CREC)
- (3) CRRC Qingdao Sifang Co., Ltd. (SIFANG)
- (4) China Construction America, Inc. (CCA)
- (5) CRSC International Company Ltd. (CRSCI)
- (6) China Railway Eryuan Engineering Group Co., Ltd. (CREEC)

The above six companies are all large-scale groups engaged in the HSR industry, most of which are listed on China or overseas stock market. This team has solid strength and rich experience in design, construction, operation and maintenance of high-speed rails, with relatively good risk management capability. Furthermore, the six companies enjoy sound relationship with the Export-Import Bank of China which also expressed interest in participating in CAHSR and providing financing.

Meanwhile, local consulting companies with abundant engineering experience and familiarity with local laws, financial system, technology, environment assessment, public relationship and financing as well as relevant experienced companies, interested banks, and small and disadvantaged businesses will be invited to join the team. Consequently, an integrated team with complete disciplines and acknowledgment of project circumstances and environment will be established.

### **1.2 Introduction to Team Members and Responsibility Division**

#### **(1) CRI**

CR International Co., Ltd. is an operational platform of overseas project cooperation for CR, whose predecessor was the former Ministry of Railways of China with reform occurred in March, 2013. As the Owner, CR takes charge of financing, construction management and operation & maintenance management of all high-speed rail projects in China. To date, the operation mileage has reached 112,000km, among which operation mileage of HSR stands at 17,300km. In the recent 10 years, its average annual railway investment has exceeded USD 100 billion, and the mileage of new railways put into operation each year has surpassed

5,000km.

As the team leader, CRI intends to build a team which integrates engineering design, construction, rolling stock design & manufacturing, system integration, project financing, civil works, equipment maintenance, rolling stock maintenance, operation management, legal consulting and financing. Giving full play to its advantages in financing, construction management and operation & maintenance management, CRI will play the role as a coordinator in the project, and provide its capabilities in technology, construction management, civil engineering, equipment maintenance and operation management for the team.

## **(2) CREC**

As a large state-owned enterprise in China, CREC is the largest construction engineering corporation in China, even in Asia, and also the second largest engineering contractor in the world, and one of the Fortune Global 500 corporations. Established in March 1950, the predecessor of CREC is General Bureau of Railway Construction and Design of the Ministry of Railways of China. Now CREC has developed into a super-large construction engineering group with its business scope covering survey, design, construction, installation, industrial manufacturing, real estate development, mineral and resource exploitation, financial investment, etc. Over the 60 years since its establishment, CREC has constructed 77,000km railways, which is two thirds of total railway mileage in China, and 52,000km overhead catenary system.

As a team member, CREC contributes its capability and expertise in construction, equipment procurement, system integration and project financing.

## **(3) SIFANG**

CRRC Qingdao Sifang Co., Ltd. is one of the core enterprises of CRRC Corporation Limited. Sifang has the complete system for independent research and development of rail transit equipment, scale manufacturing and quality service. The first 200km/h high-speed EMU, first 300km/h high-speed EMU, first 380km/h EMU and first 500km/h EMU all came into being in this corporation. At present, the corporation manufactured the most operating EMUs in China, with the most complete product category, the best quality and the longest mileage of safe operation.

As a team member, Qingdao Sifang contributes its capability and expertise in design, manufacturing and maintenance of rolling stocks and project financing.

## **(4) CCA**

Established in 1985, China Construction America (CCA) is the North American and South American subsidiary of China State Construction Engineering Corporation Ltd. (CSCEC), the world's largest construction and real estate conglomerate. The Conglomerate is specialized in providing a wide range of construction services such as project management, construction management, general contracting, DB (design-build) and PPP (public and private partnership) for public and private clients. Underpinned by its practical business approaches as well as ambitious yet prudent development strategies, CCA has delivered a significant number of commercial, residential, educational, industrial, and heavy construction projects. The addition of Plaza Construction has provided CCA with an enhanced building division and, more importantly, a stronger competitive position in the US as a whole, and an enhanced integrated development of construction, investment & financing, and property operation. With a combined revenue of over \$2 billion in 2014, the new group is ranked no. 32 top contractor and no. 23 construction manager in the US. Moreover, CCA is determined to bring

its investment endeavor to the next level. Years of commitment and efforts have brought about steady and accelerated growth. With a visionary leadership and a dedicated team comprised of seasoned professionals in every aspect of its business, CCA has become a leading construction and real estate company in the US market.

As the team member has rich experience in construction, financing and investment in U.S, CCA contributes its capability and expertise in project management, liaison for commercial and engineering issues between China and U.S., and civil works construction, equipment procurement, project financing capabilities, etc.

#### **(5) CRSCI**

China Railway Signal & Communication Corporation Limited (CRSC) is the provider of railway signal and communication technology, products and services, the precursor and leader in the China rail transit control industry, and one of the biggest rail transit system solution provider. In 2014, its business turnover reached USD 2.8 billion, serving railways, urban mass transit, highways, urban information and so on. Among railway signal and communication industry, CRSC possesses a complete industry chain and provides specialized one-stop solution of design and integration, equipment manufacturing and system implementation services of rail transportation control systems to the customers. CRSC has participated in most of high speed railway projects in China, with the mileage of revenue service more than 12,000km. CRSC has also successfully applied its system in metro and light rail, and has a significant market share. Up to now, CRSC's international business has expanded to more than 20 countries and regions.

As a team member, CRSC contributes its capability and expertise in telecommunication & signal technology, products and maintenance for rail transit, as well as project financing capabilities.

#### **(6) CREEC**

Founded in 1952, China Railway Eryuan Engineering Group Co. Ltd. (CREEC) is one of the large-scale state-owned enterprises in China. It is affiliated to China Railway Group Limited (CREC), which is on the list of both Fortune Global 500 and World's 500 Most Influential Brands. CREEC is an international enterprise integrating survey & design, general contracting, project supervision, project consulting, investment & financing, international education & training, overseas project, etc.

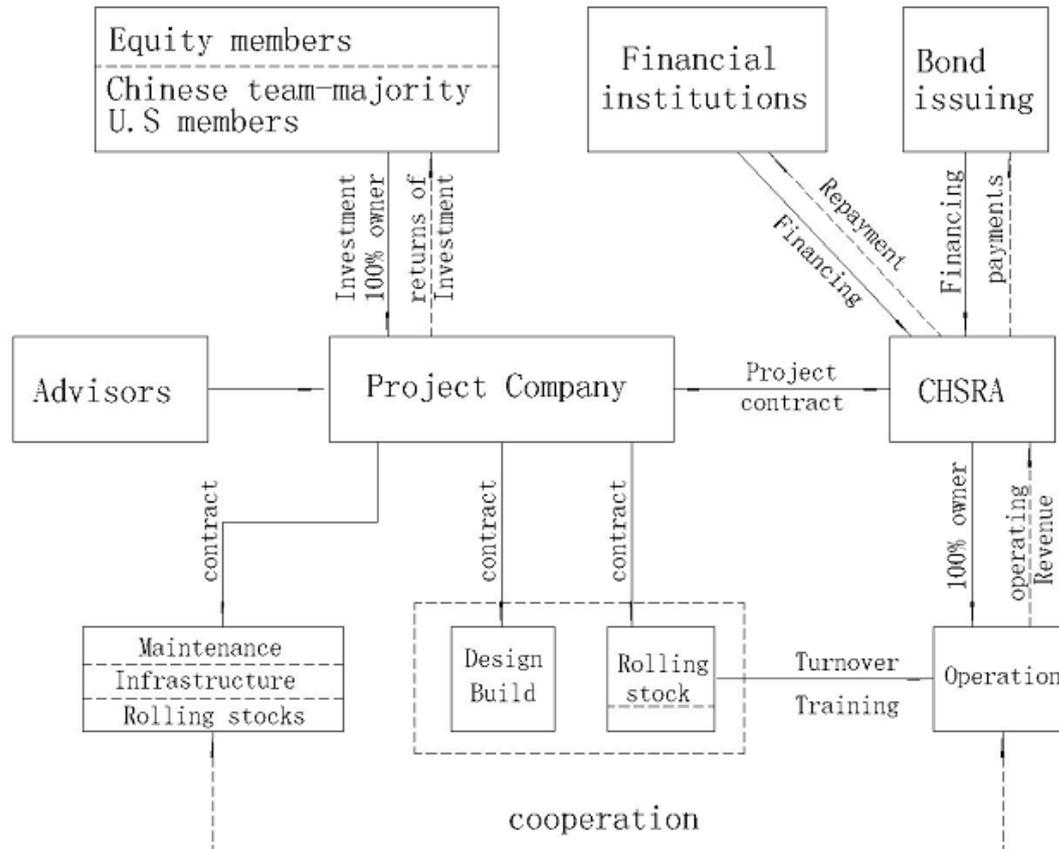
CREEC has achieved a great deal in general contracting, among which, its survey & design revenue has been ranking top for seven consecutive years. CREEC registered a company (CREEC USA) in the United States in 2014.

Over the past decade, CREEC has participated in survey & design of many important railway lines in China such as Zhengzhou-Xi'an Passenger Dedicated Line, Wuhan-Guangzhou Passenger Dedicated Line, Xi'an-Chengdu Passenger Dedicated Line, Chengdu-Chongqing Passenger Dedicated Line, Chongqing-Wanzhou Passenger Dedicated Line, etc. It has independently or jointly designed nearly 70,000km of railways, among which 10,000km are high-speed rails. Railway line of 20,000km-long has been put into service, accounting for 1/4 of total mileage of railways put into service in China.

CREEC plays a significant role in HSR construction in China. It has accumulated rich experience in design of passenger & cargo mixed line and PDL with the speeds of 200km/h, 250km/h and 350km/h. It has completed design of 4,685km railway with speed of 200km/h, 4,035km railway with speed of 250km/h, and 1,000km

railway with speed of 350km/h. It also independently or jointly provided customers with consulting services of nearly 2,500km-long high-speed PDL. Currently, CREEC has acquired a whole set of HSR survey & design technologies. As a team member, CREEC contributes its capability and expertise in project design, system integration, equipment procurement and project financing, etc.

### 1.3 Team Structure



### 1.4 Experience in Similar Projects & Services

- (1) Major projects of China Railway International Co., Ltd
- (2) Analogous projects of China Railway Group Limited
- (3) Analogous projects of China Railway Signal & Communication Corporation
- (4) Analogous projects of China Railway Eryuan Engineering Group Co., Lt

SN	Project Name	Project Description	China Railway International Co., Ltd	China Railway Group Limited	China Railway Signal & Communication Corporation	China Railway Eryuan Engineering Group Co., Ltd
1	Wuhan-Guangzhou HSR	<ul style="list-style-type: none"> <li>● Total length: 1,068.8km (667 mile)</li> <li>● Design speed: 350km (218 mile)</li> <li>● Total investment: RMB 116.6 billion (USD 19.4 billion)</li> <li>● Number of stations: 15</li> <li>● Construction period: 54 months, put into operation on December 26<sup>th</sup>, 2009.</li> </ul>	The Employer of the Project, investment and financing, construction management, operation and maintenance	Construction	Supply of CTCS-3 system	Survey and design (partial)
2	Beijing-Shanghai HSR	<ul style="list-style-type: none"> <li>● Total length: 1,318km (823.75 mile)</li> <li>● Design speed: 380km (237 mile)</li> <li>● Total investment: RMB 220.9 billion (USD 36.8 billion)</li> <li>● Number of stations: 23</li> <li>● Construction period: 28 months, put into operation on June 30<sup>th</sup>, 2011.</li> </ul>	The Employer of the Project, investment and financing, construction management, operation and maintenance	Construction	Supply of CTCS-3 system	Consulting
3	Beijing-Tianjin Intercity High-speed Railway	<ul style="list-style-type: none"> <li>● Total length: 120km (75 mile)</li> <li>● Design speed: 350km (218 mile)</li> <li>● Total investment: RMB 11.324 billion (USD 1.887 billion)</li> <li>● Number of stations: 5</li> <li>● Construction period: 36 months</li> </ul>	The Employer of the Project, investment and financing, construction management, operation and	Construction	Supply of CTCS-3 system	Consulting

			maintenance			
4	Zhengzhou – Xi'an High-speed Railway	<ul style="list-style-type: none"> <li>● Total length: 505km (315.6 mile)</li> <li>● Design speed: 350km (218 mile)</li> <li>● Total investment: RMB 54.668 billion (USD 9.111 billion)</li> <li>● Number of stations: 10</li> <li>● Construction period: 54 months</li> </ul>	The Employer of the Project, investment and financing, construction management, operation and maintenance	Construction	Supply of CTCS-3 system	Survey and design
5	Guiyang – Guangzhou High-speed Railway	<ul style="list-style-type: none"> <li>● Total length: 857km (535.6 mile)</li> <li>● Design speed: 300km (187 mile)</li> <li>● Total investment: RMB 90 billion (USD 15 billion)</li> <li>● Number of stations: 22</li> <li>● Construction period: 62 months, put into operation on December 26<sup>th</sup>, 2014</li> </ul>	The Employer of the Project, investment and financing, construction management, operation and maintenance	Construction	Supply of CTCS-3 system	Survey and design
6	Shanghai – Kunming High-speed Railway (Three sections in total: Shanghai – Hangzhou Passenger Dedicated Line, Hangzhou – Changsha Passenger	<ul style="list-style-type: none"> <li>● Total length: 2,264km (1,415 mile)</li> <li>● Design speed: 350km (218 mile)</li> <li>● Total investment: RMB 90 billion (USD 15 billion)</li> <li>● Number of stations: 53</li> <li>● Construction period: Shanghai – Guizhou section was put into operation on June 18<sup>th</sup>, 2015 and the line will be fully open in 2016.</li> </ul>	The Employer of the Project, investment and financing, construction management, operation and maintenance	Construction	Supply of CTCS-3 system	Survey and design (Changsha – Kunming section)

	Dedicated Line and Changsha – Kunming Passenger Dedicated Line					
7	Nanjing – Hangzhou High-speed Railway	<ul style="list-style-type: none"> <li>● Total length: 248km (155 mile)</li> <li>● Design speed: 350km (218 mile)</li> <li>● Total investment: RMB 23.75 billion (USD 3.96 billion)</li> <li>● Number of stations: 11</li> <li>● Construction period: 55 months, put into operation on July 1<sup>st</sup>, 2013</li> </ul>	The Employer of the Project, investment and financing, construction management, operation and maintenance	Construction	Supply of CTCS-3 system	
8	Chengdu – Mianyang – Leshan Intercity Passenger Dedicated Line	<ul style="list-style-type: none"> <li>● Total length: 318km (198 mile)</li> <li>● Design speed: 300km (187 mile)</li> <li>● Number of stations: 21</li> <li>● Construction period: 72 months, put into operation on December 20<sup>th</sup>, 2014</li> </ul>	The Employer of the Project, investment and financing, construction management, operation and maintenance	Construction	Supply of CTCS-3 system	Survey and design
9	Nanning – Kunming Railway	<ul style="list-style-type: none"> <li>● Total length: 898km (561 mile)</li> <li>● Bridge and tunnel ratio: 31%</li> <li>● Number of stations: 39</li> <li>● Construction period: 72 months, put into operation in December, 1997</li> <li>● The Railway runs upwards to the Yunnan - Guizhou Plateau from the Beibu Gulf with the relative elevation of 2010 meters. The terrain and the geology that the</li> </ul>	The Employer of the Project, investment and financing, construction management, operation and maintenance	Construction	Supply of 6502 electric interlocking for large stations	Survey and design

		<p>railway passes through are extremely steep and fairly complicated. The engineering is very arduous and complicated, and the technology is particular difficult in the railway construction history of China. The Railway won the first prize (the highest award) of 2001 National Science and Technology Progress Award.</p>				
10	Chengdu – Kunming Railway	<ul style="list-style-type: none"> <li>● Total length: 1,096km (685 mile)</li> <li>● Bridge and tunnel ratio: 40%</li> <li>● Number of stations: 129</li> <li>● The Railway passed through large geological fault zone. It is unprecedented both in terms of design and construction due to tremendous difficulties. Steep cliffs, towering mountains, deep valleys and crisscrossed ravines and gullies along the line led to the extraordinarily complex topography and geology known as "the geological museum".</li> </ul>	The Employer of the Project, investment and financing, construction management, operation and maintenance	Construction	Supply of 6502 electric interlocking for large stations	Survey and design

**(5) Analogous projects of CRRC Qingdao Sifang Co., Ltd.**

S N	Time of Contract	Railway Administration	Major Operating Lines	Speed	Qty /car
1	December 11 <sup>th</sup> , 2005	Wuhan Railway Bureau	Wuhan-Guangzhou Railway Wuhan-Chengdu Railway	300km/h (187 miles/h)	480
2	September 28 <sup>th</sup> , 2009	Wuhan Railway Bureau	Wuhan-Guangzhou Railway Wuhan-Chengdu Railway	350km/h (218 miles/h)	1920
3	September 18 <sup>th</sup> , 2013	Jinan Railway Bureau Wuhan Railway Bureau Shanghai Railway Bureau Zhengzhou Railway Bureau	Qingdao-Jinan Railway Wuhan-Guangzhou Railway Shanghai-Beijing Railway Zhengzhou-Xi'an Railway	350km/h (218 miles/h)	136
4	October 24 <sup>th</sup> , 2013	Taiyuan Railway Bureau Zhengzhou Railway Bureau Wuhan Railway Bureau Xi'an Railway Bureau Nanchang Railway Bureau Nanning Railway Bureau	Datong-Xi'an Railway Zhengzhou-Xi'an Railway Wuhan-Guangzhou Xi'an-Beijing Railway Nanning-Guangzhou Railway	350km/h (218 miles/h)	664
5	October 28 <sup>th</sup> , 2014	Taiyuan Railway Bureau Zhengzhou Railway Bureau Xi'an Railway Bureau Xichang Railway Bureau Chengdu Railway Bureau	Datong-Xi'an Railway Zhengzhou-Beijing Railway Chengdu-Chongqing Railway Nanchang-Shanghai Railway	350km/h (218 miles/h)	744

**(6) Partial U.S heavy construction project experience of China Construction America**

SN	Project Name	Project Description	Service Provided
1	Rehabilitation of	Rehabilitation and Widening	Rehabilitation

	Alexander Hamilton Bridge( on I-95)	two way 8 lanes main bridge (including approaches) over Harlem River into two ways 10 lanes bridge and 8 related Ramp bridges/roads. 55% share, of which, 60% self perform	Substructure, Superstructures, Electric and Drainage works, Landscaping, Pavements
2	Reconstruction of the Staten island expressway	CCA Civil was awarded the Staten Island Expressway project in December2011 as the general contractor. The project entails widening a 3.2 mile stretch of the highway by adding an additional HOV lane in the median and increasing the shoulder width. Three flyover bridges will be demolished and another three will be rehabilitated with new Concrete Precast NEXT beam and Box Beam Girders.	general contractor
3	Pulaski Skyway Contract 3 Deck Replacement	CCA Civil was awarded the Pulaski Skyway Contract 3 project in June 2013 as the General Contractor. This project entails demolishing and replacing the entire deck of the northbound lanes with precast concrete deck panels and installing new stringers, deck joints, cast-in-place curbs, lighting, drainage, etc. The two northbound lanes will only be closed for 9 months while construction takes place; the southbound lanes will continue to carry traffic daily.	general contractor
4	Pulaski Skyway Contract 4 Deck Replacement	Contract 4 entails demolishing and replacing the entire deck of the southbound lanes with	general contractor

		precast concrete deck panels and installing new stringers, deck joints, cast-in-place curbs, lighting, drainage, etc.	
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## 2.0 Project Approach

A team with complete disciplines, clear responsibility division and long-term solidarity and cooperation is the important guarantee for the successful implementation of the project.

According to studies on project schedule, financing demands, project operation safety, necessity of system integration, joint debugging & commissioning, pilot run of high-speed rail system, topographic features, comprehensive analysis and comparison of potential complicated geological conditions and other factors of California High-speed Rail, as well as experiences of high-speed rail construction in recent years, the Chinese team believes that the cost and construction period will be reduced if the larger project scope is undertaken by the contractor. Therefore, it is recommended that one team should develop both IOS-north and IOS-south in DBFM in order to achieve the purpose of reducing cost and construction period.

In order to deliver a complete, efficient and safe high-speed rail system to the California High-Speed Rail Authority, reduce and avoid potential risks brought by numerous interfaces between disciplines, and give play to superiority of the team in integrality and completeness taken into account responsibility division among the team members, it is suggested to include design and construction of station buildings in these sections in the service scope of the DBFM contracts. Therefore, the Chinese team will provide the California High-Speed Rail Authority with integrated services from design, construction, equipment procurement, system integration, design, to manufacture and maintenance of rolling stocks. And the team will also assist the Authority in obtaining financing from the Export-Import Bank of China.

## 3.0 Responses to Questions

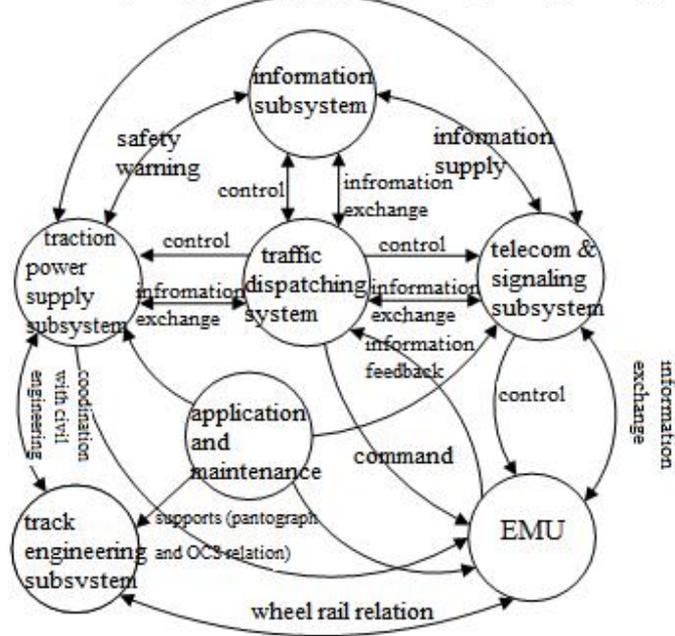
### 3.1 Commercial Questions

**1. Is the delivery strategy (i.e., combining civil works, track, traction power, and infrastructure) likely to yield innovation that will minimize whole-life costs and accelerate schedule? If so, please describe how. If not, please recommend changes to the delivery strategy and describe how those changes will better maximize innovation and minimize whole-life costs and schedule.**

High-speed rail system mainly consists of track engineering system, traction power supply system, telecom & signaling system, EMU system, information system, servicing & maintenance system and operation management system. Each system plays an important role in the operation of high-speed rail. All systems are independent systems, but they are interconnected and interactive.

See the following figure for details of the composition of high-speed rail system.

automatic passing phase-separation and integrated grounding



Level-1	Level-2	Level-3	
HSR System	Track Work	Alignment Design	
		Subgrade Work	
		Track Work	
		Bridge & Culvert Work	
		Tunnel Work	
		Station Yard Structure	
		Environmental Protection	
	Traction Power Supply	Traction Power Supply	Power Supply & Transformation System
			OCS System
			Electric Power System
			Remote Monitoring System
	Communication & Signaling	Communication & Signaling	On-board Subsystem
			Ground Subsystem
			Interlocking Subsystem
			CTC
	EMUs	EMUs	Communication System
			Overall Assembly
			Car Body
			Bogie
			Traction System
			Braking System
Information System	Information System	Train Network System	
		Passenger Transport Management System	
		Ticketing & Booking System	
		Passenger Service System	

		Security Monitoring and Control System
	Servicing & Maintenance	Personnel Training
		Comprehensive Detection
		Comprehensive Maintenance
		EMUs Depot and Post
	Operation Dispatching System	Transport Plan
		Operation and Management
		Rolling Stock Management
		Comprehensive Maintenance
Power Supply Management		
Joint Debugging & Commissioning		
Pilot Run (without Passengers)		
Formal Operation (with Passengers)		

Due to the complexity of high-speed rail system, an ideal delivery strategy should effectively reduce interface problems of each system.

DBFM delivery strategy covers the design, engineering construction and servicing & maintenance of high-speed rail. In order to minimize whole-life costs, the contractor shall not only consider the cost and schedule of the construction period, but also comprehensively consider maintenance of infrastructure and system equipment, which will certainly motivate the contractor to seek for innovation of technology and process which will further facilitate highly-efficient organic integration, and will also give play to the contractor's advantages in comprehensive technology and integration management which will effectively decrease internal & external interfaces and achieve integration of design, construction and maintenance, so as to ultimately accelerate the schedule and minimize whole-life costs.

This time, California High-Speed Rail Authority adopts DBFM model to seek for partners. Such decision is made under the full consideration of project schedule, fund raising and financing, in combination with further progress of the Project. We believe that the innovation brought by DBFM model is as follows: firstly, it can seek for partners of high-speed rail construction experience so as to reduce internal & external discipline interfaces and transfer risks; secondly, it creates conditions for comprehensively optimizing design which is conducive to schedule control and cost saving.

**2. Does the delivery strategy adequately transfer the integration and interface risks associated with delivering and operating a high-speed rail system? What are the key risks that will be borne by the State if such risk transfer is not affected? What are the key risks that are most appropriate to transfer to the private sector?**

(1) By adopting DBFM delivery strategy, there will be certain interface risks on civil works, station & yards and rolling stocks of CP1-4 during the construction period, which are beyond the engineering scope of DBFM contractor. In the operation of the project,

there will be risks on responsibility division of maintenance, especially the maintenance for civil works. If the Authority expects to transfer risks, it needs to negotiate with DBFM contractor and contractors of each discipline, and strictly define their working interfaces and responsibilities in the contract. Other risks also include power supply, temporary access road in construction and other auxiliary infrastructures, etc.

(2) When adopting DBFM delivery strategy, there will be certain risks on interfaces of operation system. As the operator does not participate in project construction, some special requirements on operation from him may not be satisfied. According to the 2014 Business Plan, the Authority will invite experienced operator to join the design and construction of the project in advance. Such action will avoid relevant risks brought by lack of consideration of future operation requirements in the process of design and construction to some extent, and will also create favorable conditions for proper combination of operation and maintenance.

(3) As for the California High-Speed Rail Authority, the adoption of DBFM model will transfer most of the risks in design, construction and maintenance to the DBFM contractor, and it will also bring about potential risk by partially losing schedule control over the project: since the DBFM contractor is relatively simple, if the contractor is short of experience and capacity, the Authority will face the risk of failing to complete the project on schedule. In order to reduce the risks above, on the one hand, the Authority is kindly requested to attach great importance to the selection of the DBFM contractor: that is to say, the team with strong integration capacity and rich high-speed rail construction experience shall be selected as the contractor; on the other hand, professional consulting agency is also recommended to participate in various aspects of design-construction-maintenance process, so as to reduce any possible risk.

**3. Are there any other components of a high-speed rail system that should be included in the scope of work for each project (e.g., rolling stock, train operations, stations)?**

**If so, how will this help meet the Authority's objectives as stated in this RFEI?**

Technical specification and performance of high-speed trains are the main prerequisite for the design and construction of main disciplines such as alignment, bridge & culvert, subgrade, track, traction power supply and signaling, and they interact with each other. The idea of including the train into DBFM will bring advantage for the design, construction, operation and maintenance of the whole high-speed rail project. This will facilitate interface coordination and system integration, unify operation management and maintenance, improve overall design quality, minimize design variations, reduce construction cost, shorten construction period and control cost. The idea of including station buildings into DBFM will be conducive to the coordination between equipment and operation rooms as well as design of grooves, gutters and pipes.

In consideration of the project integrality, the rolling stock maintenance and station buildings are recommended to be included into DBFM for the purpose of unified design and construction, joint debugging & commissioning and pilot run. In this way, interface will be effectively reduced, construction investment will be saved and construction period will be shortened. Procurement of high-speed trains should be separately arranged for the whole project. But technical specification and operation conditions of the rolling stock should be determined as soon as possible so as to provide technical parameters for design

of other systems.

**4. What is the appropriate contract term for the potential DBFM contract? Will extending or reducing the contract term allow for more appropriate sharing of risk with the private sector?**

**If the Respondent recommends a different delivery model, what would be the appropriate term for that/those contract(s)?**

In the railway industry, generally 30-50 year contract term is appropriate for a potential DBFM contract. We believe that extending or reducing the contract term cannot reasonably allow for sharing of risk with the private sector. The private sector will fully consider different contract terms in the prediction model, and propose several contract conditions to the public sector. In the end, the sharing of risks depends on the negotiation between the two sectors.

**5. In terms of the contract, What is the appropriate amount of the contract? What are the advantages and disadvantages of the contract with such scale and amount? Do you think if the two sections shall be combined into a single DBFM contract?**

Regarding the DBMF model, the size of the contract package firstly depends on the investment and financing availability on the market. Another factor needs to be considered is the interested enterprises' ability and willingness to undertake the risks of larger scale contract. To the Chinese team, a relatively large-scale contract is proper and reasonable.

Based on China's experience of high-speed rails, both IOS-south and IOS-north are on the same line and bears strong homogeneity. It is recommended to adopt unified technical standards, which can enhance the overall design quality, minimize design variations, further lower cost, reduce the time for bidding and tendering, shorten the execution period and improve efficiency. Therefore, the IOS-south and IOS-north should be integrated into one single DBMF contract. However, there are changes brought by integrating them into one DBMF contract, as follow: (1) it will increase the scale of investment and financing which will make the investment and financing conditions more complex, and cause more difficulties for the project financing. Under the premise that the project proposes appropriate loan conditions, the Export-Import Bank of China has the capability to satisfy the financing needs of the project; (2) the integration of the IOS-south and IOS-north into one single contract poses higher requirement on the bidder's organization, technology and financing capabilities.

**6. Does the scope of work for each project expand or limit the teaming capabilities? Does it increase or reduce competition?**

Under the suggested DBMF model, it poses a higher requirement on forming a team which is able to provide all services and tasks stipulated in the contract. Meanwhile, it requires the leading party of the team to have a good and comprehensive control of the whole-life operation and management of the project, including investment and financing, construction management, procurement, system integration, operation and maintenance, etc.

Once the integrated team, featured by complete disciplines and clear division of responsibilities, is established, it will certainly deliver positive effects on the project from

the aspects of project schedule, coordination of various interfaces, risk avoidance and transfer, cost saving and reduction in construction period. However, competition will still exist, which will be transferred from the external to the internal competition.

In our opinion, California High-Speed Rail Authority should firstly select a team with strong financial and technical capability, integrated abundance high speed rail DBFOM experience to work with, and then jointly figure out the roadmap to succeed, mitigating the concerns both Parties might have, such as introducing competitive bidding mechanism at trade contracts/subcontract and professional consultants levels to the Authority's concerns of pricing and insufficient competition.

### **3.2 Funding and Financing Questions**

**7. Given the delivery approach and available funding sources, do you foresee any issues with raising the necessary financing to fund the IOS-South project scope? IOS-North project scope? Both? What are the limiting factors to the amount of financing that could be raised?**

Major financing questions of the project:

According to the 2014 Business Plan of California High-Speed Rail Authority, the total construction cost of the project's Initial Operating Segment is USD 50.71 billion (YOES) while there are USD 31.76 billion to be raised, the financing gap accounts for 62.6% of the total investment.

Due to the huge financing gap of the project, potential private investors and lenders may be cautious on the successful execution of the project, so there are uncertainties in project financing.

Elements restricting financing are:

#### **(1) Public Funding Proportion**

This project is one of the most significant infrastructure projects in California. With a large amount of investment, it needs a mass of financial support from the government. The higher proportion the public funding takes, the greater importance the government attaches to the project, accordingly easier to get private financing and more favorable conditions for loans.

#### **(2) Financing Cost**

There are a lot of elements that can affect the financing cost including financial environment, equity structure of the project, government support and the economic intensity of the project itself. Generally, when the financing cost increases, the project's financial risk grows higher, and its affordable financing scale becomes smaller. Seeking low-cost financing is very important for the improvement of the project's financial sustainability.

#### **(3) Financing Period**

Due to the project's long life cycle, there is not enough cash flow to pay back its debts in the construction stage and the initial operation stage. Therefore, it needs long-term debt financing support. Financing period provided by ordinary financial institutions can hardly meet the demand of the project. If debt swap is applied, the financing cost may rise while default risk is likely to occur.

#### **(4) Financing Assurance Conditions**

If the project's financing can be guaranteed by public sector or business company of high credit rating, the debt repayment risk of the project will be greatly mitigated, and

borrowers will tend to provide favorable financial terms thus lower the project's financing cost. If there is none or insufficient assurance, the financing amount and cost will be affected.

**(5) Economic Intensity of the Project**

According to the 2014 Business Plan, the project's operation revenue can cover its operation cost, system renovation and updating expenses, and there is certain surplus cash flow which can be used to repay the project construction expenditure. However, the aforementioned content bases on a certain amount of transport volume and service level. Due to the uncertainty of the project's economic intensity, potential investors and lenders need to make decision after a more detailed financial and economic analysis.

**8. What changes, if any, would you recommend be made to the existing funding sources?**

**What impact would these changes have on raising financing?**

Relevant recommendations and impact analysis:

(1) Increase the percentage of public funding and enhance private investors and lenders' confidence in the project.

So far, the project has secured an USD 10.24 billion grant (20.2% of the total investment amount) from the government, including 1A bond funds and federal funds. In addition, Cap-and-Trade proceeds may be another source of funding for the project.

Considering the large amount of funds required for the project, the percentage of public funds should be increased moderately without compromising the responsibility and initiative of private investors. The required increase can be achieved by such means as expanding government bond issuance scale and applying more C/T proceeds for payment during the construction and operation periods. This will help boost private investors and lenders' confidence in the project and is therefore conducive to further fund raising.

(2) Increase the debt ratio as much as possible under the precondition of maintaining the project's financial sustainability

Given that debt financing usually incurs lower costs than equity financing, the percentage of debt financing should be maximized without compromising the project's financing sustainability. What's more, debt funds with high credit limit, low interest rate and long repayment period should be selected to reduce the financing cost and repayment pressure.

(3) Determine with private investors a reasonable rate of return on investment

With regard to equity financing, if a ratio is fixed for future profit distribution, private investors are likely to require higher return on investment and tend to inject smaller amounts of capital during the project's construction period. However, considering that low return on investment does not attract commercial investors, the project initiator should seek balance between the attraction of the project and the amount of financing available by selecting the most reasonable rate of return on investment.

(4) Establish a scientific and reasonable credit structure

The fund raising efficiency of the project will be improved dramatically if a scientific and reasonable credit guarantee structure is established to eliminate the potential risks that may arise during the construction and operation of the project. For example, if California government provides guarantee for the debts, investors are guaranteed a minimum rate of return on investment, which will help facilitate the project's fund raising process.

**9. Given the delivery approach and available funding sources, is an availability payment mechanism appropriate?**

**Could financing be raised based on future revenue and ridership (i.e., a revenue concession)?**

**Would a revenue concession delivery strategy better achieve the Authority's objectives?**

Given the delivery approach and disclosed availability of funding sources, doubts may exist in the market about the feasibility of using the availability payment mechanism due to the fear that the Authority may not be able to raise enough funds to make "availability payments". Such doubts constitute the main obstacle to the application of the mechanism. In accordance with the 2014 Business Plan, the operational revenue, apart from covering the operational cost and expenses for system repair and upgrading, shall have certain surplus cash flow to pay the project construction expenditure. If the traffic volume and income level reach the levels in the Business Plan, the fund would be partly raised based on the future revenue and passenger traffic volume, which, however, is far from meeting the fund requirement for the project.

Theoretically, a profitable concession delivery model can better leverage the enthusiasm of the private sector, improve the service quality and boost the project traffic volume.

As analyzed above, the future revenue and ridership's are not sufficient to support a full concession delivery model which is attractive to private sectors except that the Authority/government would subsidize and fill the financing gaps in between.

### **3.3 Technical Questions**

**10. Based on the Authority's capital, operating, and lifecycle costs from its 2014 Business Plan, describe how the preferred delivery model could reduce costs, schedule, or both.**

**Please provide examples, where possible, of analogous projects and their cost and/or schedule savings from such delivery models.**

DBFM is a model which can effectively bring down cost and shorten the construction period because it can reduce the external interfaces among the subsystems of the high-speed rail, relieve the coordination burden for the Employer and enable DBFM contractors to systematically carry out an integrated design and reduce design variations. The construction model of Chinese high speed rail resembles that of DBFM. In the Chinese model, as the Employer, China Railway Corporation is responsible for unified coordination. It organizes and completes investment & financing, design, construction management, operation and maintenance. The highly centralized model reduces the project cost and shortens the construction period by a large margin. In the past 10-odd years since the beginning of this century when China began to build high-speed rails, 17,000km of high-speed rails had been constructed with its fast speed and low cost good enough to serve as a model for the world high-speed rail construction.

For example, Wuhan-Guangzhou High-Speed Railway has a design speed of 350km/h, a total length of 1,068km and an overall investment of USD 18.8 billion. It adopts an one-time construction plan in which the Wuhan Railway Company established by the China Railway Corporation carries out an unified construction management, including the project financing & investment, survey, design, review, project tendering, management of construction organization for civil works, rolling stock procurement,

procurement of E & M equipment, management of construction organization, project acceptance, joint debugging & commissioning, and pilot run. The project was commenced on June 23<sup>rd</sup>, 2005 and open to traffic on December 26<sup>th</sup>, 2009 with a construction period of 54 months. Beijing-Shanghai High-Speed Railway has a design speed of 350km/h, a total length of 1,318km and a total investment of USD 32 billion. The construction was commenced in April 2008. After 39 months of construction period, it was open to traffic in June 2011.

**11. How does this compare to separately procuring each high-speed rail component (i.e., separate contracts for civil works, rail, systems, power separately)? Please discuss design/construction costs, operating/maintenance/lifecycle costs, and schedule implications.**

DBFM model integrates substructure works, track and E & M systems. The design and construction interface is an internal disciplinary interface which can be easily settled. It has advantages of integrated design and construction, short construction period, high quality and low cost over sub-contracting separate parts.

If high-speed rail components are separately procured, there will be a lot of external interfaces. A lot of time and energy will be needed to solve the interface issues during design and construction stage. This cannot solve the system problem of high-speed rail systematically. It is very likely to have the problem of mismatching and non-connecting of interfaces, hence causing rework of design and construction, which is also a waste to the executed works. Meanwhile, if each high-speed rail components are separately procured, in case the interface is not properly matched, the general progress of the works will be influenced because of the problems in procurement and material supply cycle. Besides, because of the independence of each system, it is hard to carry out the joint debugging & commissioning and pilot run which are required procedure for the high-speed rail. As a result, the schedule of design and construction will be prolonged and the cost, in particular the cost for operation and maintenance during whole project schedule, will be increased.

**12. For each project, are there any technical changes to the respective scope of work that would yield cost savings and/or schedule acceleration while still achieving the Authority's objectives? If so, please describe.**

We chose the DBFM model to seek cooperative partners, on the basis of full thoughts about the present construction progress, financing situation and future needs of California High-Speed Rail project. By adopting the DBFM model, we can optimize and integrate the design of each system, take full consideration of the route, subgrade, bridges, tunnels, tracks and other structures and the E & M systems. This will help to achieve the goal of optimal design for the high-speed rail. Meanwhile, we should also consider about the construction method, technique and maintenance in the design, and optimize and integrate the design-construction-maintenance process. With standard design and factorial construction, the lifecycle cost for the whole project will be reduced and the schedule for the project will be shortened.

DBFM delivery model covers the high-speed rail's design, construction in the early stage and maintenance in the following stage. To minimize the lifecycle cost for the whole project, the contractor should not only consider the cost and schedule during construction,

but also think about the maintenance for infrastructure and system facilities during operation. This will definitely stimulate the contractor to seek technical innovation and creativity in work process, facilitating highly-efficient organic integration. This will also give full play to the contractors' advantage in integrated technology and management, reduce the internal and external interfaces, and realize the **integration of design, construction and maintenance**, achieving the goal of reducing the lifecycle cost for the whole project and shortening the schedule.

However, the present DBFM delivery model does not include the station building, rolling stock procurement, joint debugging & commissioning, and pilot run. Station building and rolling stock are important components of high-speed rail facilities. The uniform design, construction and maintenance can effectively reduce the interfaces. Joint debugging & commissioning is a required procedure before the operation of high-speed rail. It refers to tests on the tracks, OCS, communication and signaling devices by the high-speed rail testing equipment before the operation of the railway, and adjusting according to the defects based on the testing results, until each system and the whole system satisfy the requirement for high-speed operation and dynamic acceptance. After this, the pilot run and formal operation can be executed. Hence, we recommend that the station building, rolling stock procurement, joint debugging & commissioning, and pilot run be included in the DBFM. Meanwhile, as the present DBFM delivery model does not include civil works of CP1-4, there can be problems concerning interface and responsibility division in regard to the civil works and E & M system between DBFM contractors and CP1-4 contractors.