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# Southwest High-Speed Rail Network: Partnership with California High-Speed Rail, High-Desert Corridor and Brightline



**LEGEND**

- HSR Phase 1
- HSR Phase 2
- HSR Planned Station/ Stop
- Brightline West
- Brightline West Station
- ..... High Desert Corridor



**CALIFORNIA**  
RAIL BUILDERS, LLC



**CALIFORNIA**  
High-Speed Rail Authority

## Geotechnical

### 01 | Current State

- Current design criteria for ground investigations requires intrusive investigations (borings) for preliminary engineering at every 1000ft for tunnels
- Authority recognizes the challenge of balancing ground investigations related cost savings vs risk in key civil engineering asset construction i.e. tunnels, bridges, structures, and earthworks

### 02 | Objectives

- Develop a civil infrastructure construction strategy utilizing supply chain feedback from discussion on Geotech, Tunnelling and Bridges
- Drive innovation into ground investigations and deploy state of the art investigation approaches to drive efficiency. For example, utilizing maturing and advanced technologies such as non-intrusive investigations and machine learning methods to predict and manage geotechnical challenges
- Authority recognizes that there is an essential balance between efficient ground investigations and effective risk management of civil engineering asset construction

### 03 | Focus Area

- Past successful projects: Examples of successful major projects with innovative approach to ground investigations that deliver outcomes for the client
- Intrusive and non-intrusive investigation: Innovative methods of intrusive and non-intrusive investigation
- Responsibilities for ground investigations: How could the ground investigations approach influence the construction phase procurement strategy
- Access issues: Innovative methods or technologies to minimize access issues

## Tunneling

### 01 | Current State

- The Authority has numerous miles of planned tunnelling in four Project Sections through mountainous areas and underground in more urban areas
- No tunneling construction has occurred to date. Only environmental clearance is secured, and designs are in the development stage.
- Limited ground investigation data at present
- Mixture of twin bore and single bore twin track sections
- Schedule for tunnel construction is in very early development
- Ventilation and fire strategies, operational performance still to be finalized
- Seismic criteria throughout

### 02 | Objectives

- Embrace best international practice for design, investigation, construction and fit-out
- Streamline delivery to build fast, efficiently and reduce program risk
- Work smarter and drive greater efficiency utilizing state of the art approaches to design and construction. For example, through design standardization, modularization, off-site manufacturing, segmental viaduct deployment systems, automated construction techniques, etc.

### 03 | Focus Area

- Past successful projects: Examples of successful major projects with innovative approaches to tunneling that deliver outcomes for the client
- Procurement and contract options: Commercial & Procurement Aspects: Procurement approach, contract type, approach to risk, streamlining and acceleration of approvals processes, combination of tunnel civil works with line wide systems, inclusion of asset maintenance responsibility post construction in contract
- Design efficiency: Lean approval processes, utilization of latest material technology, standardization and modularization
- Ground investigation technology: Utilization of latest technology (intrusive and non-intrusive) to drive cost and risk reduction
- Innovation in construction: Value engineering, innovation and challenging established requirements

## **Bridges & Structures**

### **01 | Current State**

- For the sections not under construction at present, only environmental clearance is secured, and design is in development stage
- Limited ground investigation data at present
- Most construction is prestressed or post-tension reinforced concrete – mixture of precast and cast-in-place
- Seismic performance and track structure interaction design throughout
- Over 350 structures including Type 1 and Type 2 structures (A Type 1 structure is an overcrossing, undercrossing or viaduct that the Authority will own as an asset. A type 2 structure is an overcrossing, undercrossing or other structure that will be transferred to a local government, utility, or railroad).

### **02 | Objectives**

- Work smarter and drive greater efficiency utilizing state of the art approaches to design and construction. For example, through design standardization, modularization, off-site manufacturing, segmental viaduct deployment systems and automated construction techniques.
- Streamline delivery model to build fast and efficiently
- Obtain supply chain feedback on innovations available in the market which the Authority which could adopt, and to clear barriers to those innovations

### **03 | Focus Area**

- Past successful projects: Examples of successful major projects with innovative approach that deliver outcomes for the client
- Procurement & contract options: Procurement approach, contract type, approach to risk, streamlining and acceleration of approvals processes
- Design efficiency/material technology: Efficient design and construction delivery, notably families of structures, modularization, off site manufacture, seismic design technology, sustainable material (including concrete) technology
- Ground investigation technology: Best modern industry practice for ground investigations for foundation construction to reduce cost and schedule risk
- Innovation in construction: Value engineering, innovation and challenging established requirements

## Power Generation/Renewable Energy

### 01 | Current State

- Traction power for the high-speed rail system is currently planned to be provided from the following:
  - Traction Power Substations (TPSS) at 30-mile increments, interconnected with the utility grid at transmission levels
  - Battery energy storage system (BESS), integrated into the TPSS
  - The Authority already has acquired right-of-way (ROW), specific portions of which can be utilized for renewable energy generation siting (assuming PV) to support the TPSS's for the initial operating segment, with environmental clearance and PG&E interconnection study in progress
  - The Authority is open to a range of renewable energy generation
- Authority's current conceptual design integrates renewable energy power generation and BESS into a static frequency converter (SFC) TPSS typology to minimize traction power phase imbalance and regenerative braking harmonics
- Authority is looking to explore third party capital to support the energy systems, receive input on the procurement and/or contracting approach, and identify opportunities for revenue generation from dual use of ROW and stations

### 02 | Objectives

- Seek feedback and validate Power Generation approach in a phased implementation and deployment
- Reduce capital costs
- Reduce operating expenses by reducing electricity costs
- Utilizing renewable energy systems to reduce peak demand charges
- Provide service continuity during an electrical grid outage
- Consider feasibility of other renewable energy sources such as wind and geothermal
- Ensure sufficient capital investment to achieve financially preferable operation
- Access third party capital while maintaining operating savings
- Develop an integrated system that minimizes operational risks and addresses interface risks

### 03 | Focus Area

- Third party finance of energy: Explore third party financing of the planned energy system to defer capital costs while still preserving savings over the utility bill.
- Operations & maintenance: Ensure optimal O&M over the life of the energy system consistent with the design and construction. Explore public-private partnership in O&M support
- TPSS topology: Advance the optimal way to integrate the renewable energy system with the rail system.

- Contractual structure for design, construction, and commissioning: Advance a market attractive structure for contracting implementation of the traction power substations and renewable energy, respectively
- Revenue generation from the right of way and stations: Explore alternate forms of revenue that could be generated from dual use of the ROW and stations. Uses such as telecommunications or electric power may have an economic benefit

## Track & Rail Systems, Depots & Facilities

### 01 | Current State

- Track and OCS design contract was awarded to the Systra / Tyspa joint venture. The JV is mobilized and collaboratively progressing the delivery activities
- Definition of System Design requirements continue:
  - A mix of slab/ballasted track proposed, with ballasted track forming most of the system.
  - ETCS Level 2 signaling and train control system proposed
  - Telecoms network proposed to use a combination of 5G radio and lineside WiFi networks
  - High Level System Architecture developed
  - OCS system selection started (proven system capable of 354km/h operation)
  - The Authority is adopting a carbon neutral approach to its High-Speed traction power system, incorporating Solar PV & battery energy storage system (BESS) with single utility connection, allowing all traction power and non-traction power requirements
- Operational and Maintenance Facilities for the planned system

### 02 | Objectives

- Explore Value Engineering opportunities to reduce capital costs, minimize whole of life costs, efficiently package rail system elements and establish System and Design principles and assumptions
- Explore schedule constraints and opportunities to achieve an operational service within the current timescales
  - Mobilization for procurement and delivery phases
  - Flexible and innovative Delivery Strategies
  - Supply chain challenges
- Review approaches to integration and interface management between packages to clearly define roles and responsibilities through contractual and organizational approaches

### 03 | Focus Area

- Project participation: Developing appealing contractual and technical structures to actively encourage market participation, with realistic timescales
- Packaging of scope & contract type: Optimizing the packaging and contracting of the Rail Systems elements, across the project lifecycle, exploring opportunities for Public Private Partnerships with O&M support or bolting on long term systems maintenance agreements
- Whole of life approach: Ensuring consideration is given across the individual system to Design for Maintenance, Design for Construction, operational



Reliability, Availability and Maintainability. Allowing for an optimal approach to whole of life costs for the entire system

- Program & network integration: Exploring the approaches industry has engaged on regarding network integration, through a collaborative and progressive approach to assurance, asset management, verification & validation, system integration testing and trial operation

## OCS Cable Manufacturers

### 01 | Current State

- Track and OCS design contract was awarded to the Systra / Tyspa joint venture. The JV is mobilized and collaboratively progressing the delivery activities
- The Authority has qualified proposers who have been shortlisted to support the procurement of high-speed rolling stock capable of operating at 200 mph.
- Definition of System Design requirements continue:
  - A mix of slab/ballasted track proposed, with ballasted track forming most of the system.
  - ETCS Level 2 signaling and train control system proposed
  - Telecoms network proposed to use a combination of 5G radio and lineside WiFi networks
  - High Level System Architecture developed
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- Operational and Maintenance Facilities for the planned system

### 02 | Objectives

- Explore Value Engineering opportunities to reduce capital costs, minimize whole of life costs, efficiently package rail system elements and establish System and Design principles and assumptions
- Explore schedule constraints and opportunities to achieve an operational service within the current timescales
  - Mobilization for procurement and delivery phases
  - Flexible and innovative Delivery Strategies
  - Supply chain challenges
- Review approaches to integration and interface management between packages to clearly define roles and responsibilities through contractual and organizational approaches

### 03 | Focus Area

- Project participation: Developing appealing contractual and technical structures to actively encourage market participation, with realistic timescales.
- Innovation: Opportunities for technical and delivery innovation to improve reliability and efficiency of the system, applying lesson learned from domestic and global projects
- Whole of life approach: Ensuring consideration is given across the individual system to Design for Maintenance, Design for Construction, operational

reliability, availability and maintainability. Allowing for an optimal approach to whole of life costs for the entire system

- Program & network integration: Exploring the approaches industry has engaged on regarding network integration, through a collaborative and progressive approach to assurance, asset management, verification & validation, system integration testing and trial operation

## Funding & Financing (including TOD and Private Investment) – HSR Delivery & Ops

### 01 | Current State

- The Authority is currently prioritizing completion of the (171-mile) Initial Operating Segment between Merced and Bakersfield
- Civil construction on the first 119 miles of the HSR guideway and structures for the is underway and is planned to be completed by the end of 2026
- The Authority is in discussions regarding committed funding sources to complete HSR between Gilroy and Palmdale (~350 miles), which will enable connections to existing and proposed rail operators in the Bay Area and Los Angeles
- The Authority is currently considering packaging and procurement for the construction of track, OCS, train systems, and trainsets
- Train operations testing in the Central Valley is planned for later this decade.
- The Authority is targeting completion of HSR between Gilroy and Palmdale as early as 2040
- The Authority is interested in exploring the potential benefits associated with private investment and/or public-private partnership models for the financing, delivery, and operation of HSR

### 02 | Objectives

#### *HSR Delivery and Operations:*

- Evaluate opportunities for private investment and/or public-private partnership models for the financing, delivery, and operation of HSR
- Understand necessary precursors for private investment and/or public-private partnership models for delivery and/or operation of HSR
- Identify circumstances that would attract private sector investment in HSR delivery and/or operations
- Discuss pros and cons of including or excluding different scope elements of the HSR program (i.e. considerations of bundling, including separately delivered assets) in any public-private partnership models
- Help to understand potential benefits to the Authority of increased private investment in development of the HSR program

### 03 | Focus Area

- Opportunities: Obtain industry perspectives on opportunities for private investment and strategies to package elements of the HSR program, if appropriate, to maximize the benefit realized from public-private partnership models
- Constraints: Understand the barriers to delivering value-for-money through public-private partnership models for delivery and/or operation of HSR

- Innovation: Opportunities for innovation in funding and financing delivery of all aspects of the HSR program; areas for improvement in the Authority's prior delivery approaches; and lessons-learned from public-private models employed on other HSR programs globally
- TOD: Opportunities for developing the stations and surrounding parcels to create TOD, private investments, value capture to defray stations costs, and available supporting public sources

## **Funding & Financing (including TOD and Private Investment) – Stations**

### **01 | Current State**

- The Phase 1 alignment contemplates a combine of stations that will be owned and/or leased by the Authority..
- The Authority is exploring an outsourced model for management, maintenance, and operations of the stations, along with a private sector-led development of the adjacent Transit-Oriented Development parcels. If warranted, this model could incorporate a station development corporation (or similar)

### **02 | Objectives**

- Stations should serve as catalysts for economic development, helping to deliver on mutually developed station area plans of the subject community while driving ridership, transit-oriented development (TOD) activity, and ancillary revenues
- Test the Authority's preference for an outsourced model delivered by a team that brings stations management, maintenance and commercial real estate development capabilities
- Understand market perspectives, drivers and potential risks for an outsourced model
- Identify circumstances that would attract private sector investment in HSR stations/station area TODs
- Understand how developers, investors and station operators envision teaming to address HSR's needs at stations
- Help to inform Authority strategies for assembling land, procuring, developing, funding, financing and operating stations/station areas with private sector partners.

### **03 | Focus Area**

- The Authority's preferred model: Obtain the market's perspectives on the potential benefits and constraints of the Authority's preferred model
- TOD: Opportunities for developing the stations and surrounding parcels to create TOD, and securing funding from private investments and available public sources
- Innovation: Opportunities for innovation in funding and financing, development (construction methods), and operations and maintenance
- Future Procurement strategies: Solicit the market participants for insights to inform the Authority's strategy for attracting and/or procuring funding and financing sources

## Maintenance & Operations (System Elements)

### 01 | Current State

- Preparation for Authority revenue operations to inform final design and schedule
- Service plans and detailed timetables, including connectivity to other CA transit modes, are developed
- Currently developing the operating concepts and maintenance plans to be implemented by the future operator
- Authority is seeking input and potential partnerships from established HSR operators to shape the future operational framework

### 02 | Objectives

- The Authority wishes to explore target operating scenarios with potential future operators
- Solicit industry feedback on the feasibility, risks, and potential roadblocks of the current operational approach
- Clarify expectations and to take note of any concerns potential future operators may have about future operational scenarios

### 03 | Focus Area

- Vision & innovation: Opportunities for technical innovation to improve reliability and efficiency of the rail system and to enhance passenger experience and perceived service value
- Operational capabilities: Operator experience with service punctuality and maintenance readiness for rolling stock and infrastructure
- Target operating scenario: Contractual model; operational feasibility, challenges, risks, and potential roadblocks of the target operating scenario
- Integration of other transportation networks: Coordination approach for seamless intermodal connections with other transit systems (regional buses, local rail networks, etc.)

## Innovation & Technology

### 01 | Current State

- Existing technology solutions are industry standard, commercially available solutions that support Enterprise Asset Management, Construction and Project Management, and a variety of other programmatic needs
- Comprehensive data management and integration with advanced analytics is in early stages of development
- An initial roadmap for digital integration has been developed
- A robust cybersecurity framework, inclusive of rail operations, is in the planning stage

Individual application examples:

- IBM Maximo: Enterprise asset management system to manage, monitor, and predict maintenance for assets
- Trimble eBuilder: Construction and contract project management software
- Salesforce: CRM primarily used for right-of-way acquisition and other smaller applications
- PowerBI: Data analytics and data visualization software
- Geographic Information System (GIS): Application to identify alignment and parcel acquisitions

### 02 | Objectives

The Authority aims to position itself as the most innovative mega project in the US and seeks ideas and solutions that will enable fast and efficient delivery of the high-speed rail system. Areas of interest include:

- Strategy, processes, and tools to collect, store, and organize data; ensure data quality and accessibility; protect data from unauthorized access or loss; and enable decision making
- Advanced digital solutions, with an emphasis on a comprehensive data integration that connects information across the enterprise
- Achieve full digital integration to improve management, optimize resource use, and predict challenges, delays, and other factors for ongoing and future construction segments
- Strategy and solutions for the development of a digital twin
- Geospatial analysis using GIS tools, multiple data layers, and visualization
- Cybersecurity strategies, tools, and solutions that will ensure the safety and security of the high-speed rail system
- Enterprise Resource Planning solutions
- AI-driven scheduling and sequencing technologies, and modularization



- AI-driven solutions and other innovative design & construction methods and materials to accelerate the construction progress
- Ideas on how to enhance future collaboration with leading innovative industry players through various partnership models

### **03 | Focus Area**

- **Artificial intelligence (AI):** Artificial intelligence application utilized in large infrastructure projects, such as scheduling and sequencing tools, to optimize the processes and gain valuable insights to optimize the Authorities current planning, design and construction approach
- **Digital twin solutions:** Digital process employed to design, construct, manage, and automate the Authorities projects, featuring an intelligent 3D model that acts as a shared knowledge resource throughout the entire project lifecycle for the Authority
- **Construction methods:** Utilize innovative construction methods, such as modularization, designed to optimize efforts and improve efficiency for further construction segments, as well as future segments requiring extensive tunneling
- **Enterprise resource planning (ERP):** Implement overarching digital solution to connect various platforms from the Authority into a single data source to better manage the flow of data, to eliminate data duplication, and to synchronize with other applications

## System Integration

### 01 | Current State

- Authority is in the process of developing and issuing procurements related to track and systems
- Track and OCS design contract was awarded to the Systra / Tyspa joint venture. The JV is mobilized and collaboratively progressing the delivery activities
- Authority released the draft of the Track & OCS Construction CM/GC procurement documents for industry comments at the end of 2024
- The Authority has qualified proposers who have been shortlisted to support the procurement of high-speed rolling stock capable of operating at 200 mph.

### 02 | Objectives

- Encourage innovative solutions that drive efficiency
- System integration is a key element for the success of the project, both in terms of controlling costs, schedule, and the overall system's reliability
- Develop a system integration strategy that involves all parties working on the systems, with clearly defined roles and responsibilities for each
- Innovation in integration to reduce risks and enhance the reliability of systems from Design through Testing and Commissioning and into Trial Revenue Service
- Solicit industry feedback on the feasibility, risks, and potential challenges of the current systems integration approach
- Explore how to integrate the best practices developed by industrial partners on similar projects

### 03 | Focus Area

- Past successful projects: Examples of successful major projects with innovative approaches to system integration that deliver outcomes for the client
- Challenges related to the industrial partner's role in the systems integration process and the responsibilities associated with it.
- Efficiency: Innovative methods or technologies to optimize efficiency of system integration
- Network integration: Exploring the approaches industry has engaged on regarding network integration, through a collaborative and progressive approach to assurance, asset management, verification & validation, system integration testing and trial operation.

## Utilities Investigation

### 01 | Current State

- Majority of the property to be acquired is private land, most of the land requiring acquisition is rural
- The Authority has two active construction packages (CPs) extending from Madera to 1 mile north of the Tulare/Kern county line (CP 1 and CP 2/3)
  - 75% of utility relocations have been completed on the active CPs
- Merced-Madera: approximately 33 miles in length, design process is around 30%, Right of Way (ROW) has not been acquired (majority of the area is rural)
- Bakersfield extension (LGA): approximately 20 miles in length, design process is around 30%, ROW has not been acquired (2/3 rural, 1/3 urban)
- Preliminary design plans provided to the designers, coordination with local third parties are ongoing, and minimal subsurface exploration conducted; potholing primarily performed in and around the city of Fresno
- Current challenges include power and irrigation infrastructure and work around existing railroad properties

### 02 | Objectives

- Leverage advanced design and construction technologies to enhance project efficiency
- Gain insights into managing greenfield projects that traverse private property, particularly when property access is restricted for site investigation
- Determine the optimal stage for procuring a utilities investigation contract
- Assess the current utilities investigation methods and resources utilized by industry players
- Establish a system for continuous updates on utility relocations through publicly available mapping tools, ensuring future contractors can efficiently access and utilize the latest information

### 03 | Focus Area

- Private Property Investigation: Strategies for assessing utility infrastructure in areas with restricted property access
- Utility Mapping: Development and maintenance of accurate, publicly accessible maps for tracking/maintaining utility relocations and new utility lines
- Innovative Utility Investigation Solutions: Adoption of advanced technologies and techniques for efficient utility detection and analysis
- Timeline Recommendations: Guidelines for optimal timing in procuring and executing utility investigation contracts

## Infrastructure Cost Estimators

### 01 | Current State

- Authority reset budgets and risks based on bottom-up and top-down assessment models
- Authority updated credible estimates and contingency budgets at the P65 risk level due to various inputs (e.g., inflationary periods, market prices and conditions)

### 02 | Objectives

- Fostering innovative ideas and best practices to refine future cost estimating tasks and cost reporting outputs
- Using data-driven approaches to better estimate cost and timeline
- Conduct dynamic impact analysis for potential design changes
- Authority wants to bring on Infrastructure Cost Estimators to provide input and supplemental support to the Authority in the overall development and revisions of infrastructure cost estimates.

### 03 | Focus Area

- Past successful projects: Examples of successful major P3 projects where costs were transferred to private partners under innovative approaches and practices
- Future collaboration partners: Estimators and Estimating Companies that are interested in taking on roles on the Authority project team through a fresh perspective and independent lens
- Innovative estimating & cost reporting practices: Ideas and innovations regarding industry best practices for estimating and cost reporting
- Efficiency and accuracy: Tools to assist in efficiency and accuracy of the estimating tasks

## Rail Manufacturers

### 01 | Current State

- Authority recognizes the challenge of balancing the available rail and special trackwork cost savings vs the risks in the construction and long-term maintenance costs
- Authority continues to aim at resolving the difficulties in sourcing specialized materials needed for constructing the system's infrastructure
- Authority will achieve interoperability and compliance outlined by UIC (International Union of Railways) and AREMA (American Railway Engineering and Maintenance-of-Way) Recommended Practices to ensure smooth operations and integration with other networks.

### 02 | Objectives

- Source local high-speed rail materials in compliance with regulatory requirements (i.e., Buy America and other business prohibition such as the Russia sanctions)
- Review and adopt established UIC standards and AREMA recommended practices technologies, high-speed track and rail standards,
- Ensure interoperability with other rail networks and optimize the wheel-rail interface.

### 03 | Focus Area

- Local steel material: Sourcing Local Steel material to comply with the regulatory framework and funding sources
- Mitigation strategies, construction delays, and supply chain challenges: Discuss ideas on mitigation strategies to reduce construction delays and mitigate resource logistics/supply chain challenges
- Innovative construction methods: Discuss innovative construction methods to increase efficiency and reduction in installation time and cost
- Sustainable manufacturing practices: Sustainability manufacturing practices to reduce the negative impact on the environment and communities

## Track System & Track Builders

### 01 | Current State

- Authority recognizes the challenge of balancing the available track system cost savings vs the risks in the construction and long-term maintenance costs
- Authority continues to aim at resolving the difficulties in sourcing specialized materials needed for constructing the system's infrastructure
- Authority will achieve interoperability and compliance outlined by UIC (International Union of Railways) and AREMA (American Railway Engineering and Maintenance-of-Way) Recommended Practices to ensure smooth operations and integration with other networks.

### 02 | Objectives

- Solicit feedback from Track System and & Track Builders on the latest industry trends to deliver track system components by using cutting-edge methods, ensure interoperability of trains and maintenance of way equipment across different track standards, and follow UIC and AREMA recommended practices to optimize wheel-to-track interfaces.

### 03 | Focus Area

- Regulatory compliance: Track System components will comply with the regulatory framework and funding sources (i.e., Buy America)
- Risk Mitigation: Discuss ideas on mitigation strategies to reduce construction delays and mitigate resource logistics/supply chain challenges
- Innovation: Discuss innovative construction methods to increase efficiency and reduction in installation time and cost
- Sustainability: Maximize sustainable manufacturing practices to reduce the negative impact on the environment and communities

## Questions

### Geotechnical

1. What are the non-intrusive and intrusive investigation innovation areas that could be deployed by the Authority, what are the barriers to introducing these technologies?
2. What is the suppliers view of the approach the Authority is taking?
3. Are there international approaches or best practice projects that are proven, which could offer benefits?
4. What are the opportunities and benefits of a multi stage vs single stage ground investigation strategy?
5. What are the innovative technology/methods considered to minimize access issues?
6. Would a Geotechnical baseline report by the Authority, and a further ground investigation program by construction contractors, be an efficient approach?  
What is the supplier view?

## Tunneling

1. **Use of New/Innovative Construction techniques:** Suppliers are invited to propose new and innovative methods of construction to drive efficiency and cost reduction. For example, use of Soil Mixed Walls to form retaining walls instead of more traditional cast in place retaining walls to cuttings.
2. **Procurement approach:** What are is view of suppliers on the benefits and risks of civil based only tunnel contracts in comparison to multi-disciplinary contract packages?
3. **Contract type and delivery model:**
  - a. Design-Build, Progressive Design-Build, Design-Bid-Build, Public-Private Partnerships etc.
  - b. Lump Sum, Target Cost, T&M.
  - c. Traditional US contract approach vs global alternatives (such as NEC 4).
  - d. What is the view of suppliers on benefits and drawbacks of contract options for tunnel projects? How can the contracts be aligned so everyone has same goals?
4. **Approach to Risk:** What is the supplier view of risk sharing approaches (such as NEC4 with pain-gain mechanism)?
5. **Reduce bureaucratic inefficiency:** What approaches and processes can be adopted to optimize timelines for approvals and hence minimize risk of schedule delay from late approvals?
6. **Defined time for Value Engineering at the beginning of the schedule:** Many good opportunities on projects are not realized due to lack of time for evaluation and change management. What is the supplier view on provision of time allowance within the delivery schedule for value engineering? From experience – is this likely to yield overall benefit in cost and schedule outcomes?
7. **Efficiency in design:** What approaches would suppliers advocate to pursue efficiencies in tunnel design and construction? For example, what are supplier views on:
  - a. One pass tunnel lining rather than two (e.g., Precast concrete lining only without need for cast-in-place secondary lining?). Use of fibre reinforcement rather than traditional rebar?
  - b. Benefits and disbenefits of single bore tunnels vs twin bore (single track tunnels)?
8. **Standardisation and use of precast/modular construction:** Standardising tunnel sizes may also enable reuse of Tunnel Boring Machines (subject to program) and offer other cost, time and H&S benefits. What is the industry view on this approach?
9. **Reuse of excavated materials:** Significant costs are associated with removal and disposal of excavated materials. What opportunities can be leveraged to reuse materials onsite (landscaping, noise bunds, aggregates for concrete etc)?
10. **Material technology: Low Carbon Materials:** E.g., use of earth friendly concrete. Can use of low carbon materials and other forms of sustainable materials help reduce cost?



11. **Ground Investigation Works:** What are supplier views on optimising the balance of risk for investigation works (i.e. potential savings on upfront cost and schedule program against potential risk during construction)? What are suppliers' views on use of ground penetrating radar, geophysical surveys and other non-intrusive testing as means to optimising the quantity of investigation with boreholes prior to tunnel construction?
12. **Self-Certification:** Robust and comprehensive systems for self-certification can present a leaner approach for assurance for handover and commissioning of railway assets. What are supplier views on best efficient practice for certification of underground assets for rail systems?
13. **Rental from shared use (utilities):** Is there opportunity for commercial arrangements for lease of space in tunnels for utilities including fibre optics, HV electricity, water supply pipes etc.? Arrangements should be compatible with operation and access requirements for third parties.
14. What innovations are there in the market which the Authority could adopt? What are the barriers to those innovations?
15. Views on inclusion of asset maintenance responsibility post construction for given periods into revenue service
16. Views on operations and maintenance responsibility models post construction

## Bridges & Structures

1. What are the challenges of labor for this scope, and how might they be unlocked?
2. **Procurement Approach:** What are is view of suppliers on the benefits and risks of civil/structural contracts split geographically vs structure family types?
3. **Contract Type:**
  - a. Design-Build, Progressive Design-Build, Design-Bid-Build
  - b. Lump Sum, Target Cost, T&M.
  - c. Traditional US contract approach vs global alternatives (such as NEC 4)?
  - d. What is the view of suppliers on benefits and risks of contract options for major bridges and structures? How to ensure contracts are aligned so everyone has same goals?
4. **Approach to Risk:** What is the supplier view of risk sharing approaches (such as NEC4 with pain-gain mechanism)?
5. **Cut Red Tape:** Are there options to minimize approvals, standardize designs, modularise in order to accelerate program and thus reduce overall project costs?
6. **Ground Investigation Works:** What are supplier views on optimising the balance of risk for investigation works (i.e. potential savings on upfront cost and schedule program against potential risk during construction)?
7. What are suppliers' views on use of ground penetrating radar, geophysical surveys and other non-intrusive testing as means to optimising the quantity of investigation with boreholes prior to foundation construction?
8. **Efficiency in design:** What approaches would suppliers advocate to pursue efficiencies in bridge and structure design and construction? For example, what are supplier views on:
  - a. Supply chain views on opportunities for modular design, standardisation of bridge component types and bridge families, DFMA (Design for off-site manufacture)?
  - b. Segmental Construction: What scale of elevated structure would benefit investment in span by span segmented construction techniques? How does this relate to the current scope of work?
  - c. Opportunity for utilization of seismic devices to improve structural efficiency and reduce material cost?
9. **Sustainable Material Technology:** Can use of low carbon materials and other forms of sustainable materials help reduce cost?
10. **Rental from shared use (utilities):** Is there opportunity for commercial arrangements for lease of space on elevated structures and sections of guideway for utilities including fibre optics, HV electricity, water supply pipes etc.? Arrangements should be compatible with operation and access requirements for third parties.
11. Views on inclusion of asset maintenance responsibility post construction for given periods into revenue service.

## Power Generation/Renewable Energy

1. What financing or procurement approaches and structures do you think most readily apply to bring third party capital to finance the behind the meter energy system both generation and BESS- as envisioned?
2. To deal with load variability (e.g., due to train schedule variation- say 30%) what approach would you take to proactively avoid take or pay charges? How would you pursue engaging alternative offtakers, or other approaches?
3. To facilitate alternative offtakers, would it be helpful if most (e.g. 70%) of the load were supported by a behind the meter system for the consistent load requirements, and the remaining 30%— the variable portion of the load—was supported by offsite and grid-feeding resources (e.g., via direct access type delivery as a merchant plant with the Authority having the right of first offtake)? Does your firm deal with merchant plants?
4. Could your firm provide O&M over the life of the system (25 years)? What approach would you take to optimize operations and maintenance to fully support rail operations, while minimizing OPEX cost for the authority?
5. What other renewable energy generation systems other than PV would be locally appropriate and suitable given attributes such as higher capacity factors or complementary generation profiles? Would you suggest alternative energy storage technologies to lithium-ion that could effectively address abrupt peak demands inherent in traction power, while offering improved performance and reduced degradation over time?
6. The current static frequency converter TPSS conceptual topology is envisioned to mitigate traction power phase imbalance and harmonics from regenerative braking. Do you see other integration issues or recommend an alternative approach?
7. What are your suggestions about contracting for the renewable energy and traction power components of the TPSS? Should they be contracted together (integration risk on the prime contractor) or separately (integration risk on the Authority)?
8. What is your opinion on the most effective approach to long-term Energy O&M to ensure that system design and intended O&M practices align with the Authority's long-term goals? While it is more typical in the rail industry to complete construction, close out construction bonds and leave long term O&M to other entities, in the energy industry, it is more common for developers to offer O&M over the life of the system. Would it be a viable option for the design, construction and commissioning of the overall energy-TPSS system to occur under a single combined contract, while separating long term energy O&M into a distinct contract appendix that could later be assigned to the Authority for administration, after release of the construction bonds?
9. What uses of the ROW or stations may be appropriate for dual use (for example, for communications or power transmission)? What are typical revenue structures for these uses?
10. In your experience partnering with customers and government entities, what lessons did you learn, and what do you wish your counterpart understood or

could have done differently throughout the pre-procurement and procurement process?

## Track & Rail Systems, Depot & Facilities

1. Do you agree with the current proposed packaging of contracts from a technical and delivery perspective, how would you optimize the packages to maximize cost and time efficiencies?
2. Where do you see areas to make efficiencies on rail systems design and implementation and integration?
3. Do you see an advantage or issue if the Authority contracted material procurement and novated to your contract?
4. What level of requirements and/or information do you need from the Authority to efficiently deliver the scope?
5. What elements of maintenance would you consider undertaking, and what are the limitations?
6. How would you balance innovation with compliance to Code of Federal Regulations?
7. How long do you need to submit qualifications-based proposal for these contracts?
8. How would you provide certainty in delivery of your scope?
9. What would stop you submitting a compliant proposal for any of the proposed contracts?
10. What safety and quality performance metrics would you apply to this project?
11. What level of construction management and oversight and/or Authority site presence do you expect and what do you think is the most efficient approach to oversight? What methods of client management worked most efficiently for you in the past?
12. What are the main challenges within your supply chains (Volumes, timescales, logistics, Buy America compliance)? Are there possible mitigations that the Authority could support in.
13. Would there be any appetite for minor civil engineering works to be added to any of the packages if these were associated to geographical locations (e.g. Substation bases, fencing, access road, Utility relocations etc.)?
14. In your experience delivering high-speed rail projects, what lessons did you learn, and what recommendations would you make to a public entity such as the Authority to implement in its procurement & delivery process
15. What experience have you had with modular or prefabricated designs and how can they be incorporated to reduce construction costs and timelines without compromising quality?
16. What design elements or standards have proven most effective in minimizing long-term maintenance costs?
17. What opportunities do you see to use shared or multi-use spaces in stations and depots to maximize functionality?
18. What innovations in facility layout or material selection have reduced costs without compromising safety, durability, sustainability or quality and would these work within the California environment?
19. What are the incentives or funding opportunities for incorporating sustainable practices in facility construction?

20. What features can be integrated during the design phase to reduce lifecycle costs while maintaining flexibility?

**OCS Cable Manufacturers**

1. Do you agree with the current proposed packaging of contracts from a technical and delivery perspective, how would you optimize the packages to maximize cost and time efficiencies?
2. Where do you see areas to make efficiencies on rail systems design implementation and integration?
3. Do you see an advantage or issue if the Authority contracted material procurement with the intent to novate the contract.
4. What level of requirements and/or information do you need from the Authority to efficiently deliver the scope?
5. What elements of maintenance would you consider undertaking, and what are the limitations?
6. What features can be integrated during the design phase to reduce lifecycle costs while maintaining flexibility?
7. How long do you need to submit qualifications-based proposal for these contracts?
8. How would you provide certainty in delivery of your scope?
9. What would stop you submitting a compliant proposal for any of the proposed contracts?
10. What safety and quality performance metrics would you apply to this project?

## Funding & Financing

1. Based on your precedent experience and the current Authority timeline to begin operations in the Central Valley within its schedule window ( 2030-2033), when would your firm ostensibly want to be considered as the Authority's operating and development partner?
2. What key milestones would you want to see accomplished by the Authority in advance of selection of its operating and development partner(s)?
3. What opportunities and challenges do you foresee in securing private sector investment in the stations and /or TOD elements?
4. What opportunities and challenges do you foresee in securing Build America Bureau credit assistance for the stations and/or TOD elements? Should any pursuit of said assistance form part of a broader Phase 1 strategy?
5. Given the Authority's preference for an outsourced model, what level of Authority involvement in key decisions would you require?
6. What is the process for aligning on key performance indicators with your public agency counterparts?
7. Recognizing that ownership structures of stations outside of the Central Valley segment will involve other partners, would you recommend that any forthcoming procurement for an operating and development partner extend to stations outside the Central Valley segment?
8. What experience does your firm have in pursuing land value capture strategies in partnership with public sector clients?
9. What market-based examples of outsourced models do you believe align to the scope and scale of the Central Valley segment?
10. What mechanisms have you deployed to align with station cities/communities on station area TOD programs?



**Maintenance & Operations System Elements)**

1. What are your thoughts on the operational feasibility, challenges, risks, and potential roadblocks but also opportunities of the target operating scenario while maintaining operational efficiency and safety?
2. What specific innovations (i.e., tools, technologies, automation or software systems) would you bring to streamline day-to-day O&M activities and make them more reliable and efficient? Have those been employed in any of your other operations?
3. What do you consider success factors to enable reliable HSR operations and deliver the best quality service to future passengers?
4. What would be your desired contractual model with the Authority (e.g., risk revenue operations or other)?
5. What are your experiences and how would you coordinate services with local and regional transit systems for seamless intermodal travel?
6. What strategies have been most successful in reducing maintenance downtime and costs whilst balancing a high performing railroad including lifecycle costs and replacement of assets?
7. What gaps exist in the industry that could be addressed through focused research, training, or collaboration?
8. What predictive and preventative maintenance techniques do you suggest we adopt and how effective are they?
9. How do you suggest we utilize data to improve maintenance and operations activities?
10. How do you balance cost control with maintaining high safety and performance standards?

## **Innovation & Technology**

1. How can your solution/services enable the Authority to become more efficient and faster in delivering the high-speed rail?
2. How does your solution set you apart from other leading players, what is your User Services Platform?
3. How can an AI-based scheduling and sequencing tool make the current scheduling process more efficient and accurate?
4. How can the Authority enhance the collaboration with leading innovative industry players?
5. What innovative construction methods (e.g., for heavy tunneling areas) could the Authority leverage?
6. What AI tools or solutions does your organization offer to optimize scheduling, sequencing, and resource allocation?
7. What are the capabilities of your Digital Twin technology, and how does that apply to the Authority?
8. Can you share examples of innovation and technology that have successfully improved timelines and reduced costs for large infrastructure projects?
9. What tools and technology would improve existing program delivery and data analytics?

## System Integration

1. How to ensure the integration process throughout the entire development lifecycle (design, construction, tests)?
2. What is the contractor's vision of system integration, and where do they see themselves in this process?
3. Are there international approaches or best practice projects that are proven, which could offer benefits?
4. Procurement approach and including system integration tasks in the contractor's cost.
5. What level of requirements and/or information do you need from the Authority to efficiently deliver the scope?
6. How would you provide certainty in delivery of your scope regarding the interface and integration of your scope on the wider systems?
7. What level of integration management and oversight do you expect and what do you think is the most efficient approach to levels of integration management / oversight?
8. Do you agree with the current proposed procurement strategy/packaging of Rail Systems contracts from an integration & delivery perspective, how would you optimize the packages to maximize cost and time efficiencies and risk reduction?
9. Where do you see areas to make efficiencies on rail systems design and implementation and integration?
10. What specific innovations (i.e., tools, technologies, automation or software systems) would you bring to streamline day-to-day integration activities and make them more reliable and efficient.

### **Utilities Investigation**

1. When and under what conditions should Subsurface Utility Engineering (SUE) be utilized effectively?
2. What unique qualities or expertise set your team apart in utility investigation?
3. What tools, techniques, and data sources are you currently using for utility investigation?
4. What challenges do you typically encounter with utility relocations and tracking progress?
5. How should the Authority address the challenges posed by a mix of urban and rural environments?
6. How can utility investigations be performed effectively without property access?
7. Have you experienced or used a successful approach or method that encouraged or motivated a utility owner to cooperate with a public entity to contract for utility relocation?

### **Infrastructure Cost Estimators**

1. What is the cost estimating experiences and new approaches to forecast mega-project budgets that are comprehensive, within the range of accurate and credible cost estimates, and in line with the industry best practices (USA and international) that could provide benefit to the Authority?
2. What is your experience identifying the main cost drivers that cause downstream impacts (whether it may be cost, schedule, quality, etc.) to mega-projects?
3. Have bottom-up risk assessments been used as a baseline to drive forward for more accurate cost estimates, reporting and cost controls?
4. What data has the cost estimating sector used to adjust their historical actual prices to achieve credible cost estimates, given the higher inflationary period from 2021 to present in the USA?

## Rail Manufacturers

1. Do you have thoughts and ideas on innovative ideas for rail production and delivery that optimizes both construction and long-term maintenance costs that benefit the Authority, and achieves on-time performance targets for operations?
2. What are your thoughts and ideas about meeting Buy American and Buy America requirements but still sourcing rail, and possibly long rail between 320 feet to 480 feet (97.5 meters to 146.3 meters), that provides safe, cost-effective solutions and allows the Authority to avoid using the nonavailability waiver process?
3. What innovative solutions can rail manufacturers offer to improve efficiency and reduce costs throughout the program's implementation?
4. What proven strategies and technologies currently exist that the Authority can leverage to enhance project delivery and performance?
5. What strategies can be implemented to optimize construction timelines, ensure safety, and address logistical sourcing challenges related to materials, equipment, and supplies?
6. Are there potential issues with the proposed rail and special trackwork that could impact interoperability with high-speed trains and maintenance of way equipment?
7. Are you interested in providing ongoing technical support to ensure long-term system reliability and performance?

### **Track System & Track Builders**

1. Do you have thoughts and ideas on innovative and/or proven Track System configurations that optimizes both construction and long-term maintenance costs that benefit the Authority, enhances safety of the system and achieves on-time performance targets for operations?
2. What are your thoughts and ideas about meeting Buy American and Buy America requirements, while still sourcing Track System components that help achieve cost-effective solutions and allow the Authority to avoid using the nonavailability waiver process?
3. What innovative solutions can manufacturers and builders offer to improve efficiency and reduce costs throughout the program's implementation?
4. What proven strategies and technologies currently exist that the Authority can leverage to enhance project delivery and performance?
5. What strategies can be implemented to optimize construction timelines, ensure safety, and address logistical sourcing challenges related to materials, equipment, and supplies?
6. Are there potential issues with the proposed track systems that could impact interoperability with high-speed trains and maintenance of way equipment?
7. Are you interested in providing ongoing technical support to ensure long-term system reliability and performance?