

**Colorado Department of
Transportation
Division of Transit and Rail**

***Advanced Guideway System
Project***

**REQUEST FOR STATEMENTS OF
TECHNOLOGY INFORMATION**

ISSUED September 7, 2012

**Division of Transit and Rail
Colorado Department of Transportation
4201 East Arkansas Avenue
Denver, Colorado 80222**

Statement of Technology Information due no later than 4:00 p.m. on October 10, 2012

1.0 INTRODUCTION

In 2009 the Division of Transit and Rail (DTR) was created as a new division within the Colorado Department of Transportation (CDOT). The DTR was created to plan, develop, finance, operate and integrate transit and rail services in the State. One of the powers granted to DTR, through the authority of CDOT, is the ability to enter into contracts with public and private entities to facilitate public-private partnerships for public transit projects. DTR is pleased to invite interested Technology Providers to submit a response to this Request for Statements of Technology Information (RFSOTI) in order to advance the assessment of technology options to develop an Advanced Guideway System (AGS) in the I-70 Corridor from Denver International Airport (DIA) to the Eagle County Regional Airport (EGE).

2.0 PROJECT OVERVIEW

In April 2012, CDOT DTR retained a consultant to prepare the AGS Feasibility Study. The development of an Advanced Guideway System was one of the three components of the "Preferred Alternative" (along with some highway and non-highway improvements) of the Programmatic EIS developed for the I-70 Mountain Corridor and affirmed in the Record of Decision (ROD) issued by the Federal Highway Administration in June 2011. See <http://www.coloradodot.info/projects/i-70mountaincorridor/final-peis/final-peis-file-download.html>.

As contemplated, the AGS would be the first of its kind in the world. It will traverse mountainous terrain and contend with mountain weather. Stations will be provided along the corridor at locations such as the I-70/C-470 area, Idaho Springs, Frisco/Dillon/Silverthorne, Copper Mountain, Vail/Avon and Eagle County Regional Airport (among others). A key performance criterion for the AGS is that it be as least as fast as a free flow automobile trip, including station dwell time. Part of the scope of the AGS will be determining station locations and developing interfaces with existing and future local transit systems. Additional project information can be found at <http://www.coloradodot.info/projects/AGSstudy>.

The proposed AGS is well supported by communities along the I-70 corridor. Letters of support from Clear Creek County and the I-70 Coalition are included in Attachment B. The intent of the AGS is offer a new choice of travel mode and increase mobility, at the same time reducing congestion and improving safety on I-70 by removing some portion of the automobile traffic. The AGS will serve both commuters and recreational users destined for the ski areas, national forests and communities, year around. In addition to passengers, the ROD allowed for light freight transport on the AGS system.

Information provided in the Statement of Technical Information (SOTI) by the Technology Providers will be used to develop groups of candidate technologies and corresponding alignment alternatives. If some technologies are not selected for use in the feasibility analysis that does not preclude any technology from being used in the ultimate implementation of the AGS. The goal of the current work effort is to establish if there is one or more feasible alternative to implement an AGS by the year 2025 as prescribed by the Tier 1 environmental

analysis completed in June 2011. It is envisioned that the ultimate implementation of an AGS may encompass a public-private partnership approach that will:

- (i) Finance, design, and construct the AGS between Denver International Airport and Eagle County Regional Airport starting with a minimal operable segment (MOS);
- (ii) Operate and maintain the AGS for the full term of the Concession agreement.

As DTR continues its efforts to analyze and further an optimal development and financing plan for the AGS, it expects that many aspects of the AGS will continue to evolve.

3.0 REQUEST FOR STATEMENTS OF TECHNOLOGY INFORMATION

Technology Providers are requested to provide details on possible technologies with the ability to address the needs of the AGS in their SOTI. Technology Providers must address all information described in this Section.

3.1 Travel Time

The minimum travel time acceptable to CDOT is summarized below. Technology Providers must describe how their system will meet these minimum travel times:

- (i) Express (scheduled-type operations) – AGS travel times including station dwell time should, at a minimum, be faster than a travel time calculated as the highway distance between the station locations divided by 65 mph.
- (ii) Local (scheduled-type operations) – at least as fast as an unimpeded vehicle (including station dwell time, acceleration/deceleration), and equivalent to existing local transit systems (Summit Stage, Eco-Transit, etc.) between local locations.
- (iii) Other System/Operational Types – same as Express travel time above for peak demand times and Local travel times for non-peak periods.

In addition, Technology Providers must also describe how their technology will accommodate both local and express traffic simultaneously for systems that connect to stations with vehicles that arrive/depart on a scheduled basis. These systems and other system-types should be able to accommodate, at a minimum, the peak period demands of 4,900 passengers per hour in the peak direction by 2035.

3.2 Vehicles

Technology Providers must provide a general description of the proposed vehicle that will serve passengers under their proposed technology. This description should include images of the actual vehicle, or its design if the vehicle is still in the design phase of development. Dimensions of the vehicle must be included in the response, including the length, width, height,

passenger capacity, baggage capacity and weight of the vehicle. A plan of the vehicle layout showing seating, baggage storage and other amenities must be provided.

3.3 Noise

Technology Providers must demonstrate how their technology will meet requirements for both external (system) noise and internal (cabin/vehicle) noise as follows:

- (i) External - noise levels generated by the AGS should not exceed those levels defined in the Programmatic EIS. In general, FHWA noise guidelines will apply. The Technology Providers must provide a discussion of potential external noise levels, and how those noise levels compare to the noise levels in the Programmatic EIS and FHWA noise guidelines. Noise levels should be provided at varying operating speeds up to the maximum speed of the system and shall include data on acceleration/deceleration noise levels. Means to mitigate excessive external noise must be discussed as part of the SOTI.
- (ii) Internal - noise levels generated by the AGS within the vehicle must be provided at varying operating speeds up to a maximum speed of the system including acceleration/deceleration. The goal maximum noise level for inside vehicles is set at 60 dB. Means to mitigate excessive internal noise must be discussed as part of the SOTI.

3.4 Footprint and Context Sensitive Solutions (CSS)

As required for the I-70 Mountain Corridor, the AGS will be required to conform to the CSS (<http://i70mntncorridorcss.com/>) process developed for the Mountain Corridor. Technology Providers must describe:

- (i) Cross sections of guideway, description of materials used in guideway and supporting structural details and calculations (if available).
- (ii) Description of guideway support system, including materials, size and height of supports, spacing of supports and supporting structural details and calculations (if available).
- (iii) Proposed methods for bridging of areas where regularly spaced supports cannot be provided.
- (iv) Method of delivering and constructing guideway and support system. The Technology Providers must provide information as to any pioneer/construction access roads required to construct their system and must provide a cross section showing limits of disturbance along guideway during construction.
- (v) Proposed methods to mitigate visual impacts of guideway and supports.

- (vi) Approximate size and dimensions of stations. The Technology Providers must provide a site plan drawing showing a prototype station. The station drawing need not include any external parking lots or structures but must show ticketing areas, waiting areas, loading platforms and baggage handling areas. The Technology Providers must describe how the station could be modified to limit visual impact to communities.
- (vii) Approximate size and dimensions of maintenance facilities. The Technology Providers must provide a site plan drawing showing a prototype maintenance facility. The Technology Providers must describe where on the alignment maintenance facilities will be required. The Technology Providers must describe how the facility could be modified to limit visual impact to communities.
- (viii) Approximate size, dimensions and locations of electrical substations or other power installations/equipment. The Technology Providers must describe how the substations could be modified to limit visual impact to communities.
- (ix) The conditions where the guideway could be constructed at-grade and the safety and access control features required to operate at-grade.
- (x) Design criteria including vertical/horizontal curve requirements (for maximum speed operation) and clearance envelopes (in tunnels and outside of tunnels).

3.5 Grade

The following are key elevations along the I-70 corridor:

- (i) C-470/I-70 – 6,230' (MP 259.75)
- (ii) Top of Floyd Hill – 7,890' (MP 246.52)
- (iii) US 6/Bottom of Floyd Hill – 7,259' (MP 244.27)
- (iv) SH 103/Idaho Springs – 7,543' (MP 239.65)
- (v) US 40/Empire – 8,277' (MP 231.89)
- (vi) Georgetown – 8,609' (MP 227.92)
- (vii) Silverplume – 9,125' (MP 225.72)
- (viii) East Portal Eisenhower Johnson Memorial Tunnel (EJMT) – 11,009' (MP 215.36)
- (ix) West Portal EJMT – 11,162' (MP 213.65)
- (x) Silverthorne – 9,047' (MP 205.42)
- (xi) Frisco – 9,176' (MP 201.00)

- (xii) Copper Mountain – 9,673' (MP 195.26)
- (xiii) Vail Pass – 10,668' (MP 190.10)
- (xiv) East Vail – 8,252' (MP 179.87)
- (xv) Main Vail – 8,160' (MP 176.03)
- (xvi) Eagle – 6,601' (MP 146.65)

The following is a summary of grades along I-70:

- (i) 7.2 miles with grade of 7% (4.2 miles of 7% grade EB approaching west portal of EJMT)
- (ii) 11.8 miles with grade 6% to 6.99%
- (iii) 8.6 miles with grade 5% to 5.99%
- (iv) 7.5 miles with grade 4% to 4.99%
- (v) 14.2 miles with grade 3% to 3.99%
- (vi) 10.4 miles with grade 2% to 2.99%
- (vii) 24.6 miles with grade 1% to 1.99%
- (viii) 21.6 miles with grade 0% to 0.99%

Although the proposed system does not have to follow the I-70 right-of-way along its entire length, Technology Providers must provide evidence as to the ability of their technology to accommodate grades that may be encountered along the I-70 Mountain Corridor. Tunneling may be a means of overcoming or mitigating the existing highway right-of-way grades. Technology Providers shall provide maximum operable grades for their technology, along with the maximum length of grades that can be accommodated while still maintaining adequate operating speed and acceptable power consumption levels. An Excel spreadsheet providing additional detail on grades along I-70 is available upon request.

3.6 Safety

Technology Providers must demonstrate that their technology can meet the TSI criteria (at guideway) for non-compensated lateral acceleration and braking deceleration for those technologies for whom these standards apply. If the TSI criteria do not directly apply, Technology Providers are to supply applicable safety standards and test data or system expectations concerning safety. The information provided must also demonstrate how the technology addresses requirements to provide grade-separated and wildlife crossings, an access controlled guideway, emergency egress from the vehicles and guideway including guideway on structure and guideway in tunnels, and system security.

3.7 Weather and Wind

Technology Providers must demonstrate that their proposed technology:

- (i) Is capable of operating in severe weather events with minimal interruption or delays in service. This includes tolerances for extremes of heat, cold, wind, ice and snow. Technology Providers must specify the level of service their system can provide relative to temperature range, wind speed and ice/snow accumulation. Please include any special provisions to accommodate the fact that the alignment will pass through known avalanche zones;
- (ii) Has the ability to withstand wind shear of extreme alpine windstorms such as those frequently experienced throughout the corridor. The corresponding infrastructure is required to withstand wind forces (as well as other forces, such as snow load) as specified in the applicable building codes.

Technology Providers must specify the level of service their system can provide for ranges of wind speeds along with the maximum wind speed at which operations must cease.

3.8 Scalability and Growth

Technology Providers must provide information on how their technology accommodates:

- (i) The ability to expand to address future growth in demand and/or additional station locations or branches; and
- (ii) Varying passenger demand (i.e., daily and seasonal peak demand) including how to address changes in passenger demand within reasonable time.

3.9 Passenger Comfort

Technology Providers must demonstrate how their passenger acceleration/deceleration/lateral cabin experience conforms to the requirements set forth in the European HSR Rolling Stock passenger comfort parameters/standards. If such standards do not apply to the technology, Technology Providers are to supply applicable ride comfort standards and test data or system expectations concerning passenger comfort.

The following requirements should be met:

- (i) Ability to have a cup of coffee on board without concern for spilling it;
- (ii) Work on a laptop or other electronic device;

- (iii) Ride comfort – ability to move around without being slammed against a wall for those technologies that have aisles and seating rows. Technologies that are designed to use automobile-style seating (without walkable aisles) should have ride comfort similar to auto travel;
- (iv) Access to restrooms or a substitute capability (if applicable);
- (v) Seating for each passenger (passengers should not be allowed to ride standing);
- (vi) ADA compliant (If ADA standards do not apply, the Technology Provider should state why).

3.10 Baggage Capacity

Technology Providers must demonstrate how their technology accommodates luggage and outdoor gear including skis, snowboards, bicycles and golf clubs. Loading of such gear must have minimal impact on station dwell and boarding times.

3.11 Freight

Technology Providers must demonstrate how they will:

- (i) Provide for light-weight and high-value packages including food deliveries;
- (ii) [OPTIONAL CRITERIA] Accommodate heavy freight with the system. If the Technology Provider chooses to respond to this criterion, it must be demonstrated that the provision for heavy freight does not negatively impact passenger traffic on the system, operational efficiencies or maintenance costs.

3.12 Tunnels

Technology Providers must provide details on tunnels which may be required to accommodate their technology. This shall include:

- i. Cross-section of tunnel showing location of guideway and any access walkways including emergency access.
- ii. Need for separate bores for directional travel.

If tunnels are not required, specify as such, and describe why they are not required.

3.13 Reliability

Technology Providers must demonstrate how their technology will provide 98% on-time operational reliability. “On-time” is defined as within 5-minutes of the scheduled arrival or

departure time. The only exceptions to this requirement are for the extreme weather events that have been defined by the Technology Providers under the Weather or Wind criteria. For systems that do not propose a schedule-based service, the Technology Providers will supply applicable reliability standards and test data or system expectations concerning operational and maintenance reliability.

3.14 Headways

Technology Providers must demonstrate how their technology will provide headway times that are capable of addressing peak period demands of 4,900 passengers per hour in the peak direction by 2035. For systems that do not propose a schedule-based service, the Technology Providers must supply their plan for meeting or exceeding the passenger per hour minimum (above).

3.15 Power Generation, Transmission and Distribution

Technology Providers must provide a description of the energy required to power the proposed technology, including voltage and Hz requirements and approximate substation spacing if known. Technology Providers should also describe their technology's ability to accommodate electrical power transmission/distribution lines and other utilities within the guideway area both for the system use and for uses outside of the AGS.

3.16 Energy Efficiency

Technology Providers must describe their accommodations to respond to incorporating green technology for renewable power sources such as wind and solar power.

3.17 Sustainability

Technology Providers must describe how their technology addresses sustainability principles including: supply chain, carbon footprint, construction and maintenance methods and impacts, green materials, life-cycle analysis, and alternative energy. Technology Providers should describe how their sustainability goals will be measured and met (e.g., LEED, ASCE ISI, other). Also see Section 3.24.4.

3.18 Cost

Technology Providers must provide a unit cost array showing costs for major system elements including, at a minimum, estimated project costs for the following categories:

- (i) Capital costs breaking out civil infrastructure costs (indicating what assumptions these are based on), vehicles, and other required capital investment (indicating what this includes) provided on a total capital cost/mile basis;

- (ii) Operating Costs (annual);
- (iii) Routine Maintenance Costs (annual);
- (iv) Major Maintenance Costs (indicating required intervals) annualized for at least 20 years; and
- (v) Other Lifecycle Maintenance Costs as applicable annualized for at least 20 years, including spare ratio and vehicle replacement assumptions.

3.19 Termini

Technology Providers must address any issues associated with the proposed technology ultimately operating the AGS from Denver International Airport (DIA) to Eagle County Regional Airport (EGE). The AGS can be implemented in a phased manner provided the technology is consistent and, at a minimum, the minimum operating segment (MOS) is operational from the C-470/I-70/US 6 Interchange to Summit County (west of the Eisenhower-Johnson Memorial Tunnel) by 2025. The full system implementation must be achieved by 2050.

3.20 Right-of-Way (ROW)

Technology Providers must provide information on ROW to include:

- (i) Width of ROW required for guideway including access and maintenance roads including temporary access needs during construction.
 - a. Typical width
 - i. At Grade
 - ii. Elevated
 - iii. Tunnel
 - b. Special Cases (identify general locations, if possible)
- (ii) Dimensions of ROW required for stations, not including parking lots or parking structures.
- (iii) Dimensions of ROW required for maintenance and administrative facilities.
- (iv) Dimensions of ROW required for electrical substations, power lines or other special equipment.
- (v) Other ROW required for system implementation.

3.21 Interface with Existing and Future Transit Systems

Technology Providers must provide a description of how their system will interface with existing and future local transit systems that would provide transportation from AGS stations to local destinations.

For those technologies that have the ability to provide branch lines from the AGS mainline to local destinations, the Technology Providers must provide a description of how the extension of their system from AGS mainline to local destinations may occur and the locations of potential branch lines to serve both local destinations. The ability to provide branch lines is not a requirement of the AGS.

3.22 Potential System Owner and Operator

Technology Providers must define if there are any specific issues associated with this technology due to the fact that the AGS is expected to be owned by a governmental authority and operated by a concessionaire.

3.23 Technology at System Stations

Technology Providers must describe, in detail, the following elements of passenger stations associated with their technology:

- (i) Platform or landing dimensions required for passenger boarding and disembarking;
 - 1. Note any platform barrier systems.
- (ii) Power requirements and dimensions of anticipated power facilities at the station;
- (iii) Acceleration and deceleration rates at each station;
- (iv) Number of stations;
- (v) Ability to add stations along the corridor after initial implementation
- (vi) Utilization of mainline stations, secondary or skip stop stations;
- (vii) Availability of passenger amenities such as restrooms on vehicle or at station area;
- (viii) Anticipated ticketing or fare collection and controls for system on vehicle or at station;
- (ix) Stations size – detail if all stations would be of similar size, or would the function of different stations in the system drive different sizing requirements.

Preliminary stations locations should include:

- (i) Jefferson County Station near C-470/US 6/I-70 (1 Station);
- (ii) Clear Creek County (1 Station);
- (iii) Summit County (2 Stations);
- (iv) Vail (1 Station);
- (v) Eagle County Regional Airport (1 Station).

3.24 ADDITIONAL TECHNOLOGY INFORMATION

3.24.1 Propulsion System

Technology Providers must provide a general description of the proposed propulsion system that will be utilized to move the vehicle. This description can be in general terms and should not include any confidential information.

3.24.2 Operation Control System

Technology Providers must provide a general description of the operational control system, or systems, for their technology. This operational control system(s) will be required to meet all State and Federal safety standards. Table 3.24.2-1 provides a list of required operation control safety issues that must be addressed in the SOTI.

Table 3.24.2-1 – Operation Control System

	System/Process	Standard to be Achieved
Automatic System Control		
Automatic Monitoring and Reporting		
Platform gate system		
Passive protective measures		
Active protective measures		
Fire protection		
Designed-in crashworthiness		
Unscheduled stopping of vehicles		
Loss of power		
Evacuation of passengers or workers from vehicles and guideways areas		
Communications		
Disaster preparedness (including wildfire, earthquake,		

	System/Process	Standard to be Achieved
snow/ice storm, sustained high wind event, large land slide, avalanche, etc.)		
Grade crossings or separations		
Other		

3.24.3 Performance

Technology Providers must provide performance characteristics of the proposed technology. These performance characteristics must address average travel design speed as well as operating speed for both urban and rural settings. Technology Providers must also provide estimated acceleration (in seconds) and braking (in seconds) times for the following speeds:

- 0-60 mph
- 0-120 mph
- 0-180 mph
- 0-240 mph
- 0-300 mph

Technology Providers must also complete the two tables below. Table 3.24.3-1 defines the standard operating conditions of the proposed technology; while Table 3.24.3-2 provides the planned life cycle age targets of system components.

Table 3.24.3-1 – Standard Operating Conditions

	Operating Values or Parameters	Standard to be Achieved
Temperature (low and high)		
Wind/Continuous		
Wind/Gust		
Snow & Ice Condition (on structure, vehicle, O&M facilities, etc.)		

Table 3.24.3-2 - Planned Life Cycle Age Target of System Components

	Operating Values or Parameters	Standard to be Achieved
Beam/Guideway/Track/Switches		
Foundations, support columns and systems, tunnels, drainage systems		
Vehicles		
O&M facility and wayside equipment		

	Operating Values or Parameters	Standard to be Achieved
Power systems and substations		
Propulsion systems		
Passenger stations		
Baggage and light freight handling equipment		
Control and communications equipment and systems		
Safety equipment and systems		
Other		

3.24.4 Environmental Considerations

Technology Providers must provide environmental data for their technology. Technology Providers are asked to complete the Environmental Data Needs - **Attachment A**.

A priority environmental objective is for the AGS to be developed and to operate in a sustainable manner. The goals are to reduce or mitigate carbon footprint, generate power, reduce harmful substances (creosote timber, oil/hydraulic fluid into river, etc.), and increase life cycle time frames while considering cost-effectiveness (capital vs. operating and maintenance).

Technology Providers must describe a sustainability plan that at a minimum covers: supply chain, carbon footprint, construction and maintenance methods and impacts, green materials, life-cycle analysis, and alternative energy. Technology Providers should discuss how their sustainability goals will be measured and met (e.g., LEED, ASCE ISI, other) in Table 3.24.4-1. Also see Section 3.17.

Table 3.24.4-1 – Sustainability Plan

	Planned Concept	Standard to be Achieved
Construction and Material Delivery (supply chain)		
Energy & Carbon Sequestration		
Water Resources and Climate Change		
Green Building & Infrastructure		
Emissions and Materials Management		

	Planned Concept	Standard to be Achieved
Other		

3.25 TECHNOLOGY READINESS

Technology Providers must provide an assessment of the Technology Readiness Level (TRL) as measured by several United States government agencies and many of the world's major companies (and agencies) to assess the maturity of evolving technologies (materials, components, devices, etc.) prior to incorporating that technology into a system or subsystem. The TRL in Table 3.25-1 is used by the Government Accounting Office (GAO) and Technology Providers must rate their proposed technology based on this system.

TABLE 3.25-1 – Technology Readiness Levels

Technology Readiness Levels	Description
1. Basic principles observed and reported	Lowest level of technology readiness. Scientific research begins to be translated into applied research and development. Examples might include paper studies of a technology's basic properties.
2. Technology concept and/or application formulated	Invention begins. Once basic principles are observed, practical applications can be invented. The application is speculative and there is no proof or detailed analysis to support the assumption. Examples are still limited to paper studies.
3. Analytical and experimental critical function and/or characteristic proof of concept	Active research and development is initiated. This includes analytical studies and laboratory studies to physically validate analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative.
4. Component and/or breadboard validation in laboratory environment	Basic technological components are integrated to establish that the pieces will work together. This is relatively "low fidelity" compared to the eventual system. Examples include integration of "ad hoc" hardware in a laboratory.
5. Component and/or breadboard validation in relevant environment	Fidelity of breadboard technology increases significantly. The basic technological components are integrated with reasonably realistic supporting elements so that the technology can be tested in a simulated environment. Examples include "high fidelity" laboratory integration of components.
6. System/subsystem model or prototype demonstration in a relevant environment	Representative model or prototype system, which is well beyond the breadboard tested for TRL 5, is tested in a relevant environment. Represents a major step up in a technology's demonstrated readiness. Examples include testing a prototype in a high fidelity laboratory environment or in simulated operational environment.

Technology Readiness Levels	Description
7. System prototype demonstration in an operational environment	Prototype near or at planned operational system. Represents a major step up from TRL 6, requiring the demonstration of an actual system prototype in an operational environment, such as in a rail vehicle or on an actual track system.
8. Actual system completed and qualified through test and demonstration	Technology has been proven to work in its final form and under expected conditions. In almost all cases, this TRL represents the end of true system development. Examples include developmental test and evaluation of a component of subsystem in its intended system to determine if it meets design specifications.
9. Actual system proven through successful deployment	Actual application of the technology in its final form and under operational conditions, such as those encountered in operational test and evaluation. In almost all cases, this is the end of the last “bug fixing” aspects of true system development.

Technology Providers must include in their SOTI a table similar to the example in Table 3.25-2 summarizing the TRL. At the final stage, the technology must be commercially available by 2017 and deployed for the MOS by 2025.

TABLE 3.25-2 – Example TRL Table

	Current (2012)	Stage 1 (201X)	Stage 2 (201X)	Stage 3 (201x)	Final (2017)
INFRASTRUCTURE					
Guideway	4	7	7	8	9
Switch	2.5	6	7	8	9
Poles & Foundation	(i) Commercially Available				
Stations	(ii) Commercially Available				
Power System	(iii) Commercially Available				
VEHICLE					
Levitation & Propulsion	4	7	7	8	9
Motor Drive Electronics	(iv) Commercially Available				
CONTROL SYSTEM					
Communication System	(v) Commercially Available				
Vehicle Control System	4	7	7	8	9
Security System	(vi) Commercially Available				

For each stage, Technology Providers must include a detailed plan on what is required to achieve the identified TRL. This will include such items as development of scale models,

prototypes, full-scale test tracks, etc. The plan will also identify how each stage will be funded and who will fund the development of the technology. It should be noted that CDOT does not intend to finance any research and development activities or provide right-of-way to any technology during development. If funding partners are identified, please provide contact information for a person familiar with the potential funding so that the AGS team can contact them to verify funding.

4.0 REVIEW OF STATEMENTS OF TECHNICAL INFORMATION

The current assessment effort for the AGS is focused on reaching a feasibility determination as required by the I-70 Mountain Corridor Record of Decision. The goal of this information gathering is not to select a preferred technology, but to use a group of technologies that meet the system performance and operational criteria and the Technology Readiness Level criteria described in Section 3.0 to complete the feasibility analysis. Therefore, it is anticipated that not all technologies will be selected to continue into the alignment design phase. This evaluation is not, in any way, intended to exclude individual technologies or vendors from further consideration at a later stage of project development. If a decision is made to move forward with subsequent environmental work and project implementation, no technologies are being precluded by this effort from subsequent participation. However, participation in this information gathering process by Technology Providers is important because feasible technologies are essential to completing the feasibility assessment.

In order to determine which technologies to take forth into the alignment design process, each SOTI will be reviewed and scored as follows:

- (i) Responses as to how the technology will meet each of the system performance and operational criteria (3.1 through 3.24) will be scored. A score of three will be given for a technology that can exceed the criteria. A score of two will be given for a technology that can fully meet the criteria. A score of one will be given for a technology that can partly meet the criteria. A score of zero will be given for a technology that cannot meet the criteria;
- (ii) Responses as to how the technology will meet the Technology Readiness Level (TRL) requirements (3.25) will be scored. Because being at TRL 9 by 2017 is a prime requirement of the candidate technologies, this criteria will receive additional weight. The review panel will assess the Technology Provider's verified plan to attain Technology Readiness Level 9 by 2017 and will score this criteria on a scale of 28 points to zero points, based on the current TRL and the demonstrated ability to reach TRL 9 by 2017. Table 4.0-1 provides the scoring system for determining candidate technologies;
- (iii) In the event of a tie between technologies, the TRL score will be used as the tie-breaker;
- (iv) Technologies will be placed into three groups. The first technology group will be those technologies that can operate wholly within the I-70 right-of-way. The second technology group will be those technologies that cannot, or are proposed not to, operate

within the I-70 right-of-way. The third technology group will be those technologies that can operate within I-70 right-of-way some of the time but may require alignments outside the right-of-way in specific areas;

- (v) For each of the technology groups, a maximum of six technologies, based on total score from items 1 and 2 above, will be identified for inclusion in further alignment analysis, pending presentations at the Technology Forum.
- (vi) CDOT reserves the right to modify the scoring system at any time or to include technologies that they feel have merit, regardless of score.

Table 4.0-1 - Scoring Chart for Statement of Technical Information

CRITERIA NUMBER	DESCRIPTION	MAXIMUM SCORE
3.1	Travel Time	3
3.2	Vehicles	3
3.3	Noise	3
3.4	Footprint and Context Sensitive Solutions	3
3.5	Grade	3
3.6	Safety	3
3.7	Weather and Wind	3
3.8	Scalability and Growth	3
3.9	Passenger Comfort	3
3.10	Baggage Capacity	3
3.11	Freight	3
3.12	Tunnels	3
3.13	Reliability	3
3.14	Headways	3
3.15	Power Generation, Transmission and Distribution	3
3.16	Energy Efficiency	3
3.17	Sustainability	3
3.18	Cost	3
3.19	Termini	3
3.20	Right-of-Way (ROW)	3
3.21	Interface with Existing and Future Transit Systems	3
3.22	Potential System Owner and Operator	3
3.23	Technology at System Stations	3
3.24	Additional Technology Information	3
3.25	Technology Readiness	28
Total Score		100

5.0 TECHNOLOGY FORUM

The technologies that are preliminarily selected through the process described in Section 4.0 will be invited to participate in a Technology Forum to be held October 24 and 25, 2012 at a location in the Denver metropolitan area. Invitations to the Technology Forum will be sent to Technology Providers by October 17. Technology Providers will be provided with the time at which they will be given the opportunity to make a 30-minute presentation to the Project Leadership Team, CDOT staff and Transportation Commissioners, AGS consultants and the public. Included with the invitation will be specific questions that need to be answered in the presentation. Following the presentation there will be an opportunity for the audience to ask questions of the presenters. No specific score will be associated with this presentation. This will be an opportunity for Technology Providers to further clarify and present the benefits of their systems. Additional Technology Forum details will be issued at time the Candidate Technologies are notified.

6.0 THE PROCESS

This RFSOTI is the first in a multi-stage process for the development of the AGS project. The schedule for the RFSOTI and other elements associated with the feasibility assessment is expected to generally adhere to the dates below:

Table 6.0-1 - Proposed Project Schedule

Event	Date
Advertising RFSOTI	09/12/12
SOTI Due	10/10/12
Notify Candidate Technologies	10/16/12
Technology Forum	10/24/12 – 10/25/12
Release List of Feasibility-Level Technologies	11/01/12
Financial RFI Issued (to Concessionaires)	03/25/13
Financial RFI Due	04/26/13
Draft Feasibility Study & Implementation Plan Due	07/10/13
Final Feasibility Study & Implementation Plan	09/01/13

7.0 QUESTIONS AND REQUESTS FOR ONE-ON-ONE MEETINGS

Because this Request for Statements of Technology Information will not result in a contract with CDOT, the normal procurement rules do not apply to this RFSOTI. Instead, Technology Providers will abide by the following rules:

7.1 Questions

Questions may be submitted to the CDOT Division of Transit & Rail Project Manager until October 2, 2012. Questions must be in writing; email is acceptable.

Division of Transit and Rail
Colorado Department of Transportation
4201 E. Arkansas Avenue
Denver, Colorado 80222
Attn: David Krutsinger, Project Manager
Email: david.krutsinger@dot.state.co.us
Phone: (303) 757-9008

7.2 One-on-One Meetings

Requests from Technology Providers to schedule one-on-one meetings/conference calls regarding the TRFI with DTR and its representatives or consultants will be considered up to and including October 2, 2012. Each Technology Provider will be limited to a maximum of two one-on-one meetings/conference calls. With such a request the Technology Providers must provide an agenda of items to be discussed. The purpose of the one-on-one meeting is to further understand any additional information needed or requested modifications to the process to enable the Technology Providers to be responsive to the TRFI. They are not for DTR to provide any new information that is not available to all potential Technology Providers. No decision-making will take place during the one-on-one meetings. If further information is required or a modification to the process is determined to be in the best interest of the process, a response will be provided in writing to all potential Technology Providers.

7.3 Contact with AGS Project Leadership Team

From the date of issuance of the RFSOTI to the completion of the Technology Forum, Technology Providers shall refrain from any contact with AGS Project Leadership Team members, their staff and their organization listed below. This includes phone calls, emails and any other form of contact, written, electronic or personal.

Table 7.3-1 – AGS PLT Members

Jacob Riger, Denver Regional Council of Governments	Angie Drumm, CDOT Office of Public & Government Relations
Peter Runyon, Eagle County	Peter Kozinski, CDOT Region 1
Eva Wilson, Eagle County	Tom Breslin, Clear Creek County
Flo Raitano, Summit County	Cynthia Neely, Clear Creek County
Kevin O'Malley, Clear Creek County	Peter Lombardi, CDOT Region 3
Mary Jane Loevlie, I-70 Coalition	Tim Mauck, Clear Creek County
Crissy Fanganello, City and County of Denver, Mayor's Office	Randy Jensen, Federal Highway Administration
Sara Cassidy, Denver Chamber of Commerce	Terri Binder, Club 20
Maria D'Andrea, Jefferson County	

7.4 Requests for Clarification

Following submittal of the SOTI, CDOT reserves the right to request clarification and/or additional information as required to complete the review of the SOTI. Such request will be sent to the Technology Providers via email and the Technology Providers will have 24 hours to respond to the request for clarification/additional information. Responses received later than 24 hours may not be considered during review of the SOTI.

7.5 Addenda

CDOT will issue addenda as required to clarify the RFSOTI, provide responses to questions from Technology Providers, and to summarize any information related to changes in process as a result of the one-on-one meetings.

7.6 Webinar

On September 19, 2012 a webinar will be held beginning at 10:00 AM, Mountain Daylight Time, to discuss the Request for Statement of Technology Information. During the webinar, the expectations for the Statement of Technical Information will be explained, and potential Technology Providers will be allowed to ask questions. The webinar is limited to 100 users so first preference will be given to technology providers. Once 100 slots have been filled, other interested parties can join via audio conference.

Please send an email to mriggs@aztec.us if you want to attend the webinar. Clearly state in the email that you are a Technology Provider. Information about joining the webinar will be provided via email.

8.0 SUBMITTAL REQUIREMENTS

8.1 General

DTR expects each SOTI submitted in response to this RFSOTI to provide detailed technology information and allow DTR to continue the project process. The SOTIs must be submitted exclusively in the English language inclusive of English units of measure, and cost terms in United States of America Dollar denominations.

8.2 Format

Technology Providers must submit one original and 12 copies (for a total of 13) of its SOTI. The original must be clearly marked "Original" on its face and spine. Each copy must be numbered 1 through 12 on its spine (and the copies containing financial information specifically marked). The Technology Provider's name and must also be clearly marked on the spine. In addition to the hard copy volumes, Technology Providers must submit an electronic copy of the SOTI in PDF (searchable) format. Submittals must be prepared on 8-1/2" x 11" sized white paper. Double-sided printing is encouraged. Printed lines may be single-spaced with no less than 11 point font.

8.3 Other Requirements

All packages constituting the SOTI must be individually labeled as follows:

AGS Statement of Technology Information

The SOTIs must be delivered to the DTR RFSOTI Procurement Contact listed below:

Division of Transit and Rail
Colorado Department of Transportation
4201 E. Arkansas Avenue
Denver, Colorado 80222
Attn: David Krutsinger, Project Manager

DTR will not accept facsimile or e-mail submission of SOTIs.

Acknowledgment of receipt of SOTIs will be evidenced by the issuance of a receipt by the DTR RFSOTI Procurement Contact or his designee.

SOTIs must be submitted by 4:00 p.m. Denver, Colorado time on the final SOTI Due Date. Any SOTIs received after that date and time will be rejected and returned unopened. SOTIs will be accepted by DTR during normal business hours up to the SOTI Due Date and time specified.

Each Technology Provider is solely responsible for assuring that DTR receives their SOTIs by the specified delivery date and time at the address listed above. DTR shall not be responsible for any delays in delivery beyond the control of DTR, including those caused by weather, difficulties experienced by couriers or delivery services, misrouting of packages by courier or delivery services, improper, incorrect or incomplete addressing of deliveries and other occurrences.

9.0 CONFIDENTIALITY

The purpose of this RFSOTI is to determine the feasibility of the AGS and the information obtained by the RFSOTI will be utilized for that purpose. The culmination of this step in the development of the AGS will be an AGS Feasibility Study which will be used by CDOT to determine how to proceed in the future. As such, information obtained by the RFSOTI cannot be considered confidential. In submitting their SOTI, Technology Providers provide CDOT permission to use and disclose any or all information obtained through this RFSOTI.

10.0 DISCLOSURE

In order to maintain openness and transparency, Technology Providers shall disclose:

1. Any financial interests of AGS Project Leadership Team members or their organization's staff, including CDOT staff, in the technology proposed.

2. Any lobbying done by the Technology Provider to AGS Project Leadership Team members or their organization's staff, including CDOT staff.

ATTACHMENT A

Environmental Data Needed from Technology Providers

	Energy and Emissions	Chemicals, Materials and Waste	Water and Natural Resources	Noise, Vibration, Turbulence and Visual	Standard Used	How was it Tested / Verified
PRODUCE SYSTEM COMPONENTS & CONSTRUCT	List pollutants and total tons produced	List pollutants and total tons produced	List water demand, and pollutants and total tons produced. List any anticipated impacts on plants or wildlife.	Make comments about potential visual issues related to construction. Make comments about potential unusual construction noise, turbulence and/or vibration.		
OPERATE & MAINTAIN	Other than air quality improvements due to fewer autos and trucks on the highway, are there any elements of the system that will produce changes (plus or minus) to AQ. List pollutants and tons/year produced (or eliminated)	List pollutants and tons/year produced	List water demand, pollutants and tons/year produced. List any anticipated impacts on plants or wildlife.	List noise (dbA), turbulence, vibration levels for the vehicle compartment, platform, at substations (if any) and next to the guideway. Make comments about potential visual issues related to the final system.		
DECOMMISSION & REMOVE	List pollutants and total tons produced	List pollutants and total tons produced	List water demand, pollutants and total tons produced. List any anticipated impacts on plants or wildlife.	List any noise/vibration, turbulence or visual issues related to decommissioning		

Notes on completing the table:

List all pollutants for three stages of the system’s life cycle:

- (i) Production and Construction

(ii) O&M

(iii) Decommissioning

For each, list the standard that you will use, and how the standard attainment will be measured or verified and if there is ways to mitigate any pollutants, please list those as now planned.

(i) Under “Energy and Emissions” - Typical Air Quality Pollutants include:

- a. CO - Carbon Monoxide
- b. Reactive Organic Gases
- c. PM₁₀-Particulate matter 10 micron in size or larger
- d. CO₂ – Carbon Dioxide
- e. SO_x – Oxides of Sulfur
- f. List others that apply

(ii) Under “Energy and Emissions” - Electromagnetic Fields (EMF) – if EMF exposure changes with system speed, note the changes (or graph)

- a. In passenger compartment
- b. Next to guideway
- c. On platform/in stations
- d. Near substations and power equipment (if any)

(iii) Under “Noise & Visuals,” – list Noise, Vibration, and Turbulence levels at speeds of 30 mph, 60 mph, 120 mph, 180 mph, 240 mph and 300 mph (as applicable)

- a. In passenger compartment
- b. Next to guideway
- c. On platform/in stations
- d. Near substations and power equipment (if any)

ATTACHMENT B
Letters of Support from
Clear Creek County
And
I-70 Coalition



Clear Creek County

POST OFFICE BOX 2000
GEORGETOWN, COLORADO 80444

TELEPHONE: (303) 569-3251 • (303) 679-2300

Dear Prospective AGS Proposer:

As members of the I-70 Mountain Corridor Advanced Guideway System Project Leadership Team (AGS/PLT), we'd like to welcome you to our project. The PLT is made up of stakeholder representatives including Federal and State Agencies, Local Governments, Environmental NGOs, and the Private Sector.

The decision to make the AGS a central element of our preferred alternative for the I-70 Corridor came after an extensive, inclusive and collaborative discussion to determine the best long term transportation solution for this beautiful but challenging corridor we call home. Our next step is to determine the technical and financial feasibility of specific routes and technologies that can lead to the successful implementation of the AGS. We look to Industry to help us accomplish that goal.

The Stakeholders along the I-70 Corridor are committed to building the best long term transportation solution for moving people and goods to and through our mountain environment. We strongly encourage you to seriously consider responding to our request for proposal. In spite of--and perhaps because of-- the challenges presented in this corridor, a successful outcome may set the standard of expectations for High Speed Rail in the western United States.

Thank you for your consideration and we look forward to hearing from you.

A handwritten signature in blue ink, appearing to read "Kevin O'Malley".

Kevin O'Malley
Chair, Clear Creek Board of County Commissioners
Vice-Chair, I-70 Mountain Corridor Coalition
303-670-6340 (Office)
303-877-1315 (Cell)
Komal102@msn.com

"Honoring Our Past, While Designing Our Future"



August 20, 2012

To Whom It May Concern,

The I70 Coalition is a non-profit organization comprised of 26 counties, towns and resorts along the I70 Corridor with a mission to *enhance public accessibility and mobility in the I70 Central Mountain Corridor and adjoining dependent counties and municipalities through the implementation of joint public & private transportation management efforts.*

An Advanced Guideway System (AGS) was a central component of the I70 Coalition's preferred alternative that was adopted in the I70 Programmatic Environmental Impact Statement Record of Decision. The Coalition also supports the Collaborative Effort (CE) commitment to the evaluation and implementation of AGS within the corridor. The I70 Coalition is involved in several initiatives affecting the I70 corridor, one of which is the AGS Study Project Leadership Team. Recognizing additional information is needed to determine the viability of the AGS, the Coalition supports CDOT's commitment to fund and implement the current AGS Study process.

Due to the unique characteristics of this corridor such as weather and grade, we recognize we will need strong industry involvement to determine financial and technical feasibility of an AGS system. We encourage you to seriously consider responding to the Request for Information and subsequent opportunities to assist CDOT's Division of Transit and Rail in determining the feasibility of an Advanced Guideway System.

Thank you for your interest in AGS on the I70 Mountain corridor.

Sincerely,

A handwritten signature in blue ink, appearing to read "Stan Zemler", with a long horizontal stroke extending to the right.

Stan Zemler, Chair
I70 Coalition

P.O. Box 4100 • Frisco CO 80443 • www.i70solutions.org