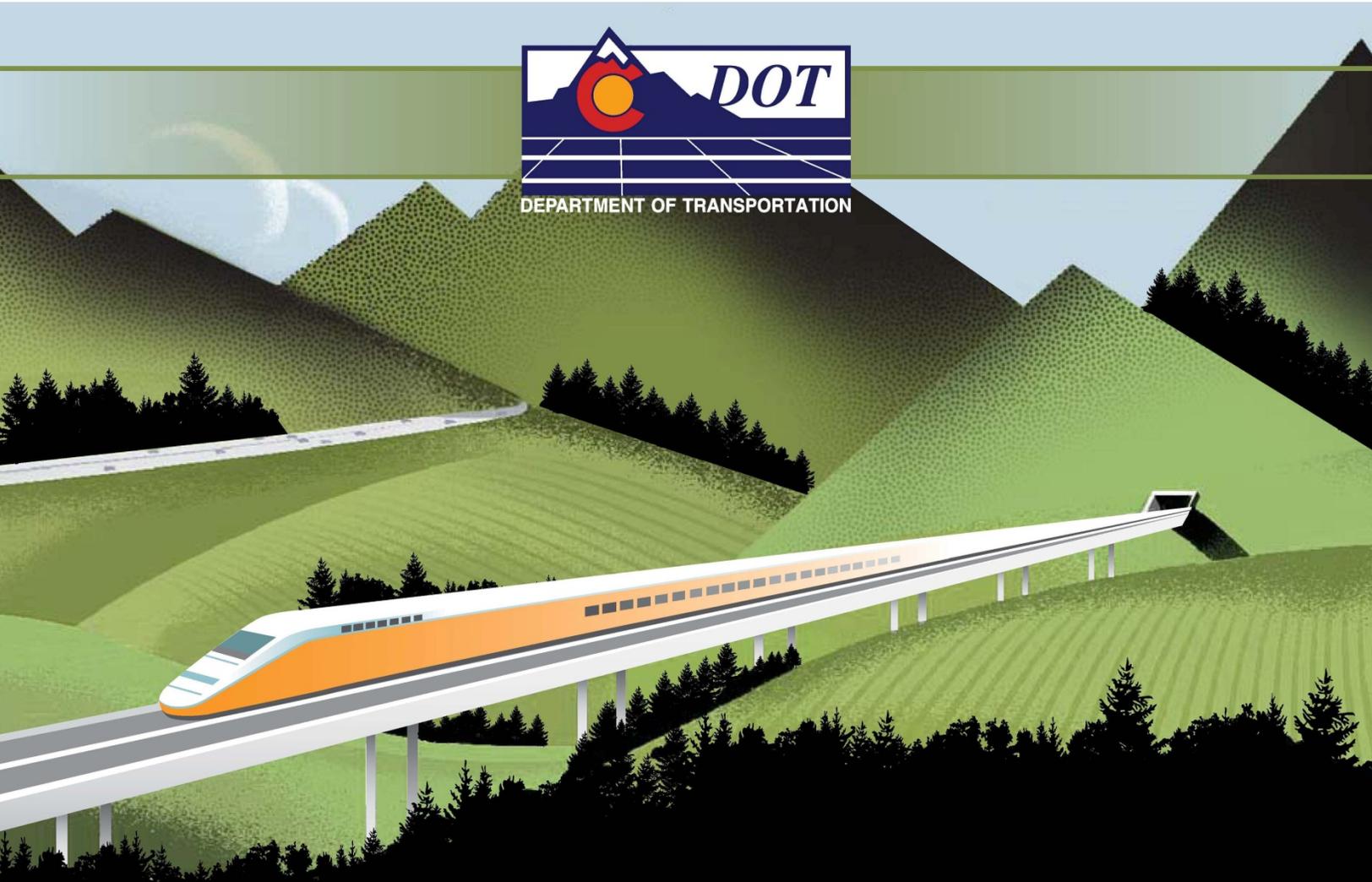


**DRAFT**



# **ADVANCED GUIDEWAY SYSTEM (AGS) FEASIBILITY STUDY**

## **APPENDIX A SYSTEM PERFORMANCE AND OPERATIONAL CRITERIA**

**COLORADO ADVANCED GUIDEWAY SYSTEM (AGS)  
SYSTEM PERFORMANCE & OPERATIONAL CRITERIA  
August 31, 2012**

On June 26, 2012 the initial draft of the AGS System Performance and Operational Criteria were released to industry. Over the past two months, we received comments on the criteria from four technology providers. In general, the comments can be characterized as:

- Make criteria less “traincentric”
- Desire to use criteria more suited to commercial aircraft or passenger car like transport.

The following revised criteria were developed based on the input we received.

**Travel Time**

For systems that connect to stations with vehicles that arrive/depart on a scheduled basis, the AGS should accommodate both local and express traffic simultaneously. 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 in 2035.

- 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.
- Local (scheduled-type operations) – at least as fast as unimpeded vehicle (including station dwell time, acceleration/deceleration), equivalent of existing local transit systems (Summit Stage, Eco-Transit, etc.) between local locations.
- Other System/Operational Types – same as Express travel time above for peak demand times and Local travel times for non-peak periods.

**Special Use Vehicles**

The AGS should allow for private entities to design and/or build vehicles for specific needs (proprietary) to meet very specialized needs beyond traditional passenger/baggage traffic.

**Technology**

The AGS technology should be proven and available. This includes commercial availability, and/or subject to full-size independent evaluation by the end of 2017. If safety certification or other requirements by FRA, FTA, Colorado Public Utilities Commission (PUC) or others are necessary to be met, the technology provider should supply written evidence by the 2017 deadline that these provisions have been met.

In order to encourage both statewide and national future connectivity, CDOT will give additional consideration to a provider that is willing to license its intellectual property and technology to others. An example might include a fee structure that declines over time where after 25 years the property would be in the public domain (e.g., year 1-5 fee is 10%, year 5-10 fee is 8%.....year 25 fee is 0%). Additionally, CDOT will give additional consideration to those that will share non-proprietary design specifications to encourage a nationwide system.

## **Noise**

The AGS should consider both external (system) noise and internal (cabin/vehicle) noise as follows:

- External – noise level generated by the AGS should not exceed those levels specified in the Technical Specifications of Interoperability (TSI, European Directive) Rolling Stock for those technologies for whom these standards apply. Other technology providers should supply applicable noise standards and test data or system expectations concerning external system noise (at various anticipated system speeds).
- Internal – ability to hold a conversation without raising one's voice (current research indicates this is approximately 50-60 decibels).

## **Footprint**

The AGS design should follow context sensitive solutions guidelines to accommodate local community desires and needs. The footprint of the AGS (especially for alignments outside of the I-70 ROW) should be minimized to the extent possible to avoid community and environmental impacts and to maximize safety.

## **Grade**

The AGS should have the ability to traverse grades (4 to 7 percent in many locations) as required by the alignment while meeting the travel time, safety, and capacity requirements.

## **Safety**

The AGS should meet the TSI criteria (at guideway) for non-compensated lateral acceleration and braking deceleration for those technologies for whom these standards apply. Other technology providers should supply applicable safety standards and test data or system expectations concerning safety. Some standards from FRA, FTA, ASCE and other sources might apply. Again, if safety certifications or other requirements by FRA, FTA or others are required to be met, the technology provider should supply written evidence by the 2017 deadline that these provisions have been met.

The AGS should provide grade separated and wildlife crossings, an access controlled guideway, and emergency egress from the vehicles and guideway including structures and tunnels. System security should also be considered in design.

### **Weather**

The AGS should be 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. The AGS provider should specify the level of service their system can provide relative to temperature range, wind speed and ice/snow accumulation.

The alignment passes through known avalanche zones and this condition will need to be addressed in the project design to maintain reliability, safety, and cost-effective maintenance.

### **Wind**

The AGS technology and network must be able to withstand windshear in excess of extreme alpine wind storms such as those frequently experienced throughout the corridor. The AGS infrastructure shall be designed to withstand wind forces as specified in the applicable building codes.

The AGS provider shall 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.

### **Scalability/Growth**

The AGS should allow for expansion of alignments to address future growth in demand and/or additional station locations or branches.

The AGS should allow for varying passenger demand (i.e., daily and seasonal peak demand) to respond to changes in passenger demand within reasonable time.

### **Passenger Comfort**

The AGS passenger acceleration/deceleration/lateral cabin experience should conform to the requirements set forth in the European HSR Rolling Stock passenger comfort parameters/standards for those technologies for whom these standards apply. Other technology providers should supply applicable ride comfort standards and test data or system expectations concerning passenger comfort.

The following requirements should be met:

- Ability to have a cup of coffee on board without concern for spilling it.

- Work on a laptop or other electronic device.
- 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. Other technologies might have other seating arrangements and should be described.
- Access to restrooms.
- Seating for each passenger (passengers should not be allowed to stand).
- ADA compliant.

### **Baggage Capacity**

The AGS should accommodate luggage and outdoor gear including skis, snowboards, bicycles and golf clubs. Loading of such accoutrements must have minimal impact on station dwell and boarding times. This may necessitate the design and/or building of specific needs vehicles.

### **Light Freight**

The AGS should provide for handling of light-weight and high-value packages. This includes food deliveries. This may necessitate the design and/or building of specific needs vehicles.

### **Heavy Freight**

This criterion is optional. The AGS provider may accommodate heavy freight with the system. If the provider chooses to include heavy freight as part of their AGS, the details of this should be presented in the proposal. The provision for heavy freight on the AGS shall not negatively impact passenger traffic on the system, operational efficiencies or maintenance costs.

### **Tunnels**

Tunnels are acceptable provided they are a cost-effective solution or one that reduces community and environmental impacts.

### **Reliability**

Except for the extreme weather events to be defined by the AGS provider under the Weather and/or Wind criteria, the AGS should provide 98% on-time operational reliability. “On-time” is defined as within 5-minutes of the scheduled arrival or departure time. For systems that do not propose a schedule-based service, the technology provider should supply applicable reliability standards and test data or system expectations concerning operational and maintenance reliability.

## **Headways**

The AGS headway times should be capable of addressing peak period demands of 4,900 passengers per hour in the peak direction in 2035. For systems that do not propose a schedule-based service, the technology provider should supply their plan for meeting or exceeding the passenger per hour minimum (above).

## **Operational Efficiencies and Maintenance Costs**

The AGS provider should provide an operational efficiency and maintenance plan.

## **Context Sensitive Solutions**

The AGS should conform to CSS principles for environmental and community considerations in design, construction and operations in all locations, the development of transit stations of all designs, all system facilities and for all types of technologies.

## **Power Generation, Transmission and Distribution**

The AGS should define the system consumption and provider's plan to obtain power and/or fuel for system components (e.g., propulsion, substations, etc.).

The AGS provider should describe their system'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.

## **Energy Efficiency**

The AGS provider should describe the ability of their system to respond to incorporating green technology for renewable power sources such as wind and solar power.

## **Sustainability**

The AGS should be implemented in a sustainable manner.

The AGS provider should describe a basic 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 describe how their sustainability goals will be measured and met (e.g., LEED, ASCE ISI, other).

## **Cost**

The AGS provider should provide a unit cost array showing costs for major system elements (e.g., guideway per mile, O&M facility, vehicles, power, others)-

Proposers are encouraged to consider a range of system size and capabilities. This might include scenarios of \$5 B, \$10 B, \$20 B and \$30 B. Providing multiple system sizes is not a requirement. There is no limit on the financial size of the proposed system.

In addition to phasing options, the proposers should identify any high cost, high risk items that may be better addressed through additional project development, ultimately reducing the total project cost.

### **Alignment**

The AGS alignment should, to the extent possible, generally follow the I-70 highway ROW. The system does not need to be limited to the current CDOT I-70 highway ROW if a more efficient, more direct, faster, more reliable, more cost-effective, safer, and/or environmentally sensitive alignment is possible. The AGS alignment should optimize ridership potential and minimize environmental impacts to both the corridor's natural and built environments, including impact to corridor communities and the current highway operation. In addition, alignment location considerations should include minimizing the impact to the current I-70 highway operation during the construction or maintenance of the AGS.

### **Termini**

Ultimately, it is planned that the AGS will operate from Denver International Airport (DIA) to Eagle County Regional Airport. 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 Front Range to west of the Continental Divide by 2025. The full system implementation must be achieved by 2050. The provider shall provide an implementation and financial plan concerning the MOS and ultimate system build out.

### **Right-of-Way (ROW)**

The system ROW will be defined by the provider and will include the guideway, platforms, stations, electrical substations and maintenance facilities/depots. The ROW will be valued and cleared by CDOT, local jurisdictions, U.S. Forest Service and other affected parties. The final ROW needed for the system will be made available at no cost to the developer prior to financial close.

### **Interface With Existing and Future Transit Systems**

The AGS provider will not be responsible for costs of development and operations of transit systems to connect the AGS stations to local destinations. Local agencies will utilize existing

transit systems or develop new transit systems prior to the AGS becoming operational to transport passengers and baggage from the AGS stations to their destinations. The provider will work with the appropriate agencies during design development to develop local transit systems to meet the demands posed by the AGS at each station.

### **Potential System Owner and Operator**

The AGS will be owned by a governmental authority and operated by the provider(s) for a term to be defined at a later date. The provider shall provide a suggested term for the concession.

### **Potential Station Locations**

Preliminary stations locations include:

- Jefferson County Station Near C-470/US 6/I-70 (1 Station)
- Clear Creek County (1 Station)
- Summit County (2 Stations)
- Vail (1 Station)
- Eagle County Regional Airport (1 Station)

AGS providers, working with the corridor stakeholders, may elect to include additional stations if their technology allows the other criteria to be met with the additional stations and stops.