



AGS Feasibility Study

PLT Meeting #14
September 11, 2013

Agenda

- ▶ Introductions (5 minutes)
- ▶ Public Comment (5 minutes)
- ▶ Summary of August Meeting / Approve Meeting Minutes (5 minutes)
- ▶ Ridership Refinements and O&M (45 minutes)
- ▶ Benefit / Cost Analysis (30 minutes)
- ▶ Funding / Financial Determination (90 minutes)
- ▶ Next Steps

Public Comment

- ▶ The public is invited to make brief comments



August Meeting Summary & Approve Minutes



August Meeting Summary: Governance

- ▶ PLT:
 - Need statewide or super-regional entity that is a creature of the state

- ▶ P3 / Concessionaire Input
 - Statewide or State Authorized
 - Better to have it be super-regional / multi-regional
 - Better to have Governor / Legislature Support
 - Technology-based SOFI's: want sole-source deal
 - Finance-based SOFI's: compete the deal for best price and risk allocation

August Meeting Summary: Funding & Financing

▶ P3 / Concession Financing

- Max theoretical private financing limit is \$2–3 B
- Likely actual private financing is \$0.5 – \$1.0 Billion
- Can't bond based on anticipated transit fares
- Net funding gap on \$5.5 Billion project is thus in the range of \$5.0 to \$4.5 Billion

August Meeting Summary: Funding & Financing

- ▶ P3 / Concession Requirements for the Corridor
 - Establish Governance Structure
 - Complete Environmental Clearances
 - Acquire Right of Way
 - Secure Voter Approval for Bonding/Taxes
 - Obtain Federal approval of technology
 - Obtain Federal Funding Grant Agreement

Ridership Refinements: Sensitivity Testing, Full Build & MOS



Ridership Refinements

- ▶ I-70 History Updated June slide w/ RMRA Info
- ▶ July Review
- ▶ August Minimum Operating Segments (CS)
- ▶ August Sensitivity Analysis on Fares (SDG)

I-70 Transit Ridership History

Preliminary Results – June 2013

Source	Annual Riders	Annual Fares	Fare per Ride	Annual O&M Cost	Farebox Recovery
2000 MIS (2020 Horizon)	1,740,000 (DIA-Glenwood) ¹	n/a	(20¢/mi + \$15 DIA charge, 1998\$)	\$162,000,000 (1998\$)	n/a
2001 CIFGA	5,900,000	n/a	x	\$47,000,000	n/a
2004 Draft PEIS (AGS)	4,160,000	\$85,000,000	\$20.43	\$180,000,000	48%
2004 Draft PEIS (Rail)	3,775,750	\$83,000,000	\$21.98	\$135,000,000	61%
2010 RMRA 150 mph Rail	4,850,000	\$101,074,000	\$20.84 ² (35¢/mi, 2010\$)	\$79,586,000	127% ²
2013 AGS 120 mph Maglev	2,880,000	TBD	TBD (35¢/mi, 2012\$)	\$75,100,000– \$106,130,000	TBD
2013 AGS 150 mph Maglev	3,320,000	\$ 76,604,404	\$23.94 (35¢/mi, 2012\$)	\$63,000,000– \$89,000,000	86% – 122% ²
2013 AGS 150 mph Rail	3,430,000	\$64,840,000– \$81,855,140	\$23.86 (35¢/mi, 2012\$)	\$81,500,000– \$115,140,000	71% – 79% ²

Notes: ¹Includes 400,000 Vail-Glenwood, ²With both I-25 and I-70 high-speed transit in place.

Numbers in orange have been factored from daily to annual or result from other factored numbers.
2013 AGS Numbers on this slide were preliminary. Not optimized or finalized.

Ridership & Revenue Summary

Preliminary Results – July 2013

Scenario	I-70 Ridership (millions)	I-70 Revenue (millions)	Total Ridership (millions)	Total Revenue (millions)
A-1 (I-76)	3.2	\$103.8	12.2	\$293.8
A-1 (US 6)	3.9	\$126.8	13.2	\$323.1
A-5 (I-76)	3.4	\$114.4	13.0	\$305.0
A-5 (US 6)	3.1	\$103.6	13.1	\$306.8
C-1	2.2	\$75.5	10.8	\$242.7
B-2a	4.3	\$137.4	13.8	\$319.0
B-4	3.9	\$124.8	13.7	\$310.3
Stand-alone AGS	3.0	\$72.9	3.0	\$72.9
A-5 (I-76) High Speed Maglev Base	3.3	\$114.7	12.9	\$306.0
A-5 (I-76) Medium Speed Maglev Hybrid	2.9	\$93.4	12.5	\$284.7
A-5 (I-76) High Speed Maglev Hybrid	3.6	\$123.7	13.2	\$315.0

Ridership Refinements (A-5a)

Run #	Technology	Segment	I-70 Ridership	I-70 Revenue
A5a-1	High Speed Rail	Full Corridor with Full ICS	2,854,700	\$ 93,935,400
A5a-2	High Speed Rail	Full Corridor Standalone	2,292,100	\$ 72,885,600
A5a-3	High Speed Maglev	Full Corridor with Full ICS	3,316,400	\$ 114,724,400
A5a-4	MS Maglev	Full Corridor with Full ICS	2,882,700	\$ 93,420,400
A5a-5	High Speed Rail	MOS Standalone***	1,033,500	\$ 21,857,600
Alt 1	High Speed Maglev	MOS Standalone	1,212,900	\$ 22,064,700
Alt 2	High Speed Maglev	MOS with Full ICS	1,662,200	\$ 52,971,800
Alt 4	High Speed Maglev	MOS with Connection to DIA	1,267,300	\$ 27,909,100
Alt 5	High Speed Maglev	MOS Standalone with El Rancho Station	1,156,900	\$ 20,943,000
Alt 1a	Medium Speed Maglev	MOS Standalone	1,005,500	\$ 18,246,000
Alt 2a	Medium Speed Maglev	MOS with Full ICS	1,600,500	\$ 47,083,500

Minimal Operating Segment (MOS) Results

1. Modeled the following Maglev Alternatives
 - High Speed:
 - Alt 1–Golden to Breckenridge MOS – Standalone
 - Alt 2–Golden to Breckenridge – Full Denver Metro & I-25 system
 - Alt 4–DIA to Breckenridge MOS – Standalone
 - Alt 5–Golden to Breckenridge w/ El Rancho MOS – Standalone
 - Medium Speed:
 - Alt 1a– Same stations and alignment as Alt 1
 - Alt 2a– Same stations and alignment as Alt 2
2. Runs compared against SDG’s A5a Hybrid High Speed Maglev (Full AGS + ICS) and each other

Minimal Operating Segment (MOS) Results

1. Potential ridership markets:

- Inter-urban Auto Market - included in the results presented today
- Induced - included in results presented today
- Intra-urban models - expected to have impact on full system runs [CS working with SDG to run intra-urban model for MOS]
- Bus diversion is negligible (< 1% of total ridership)
- Air diversion - n/a since Eagle County Regional Airport was removed

2. SDG Alternative A5a Hybrid High Speed Maglev

Models	Ridership	Percent of Total
Inter-urban	8,799,000	66.6%
Induced	1,063,400	8.0%
Intra-urban	2,646,100	20.0%
Bus diversion	104,500	0.8%
Air diversion	600,100	4.5%
Total	13,213,100	100.0%

Draft Ridership Observations (all ridership figures are based on the Auto Inter-Urban model only)

1. Alt. 1: Removal of ECRA, Avon, and Vail results in about one-third fewer riders for I-70 to I-70 market compared to A5a High Speed Hybrid (1.2M vs. 1.6M)
2. Alt. 2: removing Vail, ECRA, Avon results in about 17% loss in ridership compared to Alt. A5a (8.3M vs. 9.9M)
3. Alt. 4: adding DIA and I-76/72nd Avenue station has little impact on ridership compared to Alt. 1 (1.21M vs. 1.27M)
4. Alt. 5: diverting to El Rancho results in loss in ridership (1.16M vs. 1.21M) compared to Alt. 1; slower travel times
5. Alt. 1a: MS Maglev results in fewer riders on I-70 alignment compared to HS Maglev (1.2M vs. 1.0M); slower travel times

Draft Ridership Observations (all ridership figures are based on the Auto Inter-Urban model only)

1. Alt. 2a: MS Maglev with full metro system results in fewer riders on I-70 corridor compared to HS Maglev (1.6M vs. 1.8M); only I-70 markets affected; slower travel times
2. Alt 1: Compared SDG's AGS standalone run, I-70 interurban ridership is significantly lower (1.2M vs. 2.9M); **But**
 - Not an apples-to-apples comparison
 - SDG's AGS standalone includes ECRA and Vail; also Georgetown
 - Removing all ECRA and Vail markets from SDG's AGS standalone results in I-70 ridership around 1M.

Ridership & Revenue Summary

Preliminary Results – July 2013

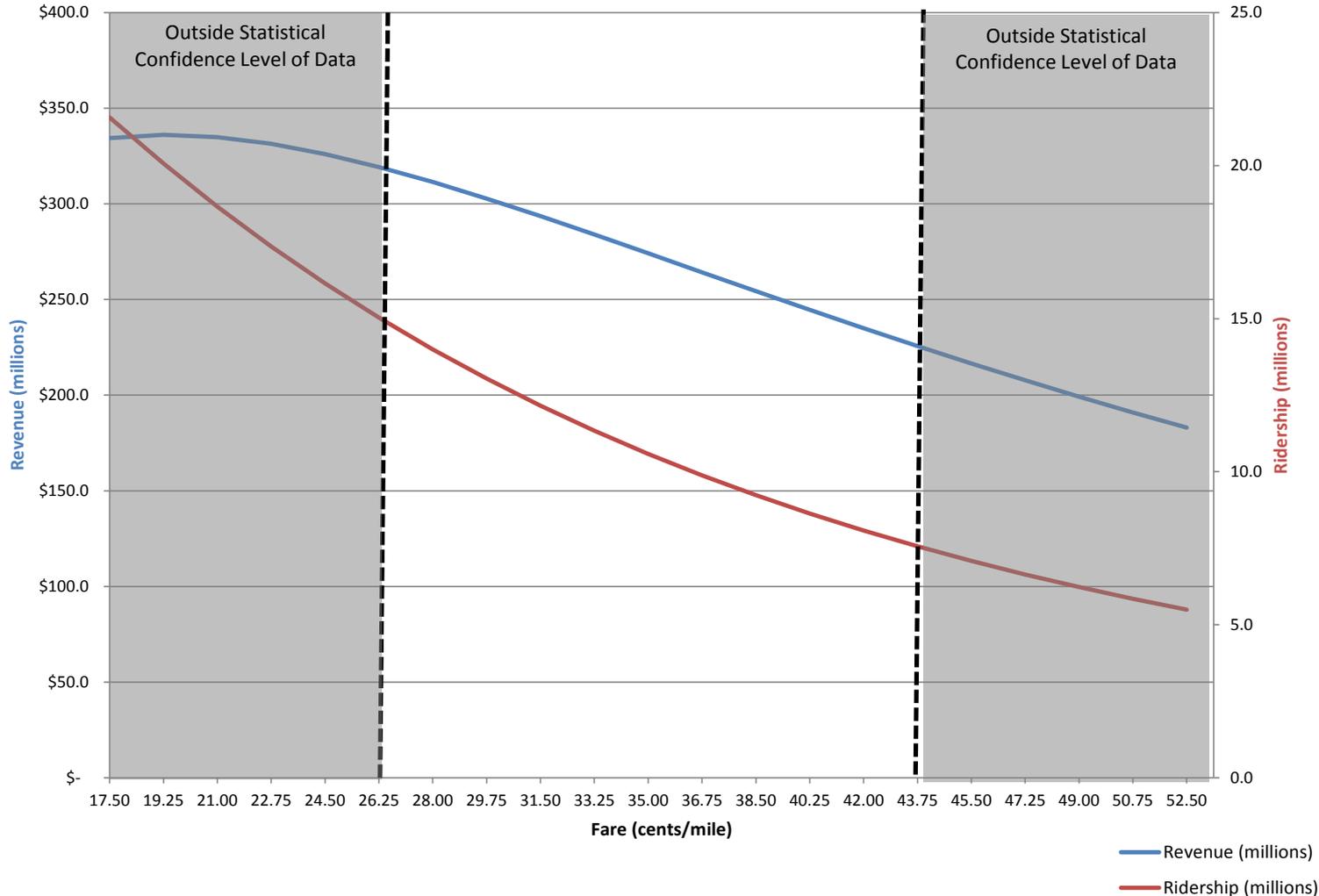
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Ridership: Fare Sensitivity

AGS+ICS System Results



Intercity Revenue Maximization



Ridership: Fare Sensitivity

What it Means for AGS Results – Full Corridor

Source	Annual Riders	Fare per Mile	Annual Fares (2012\$)	Fare per Ride
2013 AGS	4,254,000	35 ¢/mi	\$134,802,400	\$31.69
150 mph Rail with B2-A connections				
2013 AGS	6,502,000	26.25 ¢/mi	\$167,556,697	\$25.77
150 mph Rail with B2-A Connections				

53% Increase
in riders

25% less
per mile

24% Increase
in fare revenue

19% less
per ride

Ridership: Fare Sensitivity

What it Means for AGS Results – MOS

Technology	Annual Riders	Fare per Mile	Annual Fares (2012\$)	Fare per Ride
HS Maglev with ICS	1,662,200	35 ¢/mi	\$52,971,800	\$31.87
	2,425,500	26.25 ¢/mi	\$65,685,000	\$27.08
MS Maglev with ICS	1,600,500	35 ¢/mi	\$47,083,500	\$29.42
	2,432,800	26.25 ¢/mi	\$58,383,500	\$21.94

46% Increase
in riders

24% less
per mile

24% Increase
in fare revenue

15–25%
less
per ride

Operating & Maintenance Costs: Full Build & MOS



General Methodology

1. Costs are driven by service and facility characteristics (e.g., number of revenue train-miles, number of stations).
2. Utilized known commuter rail cost data as starting point (e.g., UTA FrontRunner, other commuter rail systems).
3. Modified cost characteristics for specific line items to account for modal differences (e.g., HS Rail, Maglev).
4. Utilized TRI and AMT-provided information for basis of any cost modifications.

Assumed Organizational Structure

1. Operations

- a. Administration
- b. Train Operations
- c. Station Operations

2. Maintenance

- a. Administration
- b. Vehicle Maintenance
- c. ROW Maintenance

3. General Administration

Functions With Consistent Cost Assumptions

(i.e., regardless of mode)

- Operations and Maintenance administration
- Train crews (1 operator and one train attendant driven by # of train-hours)
- Station operations and maintenance (costs driven by # of stations)
- Train and station security (assumed to be contracted)
- Vehicle cleaning (assumed to be contracted)
- General Administration

*Labor Wages consistent across modes and based on typical transit wages.
Fringe Benefit Rate consistent across modes and assumed to be 40% of wages.*

Functions With Variable Cost Assumptions

(i.e., productivity rates can vary by mode)

- Propulsion power
 - Driven primarily by Route–Miles (distribution) as opposed to usage (consumption)
- Vehicle maintenance (labor & non–labor)
- ROW maintenance (labor & non–labor)

Service Assumptions Used to Generate Cost Estimates

Full-Build

- Suburban West to Eagle County
- HS Rail includes spur to Breckenridge
- 6 stations for HS Steel Rail, 7 stations for HS Maglev, 8 stations for 120 mph Maglev
- 24 round trips Thur–Sun, 15 round trips Mon–Wed

MOS

- Suburban West to Breckenridge
- 4 stations for all alternatives
- 24 round trips Thur–Sun, 15 round trips Mon–Wed

Two service levels evaluated for 120 mph maglev, as described in next slide

Train Consist Assumptions Used to Generate Cost Estimates

High Speed Steel Rail

- 10-passenger cars per train (capacity=450 passengers per train)
- HS Rail includes spur to Breckenridge

High Speed Maglev

- 5 passenger cars per train (capacity=410 passengers per train)

Low Speed Maglev

- Trains operate as two-car married pairs
- Train capacity = 186 passengers per married pair train
- Two scenarios evaluated:
 - 24 trips/day (Thur–Sun) for equivalent level of train service as other alternatives
 - 48 trips/day (Thur–Sun) for comparable passenger capacity as other alternatives

Annual O&M Cost Estimates for Full-Build System

Service Characteristics & O&M Cost Categories		FULL BUILD ALTERNATIVES			
		High Speed Steel Rail	High Speed Maglev	120 mph Maglev 30 m. freq. 15 m. freq.	
Service	Rev. Train-Hrs.	21,290	22,540	29,420	58,850
Statistics	Rev. Train-Mi's.	1,307,600	1,712,800	1,695,600	3,389,500
	Rev. Car-Miles	13,080,600	8,563,300	3,389,500	6,779,000
	Route Miles	108	116	115	115
	Major Stations	1	1	1	1
	Minor Stations	5	6	7	7
	Peak Cars	40	30	16	32

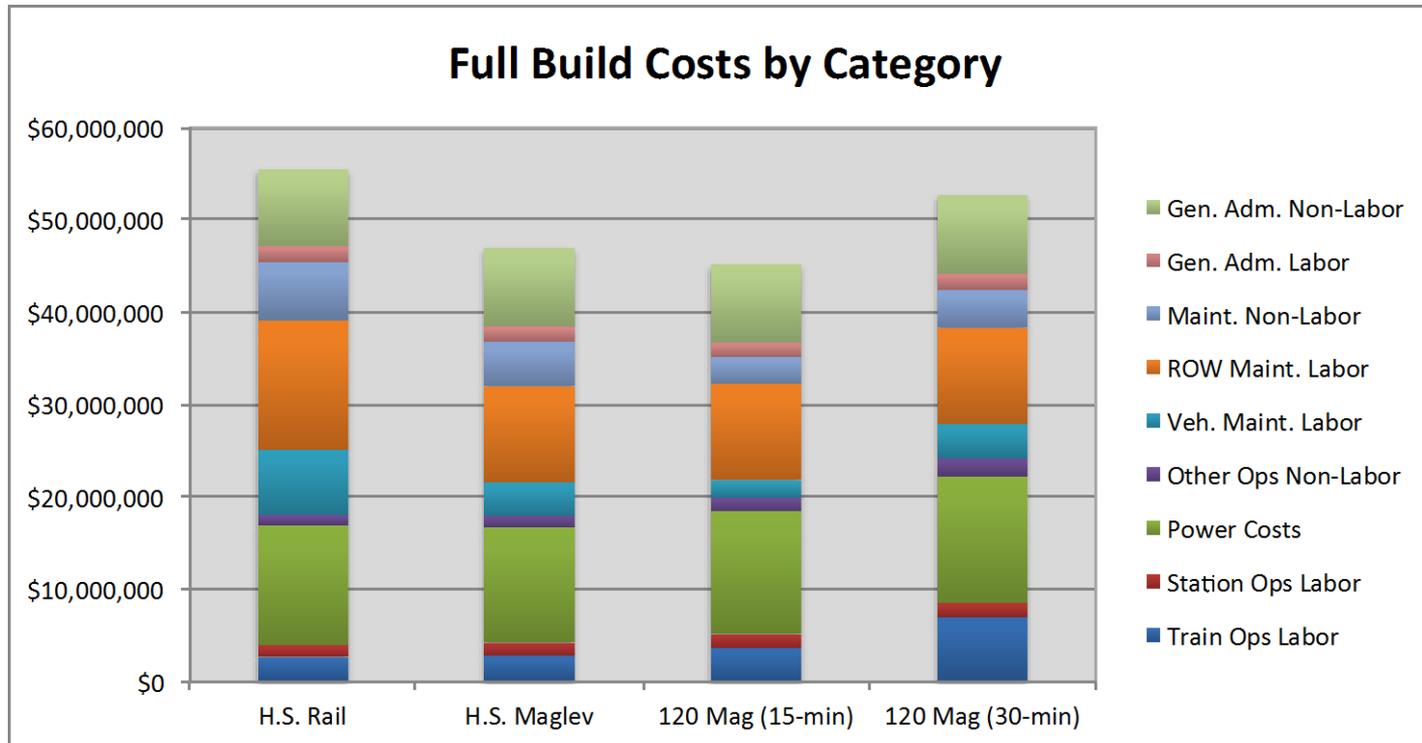
ANNUAL O&M COST ESTIMATE (2013\$)

Operations	Admin.	\$276,000	\$276,000	\$276,000	\$276,000
	Train Op's.	\$15,857,000	\$15,505,000	\$17,229,000	\$21,498,000
	<u>Station Op's.</u>	<u>\$1,881,000</u>	<u>\$2,160,000</u>	<u>\$2,381,000</u>	<u>\$2,381,000</u>
	Total	\$18,014,000	\$17,941,000	\$19,886,000	\$24,155,000
Maintenance	Admin.	\$276,000	\$276,000	\$276,000	\$276,000
	Vehicle	\$11,447,000	\$6,580,000	\$2,994,000	\$5,988,000
	<u>ROW</u>	<u>\$15,645,000</u>	<u>\$11,994,000</u>	<u>\$11,980,000</u>	<u>\$11,980,000</u>
	Total	\$27,368,000	\$18,850,000	\$15,250,000	\$18,244,000
General Administration		\$10,079,000	\$10,222,000	\$10,077,000	\$10,295,000
TOTAL O&M COST ESTIMATE		\$55,461,000	\$47,013,000	\$45,213,000	\$52,694,000

Note: 120 mph maglev assumes same labor rates as H.S. maglev for vehicle and track maintenance for consistency purposes. Information provided by AMT indicates rates could be significantly lower, thus reducing costs for 120 mph Maglev scenario.



Annual O&M Cost Estimates for Full-Build System



- Labor accounts for 42–48% of total costs
- Power accounts for 23–29% of total costs
- Other non-labor accounts for 28–31% of total costs
- Insurance costs account for approximately 50% of other non-labor costs

Annual O&M Cost Estimates for MOS System

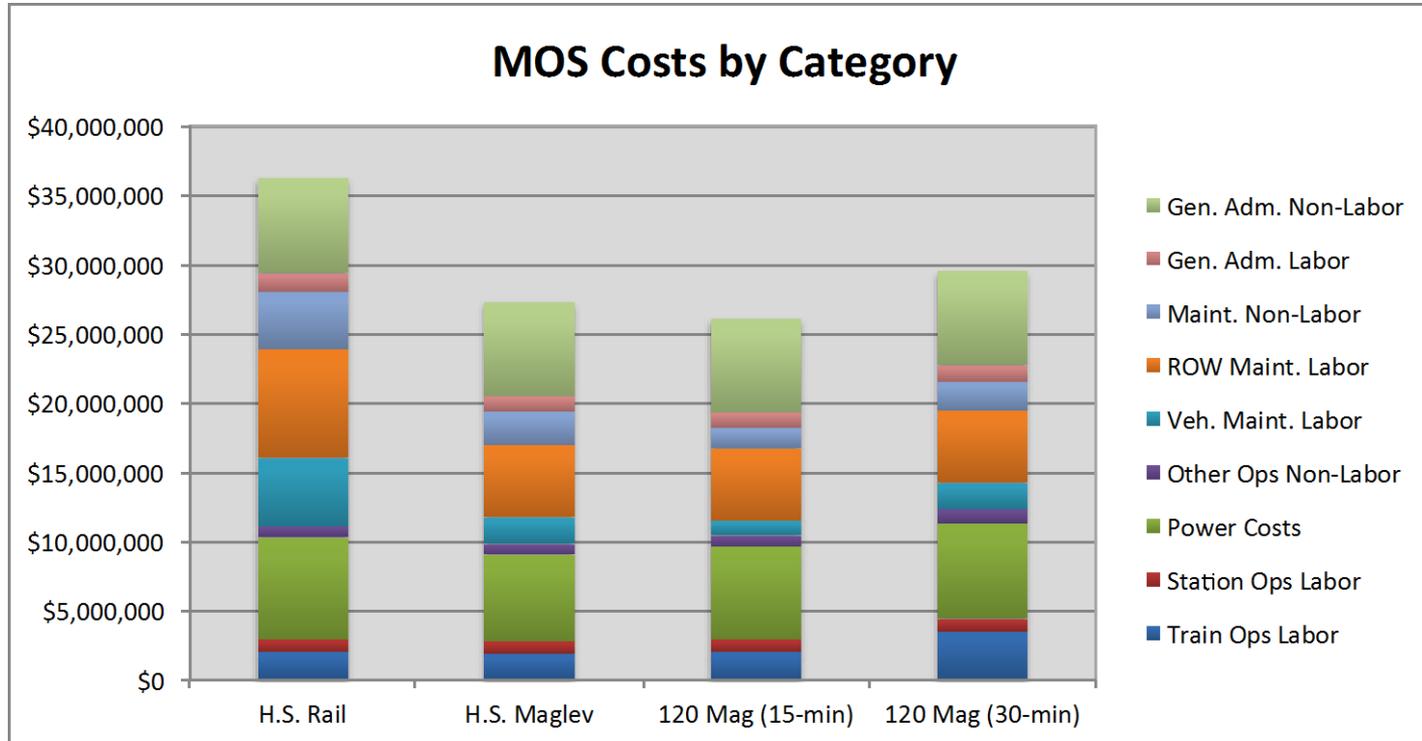
Service Characteristics & O&M Cost Categories		MOS ALTERNATIVES			
		High Speed Steel Rail	High Speed Maglev	120 mph Maglev	
				30 m. freq.	15 m. freq.
Service	Rev. Train-Hrs.	14,710	13,460	14,710	28,480
Statistics	Rev. Train-Mi's.	894,200	856,200	852,400	1,650,300
	Rev. Car-Miles	8,949,800	4,281,700	1,703,300	3,299,100
	Route Miles	61	58	58	58
	Major Stations	1	1	1	1
	Minor Stations	3	3	3	3
	Peak Cars	40	15	8	16

ANNUAL O&M COST ESTIMATE (2013\$)

Operations	Admin.	\$276,000	\$276,000	\$276,000	\$276,000
	Train Op's.	\$9,459,000	\$8,178,000	\$8,777,000	\$10,670,000
	Station Op's.	<u>\$1,330,000</u>	<u>\$1,330,000</u>	<u>\$1,330,000</u>	<u>\$1,330,000</u>
	Total	\$11,065,000	\$9,784,000	\$10,383,000	\$12,276,000
Maintenance	Admin.	\$276,000	\$276,000	\$276,000	\$276,000
	Vehicle	\$7,933,000	\$3,326,000	\$1,554,000	\$2,966,000
	ROW	<u>\$8,707,000</u>	<u>\$5,958,000</u>	<u>\$5,954,000</u>	<u>\$5,954,000</u>
	Total	\$16,916,000	\$9,560,000	\$7,784,000	\$9,196,000
General Administration		\$8,210,000	\$7,914,000	\$7,905,000	\$8,013,000
TOTAL O&M COST ESTIMATE		\$36,191,000	\$27,258,000	\$26,072,000	\$29,485,000

Note: 120 mph maglev assumes same labor rates as H.S. maglev for vehicle and track maintenance for consistency purposes. Information provided by AMT indicates rates could be significantly lower, thus reducing costs for 120 mph maglev scenario.

Annual O&M Cost Estimates for MOS System



- Labor accounts for 40–47% of total costs
- Power accounts for 20–26% of total costs
- Other non-labor accounts for 33–37% of total costs
- Insurance costs account for 50–60% of other non-labor costs

Operating Ratio (Farebox Recovery Ratio)

- ▶ Operating Ratio = Revenue/Operations & Maintenance Cost

	Full System - HSR	Full System - HSM	Full System - MSM	MOS - HSR	MOS - HSM	MOS - MSM
Farebox Revenue	\$93.94 M	\$114.72 M	\$93.42 M	\$21.86 M	\$52.97 M	\$47.08 M
O&M Cost	\$55.46 M	\$47.01 M	\$52.69 M	\$36.91 M	\$27.26 M	\$29.49 M
Operating Ratio	1.69	2.44	1.77	0.60	1.94	1.60
Excess Revenue/Year	\$38.47 M	\$67.71 M	\$40.73 M	-\$14.33 M	\$25.72 M	\$17.60 M

Benefit/Cost Analysis



Benefit / Cost Analysis (TBD)

- ▶ Utilizes Methodology From ICS project
- ▶ Based on \$0.35 per mile fare
- ▶ Calculated for Both Full System and MOS

Benefit/Cost Ratios

Federal Contribution	Full System – HSR	Full System – HSM	Full System – MSM	MOS – HSR	MOS – HSM	MOS – MSM
0%	0.60	0.67	0.87	0.64	0.68	0.91
10%	0.82	0.89	1.07	0.86	0.89	1.12
20%	1.03	1.10	1.28	1.07	1.11	1.38
30%	1.25	1.32	1.49	1.29	1.32	1.53
40%	1.47	1.54	1.70	1.50	1.54	1.74
50%	1.68	1.75	1.90	1.72	1.75	1.95

Funding & Financing Determination



Funding / Financing Conclusions

- ▶ AGS MOS Cost Currently Has No Identified Funding
- ▶ No Ability to Finance without Funding
- ▶ AGS MOS at \$5.5B is Challenging as a “Starter Project”, To Have Expectation of Expansion

Funding / Financing Conclusions (continued)

- ▶ Overall Transportation Funding Challenges
 - Minimum Program in PEIS
 - Other Major Projects Throughout the State
- ▶ Higher Risks for AGS...Costs, Mountains, Tunneling, Technology, & Weather
- ▶ Political Support for AGS is Non Existent. No Support for Funding

DRAFT Funding / Financing Determination

- ▶ Not Feasible at this Time
- ▶ Needed Elements:
 - Resource availability: Abundant Federal, State, and Local Funding is Identified & Committed
 - Technological Advancements: Market Competition Reduces Cost Risk for Maglev & Tunneling

What This Means...PEIS/ROD

- ▶ PEIS Allows for Adaptive Management
- ▶ CDOT Continues to Pursue Minimum Program of Highway Improvements As Funding Becomes Available
- ▶ Minimum Program Projects Are Not an Impediment to AGS

What This Means...PEIS/ROD

▶ PEIS Has Re-Assessment Trigger in 2020

- Regardless of the status of the triggers, there will be a thorough reassessment of 1) the overall purpose & need and 2) effectiveness of the implementation of the Preferred Alternative components.
- A full range of improvements evaluated at Tier 1 may be considered.
- The Collaborative Effort committee may also pursue a new process because the context has changed to the point that previous alternatives would not meet the future transportation need.
- Global, regional, and local trends such as peak oil, climate change, technological advances, and changing demographics could affect these future transportation needs

What This Means...CDOT

- ▶ AGS Included in Update to State Freight & Passenger Rail Plan
- ▶ AGS Next Step is Years into the Future, Dependent on Funding Support
- ▶ AGS Included in Statewide Conversations about Prioritization

What This Means...

- ▶ Review of Draft Feasibility Statement
- ▶ ICS PLT Coordination
- ▶ Open Discussion

Next Steps



AGS Study Next Steps – Draft Report

1. Executive Summary
2. Project Purpose & Need and the CSS Process
3. Operational & Performance Criteria
4. Selection of Candidate Technologies
5. Development of Alignments
6. Cost Estimation
7. Analysis of Benefits
8. Funding & Financing Options
9. Implementation Plan / Next Steps Plan
10. Conclusions & Recommendations

AGS Study Next Steps – Schedule

- ▶ Sep 13th: STAC Update
- ▶ Oct 9th: AGS PLT re: Draft Report
- ▶ Oct 9th: I-70 Corridor Coalition Meeting
- ▶ October/November Corridor Meetings
- ▶ Oct 11th: STAC Presentation re: Draft Report
- ▶ Oct 11th: TRAC Presentation re: Draft Report
- ▶ Oct 17th: CDOT TC Workshop re: Draft Report
- ▶ Nov 9th: STAC Presentation: re: Final Report
- ▶ Nov 21st: CDOT TC action re: Final Report