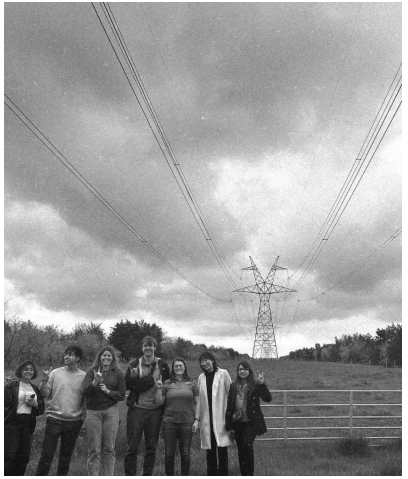
Dallas to Houston Intercity Rail: *Roadmap for Implementation*

May 2, 2024

The University of Texas at Austin
Community and Regional Planning
School of Architecture

About Us

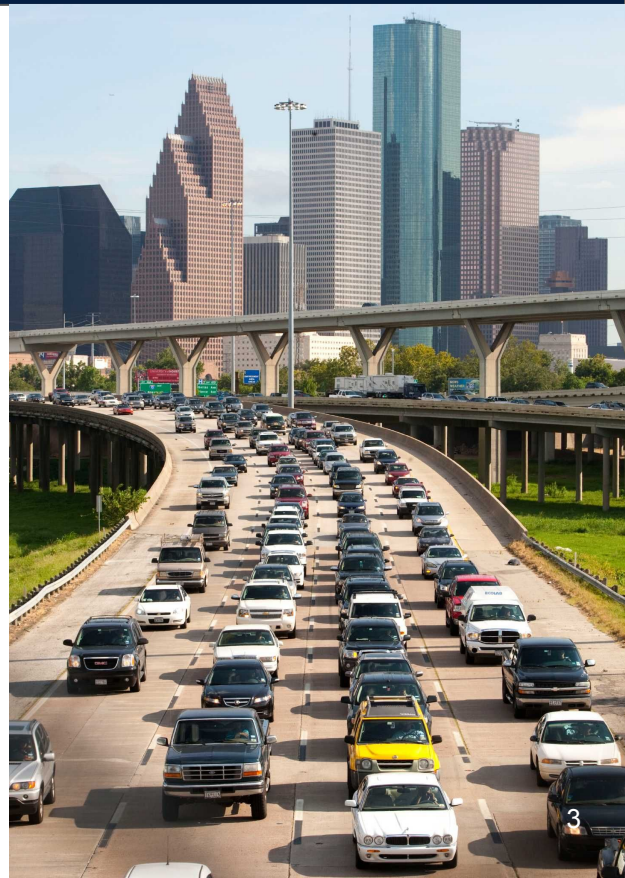
- Graduate students at UT Austin's School of Architecture - City and Regional Planning Program
- This course is a Practicum - aimed at studying a real problem and offering real solutions



(L and top)Recent field trip viewing possible rail corridors from Houston to Dallas; (R) Meeting with Judge Brown and Texas Rail Advocates conference

The Mission

- Should Dallas-Houston be connected by passenger rail?
  - If so, which mode produces the most benefit (high speed rail, high performing rail, conventional rail) to TEXANS?
- Forget the actors for a moment
  - Sketch the ideal traits of developers and operators to serve the needs of Texans
- Build a policy roadmap with a nod to realistic politics



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County Commissioner
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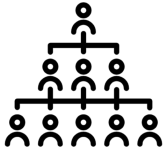
Agenda

- Approach
- Benefits & Costs
- Funding
- Governance
- Recommendations

Approach

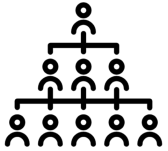
Reasoning for Studying BCA and Governance

Monetization of benefits and costs of each presented option



Conceptualization of a system based approach

BCA provides a benchmark for evaluation and comparison for investment decisions



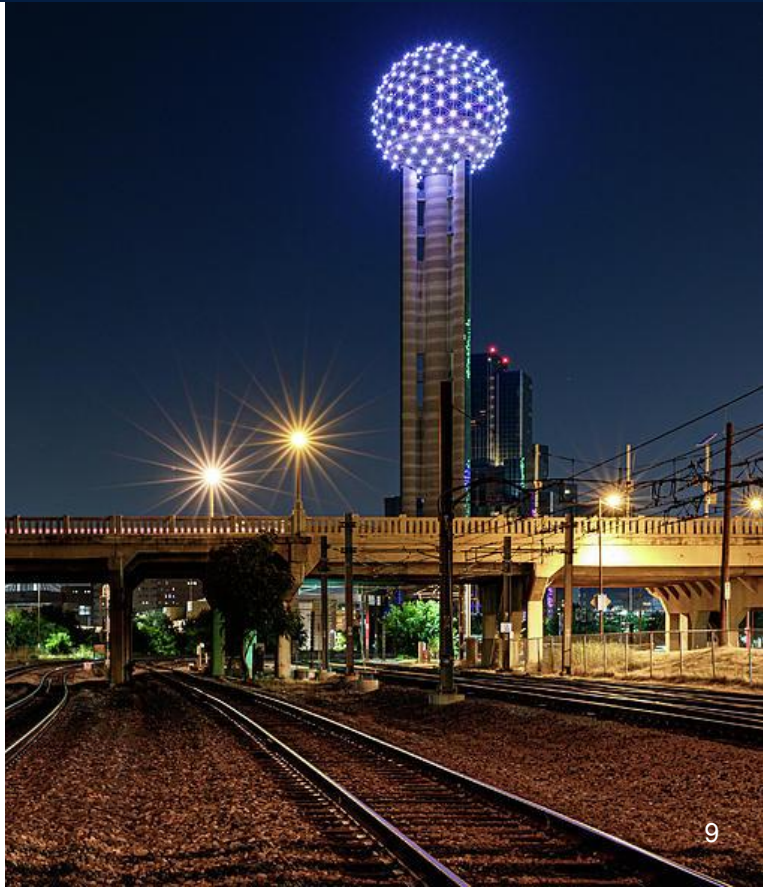
Establishment of a single point of accountability

Topics Outside of Scope

No precise alignments; only general corridors + existing proposals

No operating details, for both freight and passenger

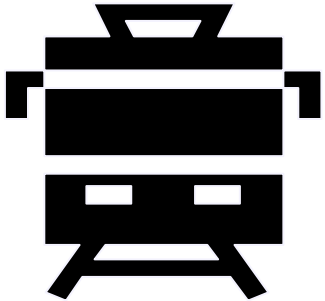
Not prescriptive of station locations, unless in existing proposal



Guiding Questions: Why?

Problem Statement: The Houston to Dallas metro areas are experiencing increasing population and people need more options for transportation between the two regions.

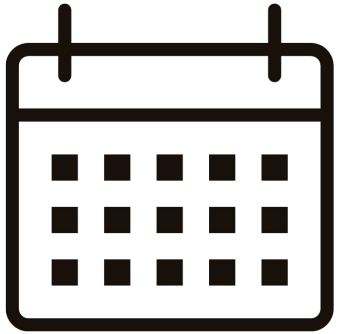
Guiding Questions: What?



What type of infrastructure is most appropriate to provide mode shift options in the corridor between?

- High speed rail;
- High performance passenger rail; or
- Conventional passenger rail?

Guiding Questions: When?



For whichever strategy is chosen, when should the process begin and over what time scale?

Guiding Questions: Where?

Which corridors are most well suited to house each type of infrastructure?

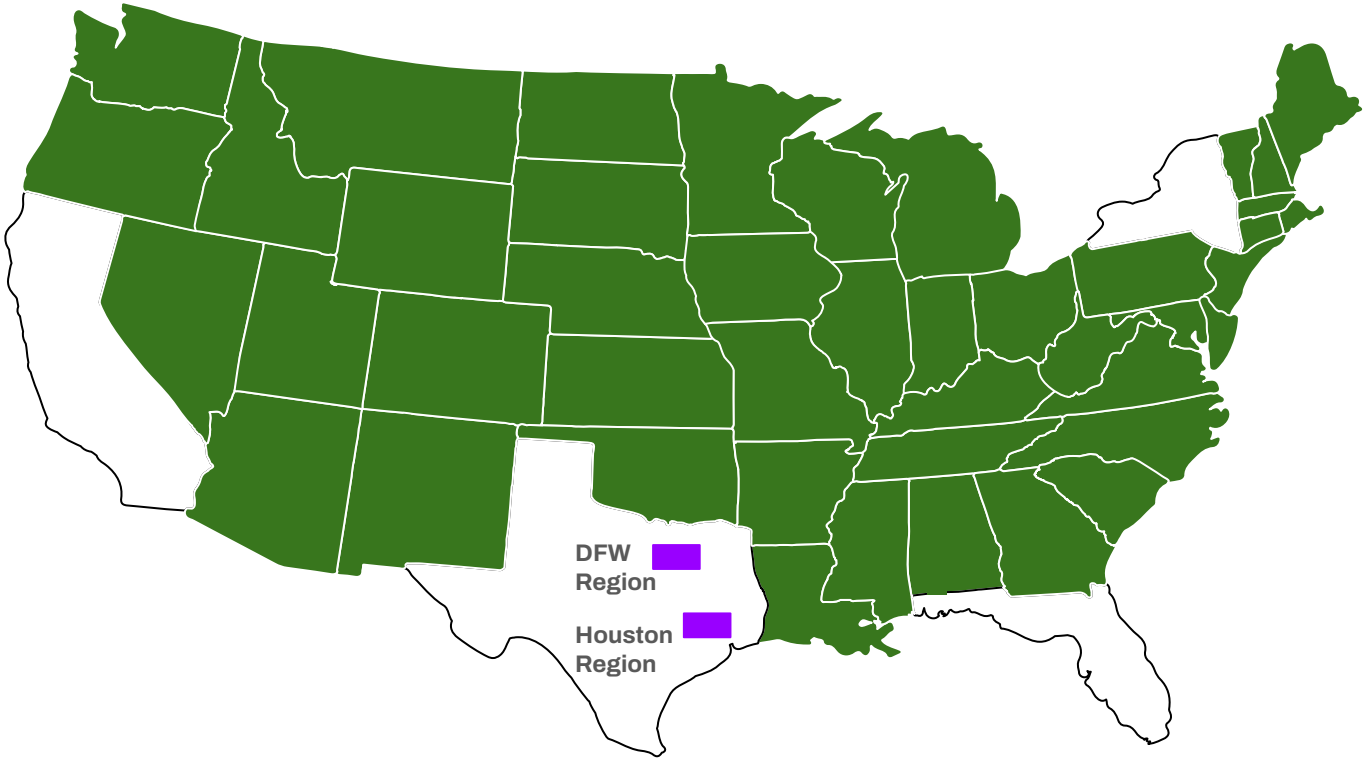
Guiding Questions: Who?

Who should own the infrastructure?
Who should operate the rail?
Who should develop the stations?

Why Texas?

American Commerce Depends on Texas

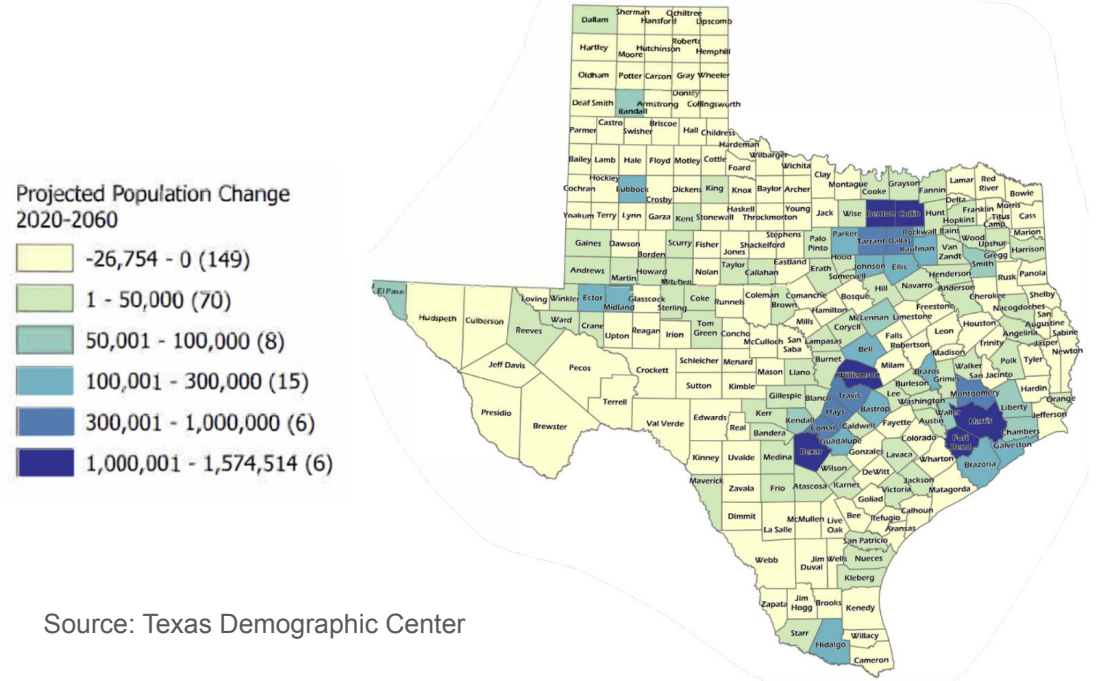
States with a smaller population than DFW and Houston MSA



Rapid Population Growth

- Harris County is expected to grow by 1.5 M by 2060
- Dallas County is expected to grow by nearly a half a million by 2060

Projected Population Change, Texas Counties, 2020-2060



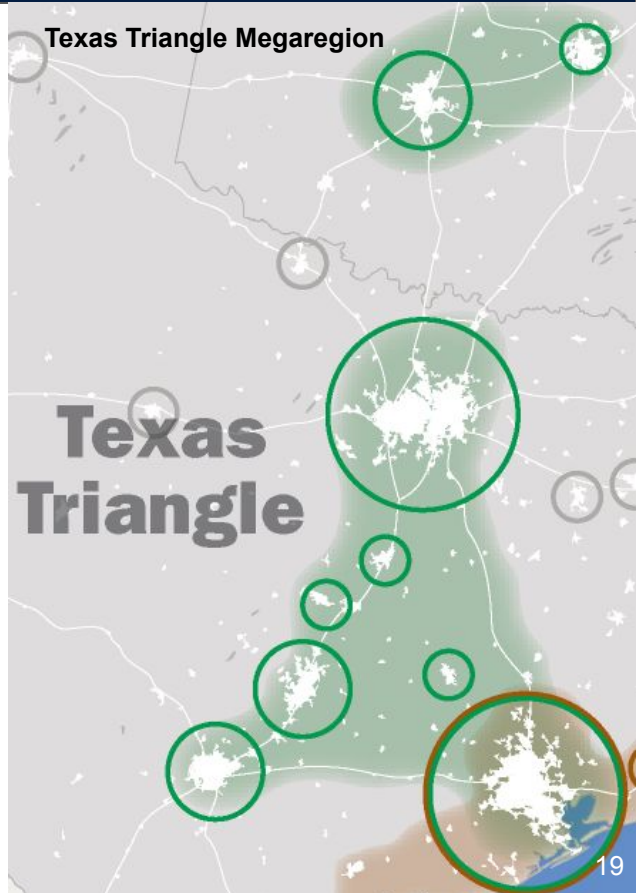
Source: Texas Demographic Center

Trade Corridors Compete with Passenger Rail

- Texas is at the geographic intersection of USMCA trade routes
- 48% of USMCA trade products are transported through Texas using the I-35 corridor

People Need the Option

- No better city pairings for passenger rail
- Topography is perfect
- Similarly large metro areas
- High-Speed rail is competitive for distances under four hours driving



Source: Regional Plan Association America 2050

Why Now?

America's Cargo Capacity is Maxed Out

The New York Times

FLIGHT RISKS

Airline Close Calls Happen Far More Often Than Previously Known

Near-miss cargo/passenger collision at Austin airport, 2023

Baltimore Bridge Collapse from Cargo Ship safety errors

Palestine, OH Derailment of hazardous materials

Passengers Are an Afterthought

- Texas' population is exploding and our infrastructure is bursting at the seams
- Demand for cargo capacity is only growing with more eCommerce and USMCA trade from nearshoring

Freight is at Max Capacity

Growing freight demand strains highways:

eCommerce → increased freight transportation

Rank	State	Freight by Value - All Modes ($2022 millions)
1	**Texas**	**3,132,697**
2	California	2,845,127
3	Illinois	1,571,888

Rank	State	Freight by Value - Trucks ($2022 millions)
1	**Texas**	**2,053,701**
2	California	1,896,400
3	Illinois	1,123,656

TRIP Freight Report - December 2023

Freight is at Max Capacity

Growing freight demand strains highways:

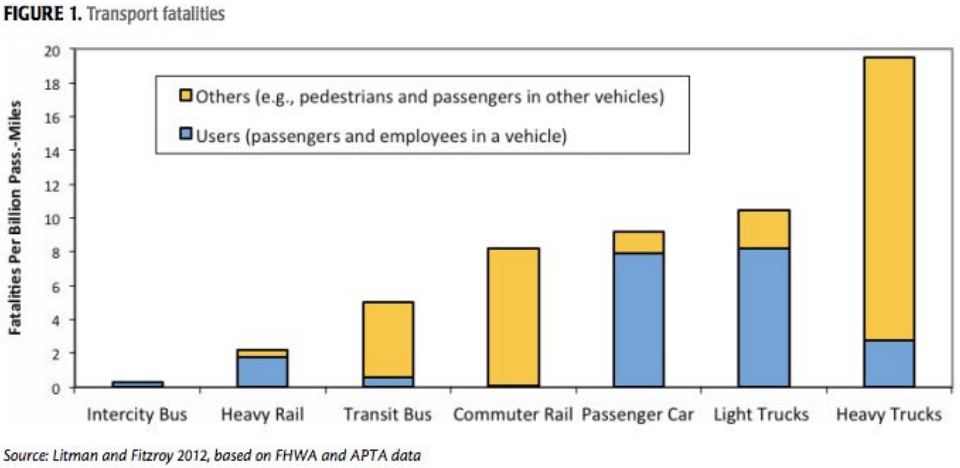
92% increase in truck freight value expected by 2050

TRIP Freight Report - December 2023

Freight Rail is at Max Capacity

Intercity rail for passengers is equally important:

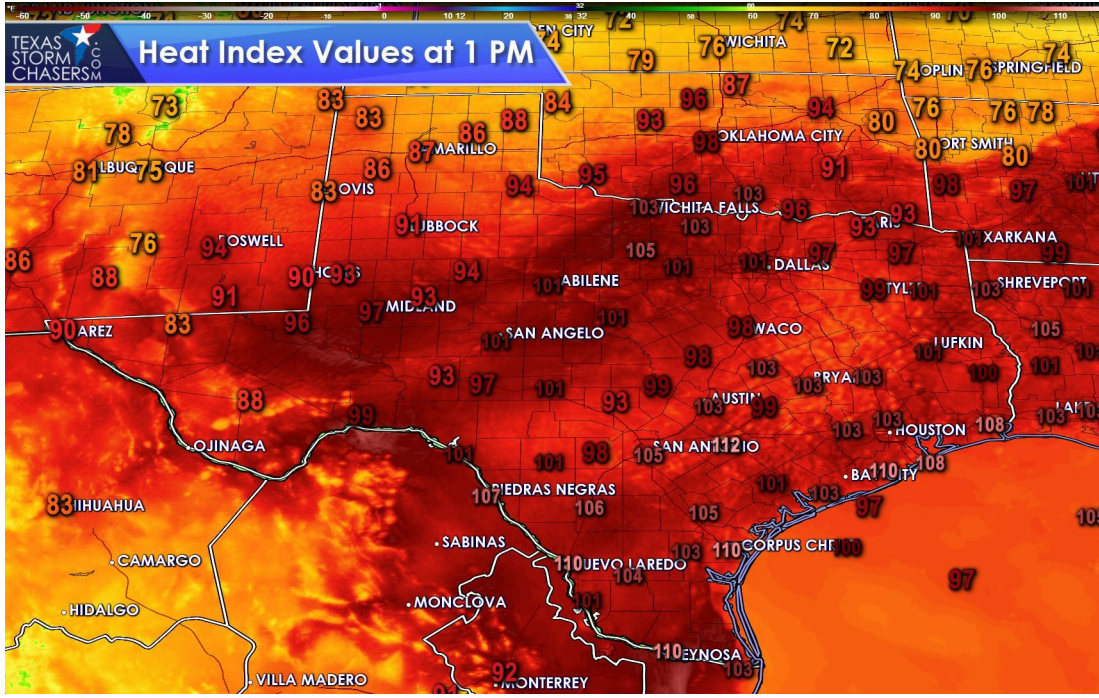
- Reliability and safety increase
- Reduces SOV traffic
- Efficiency of movemer
- Economic growth



Litman & Fizzroy, 2012

Must Move Toward Environmental Sustainability

- HSR is 8x more energy efficient than planes & 4x more than cars
- 14-16x reduction in Greenhouse Gas (GHG) emissions
- Less dependence on foreign oil
- Improvement in air quality



Induced & Needed Indirect Benefits

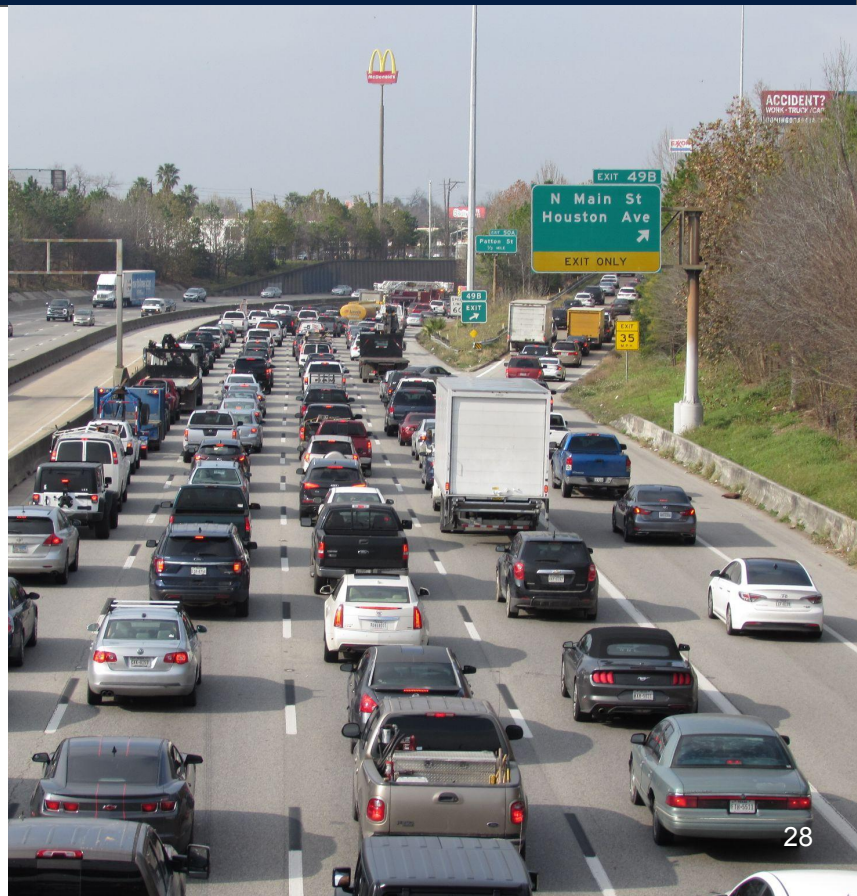
There are a variety of benefits that Texas could miss out on…

- Increases in tax revenue (Japan)
- Benefits to per-capita GDP (China)
- Increased opportunity along HSR corridors
- Increased quality of life

Increased Vehicle Travel Time

If we continue to do nothing:

- Travel time on IH 45 to increase to 6.5 hours by 2035
- Freight trucks will suffer
- ~22% of these vehicles are freight trucks



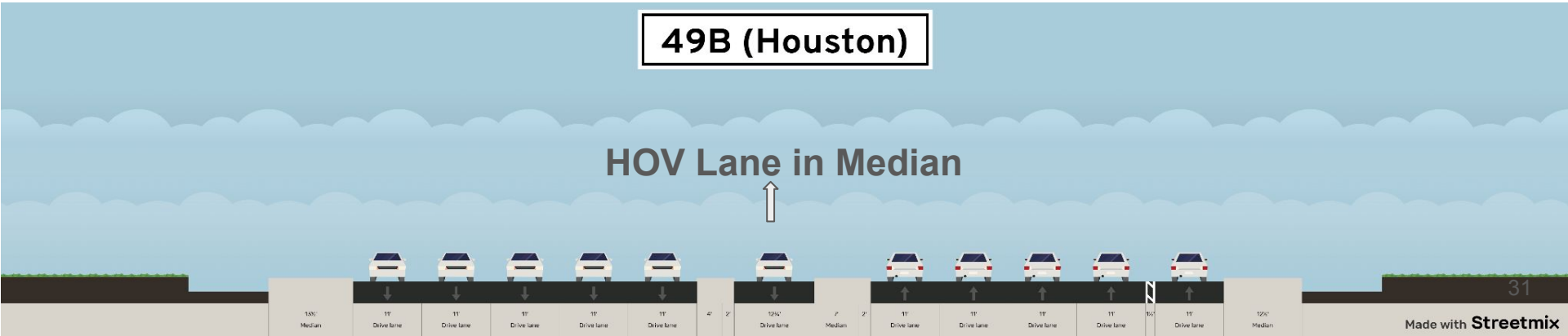
Why Not Now?

- Not a priority in Republican-led state
- Previous attempts failed
- Private property ownership culture at odds with eminent domain needs
- Infrastructure costs are high
- Lack of organization

Benefits & Costs

Why not the IH-45 Corridor?

- Meanders too much for high-speed rail co-alignment
- Not enough ROW in median
- Other, non-greenfield options in conventional rail



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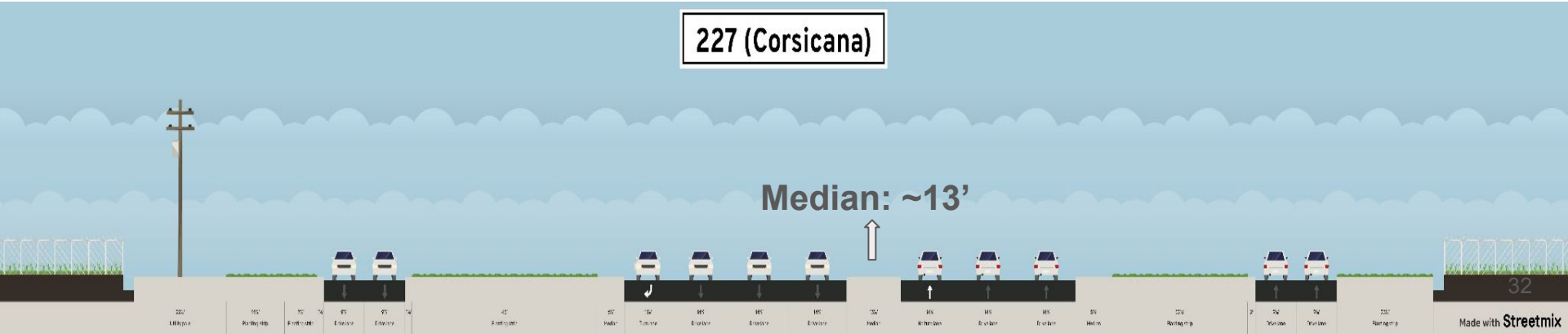

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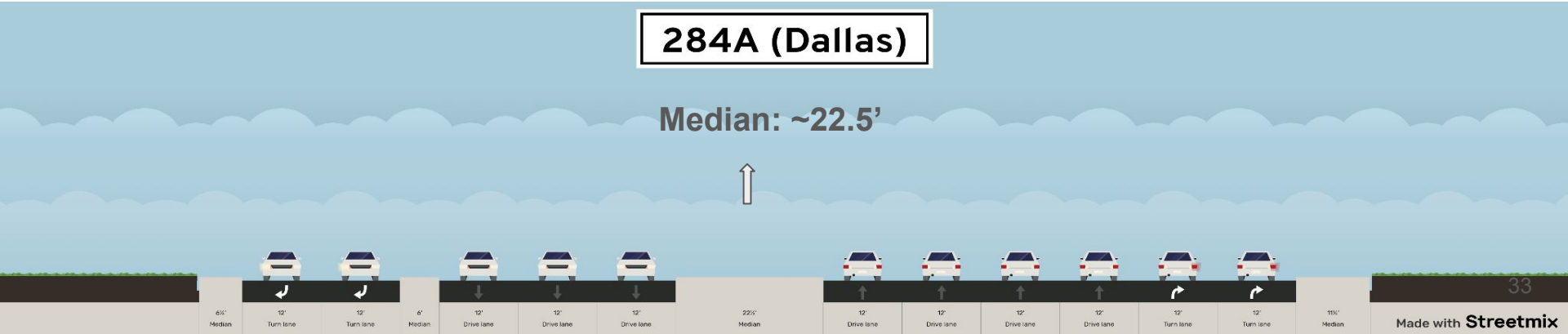


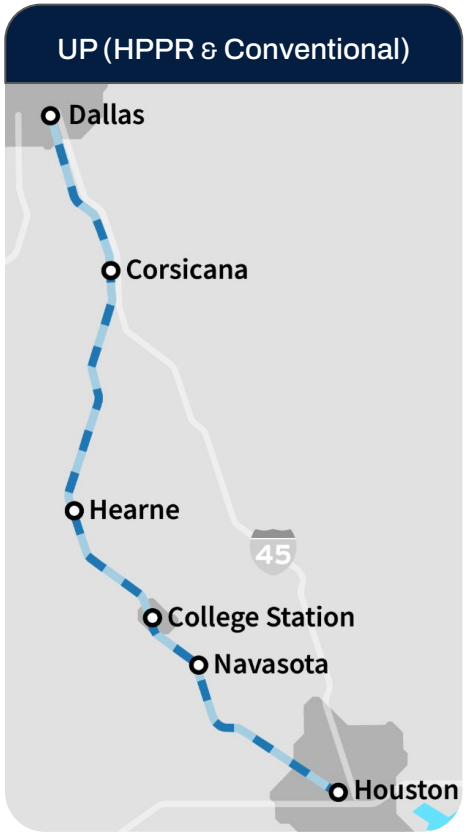
Options Overview

Mode	Most Like…	Maximum Speeds	Greenfield?	Build
High-Speed Rail	Japanese Shinkansen	160–200 mph (260–320 km/h)	Yes	On Texas Central's proposed utility corridor
High Performance Passenger Rail	Amtrak Northeast Corridor (Acela)	90–125 mph (145–200 km/h)	Yes	Alongside existing UP/BNSF track
Conventional Passenger Rail	Amtrak Long Distance Routes	55–80 mph (88–127 km/h)	No	Use existing UP/ BNSF track

Proposals

#	Projects Evaluated	Proposed by…
1	High Speed Rail	**Texas Central**
2	High Performance Passenger Rail - UP	Hypothetical
3	High Performance Passenger Rail - BNSF	Hypothetical
4	High Performance Passenger Rail - Collaborative	Hypothetical
5	Conventional Rail - UP	**TxDOT/Amtrak**
6	Conventional Rail - BNSF	Hypothetical
7	Conventional Rail - Collaborative	Hypothetical

Proposal Alignments



Benefit-Cost Analysis Approach

Calculate **direct** monetary benefits for each proposal

Travel Time Savings

Reduction in Crashes

Residual Value

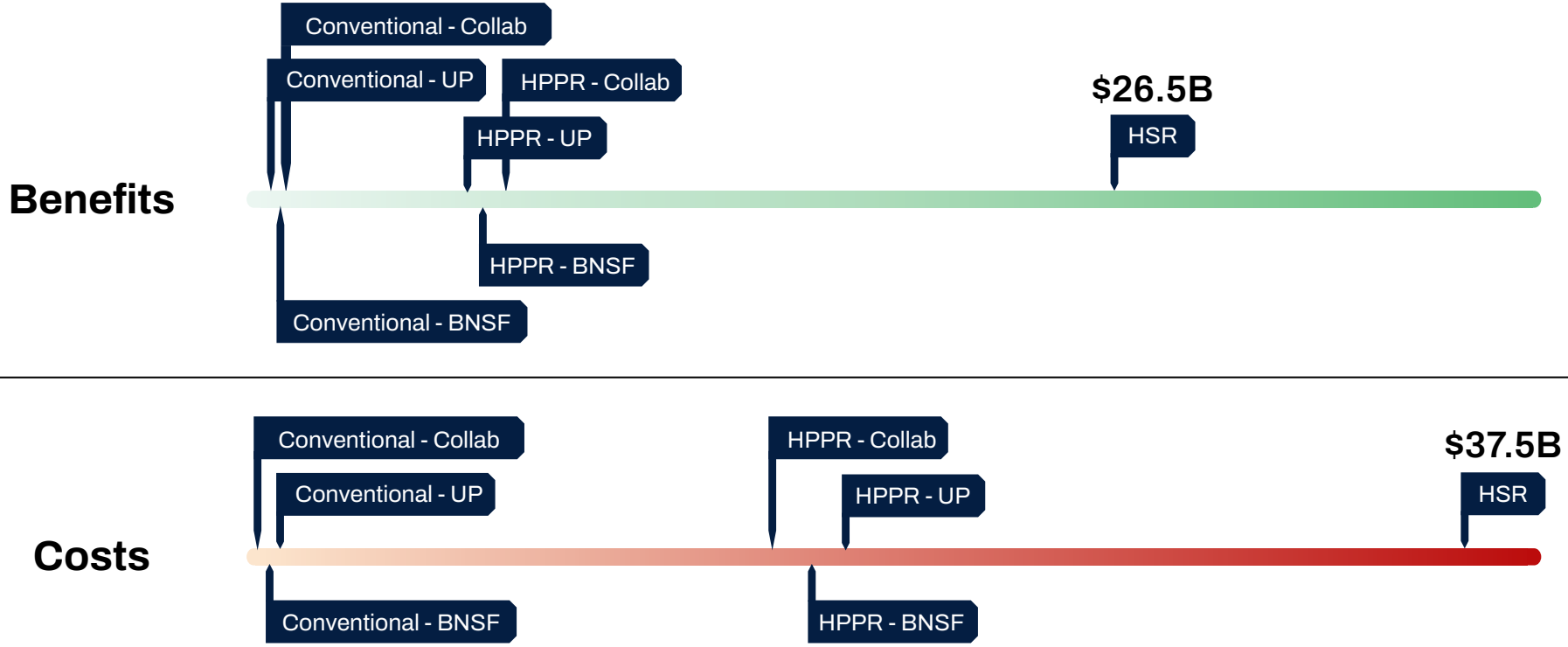
Operating Cost Savings

Reduced Emissions Damage

Comparative Table

	Ridership (2035 est. millions)	Benefits ($2022 millions)	Costs ($2022 millions)	Benefit-Cost Ratio
High Speed Rail	2.41	$ 26,250	$ 37,500	0.70
HPPR - UP	0.46	$ 7,104	$ 19,200	0.37
HPPR - BNSF	0.50	$ 7,544	$ 18,400	0.41
HPPR - Collaborative	0.53	$ 8,010	$ 17,800	0.45
Conventional - UP	0.09	$ 1,065	$ 1,500	0.71
Conventional - BNSF	0.10	$ 1,320	$ 1,500	0.88
Conventional - Collaborative	0.10	$ 1,526	$ 1,400	1.09

Comparison


Benefits
Conventional - Collab
Conventional - UP
HPPR - Collab
HPPR - UP
$26.5B
HSR
HPPR - BNSF
Conventional - BNSF
Costs
Conventional - Collab
Conventional - UP
HPPR - Collab
HPPR - UP
$37.5B
HSR
Conventional - BNSF
HPPR - BNSF

High Speed Rail

Alignment chosen by Texas Central after EIS completion

70% of alignment runs alongside an existing utility corridor

Highest benefits in terms of raw numbers, but also very high capital cost

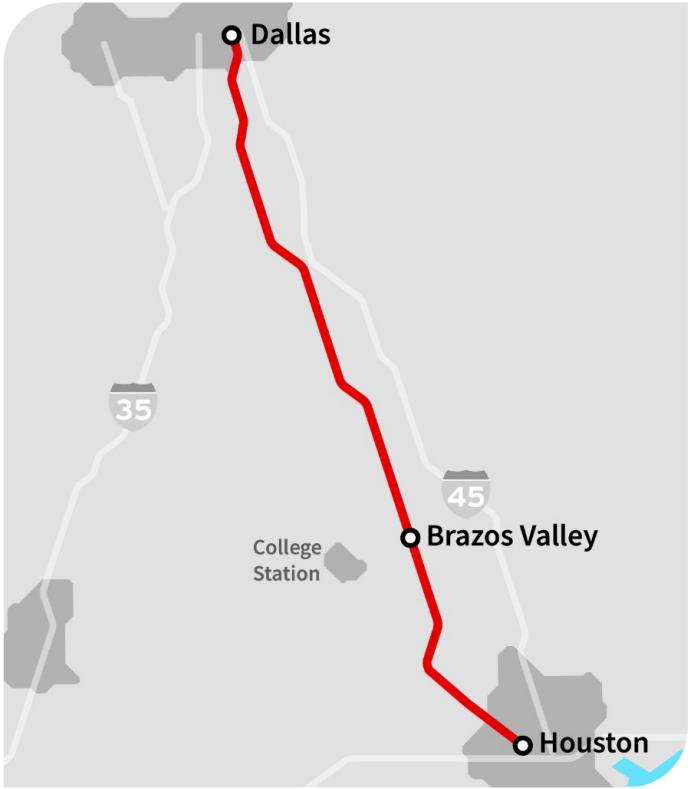
At a Glance

2035 — 2.41M riders

90 minutes

240 miles

0.70 B/C ratio



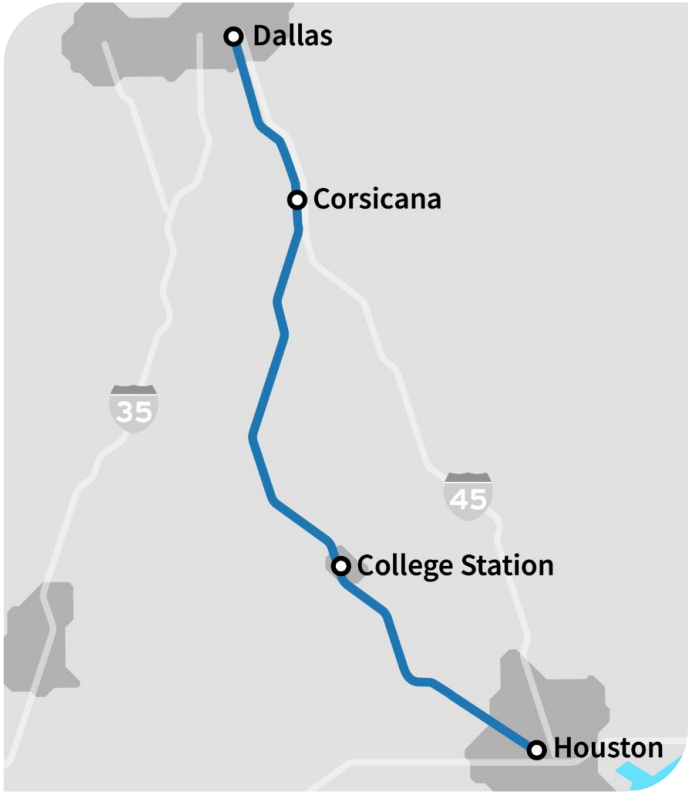
High Performance Passenger Rail (UP Alignment)

New tracks would run parallel to the existing UP tracks

Alignment is the longest distance of all of the options

At a Glance

- 463K riders (2035)
- 207 minutes
- 311 miles
- 0.37 B/C ratio



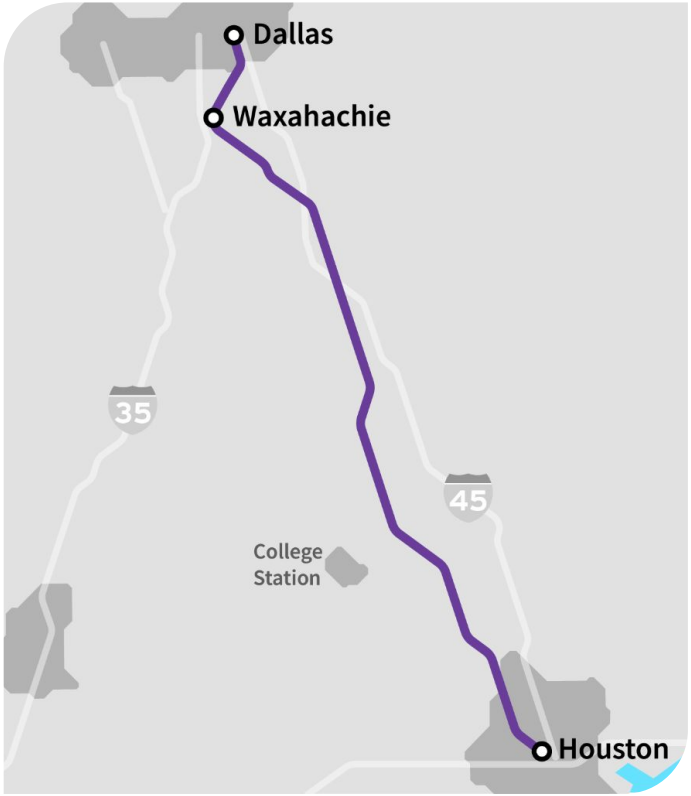
High Performance Passenger Rail (BNSF Alignment)

New tracks would run parallel to the existing BNSF tracks

Slightly shorter route than the UP corridor alternative

At a Glance

- 496K riders (2035)
- 198 minutes
- 297 miles
- 0.41 B/C ratio



High Performance Passenger Rail (Collaborative Alignment)

Would run parallel to BNSF tracks for about 80%, and parallel to UP for about 20%

Would stop in fewer towns but be a faster trip time between Dallas-Houston

At a Glance

- 530K riders (2035)
- 191 minutes
- 286 miles
- 0.45 B/C ratio

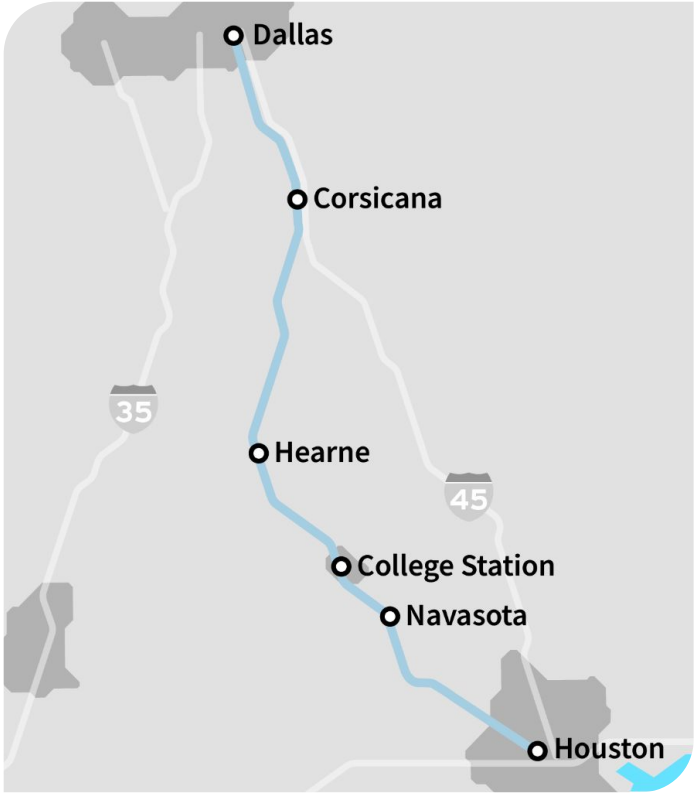
Conventional Rail (UP Alignment)

Train stops in Corsicana, Hearne, and Navasota, per TxDOT Corridor ID grant application

Parts of this UP track can run up to 15 trains per day

At a Glance

- 89K riders (2035)
- 270 minutes
- 311 miles
- 0.71 B/C ratio



Conventional Rail (BNSF Alignment)

Would run on existing BNSF right-of-way where they currently operate up to 10 trains per day

Slightly shorter route than the UP corridor alternative

At a Glance

- 95K riders (2035)
- 258 minutes
- 297 miles
- 0.88 B/C ratio

Conventional Rail (Collaborative Alignment)

Shortest possible route between Houston and Dallas using existing freight corridors

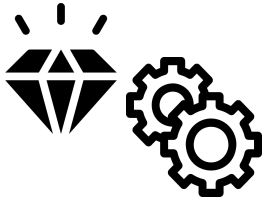
Would run on both UP and BNSF tracks, switching in Corsicana

At a Glance

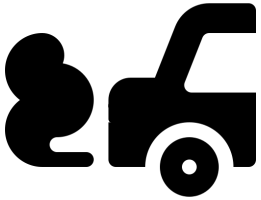
- 100K riders (2035)
- 249 minutes
- 286 miles
- 1.09 B/C ratio

BCA Takeaways

Across all options, savings from crashes and travel time were **by far** the highest

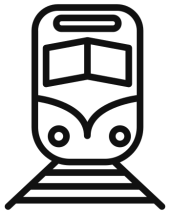


Operating cost savings and residual value were about equal across the board

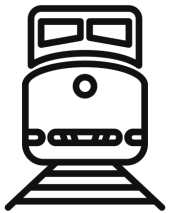


Emissions savings were lowest for all options, but still positive

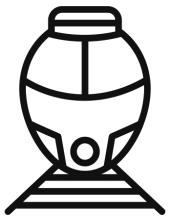
BCA Takeaways



HPPR performs the worst—can spend proportionately more for much better HSR



Conventional with best B/C ratios—low raw benefits, but also low capital cost



HSR has the largest raw benefits, but the capital cost is extremely high

Indirect Benefits

- BCA only outlines **direct** benefits
- But, there are many **indirect** benefits
  - Economic agglomeration
  - Labor market integration
  - Future-proofing for growth
  - Ease of travel and comfort
  - Evacuation use
  - And more…

Hurricane Rita evacuation (2005)

Indirect Benefits

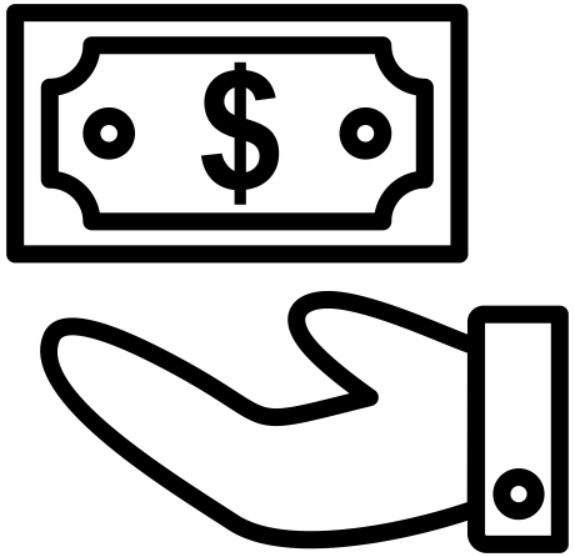
- HSR would contribute most indirect benefits
  - HSR has the highest ridership numbers
  - In long-term, HSR can handle growth best
  - More cars off of road means less need for road expansion

Funding

Funding Considerations

Who will manage the funds?

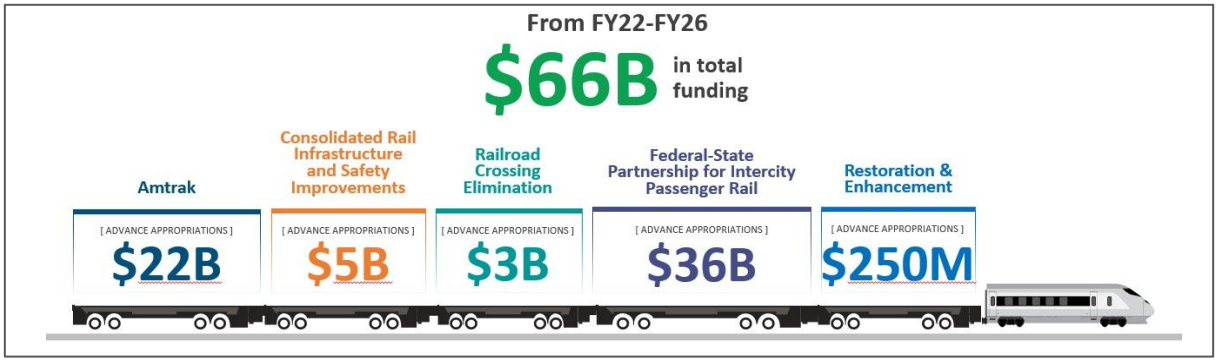
- **What's needed:**
  - A bank account
  - A financial manager
  - Capacity to receive public and private funding



Possible Funding Sources

Federal Grants

- **Funds from Bipartisan Infrastructure Law : $66 billion**



Source: FRA

- **Future legislation**
  - Federal government interested in further in high speed rail investment nationwide
  - Clean energy & green jobs legislation

Possible Funding Sources

Federal financing programs

- Transportation Infrastructure Finance and Innovation Act (TIFIA)
- Railroad Rehabilitation and Improvement Financing (RRIF)
- State Infrastructure Banks (SIB)
- Section 129 Loans
- Grant Anticipation Revenue Vehicles (GARVEEs)

BUILD AMERICA BUREAU

DEPARTMENT OF TRANSPORTATION · UNITED STATES OF AMERICA

OFFICE OF PERFORMANCE AND INNOVATIVE FINANCE

Possible Funding Sources

State and Local funds

- **Statewide and Citywide Bonds**
  - General Obligation bonds
  - Revenue bonds
- **Taxes and Fees**
  - Carbon cap & trade
  - Gasoline tax

PROPOSITION **1A** SAFE, RELIABLE HIGH-SPEED PASSENGER TRAIN BOND ACT.

OFFICIAL TITLE AND SUMMARY

SAFE, RELIABLE HIGH-SPEED PASSENGER TRAIN BOND ACT.

- Provides long-distance commuters with a safe, convenient, affordable, and reliable alternative to driving and high gas prices.
- Reduces traffic congestion on the state's highways and at the state's airports.
- Reduces California's dependence on foreign oil.
- Reduces air pollution and global warming greenhouse gases.
- Establishes a clean, efficient 220 MPH transportation system.
- Improves existing passenger rail lines serving the state's major population centers.
- Provides for California's growing population.
- Provides for a bond issue of $9.95 billion to establish high-speed train service linking Southern California counties, the Sacramento/San Joaquin Valley, and the San Francisco Bay Area.
- Provides that at least 90% of these bond funds shall be spent for specific construction projects with private and public matching funds required, including, but not limited to, federal funds, funds from revenue bonds, and local funds.
- Requires that use of all bond funds is subject to independent audits.
- Appropriates money from the General Fund to pay bond principal and interest.

Summary of Legislative Analyst's Estimate of Net State and Local Government Fiscal Impact:

- State costs of about $19.4 billion, assuming 30 years to pay off both principal ($9.95 billion) and interest ($9.5 billion) costs of the bonds. Payments of about $647 million per year.
- When constructed, additional unknown costs, probably in excess of $1 billion a year, to operate and maintain a

Possible Funding Sources

Private Financing:

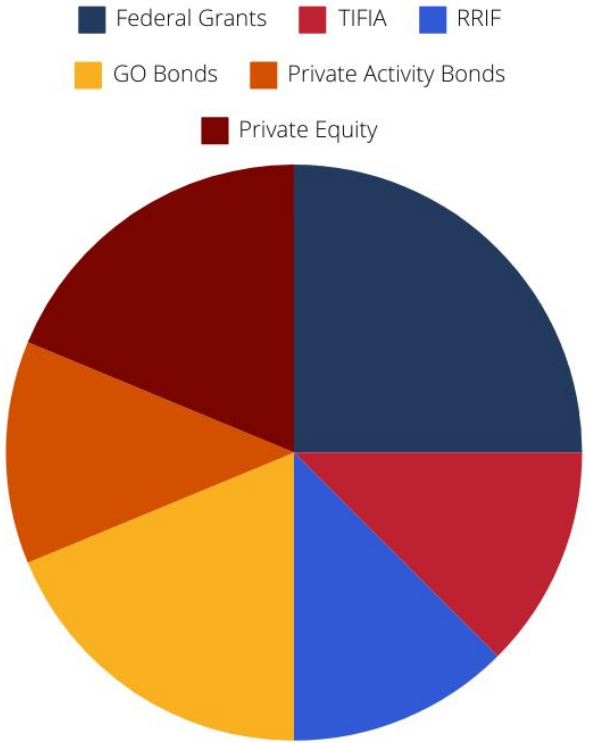
- **Public-Private Partnerships**
  - Lower capital costs
  - Private sector flexibility
  - Risk-sharing benefit
- **Private Activity Bonds (PABs)**

P3 Structure	Design Risk	Constr. Risk	Financial Risk	O&M and Rehab Risk	Traffic Risk	Revenue Risk
Traditional Design-Bid-Build		X				
Design-Build (DB)	X	X				
Design-Build-Finance (DBF)	X	X	X			
Design, Build, Finance, Operate and Maintain (DBFOM)	X	X	X	X	Yes, if toll or traffic-based payment	Yes, if performance -based payment

Source: Federal Highway Administration

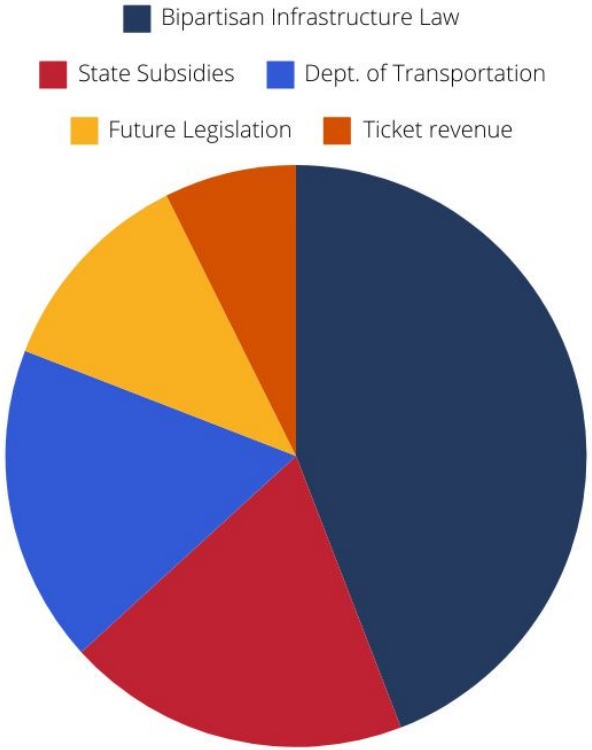
High Speed Rail

- **Estimated cost = $37.5 Billion**
- **Cost/mile = $156.25 Million**
- **“Blended approach”**
  - Federal grants (BIL)
  - Federal direct loans
  - Tax-exempt bonds
  - Private activity bonds
  - Developer equity



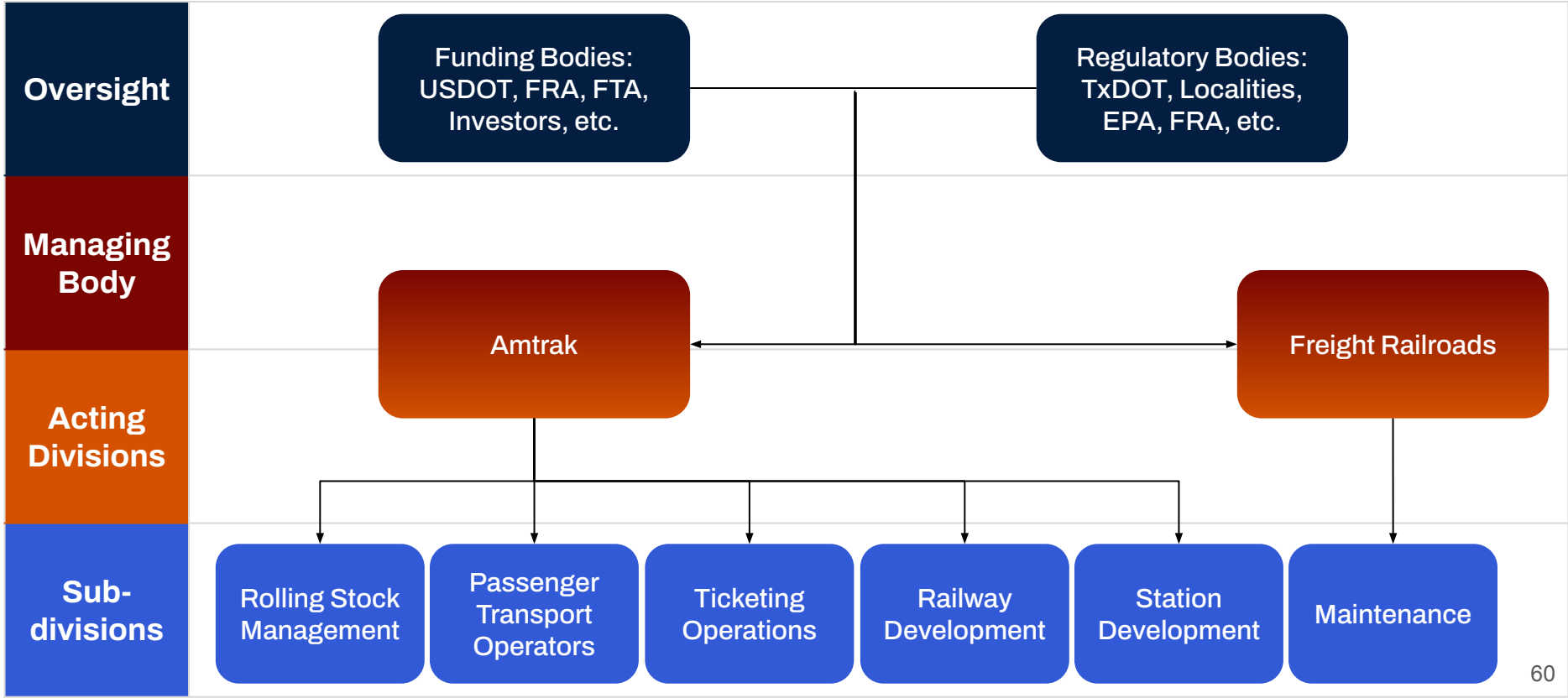
Conventional Rail - UP Alignment

- **Estimated Cost = $1.5B**
- **Cost per mile = $4.82M**
- **Mostly government funding**
  - BIL
  - DOT/FRA
  - State subsidies
  - Future legislation



Governance

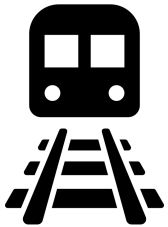
Generalized Conventional Rail Governance



Existing Rail Governance Models

Integration Model

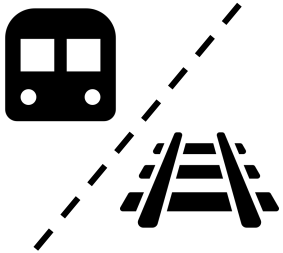
Unified Operations & Development



- Consolidated/nationalized rail infrastructure and development
- Ex: France, Switzerland, California

Separation Model

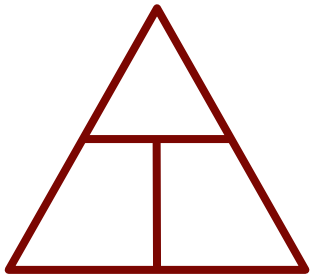
Separate Operations & Development



- An entity receives funding and manages subsidiaries in charge of operations and development
- Ex: Spain, Japan, UK

Recommended Governance Model

We Recommend

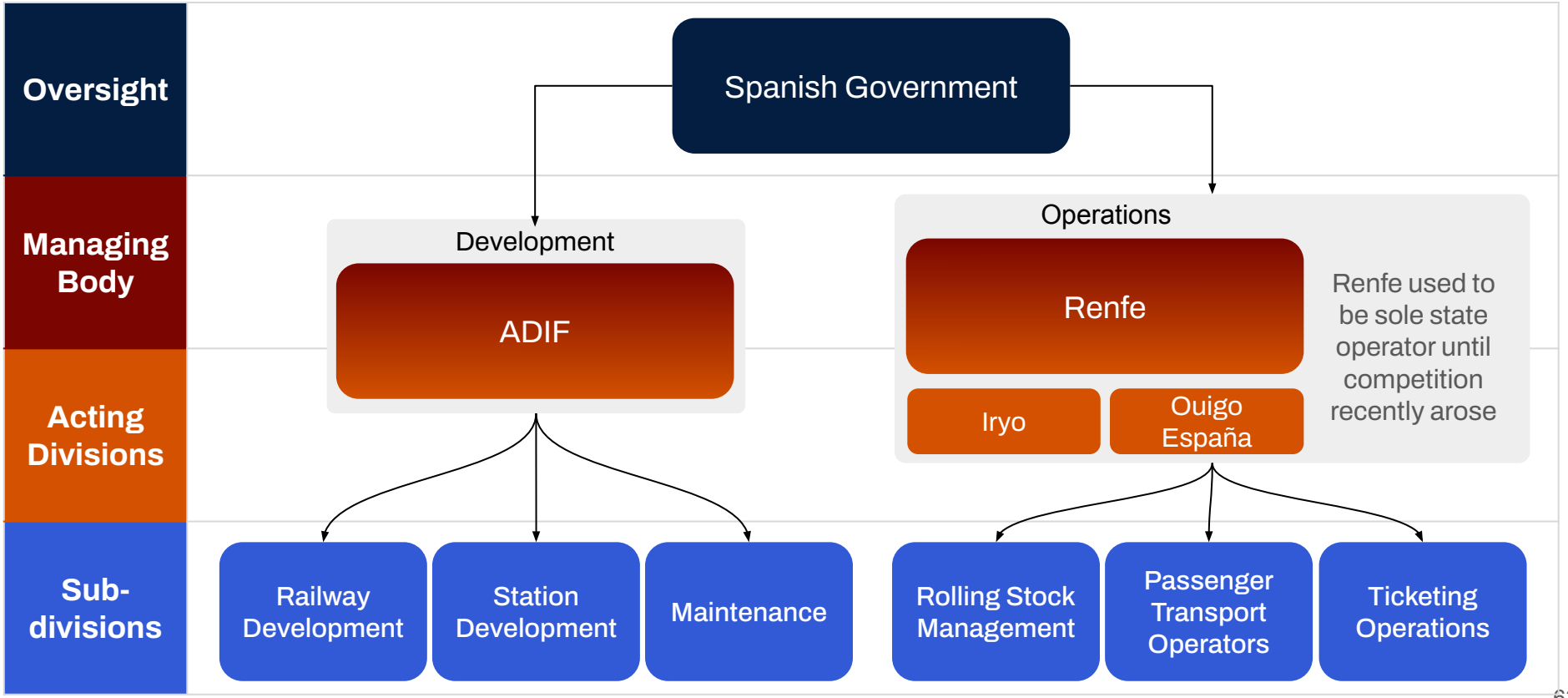


Separation Model

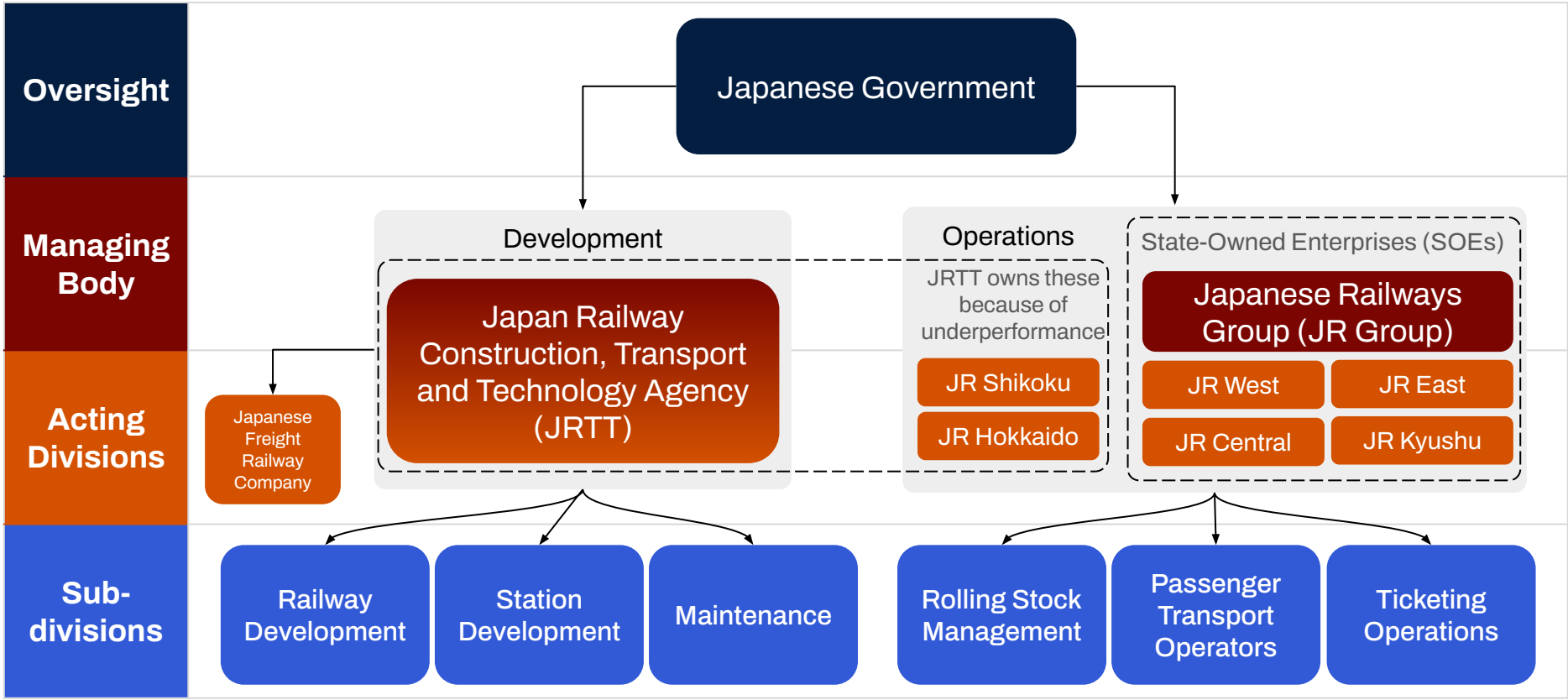
The Managing Body:

- Plans and funds programs
- Adapts to changing demands and conditions
- Contracts development and operations to subsidiaries
- Manages growth and public relations
- Is State supported, regionally led

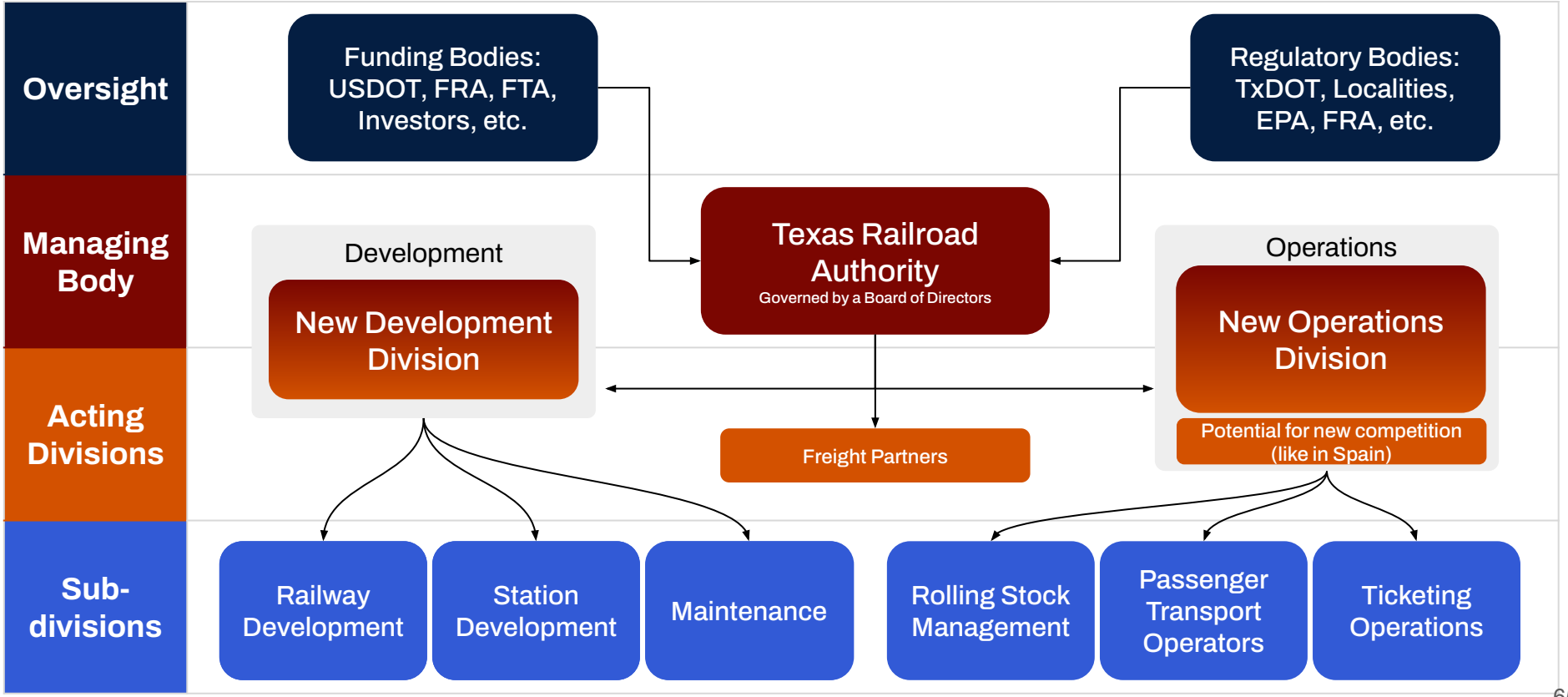
Spain's Separation Model



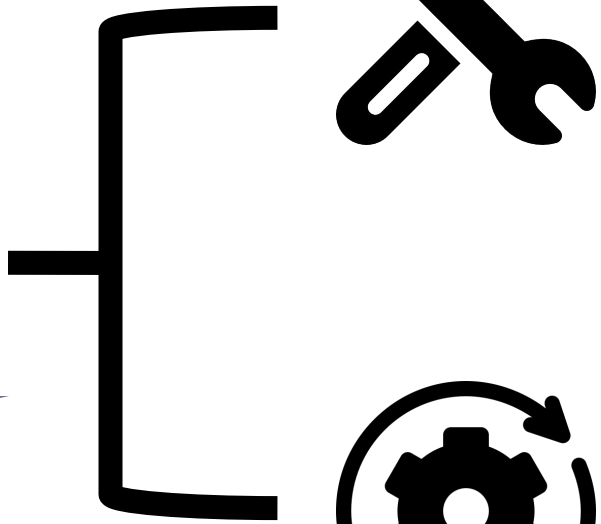
Japan's Separation Model



Proposed Separation Model for Texas



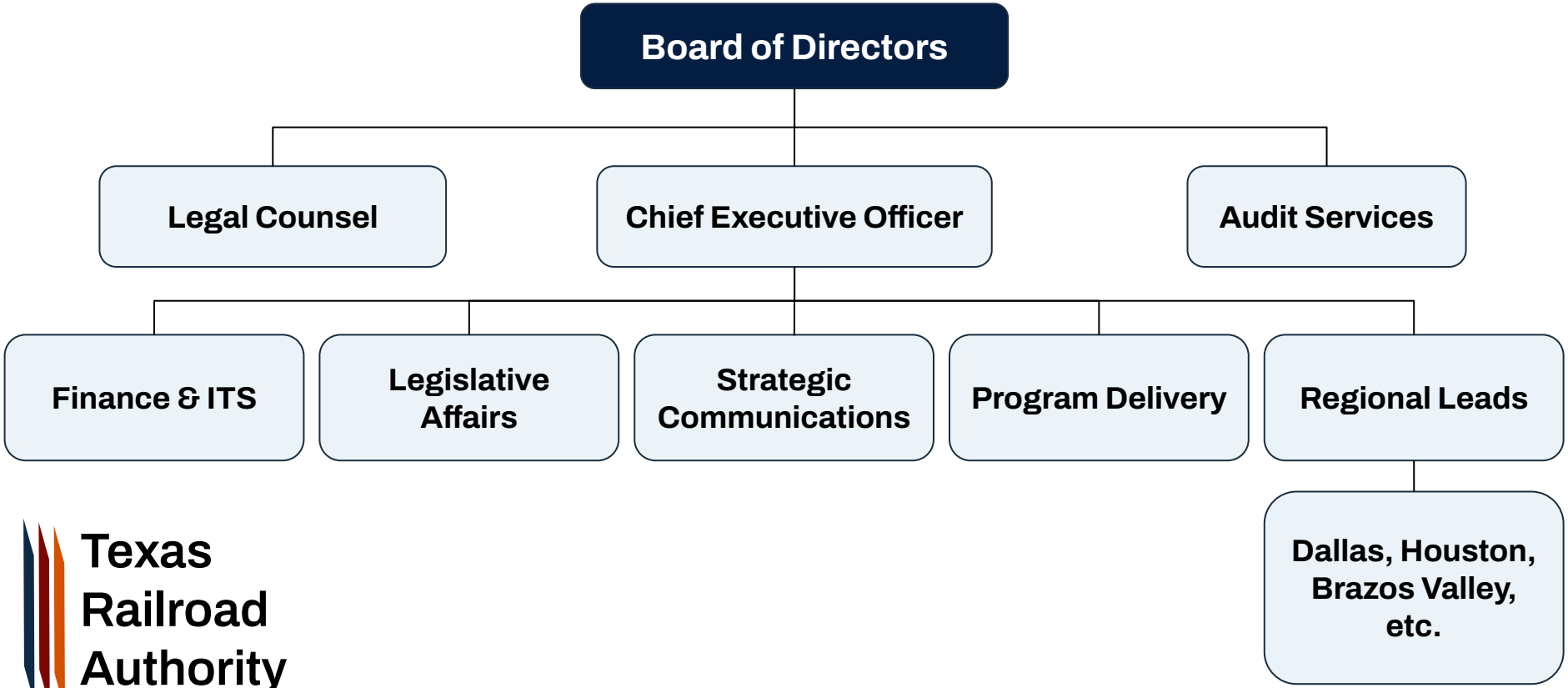
Simplified Model for Texas



Development Division

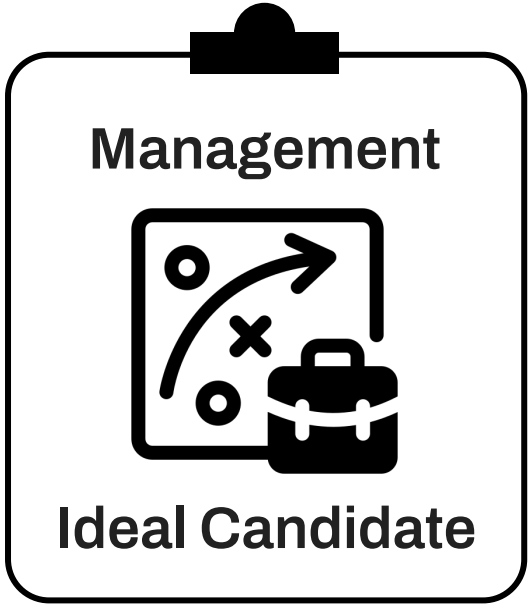
Operations Division

Proposed Authority Structure



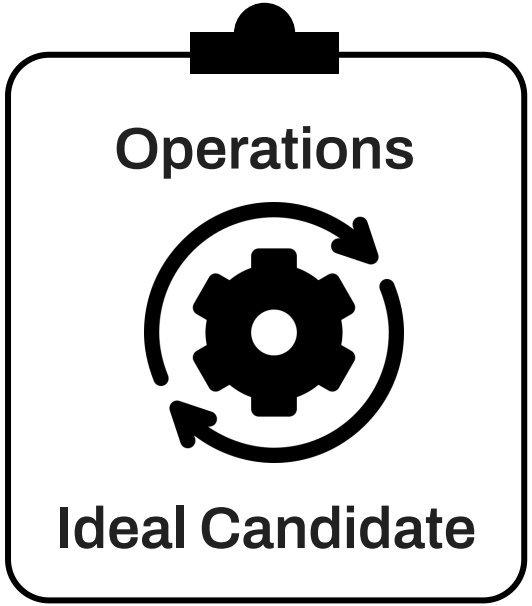
Texas Railroad Authority

Managing Body Job Description



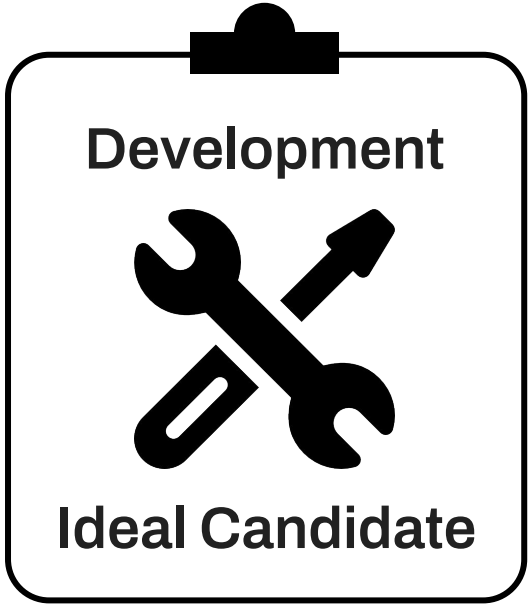
- ✓ History of forming relationships with local and governmental entities
- ✓ Ability to navigate financing mechanisms
- ✓ Understanding of rail operations and development
- ✓ Local, Texan knowledge

Operations Division Job Description



- ✓ **Demonstrated ability in:**
  - **Route planning**
  - **Service planning**
  - **Ticketing services**
- ✓ **Holds a clean safety record**

Development Division Job Description

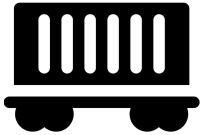


- ✓ Experience with regulatory processes (e.g. NEPA)
- ✓ Holistic view of impacts: equity, environmental, and economic
- ✓ Adaptive to change
- ✓ Proficient in partnerships

Managing Body Board Membership

- TxDOT
- Amtrak
- Investors
- Relevant Counties
- Freight Companies
- Relevant Cities
- COGs/MPOs
- etc.

Recommendations for Organizing



Partner & cooperate with freight companies

Gain allies at the state legislature

Engage locals and other partners

Making the Argument at a State Level

- Proven business model
- Strong ROI for economic growth
- Strong job creation
- Tourism promotion
- Expanding job opportunities
- Freeing room for 18-wheelers (freight)
- Shared use is not ideal for freight rail
- Vastly enhanced highway safety

Recommendations

Build Capacity Now

- Purchase land for future alignments
- Build trust through partnerships with freight companies and shown commitment to work
- Prove ridership is viable
- Coordinate federally allocated funding to be co-beneficial

Incremental Approach

- Prioritize conventional rail now
- Target collaborative alignment (UP+BNSF) option between Dallas & Houston
- Conduct preliminary studies with freight cooperation
- Create shared-use agreements with UP & BNSF

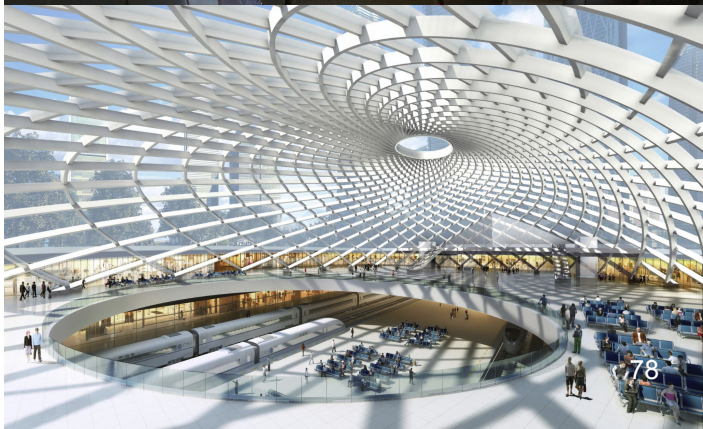
Recommendations

Develop incrementally, build capacity along the way

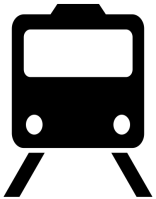
- Develop conventional rail now
- Work towards establishing the Texas Rail Authority; High Speed rail will take more sophisticated governance, funding, and will need bipartisan political momentum

Recommendations

- In the meantime…
  - Establish the TRA now
  - Begin forming stronger partnerships with freight entities,focusing on co-benefits
  - Improve rail capacity
  - Lay the groundwork for future HSR, begin ROW acquisition



Recommendations



Pursuing
Conventional Rail

Planning for HSR

Summary Roadmap

Short-Term

- Texas Railroad Authority — Establish the TRA
- Pursue Conventional Rail on Collaborative Alignment

Mid-Term

- Build relationships with freight
- Seek political allies
- Right-of-way acquisition

Long-Term

- Build High Speed Rail on Utility Corridor

Questions?

Discussion

Appendix

Proposal	Time Travel Savings	Reduced Crash Costs	Reduced Emissions	Operating Cost Savings	Residual Value	Estimated Capital + O&M Cost	B/C Ratio
High Speed Rail	$7.9B	$8.2B	$591M	$4.0B	$6.4B	$37.5B	**0.70**
HPPR - UP	$1.6B	$2.1B	$166M	$1.0B	$3.2B	$19.2B	**0.37**
HPPR - BNSF	$1.9B	$2.3B	$168M	$1.1B	$3.1B	$18.4B	**0.41**
HPPR - Collaborative	$2.2B	$2.4B	$168M	$1.1B	$3.0B	$17.8B	**0.45**
Conventional - UP	$288M	$423M	$34M	$195M	$231M	$1.5B	**0.71**
Conventional - BNSF	$430M	$450M	$28M	$209M	$220M	$1.5B	**0.88**
Conventional - Collaborative	$602M	$477M	$30M	$221M	$213M	$1.4B	**1.09**

**All figures in 2022 dollars; benefits and costs discounted 3.1%, 2.0% for CO2, per 2024 USDOT BCA Guidance*

- **Did you consider the cost of doing nothing?**
  - In many of the benefits, the no build scenario was estimated
  - The build scenario values were subtracted from the no build scenario to get a final benefit value
  - Therefore, the cost of doing nothing is implied in the benefits (i.e. we are missing out on benefits *by not building* option X)

- **How did you estimate ridership?**
  - Weighted average of 3 sources estimating daily trips/people traveling between Dallas and Houston
    - Amtrak est. (2022), TxDOT est. (2011), and Texas Central est. (2029)
    - Weights - Amtrak (.6), TxDOT (.3), TX Central (.1)
  - Each sources' date of estimation was scaled up to 2035 and 2065 using future population growth rate estimates
    - Used Texas Demographic Center 2060 - 0.5 migration scenario, intended for long-range planning

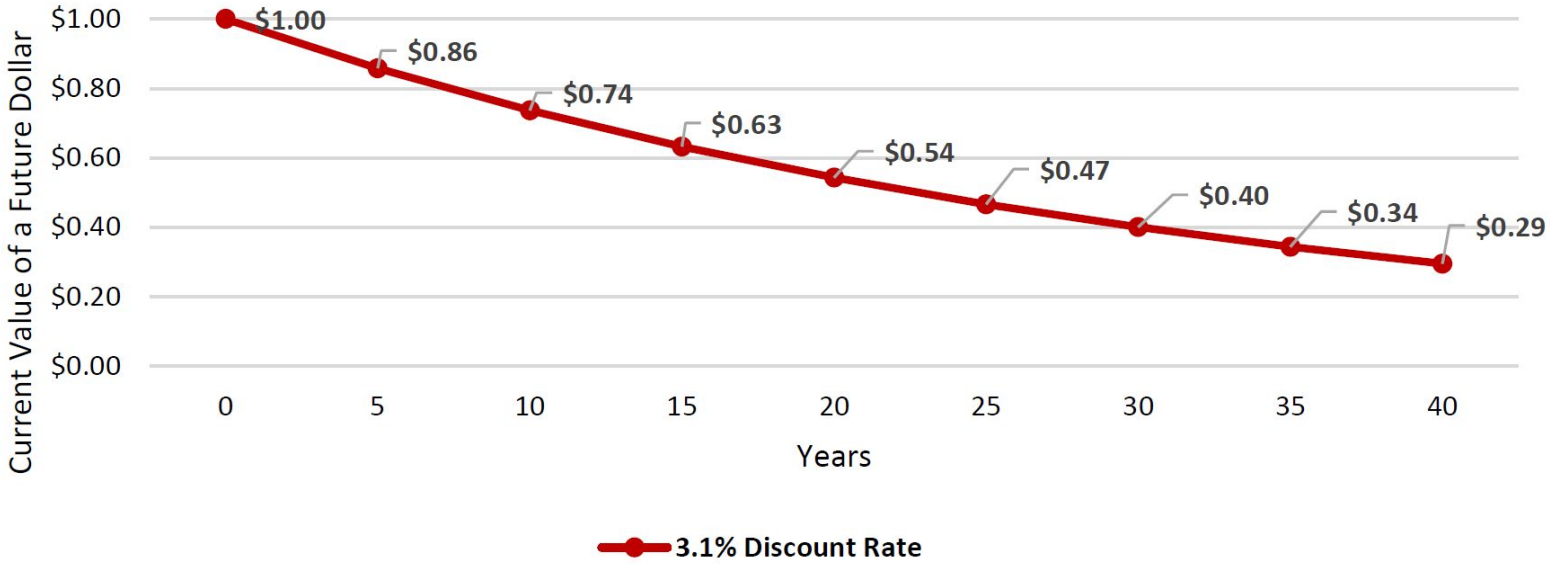
- **Did you consider a bump in ridership for options that would pass through College Station?**
  - This study only looked at trips between Dallas and Houston using existing sources
  - We would have to be more speculative about ridership to and from College Station using more extrapolative methods (e.g. looking at AADT on roads between IH 45 and College Station, then assuming a % shift to rail)
  - Football gameday surges are difficult to account for in our ridership analysis without a more complex model

- **What was the period of analysis for the BCA?**
  - 30 year analysis period, assuming that the opening dates for all of the options is 2035
  - Therefore, the analysis period was from 2035 to 2065

- **Did you consider inflation?**
  - All calculations for benefits and costs were done in 2022 dollars, per 2024 USDOT BCA Guidance
    - This means that future anticipated inflation does not affect the dollar outputs in the analysis because everything is expressed in raw 2022 dollars

- **What is discounting and why was it applied to the BCA?**
  - Discounting is the principle that benefits and costs that occur sooner in time are more highly valued than those that occur in the future
  - 2024 USDOT BCA Guidance requires that benefits and costs be discounted at a rate of 3.1%, except for carbon dioxide emissions, which are discounted at a rate of 2.0%

- **What is discounting and why was it applied to the BCA? (continued)**
  - An illustration of a 3.1% discount rate is shown below



- **What is residual value?**
  - Residual value is the estimated worth of an asset following full depreciation
  - The useful life of all the projects here were assumed to be 100 years
    - Major infrastructure projects like rail are expected to have very long useful lives–100 years is reasonable for a BCA on rail assets (assuming proper maintenance)

- **Why weren't ticket sales counted as a benefit?**
  - Per the most recent 2016 FRA BCA Guidance (most relevant to passenger rail), you should not calculate passenger ticket sales as a benefit
  - Fares and fees considered "transfers of the value of real benefits" between users and the rail entity, and would therefore represent double counting benefits


Texas
Railroad
Authority


Texas
Railroad
Authority


Texas
Railroad
Authority


Texas
Railroad
Authority

Corridor	Intersections Based on AADT Value			
	AADT >=30000	AADT<=1000	30000>AADT>=2000	All Roads
Utility	19	59	67	229
BNSF	33	80	80	300
UP	31	68	102	338
Collaborative	36	77	82	296

Summary Roadmap

Short-Term

- **Texas Railroad Authority** — Establish the TRA
- Pursue Conventional Rail on Collaborative Alignment

Mid-Term

- Build relationships with freight
- Seek political allies
- Right-of-way acquisition

Long-Term

- Build High Speed Rail on Utility Corridor

Options Overview

Mode	Most Like…	Maximum Speeds	Greenfield?	Build
High-Speed Rail	Japanese Shinkansen	160–200 mph (260–320 km/h)	Yes	On Texas Central's proposed utility corridor
High Performance Passenger Rail	Amtrak Northeast Corridor (Acela)	90–125 mph (145–200 km/h)	Yes	Alongside existing UP/BNSF track
Conventional Passenger Rail	Amtrak Long Distance Routes	55–80 mph (88–127 km/h)	No	Use existing UP/ BNSF track

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Dallas to Houston Intercity Rail: *Roadmap for Implementation*

May 2, 2024

The University of Texas at Austin
Community and Regional Planning
School of Architecture