BNSF and C/AV
(Connected and Automated Vehicles)

French Thompson III
Director, Public Projects
### Various Interested/Impacted Teams

<table>
<thead>
<tr>
<th>Public Projects</th>
<th>Signal/Telcom</th>
<th>Technology Services</th>
<th>Operations</th>
<th>Hub Ops</th>
<th>#Affairs (Public, State, Federal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Grade Crossing Safety</td>
<td>• Grade Crossing Safety</td>
<td>• Systems Support</td>
<td>• Safety</td>
<td>• Hub Safety</td>
<td>• Public Policy</td>
</tr>
<tr>
<td>• Public Policy</td>
<td>• Public Policy</td>
<td>• Research and Development</td>
<td>• Moving Block</td>
<td>• Efficiency</td>
<td>• Piecemeal Legislation</td>
</tr>
<tr>
<td>• Public Infrastructure &amp; Investments</td>
<td>• PTC/NCS Infrastructure</td>
<td></td>
<td>• Semi Autonomous Trains</td>
<td>• and Velocity</td>
<td>• Productive Rule Making</td>
</tr>
</tbody>
</table>
3 Distinct “Spheres” of C/AV Development:

1. **Public Policy** – Local, State and Federal policy development – requires high participation level
2. **Research and Academia** – Silicon Valley types and Universities are developing tech and ideas in a utopian state
3. **Private industry** – Primary interest lies in the monetization of the technology through production, or efficiency gains

BNSF Operates at the intersection of these “Spheres”

Our Challenge and Opportunity: to reside in the “Sweet Spot”
CAV guidance and navigations systems *should limit vehicle-train interaction* through emphasis in routing to *grade separated crossing* locations.

In design of systems for CAV infrastructure, at-grade highway-rail crossings should be treated as a *dynamic intersection for CAVs to navigate*, e.g. work zones.

Railroads *shall not be responsible for* facilitating *communication with CAVs* at highway-rail intersections.

Railroad right-of-way is *reserved for railroad infrastructure* to ensure customer demands are met and to support future expansion needs.

Modal equity: *Users of infrastructure should* be the primary source to *pay for the implementation and maintenance* of that infrastructure.
CAV Interaction at Highway-Rail Grade Crossings
The greatest **safety** improvement for at-grade highway-rail crossings will come from autonomous technologies reducing distracted driving incidents.

FRA and DOT offices must ensure **consistent** technical standards and regulation to support integration of connected and autonomous vehicles navigating grade crossings.

94% of at-grade crossing accidents are human factor related¹.

---

¹Source: Various studies on at-grade crossing accidents.
Dynamic Intersections

- Highway-rail grade crossings must be treated as a dynamic intersection for CAVs to navigate, e.g. work zones, with a closed-loop safety system for detecting rail traffic
- CAV navigation systems must **prioritize** utilizing grade separated crossing locations
- Considerations for both passive and active at-grade crossings
Positive Train Control – Not for CAVs

- PTC is a **rail traffic control system** that uses radio communication and railroad based servers to prevent certain train to train collisions and over speeding.
- PTC has no capability to communicate with highway vehicles.
- For **safety and security** of railroad operations, railroads will not make such communication accessible to non-railroad entities.
- Installation and modification costs for new vehicle to infrastructure exchanges must be borne by the **road authority** accommodating CAVs.
Modal Equity
Railroads Reduce Highway Congestion

One BNSF intermodal train removes more than 280 long-haul trucks from our nation’s highways
Successful freight movement involves seamless interaction with all other modes

BNSF handles 5 million trucks per year at intermodal facilities across our network

Many automated systems and inspection technologies for facilitating connected and autonomous trucks have already been implemented
Preparing for a CAV Future

States must work with U.S. DOT and the private sector to form advisory groups for a national multimodal discussion.

**Collaborative** approach with U.S. DOT, academia, and the rail industry to institute compatible CAV technology that ensures equitable automation and digitization alignment across all modes of transportation.

Agencies must provide **oversight** for testing and deployment of CAV technology.
• How do these polices address private facilities vs public ROW?
• Are there incentives BNSF can leverage for our own gain?
• What real world testing is happening and where does it interest BNSF’s ROW?
• What is on the Horizon?
BNSF is the reliable constant for people who need us to never stop moving.