

Ethanol Rail Transportation Review



STB Rail Energy Transportation Advisory Council

June 12, 2008

Paul Hammes – VP & GM Agricultural Products

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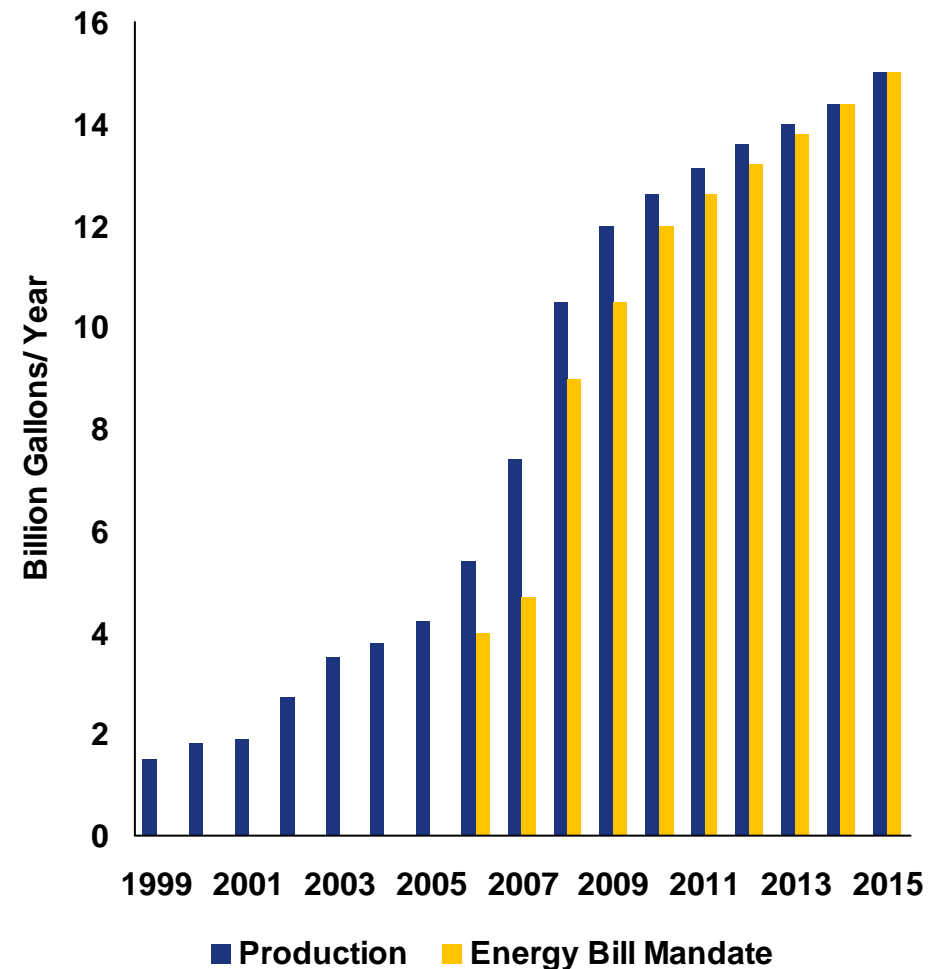
Ethanol Rail Transportation Review

- **Ethanol Market Overview**
- **Ethanol and DDGS Impact on Rail Network**
- **Ethanol Supply Chain Components**
- **Potential Ethanol Supply Chain Constraints**
- **Managing Ethanol Rail Transportation**

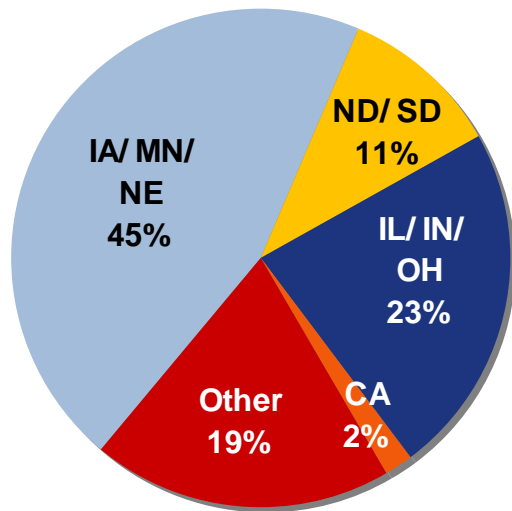
Ethanol Demand Drivers

- **RFS Mandate**
 - Political
- **MTBE**
 - Ban
 - Liability
- **Extend Gasoline Stocks**
 - Economics
 - Limited Refining Capacity
- **Octane Efficiency**

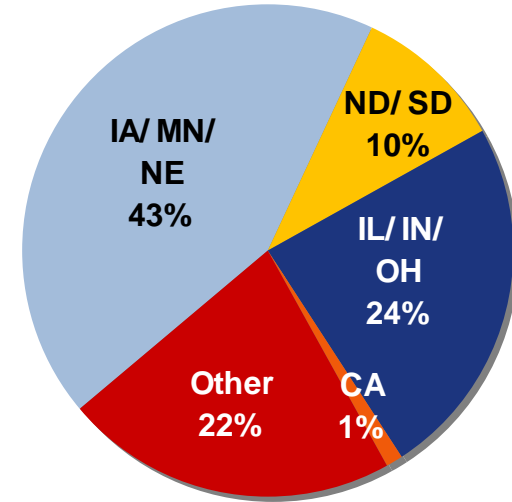
U.S. Ethanol Production Capacity



Ethanol Production and Demand Markets



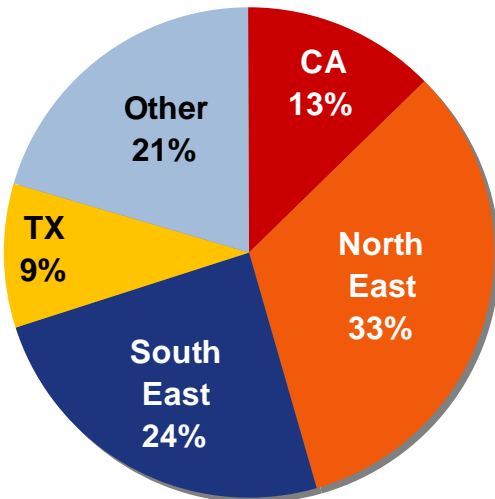
Production



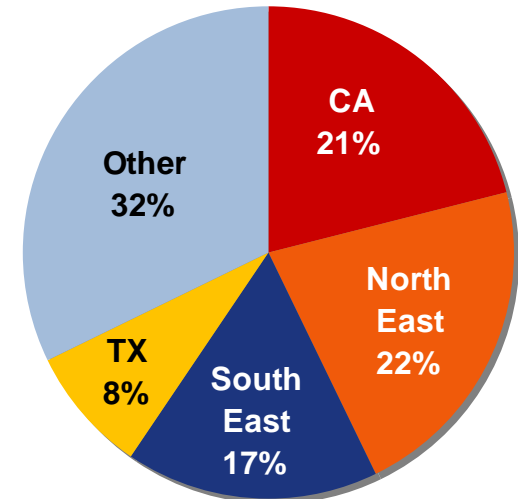
2008



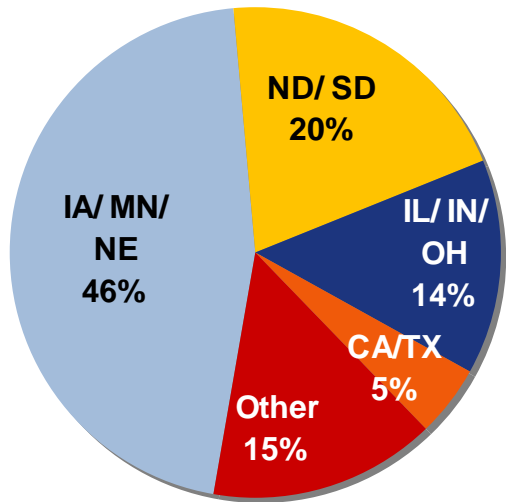
2015



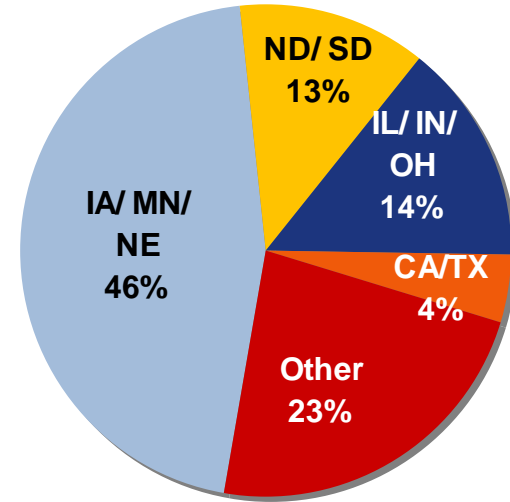
Demand



DDGS Production and Demand Markets



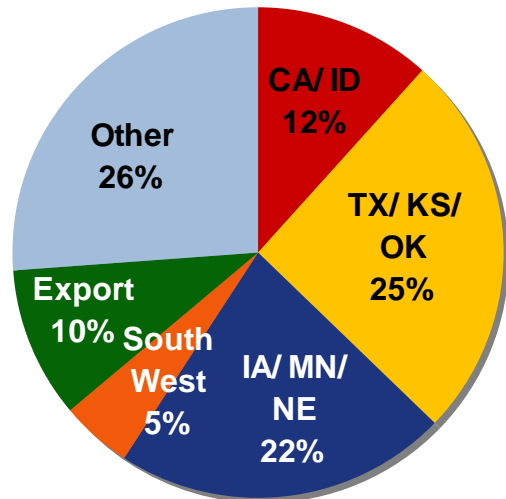
Production



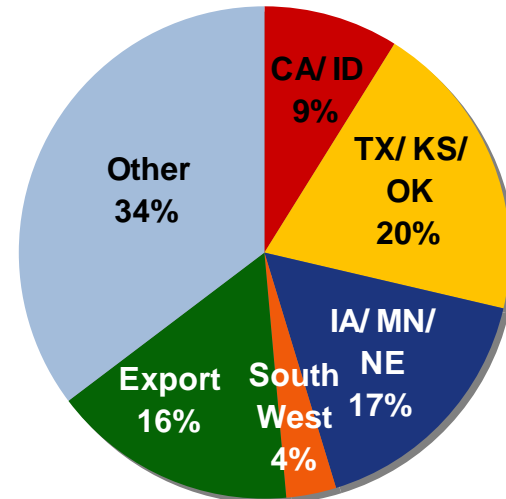
2008



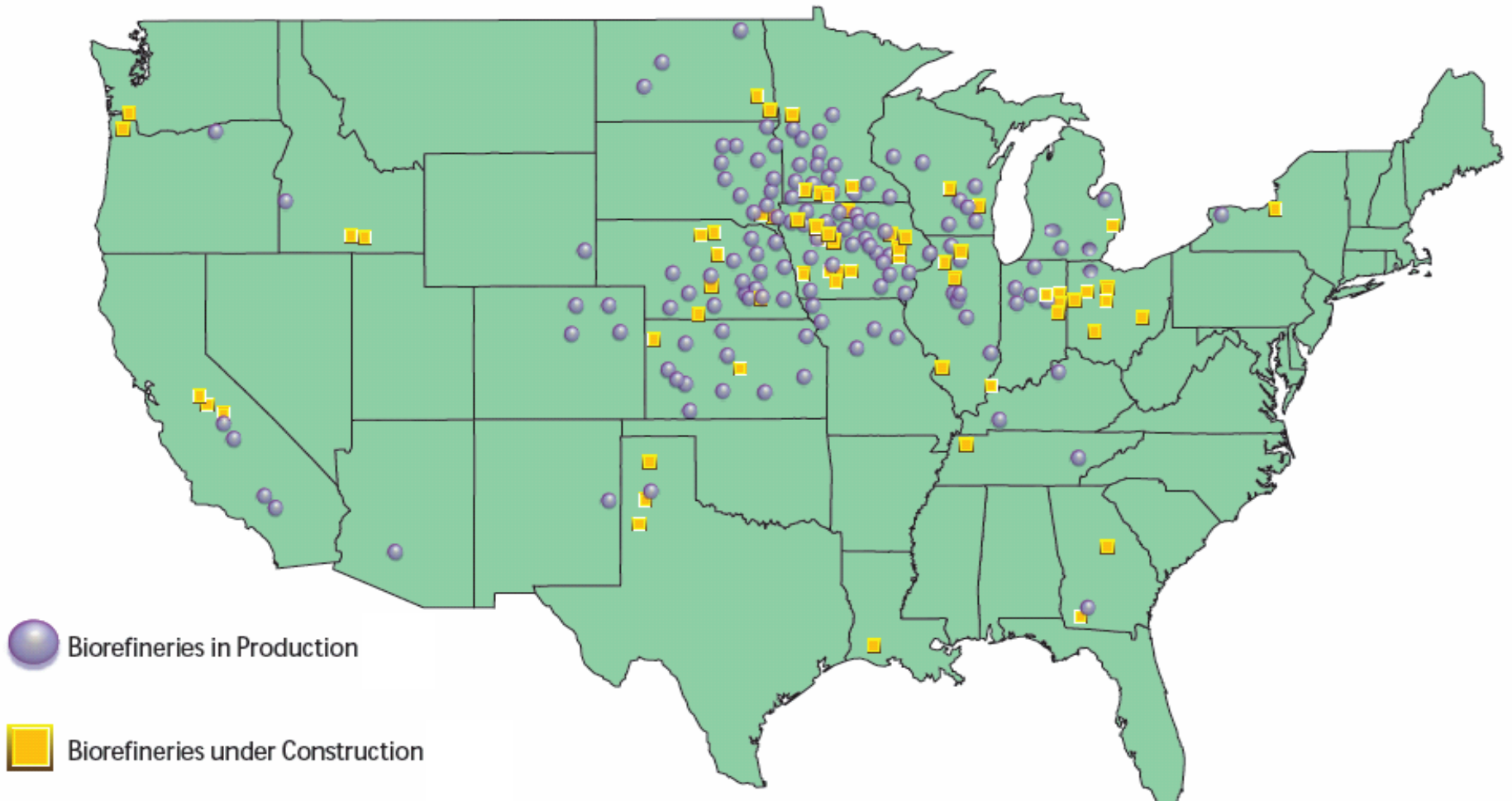
2015



Demand

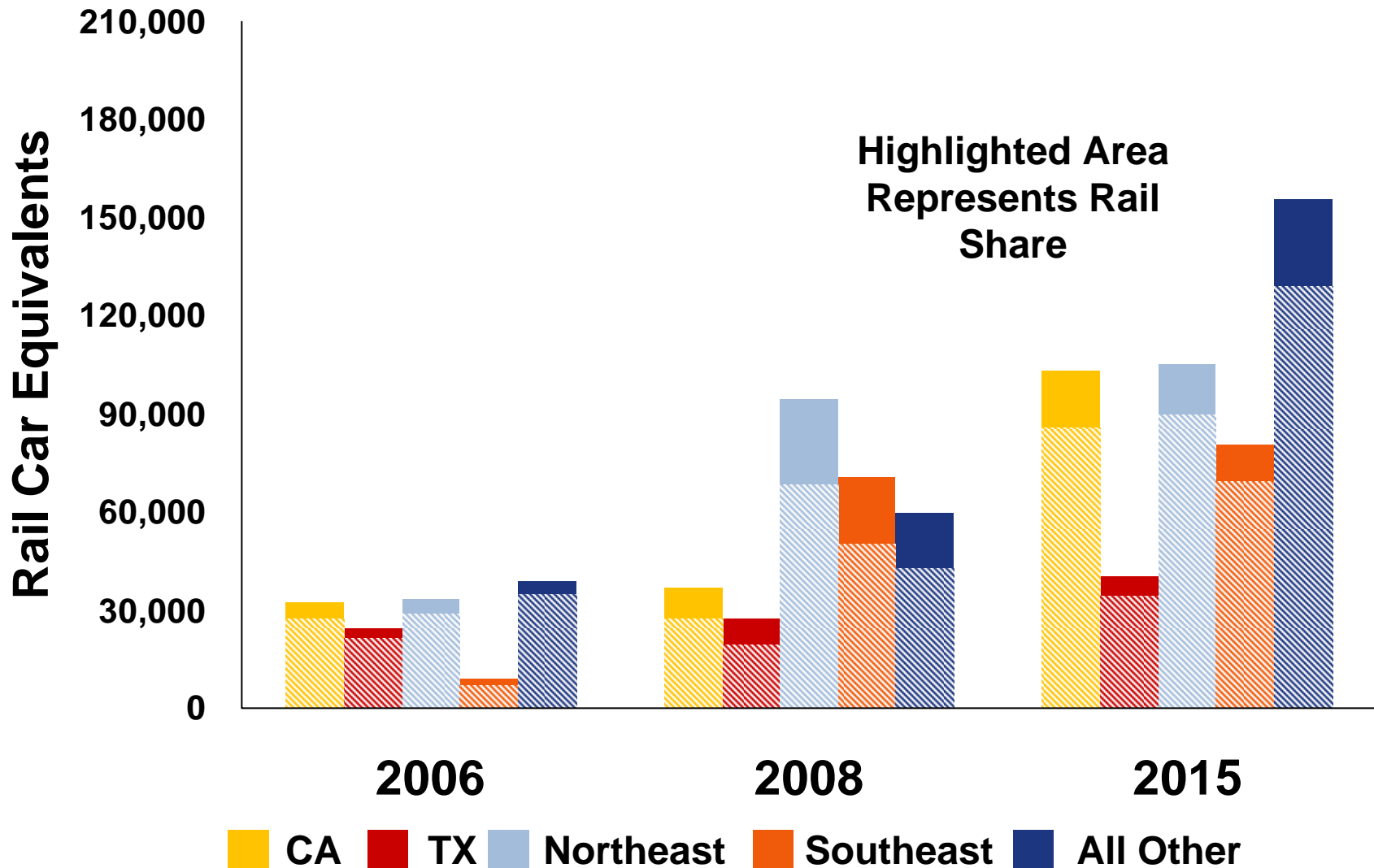


US Ethanol Biorefinery Locations



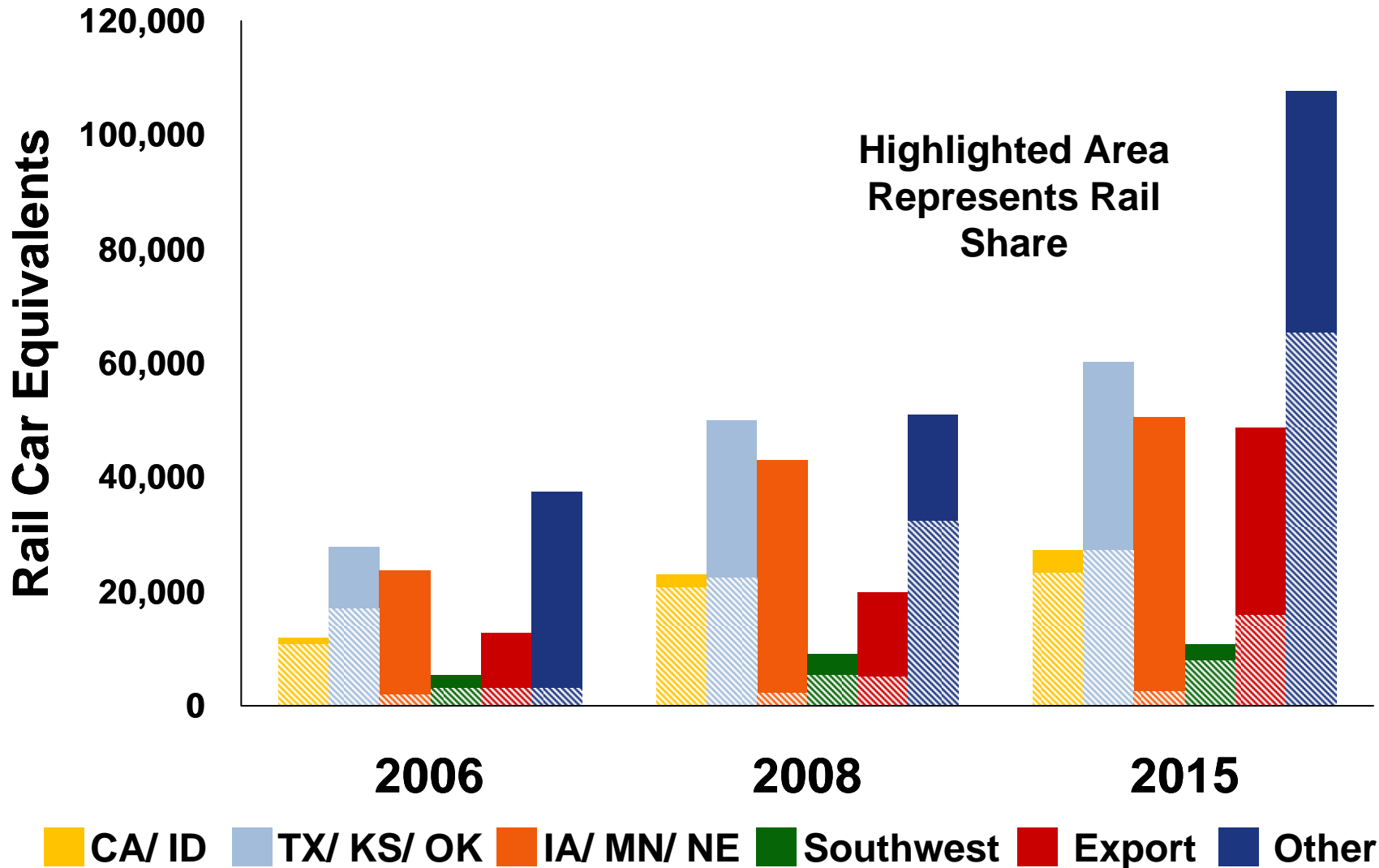
Ethanol Supplied by Rail

Rail Share of Total Ethanol Demand by Region



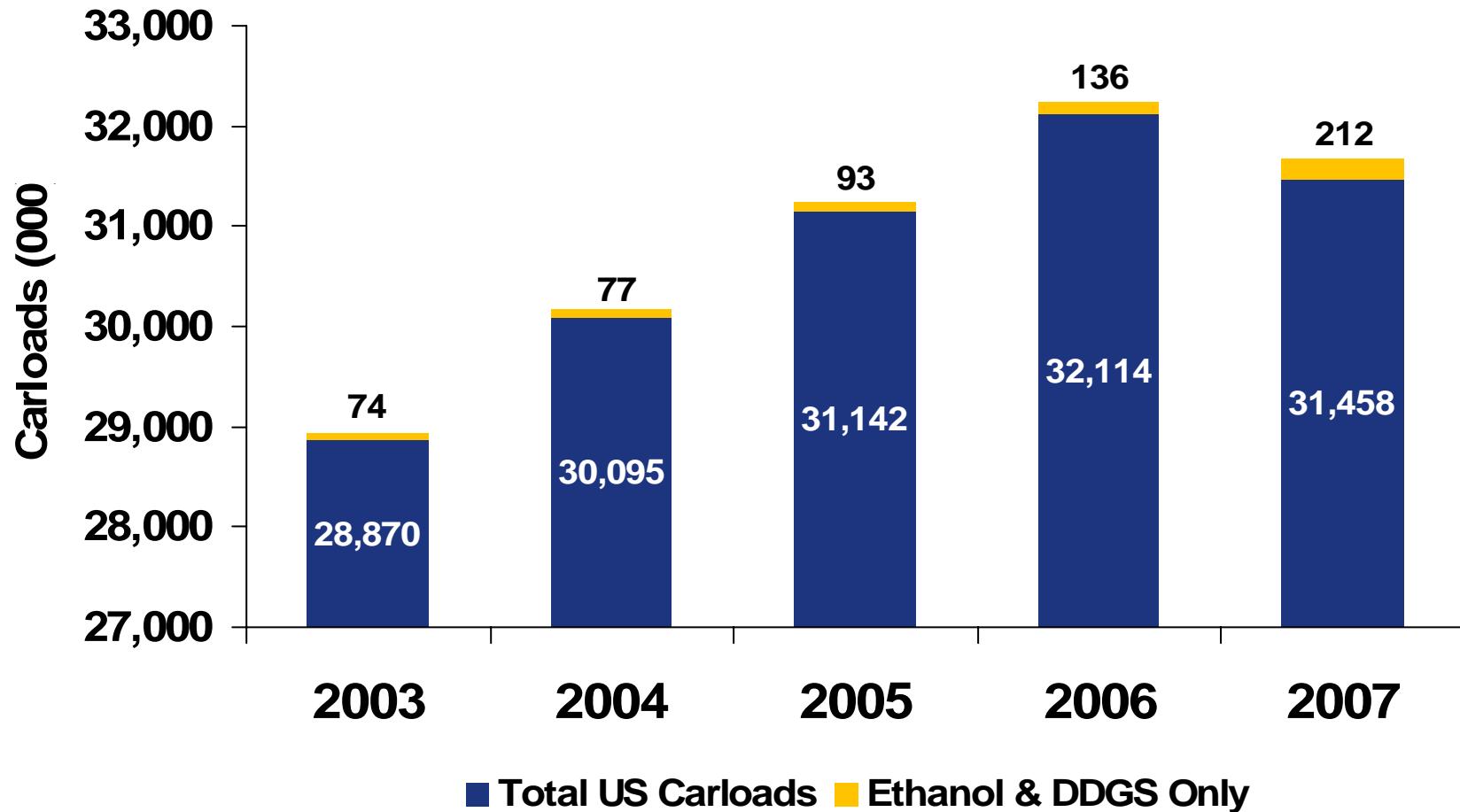
DDGS Supplied by Rail

Rail Share of Total DDGS Demand by Region



Ethanol & DDGS Impact on US Rail Volume

2003 - 2007



Ethanol Supply Chain Components

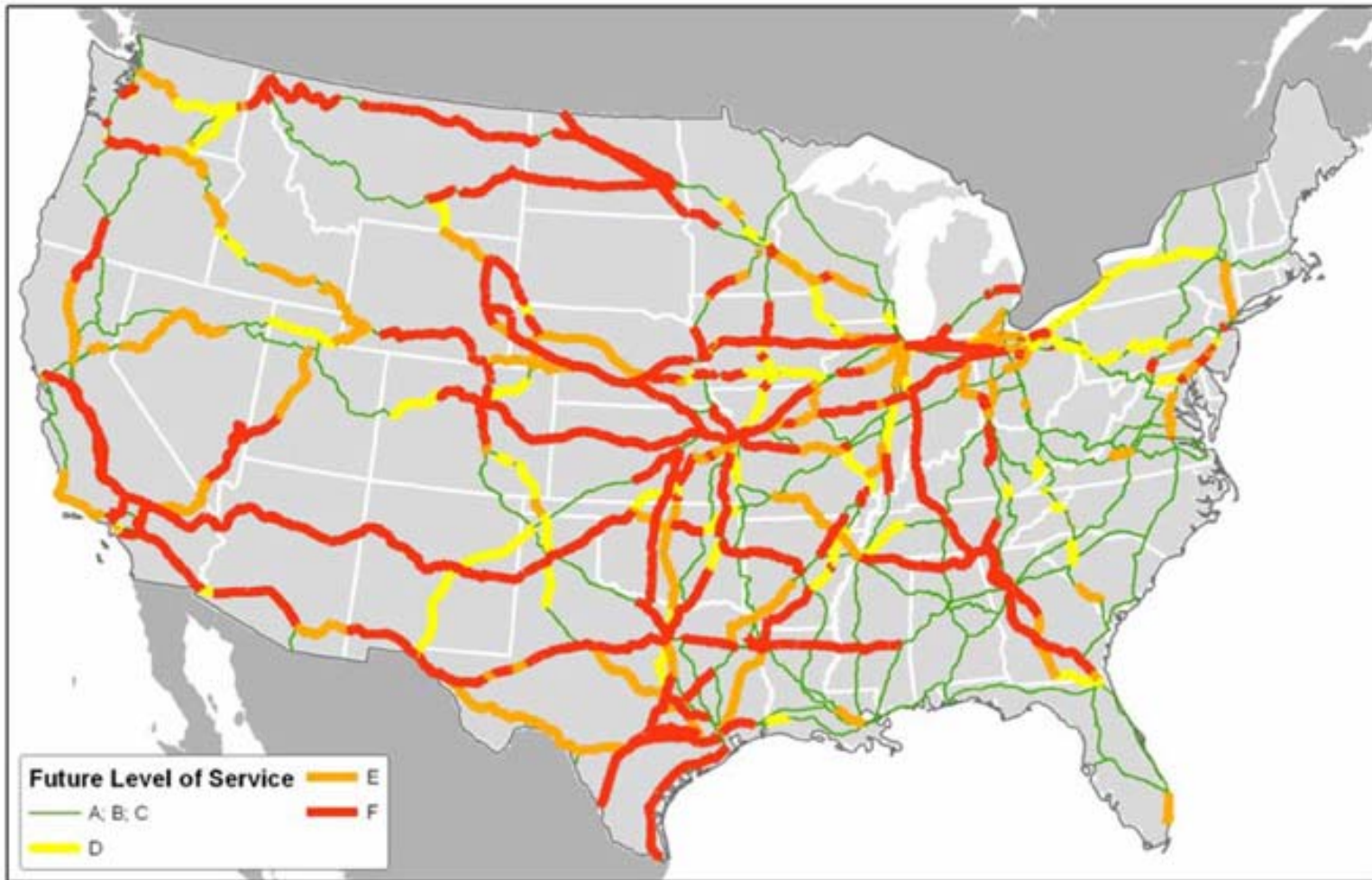
- **Production Plant**
 - 55 MGY generates 5 cars each of ethanol and DDGS per day
 - Track infrastructure
- **Tank Cars**
- **Rail Network**
 - Manifest/Gathered-Combo/Unit
 - Terminal Yards/Line haul
- **Unload Terminal**
 - Unload System and Tank Storage
- **Truck Rack**

Potential Ethanol Supply Chain Constraints

- **Rail Line Capacity**
- **Rail Terminal/ Yard Capacity**
- **Unit vs Manifest Shipments**
- **Terminal Unload Capacity**
- **Pipeline Management**
- **Tank Cars**
- **Storage Capacity**

Future Corridor Volumes Compared to Current Corridor Capacity

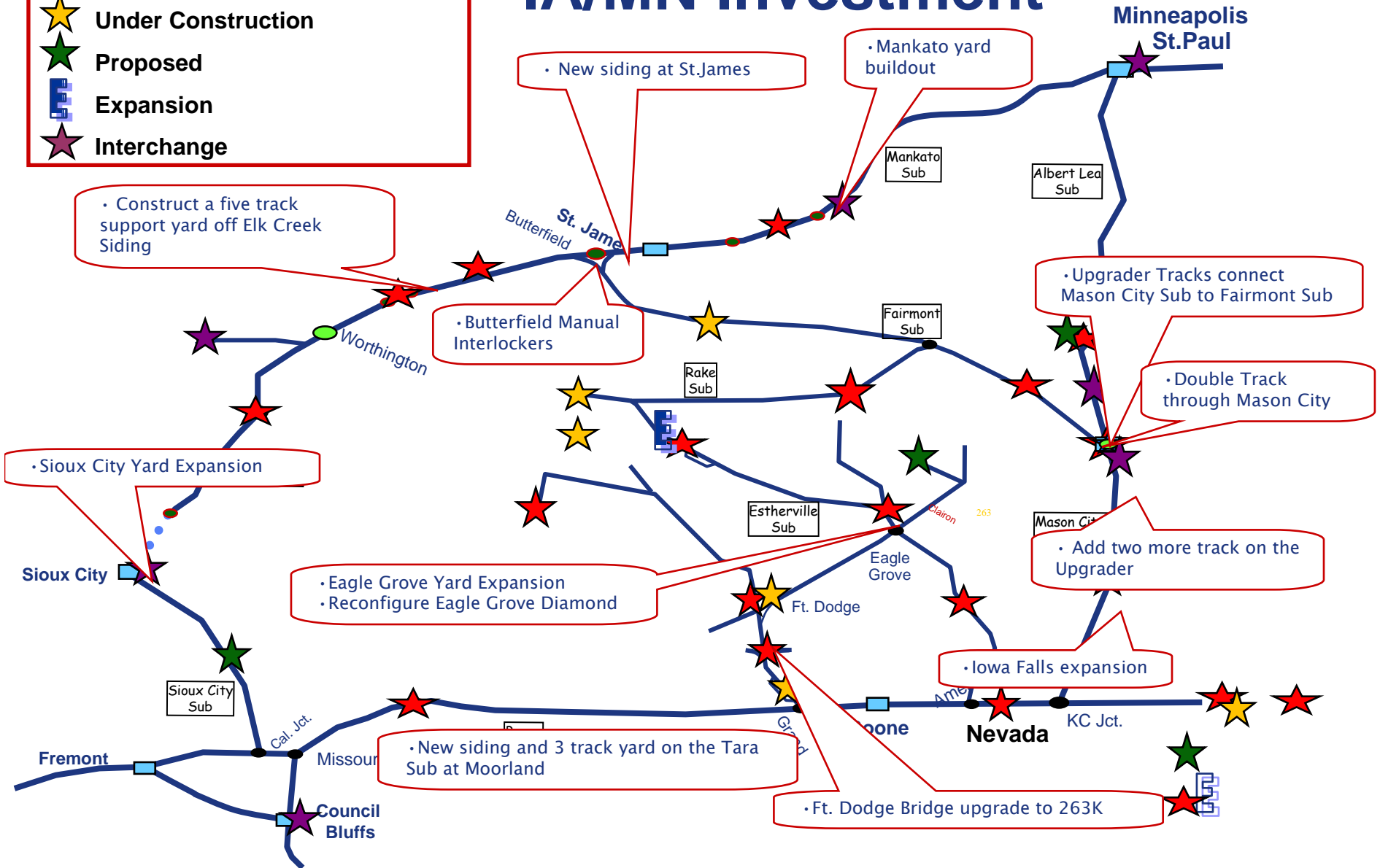
2035 Without Improvements



Note: Volumes are for the 85th percentile day

IA/MN Investment

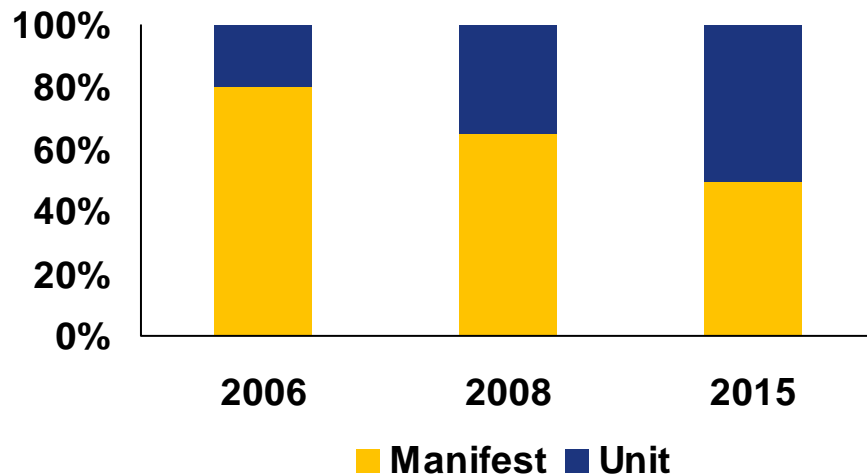
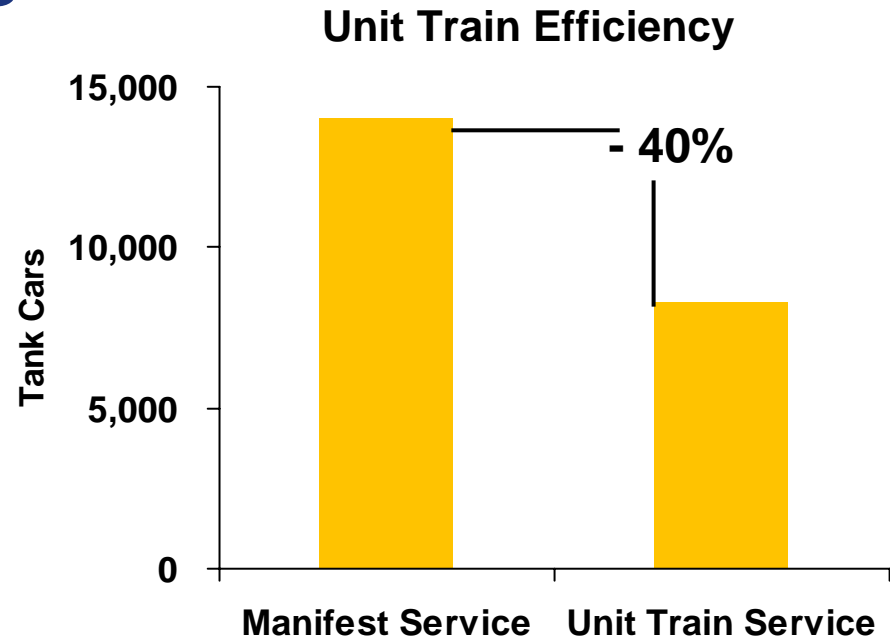
-  Active UP
-  Under Construction
-  Proposed
-  Expansion
-  Interchange



Unit Train Efficiencies

Efficiency Example Assumptions

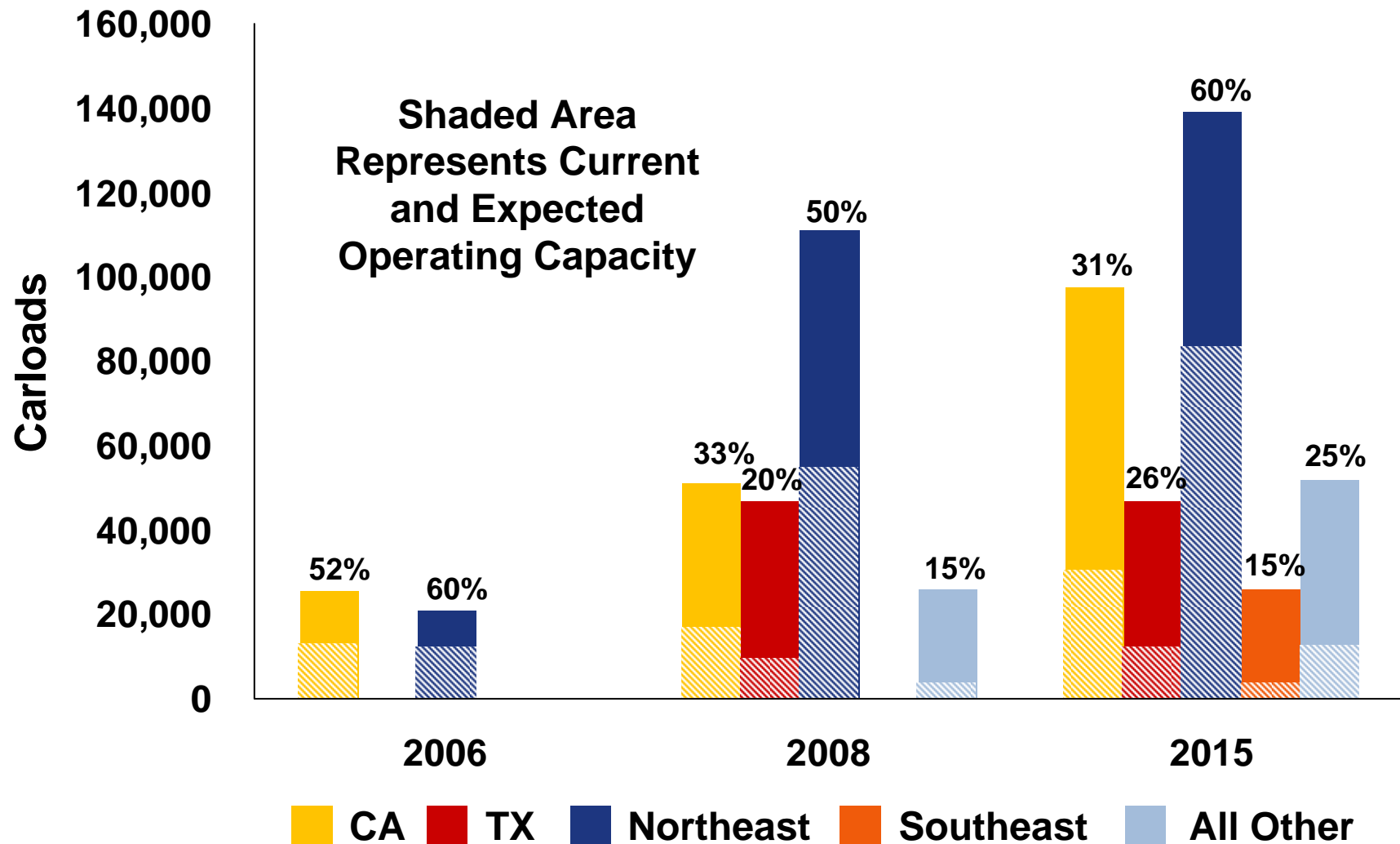
- Using 2007 AAR Ethanol data
- 40% Reduction in Tank Cars if Volume Moved Via Unit Trains



- Unit vs Manifest Breakdown for US Ethanol Industry

Estimated Unit Train Terminal Capacity

Maximum vs Current or Forecasted



Constraints

Constraint	2006	2008	2015
Tank Cars	Red	Green	Green
Terminal Load out	Yellow	Green	Green
Unit vs Manifest Shipments	Red	Yellow	Green
Rail Terminal/ Yard Capacity	Red	Green	Yellow
Rail Line Capacity	Red	Yellow	Red
Terminal Unload Capacity	Red	Yellow	Green
Storage Capacity	Yellow	Yellow	Green

■ Constraint
 ■ Marginal
 ■ No Constraint

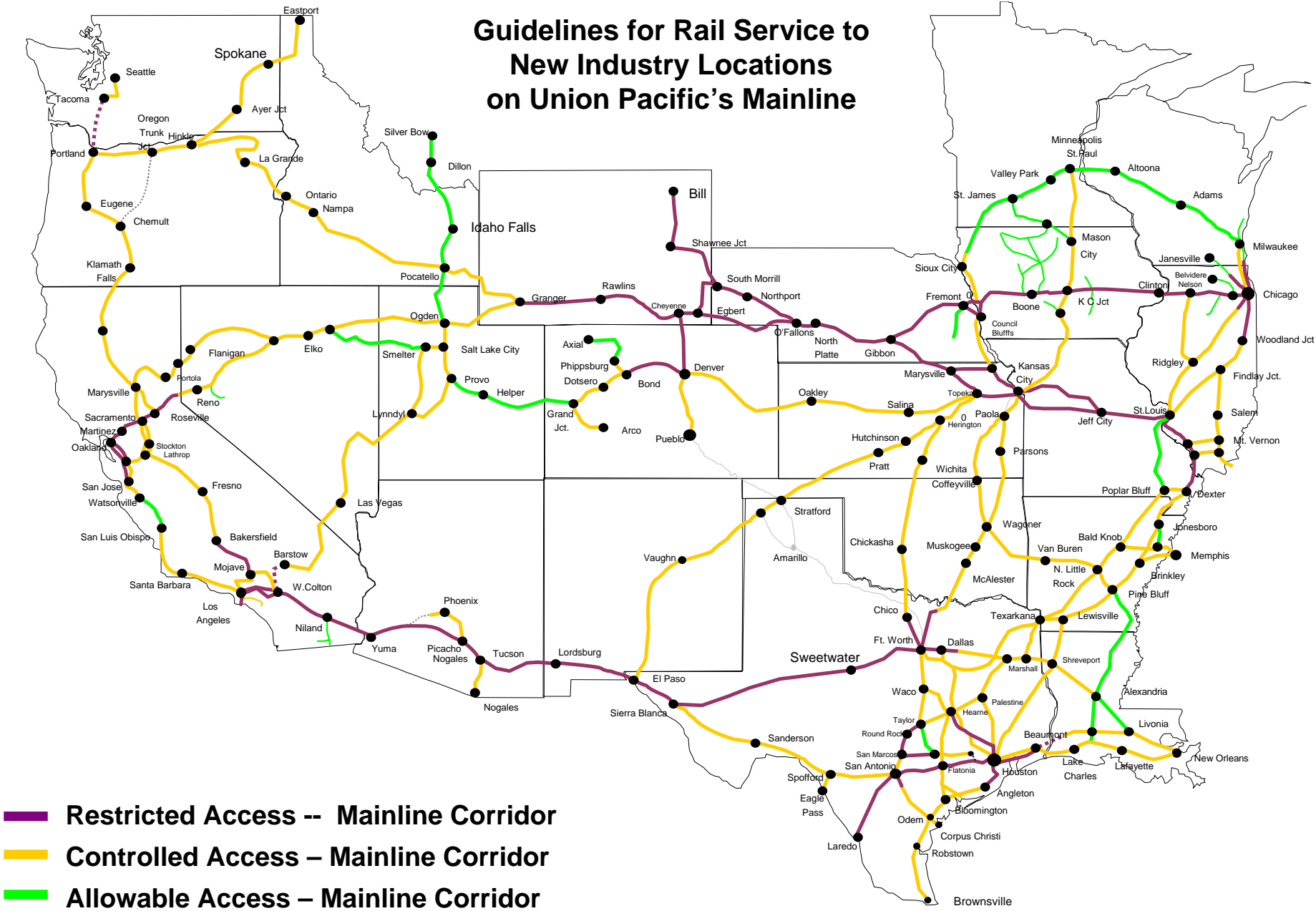
Managing Ethanol Rail Transportation

- **Resource and Capacity Planning**
- **Pipeline Management**
- **Tactical Management Tools**

Resource and Capacity Planning

- **Site Development Assistance**
- **Guidelines for Rail Service to New Industry Locations**
- **Rail Access Approval Process**
 - **Links to Operating, Network Planning, Service Design, Engineering and Commercial Teams**
- **Capacity and Resource Evaluation**

Guidelines for Rail Service to New Industry Locations on Union Pacific's Mainline



Rail Access Process

- **Industrial Development contacted during site selection**
- **Commercial Team assesses rail transportation needs and requirements**
- **10% Conceptual Drawing sent for approval**
- **Customer Service Profile submitted**
- **Memorandum of Understanding issued**
- **Exhibit A Prints / Construction Drawings submitted**
- **Track Inspection completed**
- **Industry Track Contract issued**

Pipeline Management

- **Ethanol Shipment Forecasting System**
- **Loaded and Empty Unit Train Coordination**
- **Tactical Management Tools**

Ethanol Shipment Forecasting System

- 30 Day Rolling Forecast
- Update System as Changes Arise
- Provide Trace and Buffer Cars in System 24 Hours Prior to Release
- Provide Billing Prior to 9A Cutoff

The screenshot displays the 'Union Pacific's Car Release Forecast System' interface. At the top, it features the 'BUILDING AMERICA' logo and the system title. Below the title, there are navigation links for 'Applications', 'Pickup Request System', and 'View Pickup Requests'. The main content area is divided into several sections: 'Origination Information' with fields for 'Plant' (a dropdown menu), 'Pickup Date', 'Request Info' (displaying 'smkt445 (Aaron G. Evans) on 10/11/2007'), and 'Record ID' (displaying 'UPRR-77VMN7'); 'Destination Information' with a 'Destination' dropdown; 'Transport Information' with input fields for 'Number of Ethanol Cars', 'Number of DDG Cars', 'Number of Corn Gluten Cars', 'Number of Corn Syrup Cars', and 'Number of Soy Bean Meal Cars', all currently set to 0; 'Trace Car', 'Buffer Car', and 'Train Symbol' sections, each with an input field and a 'Characters Left' indicator (all showing 11); a 'Notes / Additional Details' section with a large text area and a 'Characters Left' indicator (showing 255); and a 'Unit Train or Unit Sweep With' dropdown menu with an example '(Example: City, State)'. There are also checkboxes for 'Entered in BTP'. At the bottom, there is an 'Edit History' section and 'Cancel', 'Delete', and 'Submit' buttons.

Ethanol Shipment Forecasting System

Compliance

- Power Plan
- Crew Availability
- Corridor/ Terminal Capacity
- Train Slotting

Non-Compliance

- Power Imbalances
- Recrews/ Extras
- Crew Imbalances
- Power Repositioning
- Increased Fuel Consumption

Unit Train Coordination

- **Customer Input into Forecast System**
- **Bulk Train Planner symbols Unit Train**
- **Weekly Communication with Load Facilities**
- **Resource Planning Based on Customer Forecast**
- **Daily Communication with Eastern Carriers**
- **Daily Communication with Unload Terminals**
- **Power Placement**
- **Crews Forecasted Several Days**

Tactical Management Tools

- **Bulk Train Planner (BTP)**
 - Real Time Unit Train Monitoring
 - Efficient Coordination of Unit Train Resources
- **Customer Inventory Management System (CIMS)**
 - Proactive Management of Customer Car Flow
- **Customer Operating Instructions (COI)**
- **Permit Distribution System (PDS)**
 - U.S. Development Group (USD) System
 - Schedule and Control Traffic Flow into USD Terminals



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