



Ethanol

A prototype you can model

A presentation to the NMRA Rails by the Bay Convention
2021
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Ethanol -- background

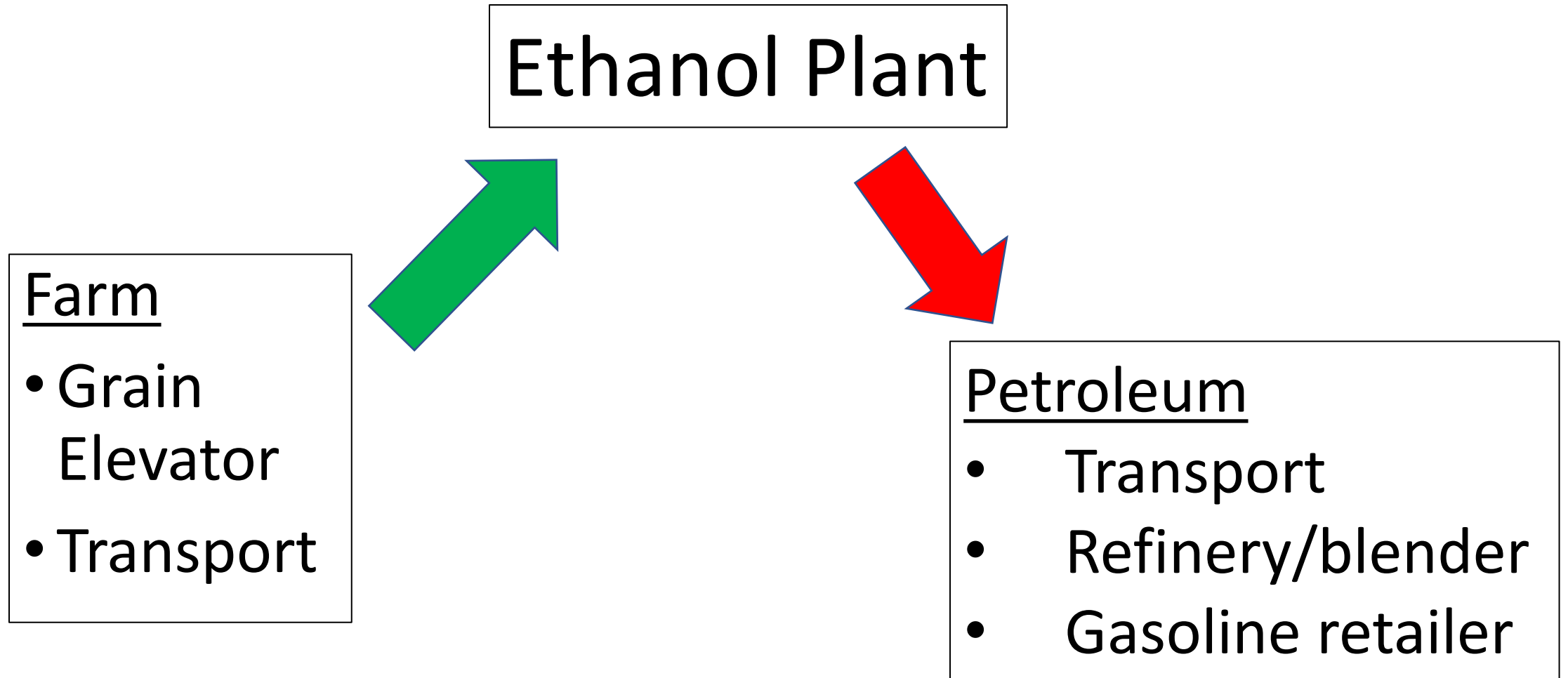
- Gasoline additive -- reduces carbon monoxide
- Usage mandated by clean air and energy laws
- Widely used in 21st Century
- Street name – white lightning



Ethanol: Feedstocks

- Corn
- Sugar cane
- Sugar beets
- Sorghum
- Barley

Ethanol Supply Chain: Overview





Ag production: Grain elevator

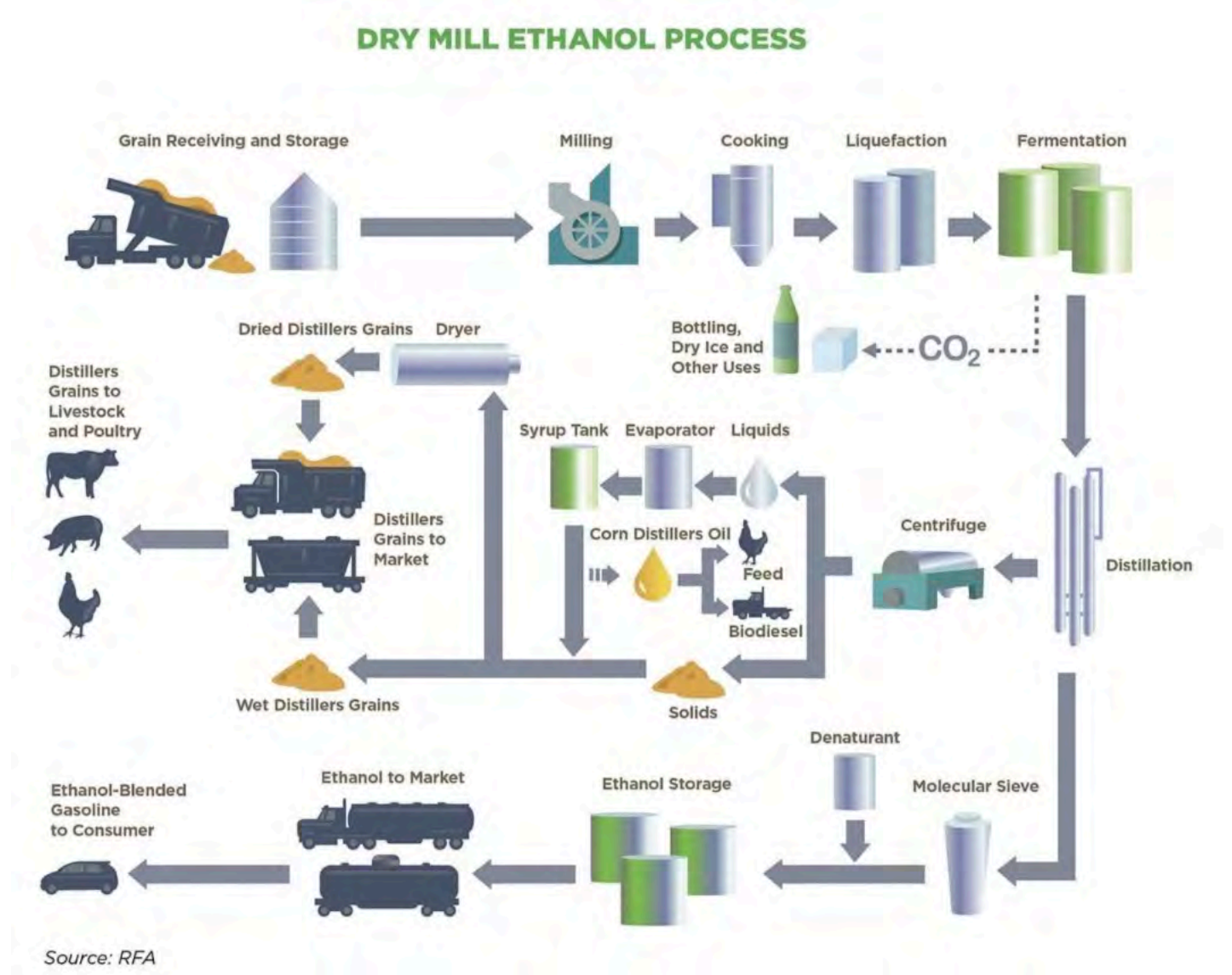
Ag transport: Grain truck



Ag transport: Covered hopper rail car



Ethanol – production process



Natural gasoline – DOT-112 pressurized tank car





Ethanol plant design and operation

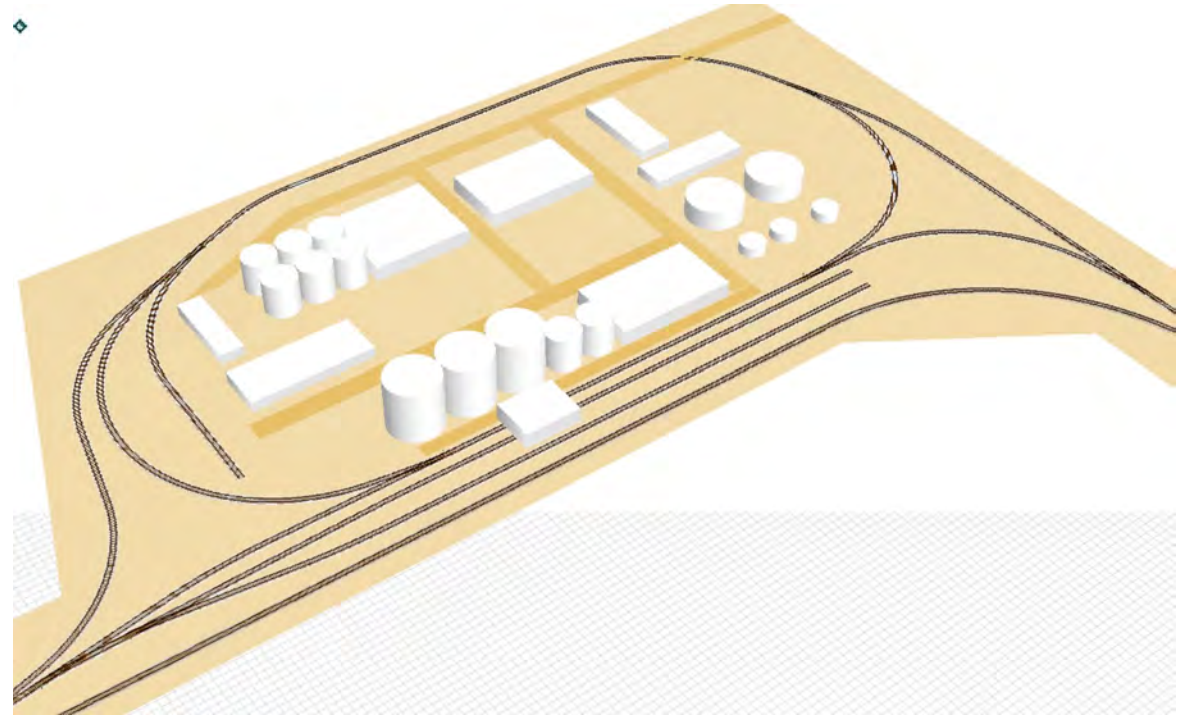
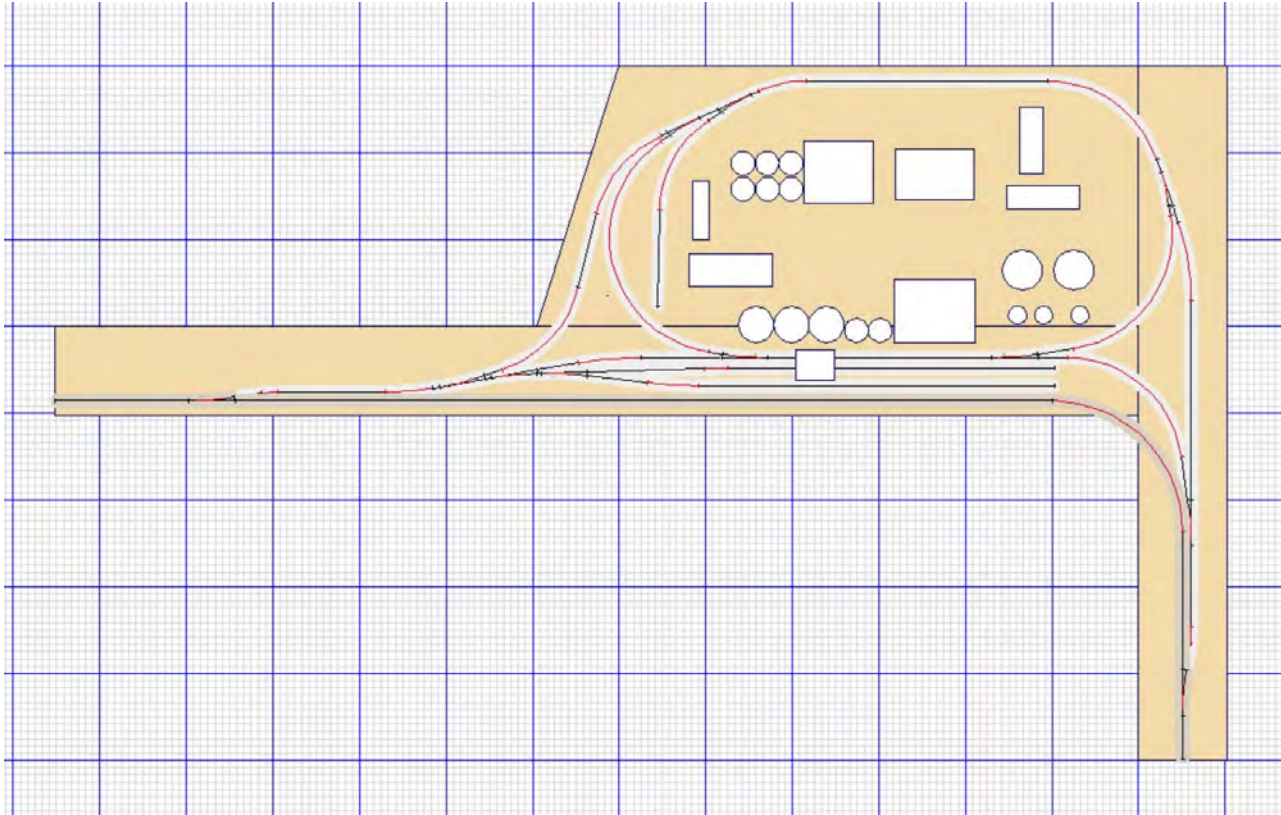
Ethanol: 100 million gal/yr plant INBOUND

- 25-28 hopper cars of corn/day. Can also receive corn by truck.
- 1 tank car of natural gasoline - one per week. Used as denaturant. A week's worth of storage 2% of finished product. (DOT-112)
- Source: <http://www.ethanolproducer.com/articles/5462/the-ethanol-line> and interviews with industry sources

Ethanol: 100 million gal/yr plant OUTBOUND

- 10 tank cars of ethanol/per day (DOT-111)
 - 8 covered hopper cars/day of distillers dried grains with solubles (DDGS).
 - 2 tank cars of corn distiller's oil every three days. (DOT-111)
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- Source: <http://www.ethanolproducer.com/articles/5462/the-ethanol-line> and interviews with industry sources

Ethanol: Modeling – N scale

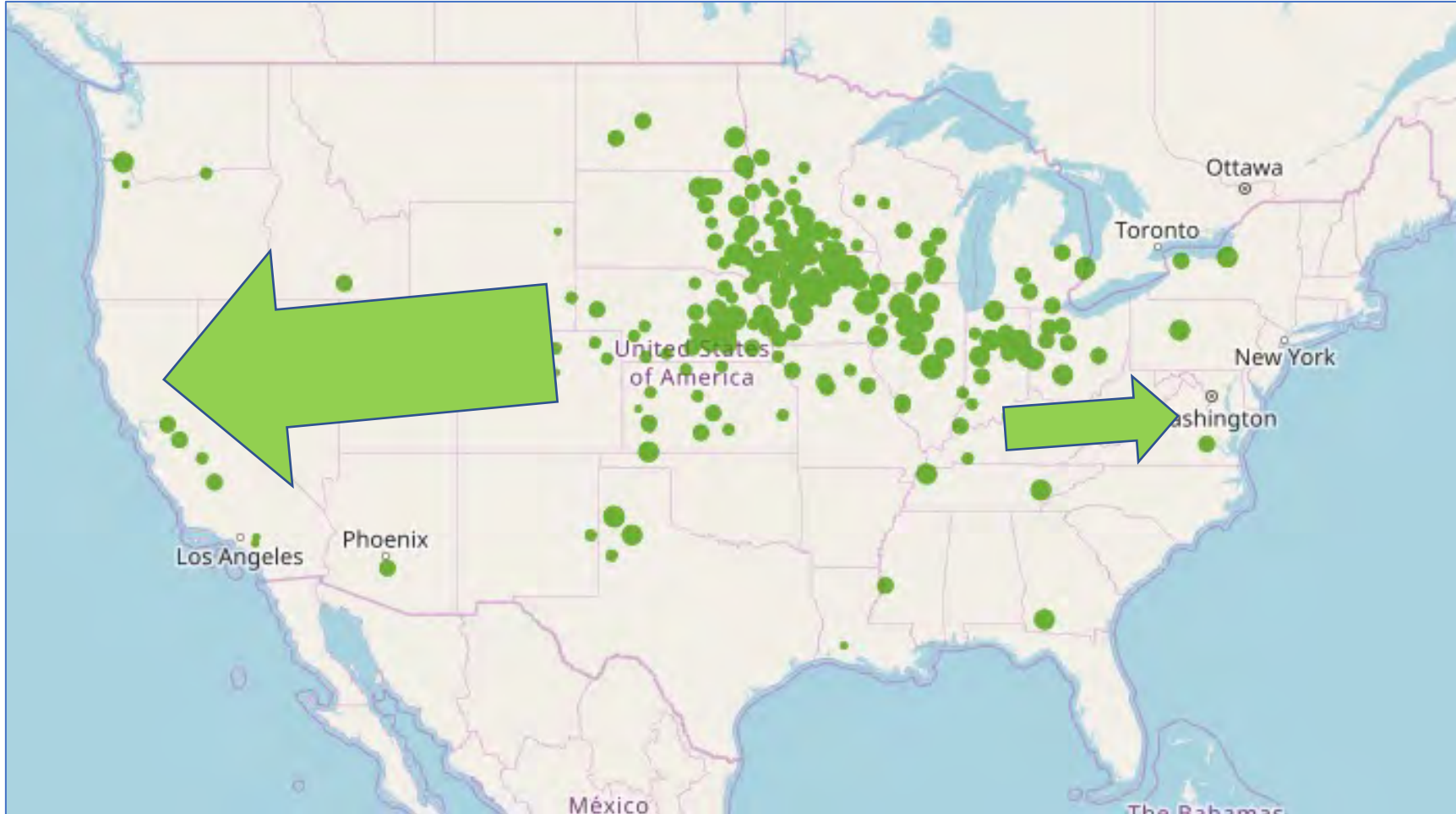


Track plan by Steven Cox, used with permission



Ethanol transport: DDGS

Ethanol transport: the logistics challenge



Map source: U.S. Dept. of Energy

Plants in the Midwest – consumers on the Coasts

Ethanol: transport

Tank car unit
train





Key element:
tank car

Prototype – DOT-111, CPC-1232
general service tank car

Key element: tank cars

Specifications – DOT 117 - Greenbrier

- Capacity: 30,400 gallons (714 bbl)
- weight: 286,000 lbs. gross weight
- length: 60' 3-1/2"
- width: 10' 7.875"
- height: 15' 6"
- AAR clearance: Plate C



DOT 111A100W1

	STATION STENCIL	QUALIFIED	DUE
TANK QUALIFICATION	GNGM	2014	2024
THICKNESS TEST	GNGM	2014	2024
SERVICE EQUIPMENT	GNGM	2014	2024
PRD: VALVE 75 PSI	GNGM	2014	2024
LINING:			
88.B.2 INSPECTION	GNGM	2014	2024
STUB SILL INSPECTION	GNGM	2014	2024

DE-10	
DE-20	
BLT	05-14



2 INCH HF COMP SHOES

↓ BRAKE CYLINDER
PRESSURE TAP

Modeling
details:

- tank car placard
- stencil



Modeling
detail:

- shelf couplers

Placing tank cars in train consist

- Common rule is 6-deep
- If 6-deep is not possible add a non-placarded buffer car – common with unit trains.



Ethanol: Rolling stock operations

- Corn: covered hopper cars
- Natural gasoline: tank cars
- Ethanol: tank cars
- DDGS: covered hopper cars
- Bio-fuels: tank cars

Ethanol in petroleum - elements

- Rail loading/unloading racks
- Tank cars
- Fencing
- Truck rack – optional but . . .
- Tanks - optional
- Refinery - optional



Ethanol unloading rack



Ethanol key element - fencing



Refinery

- Shell Refinery – Martinez, CA



Blending operations

NuStar blending terminal – Tormey, CA

Tank car logistics at the refinery/blender

- What is the daily production/loadout capacity?
- How many cars are needed/day?
- How many do you need lined up?

Ethanol: structure/detail modeling

- Ag: Grain elevator, grain trucks
- Ethanol plant
- Petroleum side:
 - Refinery/Blender
 - Rail car loading/unloading rack
 - Fencing
 - Gas station, tank trucks



The End: Thank you for your attention!