



THE TIOGA GROUP

Clean Technology Options Overview

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Background: Cargo Growth

- **Cargo growth has exceeded highway and rail system capacity, and demand continues to grow**
- **Port expansion and cargo growth depend on community acceptance**
- **Community acceptance depends on cleaning up the mess we've already made and mitigating further impacts**

2005

2010

2015

2020

Containers: Problem and Solution

Problem

- BC (before containers) cargo moved piecemeal
- Containers improved productivity, economics, safety, service, and security
- Interchangeability led to intermodal minilandbridge service and the growth of Southern California ports

Solution

- Interchangeability permits mixing modes and technologies
- Standardization permits design commonalities

Legacy Highway and Rail System

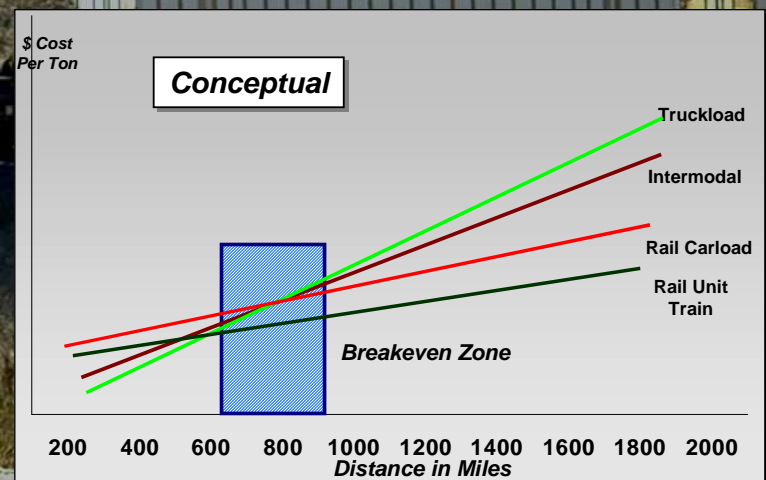
Both highway and rail systems are congested

- **Never built to handle current trade volumes, much less future trade growth**
- **Half is trucked to local or regional destinations**
- **Some portion of the “local” cargo is transloaded to domestic truck or intermodal rail.**
- **On-dock rail limited by infrastructure and rail logistics**
- **Near-dock rail requires 4-20 miles of drayage**

Why double-stack trains from LA/LB?

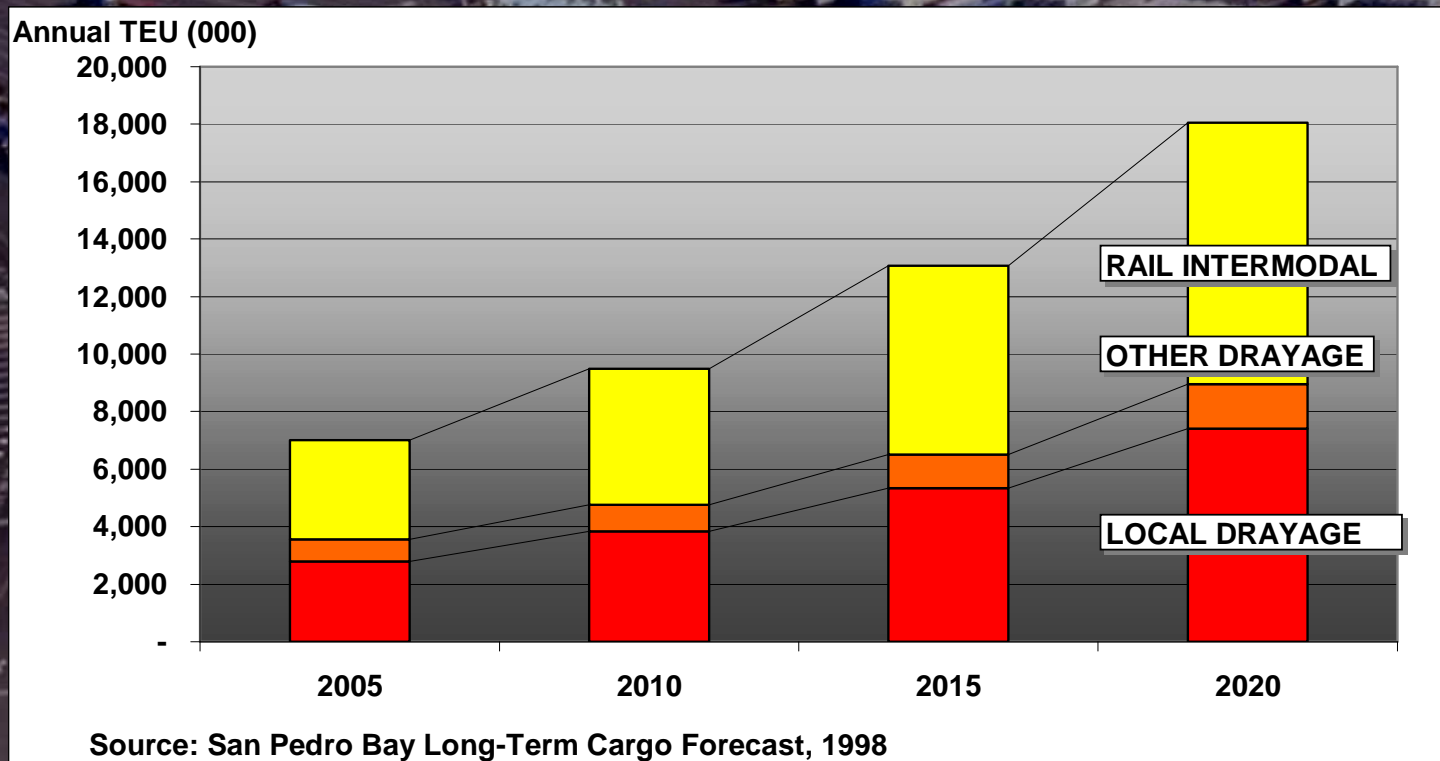
Everyone comes to Southern California anyway...

- First-call vessel service frequency and capacity bring inland loads to LA/LB
- Rail intermodal service is a superior cost and service option for long-haul movements
- Anything East of the Rockies tends to move by rail



The Ports will continue to rely on drayage

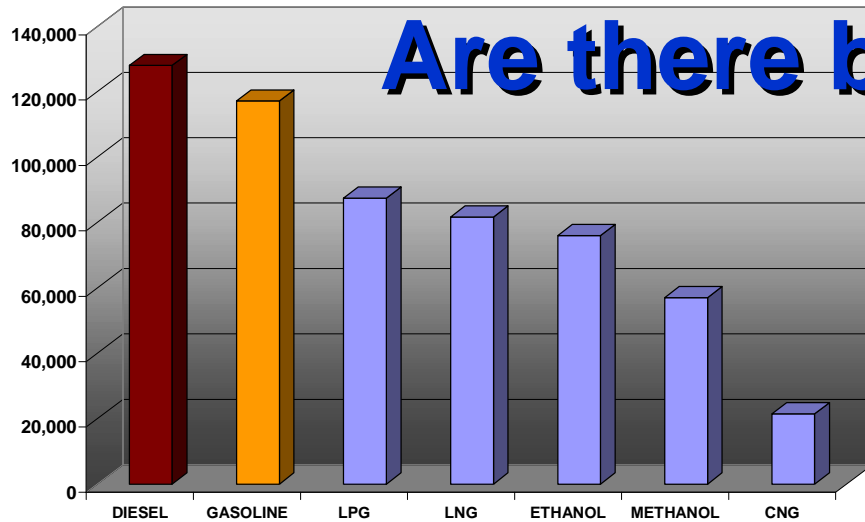
- About 75% of Port traffic is drayed
- At least 50% will be drayed indefinitely



Why conventional diesel tractors?

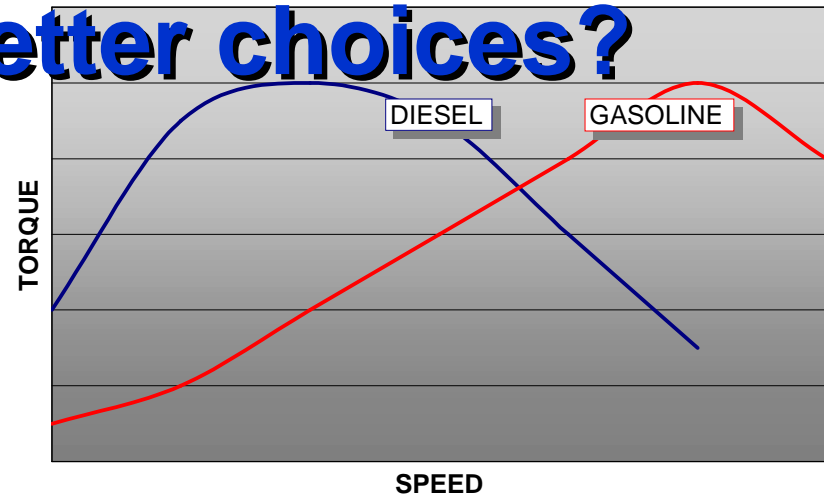
- Flexibility
 - Low capital cost
 - Fuel economy
 - Durability
 - Low-speed torque
-
- 20,000 hand-me-down long-distance tractors
 - Higher emissions, higher fuel use
 - Harder retrofits, poor performance

FUEL BTU PER GALLON



Are there better choices?

COMPARATIVE TORQUE CURVES



Big Picture Options

Clean up what we have

- Truck: Cleaner diesel, alternative fuels, hybrids
- Rail: More on-dock and near-dock, cleaner engines

Shift more to rail

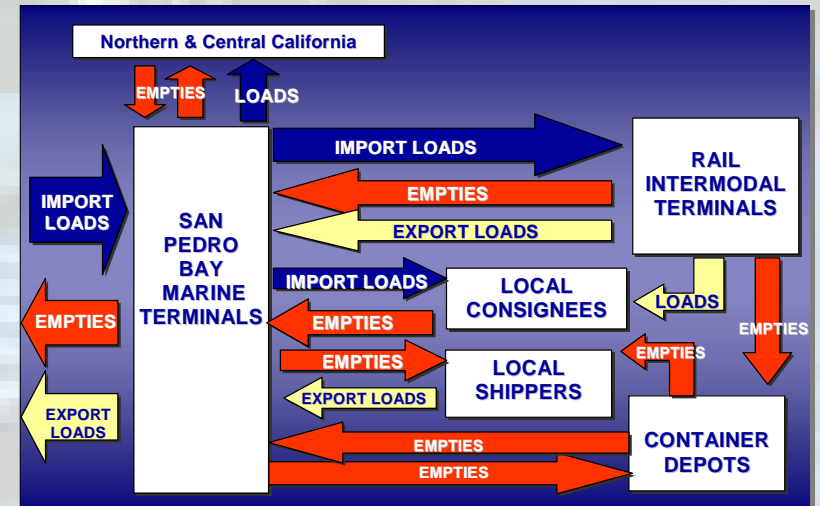
- Southern California rail shuttles
- Short-haul rail markets (e.g. N. California and Arizona)

New Systems

- New line-haul technologies
- New terminal transfers
- New infrastructure

Operational Improvements

- VCYs and empty returns
- Pier Pass & appointment systems



No silver bullet – we need all of them

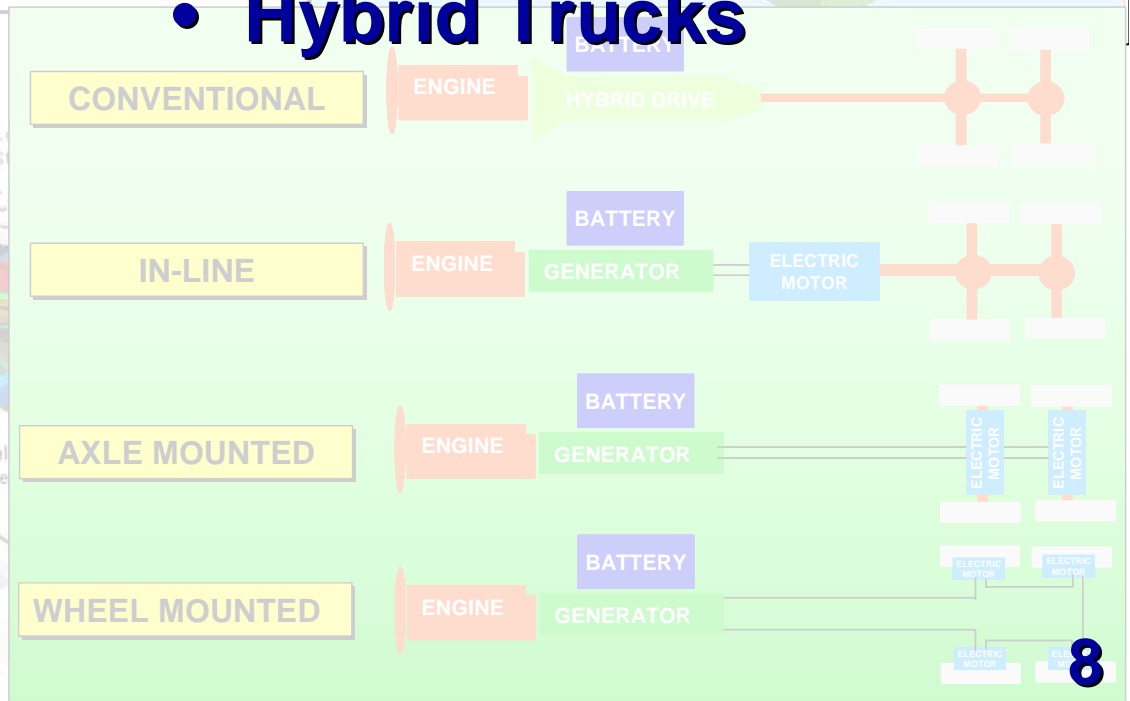
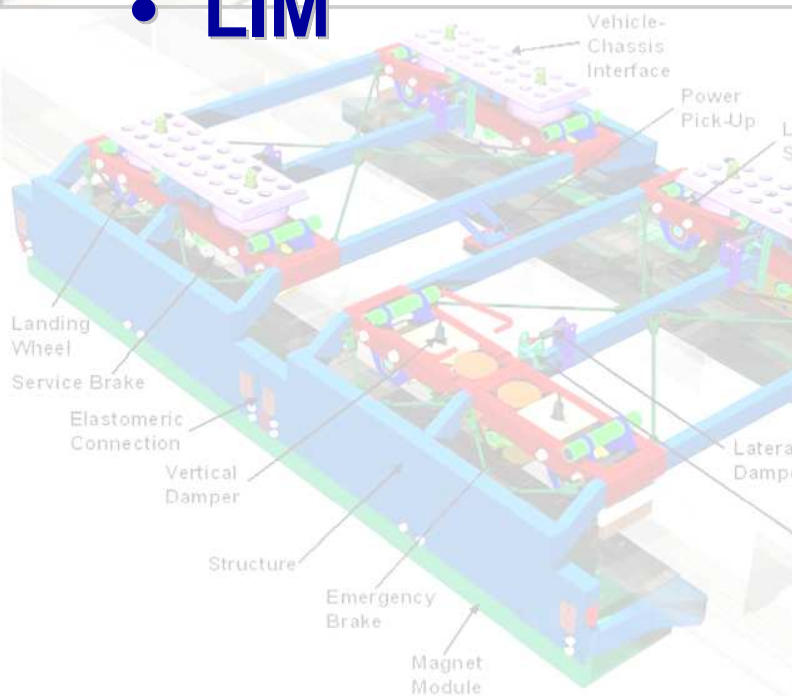
Technology Options

New Technologies

- Dual-mode Trams
- MagLev
- LIM

Improved Technologies

- Locomotives
- Truck Engines
- Hybrid Trucks



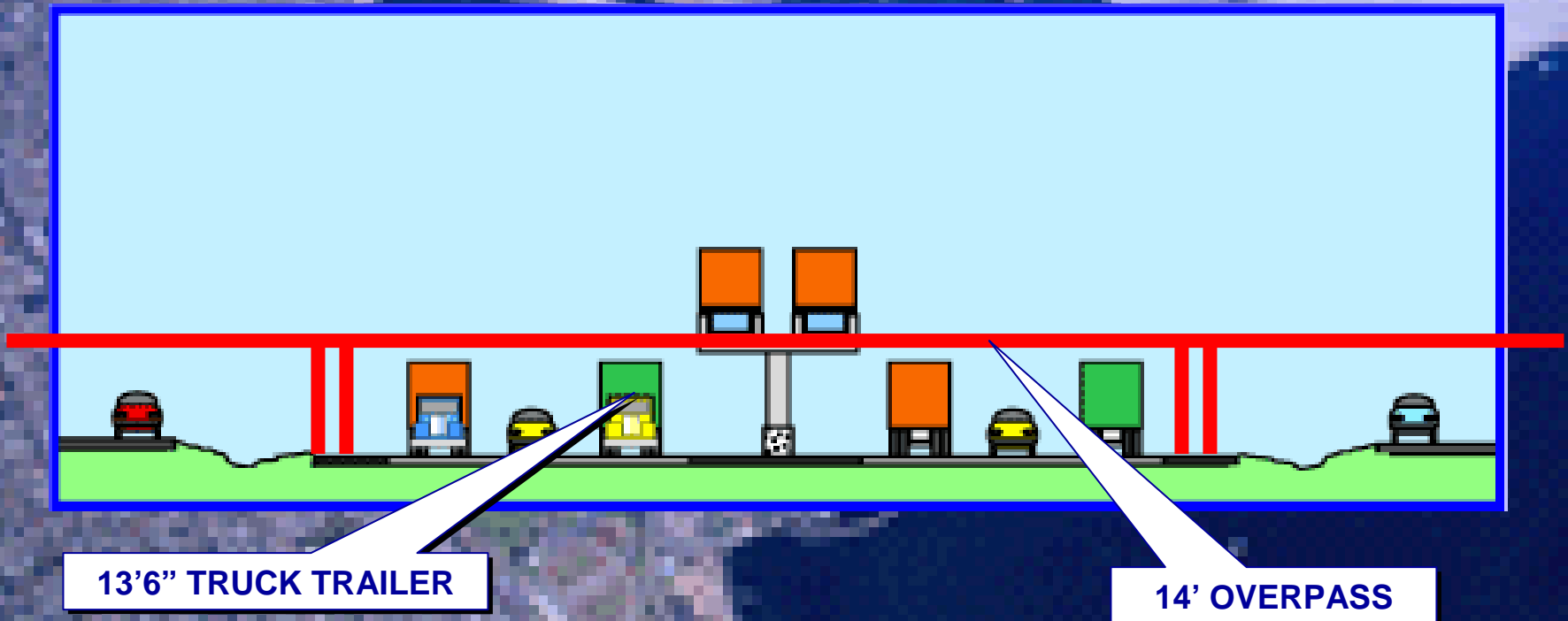
Is it technically feasible? Will it work?

- Line-haul operations
- Terminal operations
- Multi-site connectivity
- Right-of-way availability
- Terminal availability
- Legacy compatibility
- Capacity
- Reliability
- Safety
- Security



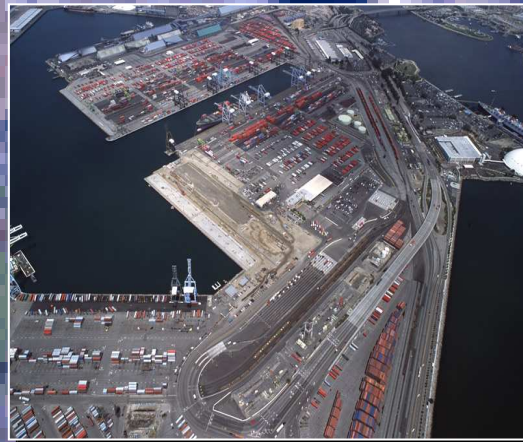
Right of Way – Where can we build it?

Exclusive right of way may be the scarcest commodity in Southern California



Terminal Operations and Compatibility

- Point-to-point technologies must serve multi-site networks
- Inland terminal sites must be found
- Can we mesh with legacy operations?



Is it part of a solution? Will it fly?

- Emissions reduction
- Congestion reduction
- Commercial acceptance
- Community acceptance
- Operating cost
- Capital cost
- Timeline

2005 Inland Port Truck Emission Reduction*					
2005 Urban Freeway Truck Emissions (kilograms)					
Year	VOC	CO	Nox	PM-10	PM-10 (Exhaust only)
Colton	(38.9)	(224.6)	(2,323.3)	(37.1)	(33.5)
SBIA	(33.0)	(190.5)	(1,969.9)	(31.5)	(28.4)
SCLA	(3.3)	(19.0)	(196.5)	(3.1)	(2.8)

**Used 2002 emission factors*

2010 Inland Port Truck Emission Reduction					
2010 Urban Freeway Truck Emissions (kilograms)					
Year	VOC	CO	Nox	PM-10	PM-10 (Exhaust only)
Colton	(32.4)	(131.9)	(969.7)	(19.7)	(15.0)
SBIA	(27.6)	(112.5)	(826.7)	(16.8)	(12.8)
SCLA	(3.8)	(15.5)	(113.6)	(2.3)	(1.8)

