



BUILDING AMERICASM

Engines of ChangeSM

Union Pacific and environmentally friendly locomotives

California State Railroad Museum, Sacramento
September 13, 2005

Union Pacific

Environmental Policy



Union Pacific Railroad is committed to protecting the environment for our customers, our employees, and the communities in which we live. We strive to meet the highest principles of environmental responsibility in our role as a leader in transportation.

“Environmental protection is the responsibility of every UP employee.”

Jim Young, President



Union Pacific employees accomplish this through:

Stewardship

- ☞ Protecting the natural resources where we operate
- ☞ Promoting the efficient use of energy
- ☞ Conserving resources through waste minimization, recycling and reuse of materials

Relationships

- ☞ Building relationships based on common safety and environmental goals
- ☞ Openly communicating with government agencies and communities

Process

- ☞ Assessing our environmental performance using measurable business objectives
- ☞ Using assessment results to guide environmental management improvement strategies

Results

- ☞ Meeting and exceeding compliance standards of environmental laws and regulations
- ☞ Supporting development of effective and balanced environmental laws and regulations
- ☞ Practicing and continually improving healthy work activities



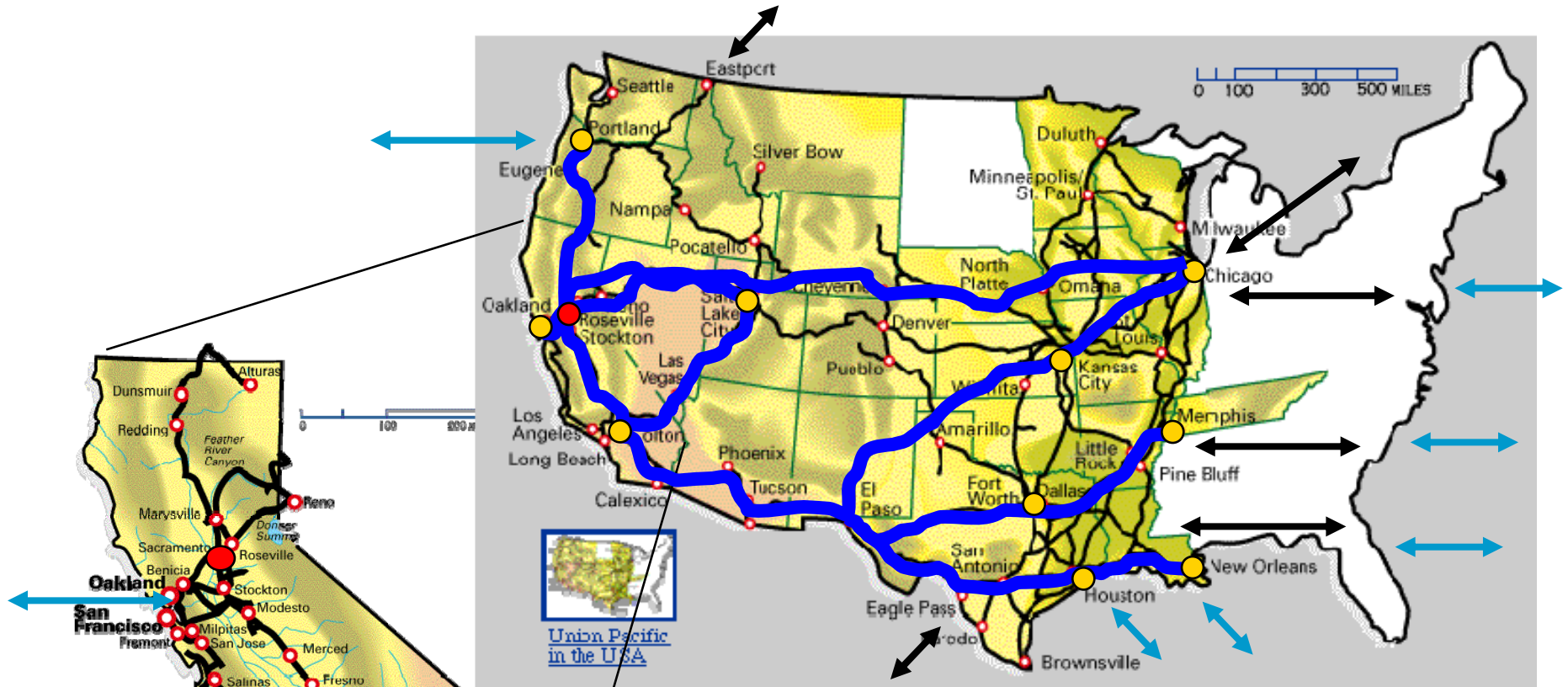
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4,360 Californians employed by UP



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California, the UP & world commerce



Primary UP routes to/from California

California is the hub of the "intermodal engine" supporting the US economy



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UPRR, its locomotives & the environment

→ Has reduced diesel fuel usage per unit work performed (“gallons per 1000 gross ton-miles”) by >14% since 1994

- ↗ New more-efficient locomotives, and improvements in train operations and train handling techniques
- ↗ Diesel exhaust emissions per unit work performed have decreased even more due to newer technology
- ↗ Progressive reduction in new locomotive exhaust emissions 2000-2001, 2002-2004 and 2005+

→ Each UP intermodal train equals 280+ trucks

- ↗ Each UP train emits only 1/3rd the emissions of trucks on a per-gross-ton-mile basis



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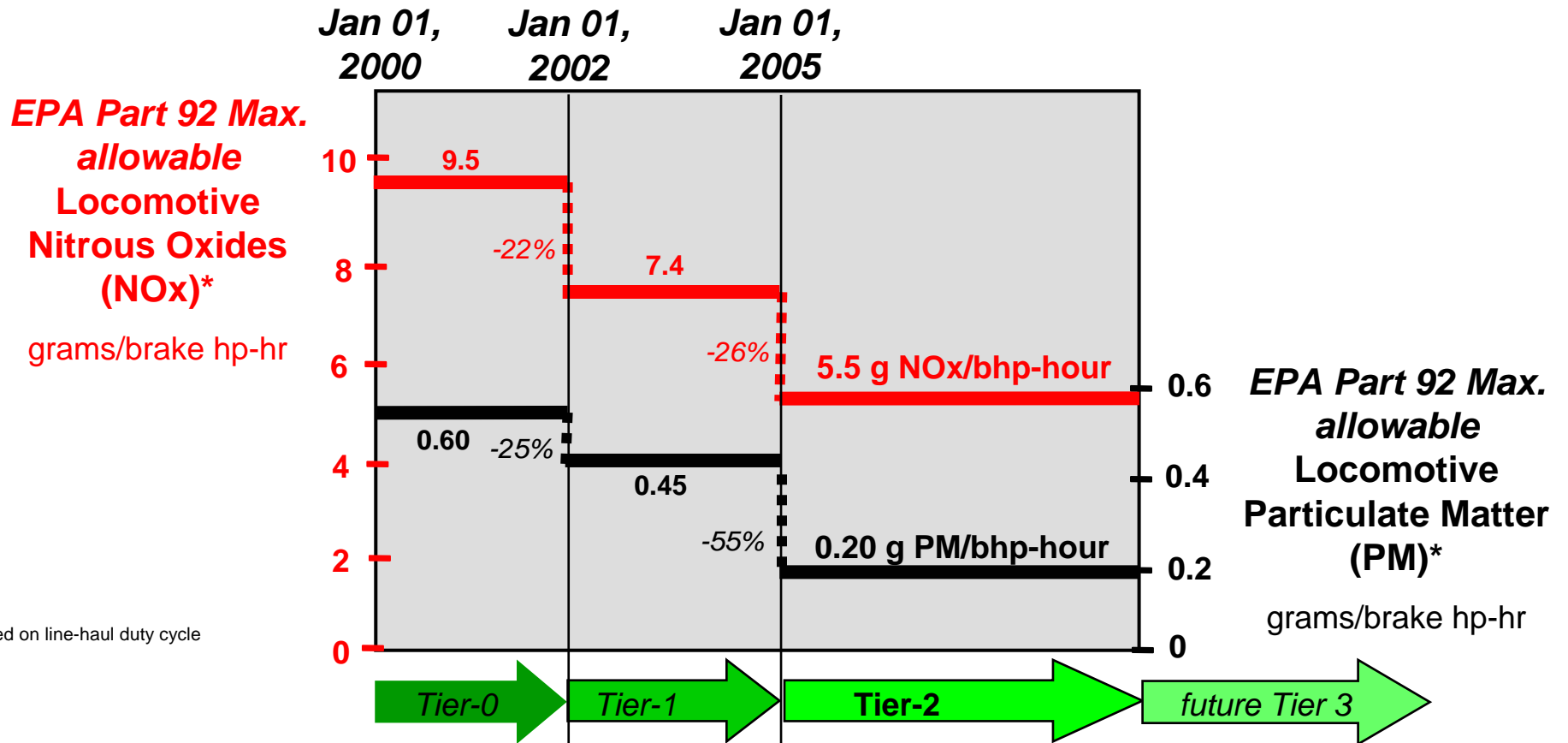
Mobile Source requirements compared

	Trucks	Off-Road Equipment	Ships	Aircraft	Urban Buses	Railroad Locomotives
2010 NOx Inventory (from SCAQMD)	21%	17%	7%	4%	2%	2%
Federal Standards for New Units	Yes	Yes	Yes	Yes	Yes	Yes
Retrofit Existing Units to Reduced Emissions	<u>No</u>	<u>No</u>	<u>No</u>	<u>No</u>	Yes	Yes
Rebuild Older Engines to New Standards	<u>No</u>	<u>No</u>	<u>No</u>	<u>No</u>	<u>No</u>	Yes
In-Use Post-Delivery Testing of Emissions	<u>No</u>	<u>No</u>	<u>No</u>	<u>No</u>	<u>No</u>	Yes
Fleet Average for South Coast AQMD	<u>No</u>	<u>No</u>	<u>No</u>	<u>No</u>	<u>No</u>	Yes



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US EPA loco. emissions regulations



* Based on line-haul duty cycle

UP acquisitions under EPA regulations:

Road units:	790 units	1,258 units	316 units ('05 delivered)
Yard units:			120 units ('05 delivered or ordered)



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Roseville Monitoring Program

- Assembled Technical Advisory Committee (TAC), a team of extremely well-qualified scientists from across California
- TAC has been working since February 2005 to monitor air quality around the yard, and is assisting the PCAPCD & developing QA/QC protocols for the monitoring
- Main goal is to use the monitoring data to verify values derived from the October 2004 modeling report
- Secondary goal is the tracking of diesel exhaust concentrations over time to measure improvements attributed to reductions in the yard
- Two pairs of monitoring stations are contemplated; one is operational
- Preliminary data will be available in late 2005



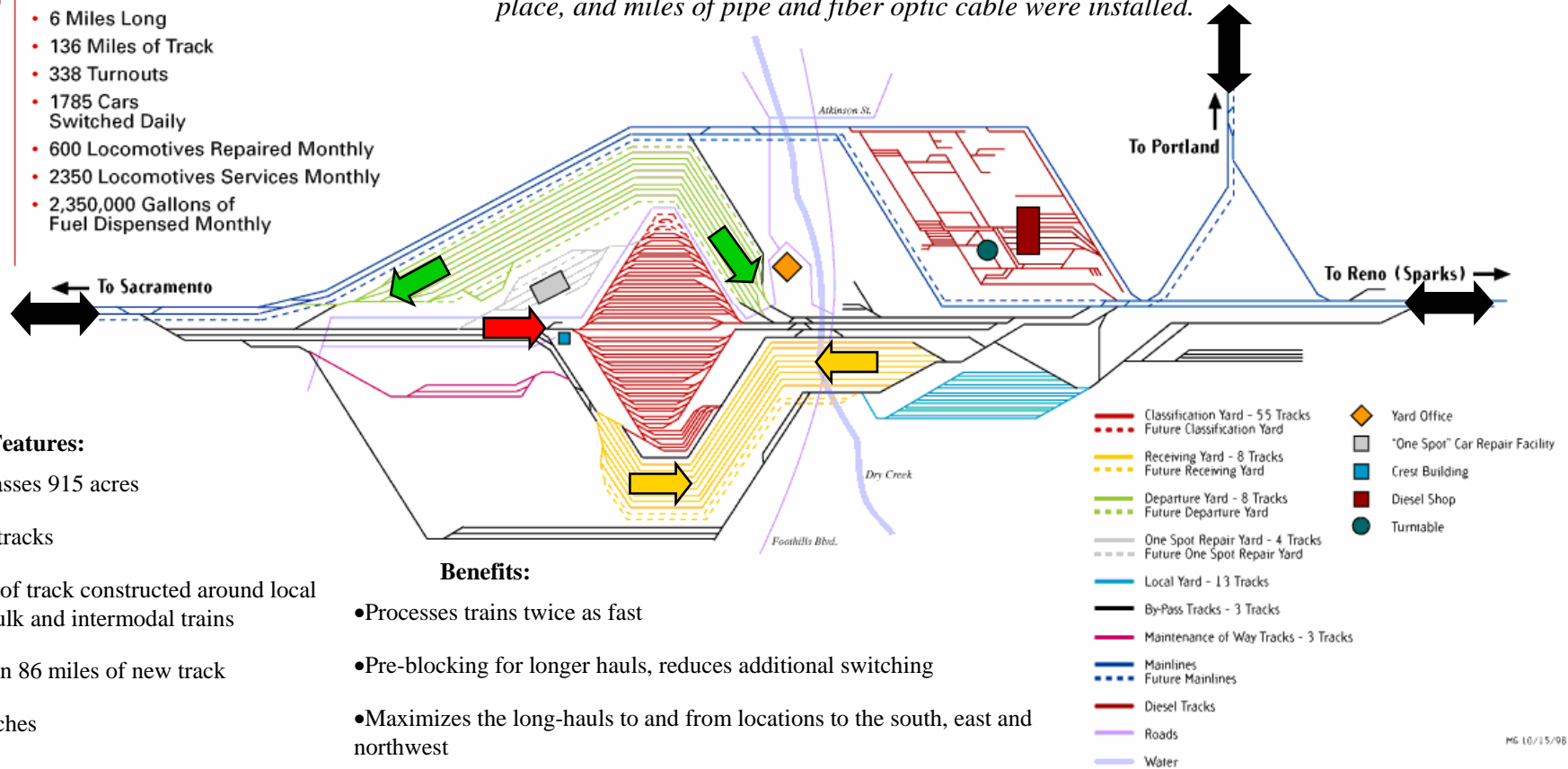
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J. R. Davis Yard Schematic Rendering

Roseville, California

- 780 Acres
- 6 Miles Long
- 136 Miles of Track
- 338 Turnouts
- 1785 Cars Switched Daily
- 600 Locomotives Repaired Monthly
- 2350 Locomotives Services Monthly
- 2,350,000 Gallons of Fuel Dispensed Monthly

The site of the Union Pacific J. R. Davis Yard first opened in 1906, with the last renovation completed in 1952. In the largest renovation since its opening at the turn of the century, more than 120 old buildings were demolished to make way for three new buildings: a hump crest building, a yard office, and a one-spot repair facility. Four new bridges were built, signals were upgraded, utility and electrical lines were put into place, and miles of pipe and fiber optic cable were installed.



Features:

- Encompasses 915 acres
- 55 bowl tracks
- 50 miles of track constructed around local area for bulk and intermodal trains
- More than 86 miles of new track
- 247 switches
- 2 main lines
- 6,500 rail car capacity
- 1,800-2,300 cars per day classification ability
- 8 receiving and departure tracks
- New repair facility

Benefits:

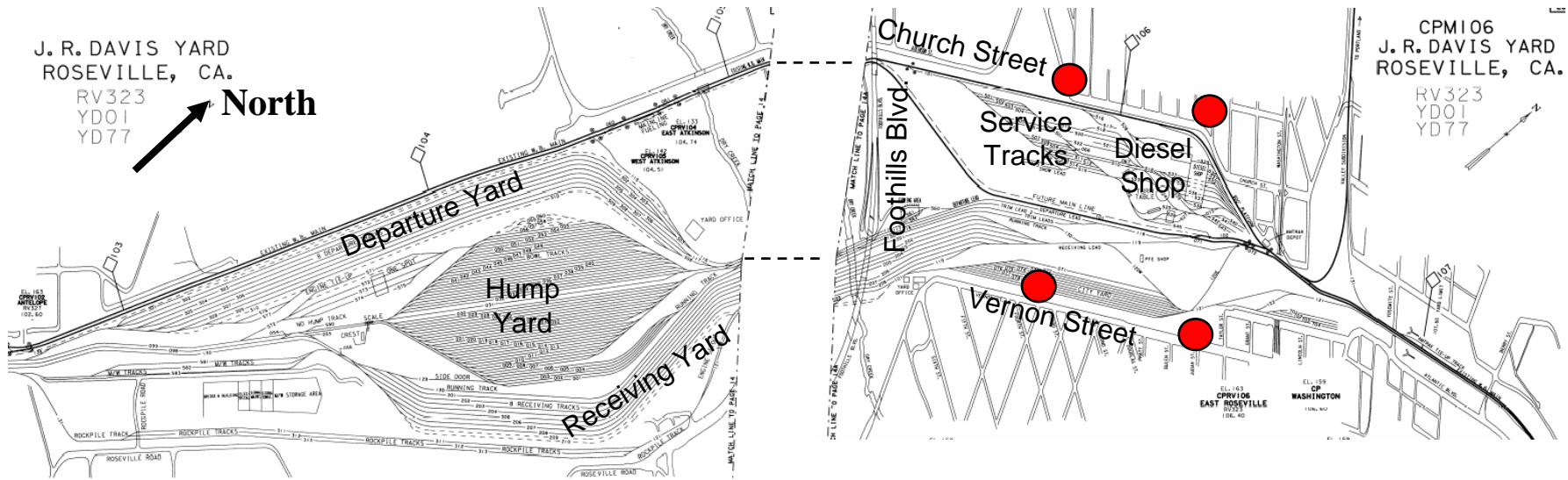
- Processes trains twice as fast
- Pre-blocking for longer hauls, reduces additional switching
- Maximizes the long-hauls to and from locations to the south, east and northwest
- Improved transit times
- Cuts one-five days off transit times
- Expediated manifest service from Northern California to Chicago and further east on CSXT and NS
- Improved run-through service from and to the major shortlines in the Pacific Northwest
- Improved local service

MG 10/15/98



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Davis Yard emissions monitoring sites



Stationary emissions monitoring locations around UP's Davis Yard in Roseville



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ARB Railroad MOU of 2005 – How it Works

- This agreement brings about a 20% reduction in particulate emissions from rail yards throughout California over the next three years
- The reductions achieved by the agreement are larger and sooner than could have been required by any California regulatory or legislative body.
- The only way the State could get reductions from preempted sources was through a voluntary agreement.
- By using a cooperative approach, California has also avoided implementation delays due to disagreements over the State's legal authority.



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ARB Railroad MOU of 2005 - Outcomes

- 500-600 (intrastate) locomotives will be fit with automatic shutdown devices. This in addition to the 2,700 units already equipped and the new locomotives are equipped with these devices.
- At least 80% of all fuel placed in units in California will be low-sulfur – 6 yrs earlier than required by federal regulation.
- At least 99% of all units will comply with stringent smoke regulations – a much higher rate than any other mobile source.
- Health risk assessments will be carried out at 16 major rail yards throughout California, based on the successful program that CARB conducted at UP's Roseville facility.



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UP & locomotive technology

- Worldwide leader in adopting best-available locomotive technology
- Has loco fleet with lowest average emissions in U.S.
 - ✓ UP fleet of ~8,000 units versus US total fleet of ~21,000 units
- Investigated gas fuels in 1953 (LPG) and 1990s (LNG)
- Aggressively acquiring EPA Tier 2 road locomotives
 - ✓ 316 delivered in 2005 ... 30+% of fleet is now EPA Tier 0, 1 or 2
- Pioneering adoption of diesel-battery hybrid switchers
 - ✓ UPY 2004 (Fresno) is California's first hybrid locomotive
- Pioneering development of all-diesel "genset" switchers
 - ✓ Anticipated in-service in CA by October 31



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“Road” versus “Switcher” locomotives

→ **ROAD** locomotives propel freight trains between major terminals (ex: Chicago-Oakland or Los Angeles-Portland)

✦ Primary UP road locomotives are 4000-to-4400 HP each, 1-to-10 years old

→ **SWITCHER** locomotives are used for switching operations inside yards and around minor locations

✦ Typical UP switchers are 1500 or 2000 HP each, 20-30 years old

✦ Switcher marketplace has been dormant for >25 years, now being stimulated by UPRR



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US diesel loco v truck markets

→ Diesel engine technology is driven by the US over-the-road truck market

- ↘ 30+ years since 1972: **23 million+** Class 8 diesel trucks
- ↘ Same period of time: **21,000+** diesel locomotives

→ Engine technologies “cascade down” thru normal marketplace forces

- ↘ Automotive > Truck > Locomotive, Stationary & Marine
- ↘ Electronic Fuel Injection is good example: introduced in auto market in *early-1980s*, entered truck market *late-1980s*, entered locomotive market in *1994*
- ↘ Engine technologies *cannot* be quickly and simply “scaled up”



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US locomotive mfrs. represented here

→ Electro-Motive Diesel (“EMD”)

✦ Road locomotives; former subsidiary of GM

→ GE Rail

✦ Road locomotives, now offering diesel-battery hybrid yard units and developing a diesel-battery road hybrid

→ Railpower Technologies

✦ Diesel-battery hybrid pioneer, now also offering all-diesel genset switchers

→ National Railway Equipment

✦ Building first genset switcher



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UP SD70ACe Tier 2 road locomotive



*115 EMD Tier 2 units ordered by
and delivered to UP in 2005*

Built by Electro-Motive Diesel (“EMD”)

EPA Tier 2 certified

4300 horsepower 16-cylinder diesel engine, electronic fuel injection

**Equipped with Automatic Engine Stop-Start (“AESS”) engine
idle reduction technology**



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UP C45ACCTE Tier 2 road locomotive



201 GE Tier 2 units ordered by and delivered to UP in 2005

Built by GE Rail

EPA Tier 2 certified

4400 horsepower 12-cylinder diesel engine, electronic fuel injection

**Equipped with Automatic Engine Stop-Start (“AESS”) engine
idle reduction technology**



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UP “Green Goat”™ diesel hybrid switcher



UPY 2004 is California's first hybrid locomotive ... placed in service at Fresno on April 8, 2005

Built by Railpower Hybrid Technologies

EPA Tier 2 certified & CARB certified as an Ultra-Low Emitting Locomotive (“ULEL”, NO_x << 4.0 grams/brake hp-hour)

290 horsepower truck-derivative gen set recharges battery banks



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UP prototype “gen set” diesel switcher



UP funded development of this innovative prototype loco, which uses state-of-the-art low-emissions truck-derivative diesel gen sets

Unit should arrive in California by October 15th!

1400 horsepower all-diesel low-emissions switcher

Built by National Railway Equipment, UP funded, a 2-1/2 year project

Will be EPA Tier 2 certified & expected CARB certification as Ultra-Low Emitting Locomotive (“ULEL”, NOx << 4.0 grams/brake hp-hour)

Twin 700 horsepower diesel gen sets (=1400 horsepower total)



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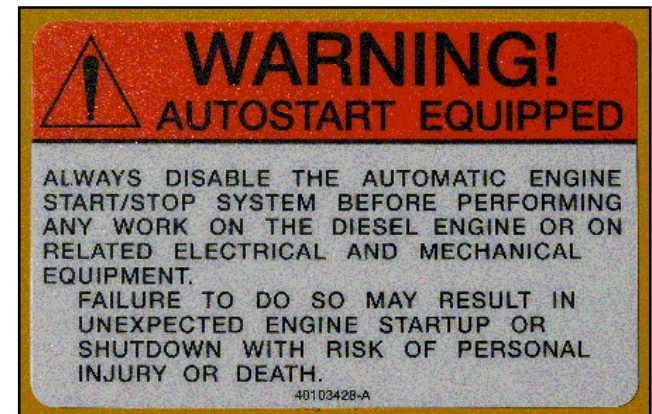
Automatic Idle Elimination technology

→ UP has retrofitted about 900 low-HP switchers with “SmartStart”™ from ZTR Controls



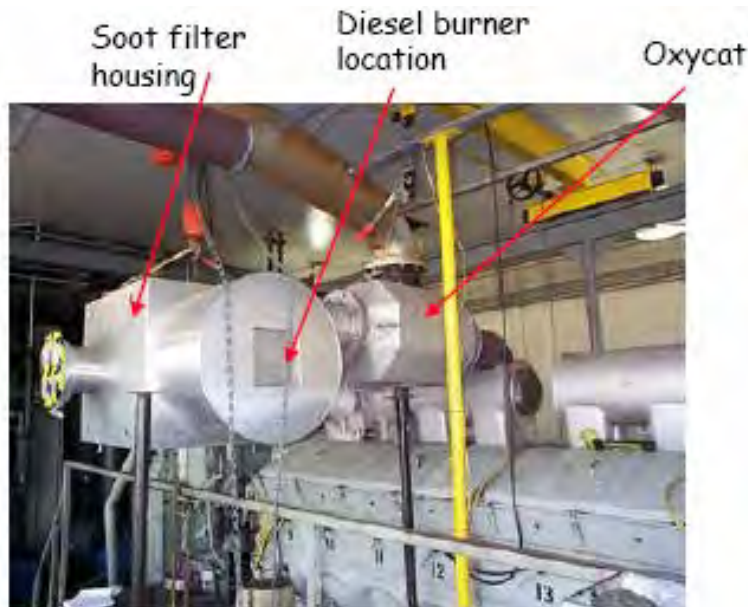
→ UP now acquiring all new EMD and GE road units with Automatic Engine Stop-Start (“AESS”) factory-installed

→ About 28% of entire UP fleet has some form of Automatic Idle Elimination technology to reduce unwanted engine idling, noise and emissions



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UP funding Diesel Particulate Filter R&D



Two UP 1500 horsepower switchers will be equipped with DPF technology in 4Q '05 and tested for maintainability, durability and emissions performance in California

UP has been co-funding 5-year R&D project investigating performance, durability and applicability of Diesel Particulate Filters (“DPF”) to older switching locomotives

R&D work being performed by *Southwest Research Institute (“SWRI”)* through Association of American Railroads (“AAR”)

**There is no technical precedent for this work ...
*European locomotives have NO in-service testing due to type of locomotives equipped***



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Notes



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