

Burlington Northern Santa Fe Corporation

Blue Skyways Collaborative Meeting

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Current Opportunities, Funding and Technology

Current Practices

- **Low torque wheel bearings to reduce rolling resistance**
- **Wheel and rail lubrication to reduce friction**
- **Reduction in gaps on intermodal trains to reduce drag**
- **Increased used of aluminum in cars used for bulk commodity service**
- **Training program for engineers to conserve fuel in train handling**

Current Opportunities, Funding and Technology

Current Practices

- **Idle Reduction Technology**
 - All new locomotives come from the factory with automatic start and stop technology
 - Switch engines – Several different vendors provide start/stop technology. Kim HotStart, ZTR SmartStart, EcoTrans APU
- **New Technology for Switch Engines**
 - RailPower Green Goat – Gen set is used to charge a large bank of lead acid batteries that power the locomotive traction motors
 - “Truck Engine” Powered - Two, 700 horsepower truck like engines that meet EPA Tier 3 standards are used to provide power to a generator. Engines are sequential.

New Switch Locomotive Technology: *Hybrids*

2000 peak horsepower from batteries



“Hybrid” light-medium duty switcher

**Batteries recharged by 290 HP EPA off-road Tier 2 diesel gen set
significantly exceeds EPA locomotive Tier 2 requirements**

Current Opportunities, Funding and Technology

Funding Opportunities

- **Have entered several demonstration projects with state environmental agencies and the EPA.**
 - **Vancouver, Houston and Chicago – Put idle reduction kits on several switch engines in each location.**
- **Texas Emissions Reduction Program (TERP) – Have received several grants over the past three years to obtain hybrid switch engines and install idle reduction technology on locomotives.**
- **Carl Moyer Program – Have purchased hybrid and “truck engine” switch locomotives for use in the Los Angeles area.**

Significant Trends

New Locomotive Technology

- **Several Class I railroads have placed orders for both hybrid and “truck engine” switch engines**
- **General Electric is developing a line haul locomotive that can recover and store electrical power that is currently shed as heat during dynamic braking**
- **General Electric Consist Management Software being demonstrated at BNSF. Software monitors the need for power and automatically adjusts throttle position in trailing locomotives**
- **EPA issued ANPRM in 2004 for Tier 3 locomotive standards. Will require exhaust aftertreatment.**

Easily Implemented Measures

- **Idle Reduction for Switch Engines**
 - **Off the shelf technology that railroads are familiar with. Typical installed cost range from \$20,000 to \$40,000 depending on what type of equipment is used.**
- **Replacement of Switch Engines**
 - **New technology for low emissions switch engines continues to evolve.**

BNSFSM

The logo features the letters "BNSF" in a bold, italicized, orange sans-serif font. A thick black horizontal bar is positioned below the letters, starting from the left edge of the "B" and extending to the right edge of the "F". A small "SM" trademark symbol is located at the top right of the "F".