NS Locomotives: An NS Competitive Advantage
Norfolk Southern Investor and Financial Analyst Conference
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Assistant Vice President
Mechanical
Agenda

- Low Cost Carrier for ...
  - Locomotive Maintenance
  - Replacement Locomotives
- Planning for the Future
- Juniata Shop Tour
### Annual Cost of Locomotive Maintenance Per Unit

#### 2010 R-1 Data

<table>
<thead>
<tr>
<th></th>
<th>NS</th>
<th>Peer 1</th>
<th>Peer 2</th>
<th>Peer 3</th>
<th>Peer 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>$124,720</td>
<td>$149,560</td>
<td>$156,670</td>
<td>$163,720</td>
<td>$203,840</td>
</tr>
</tbody>
</table>

**Note:** The values are represented in dollars ($).
### 410. RAILWAY OPERATING EXPENSES - Continued
(Dollars in Thousands)

<table>
<thead>
<tr>
<th>Name of railway operating expense account (a)</th>
<th>Line No.</th>
<th>Salaries and wages (b)</th>
<th>Material, tools, supplies, fuels and lubricants (c)</th>
<th>Purchased services (d)</th>
<th>General (e)</th>
<th>Total freight expense (f)</th>
<th>Total (h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EQUIPMENT LOCOMOTIVES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Administration</td>
<td>201</td>
<td>1.80</td>
<td>0.11</td>
<td>0.30</td>
<td>0.32</td>
<td>2.54</td>
<td>2.54</td>
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<tr>
<td>Repair and Maintenance</td>
<td>202</td>
<td>23.79</td>
<td>38.81</td>
<td>3.50</td>
<td>0.05</td>
<td>66.16</td>
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<tr>
<td>Machinery Repair</td>
<td>203</td>
<td>0.86</td>
<td>0.75</td>
<td>0.20</td>
<td>-</td>
<td>1.82</td>
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<tr>
<td>Equipment Damaged</td>
<td>204</td>
<td>0.02</td>
<td>0.07</td>
<td>0.00</td>
<td>-</td>
<td>0.09</td>
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<tr>
<td>Fringe Benefits</td>
<td>205</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>11.83</td>
<td>11.83</td>
<td>11.83</td>
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<tr>
<td>Other Casualties and Insurance</td>
<td>206</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>5.89</td>
<td>5.89</td>
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<tr>
<td>Lease Rentals - Debit</td>
<td>207</td>
<td>-</td>
<td>-</td>
<td>4.67</td>
<td>-</td>
<td>4.67</td>
<td>4.67</td>
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<tr>
<td>Lease Rentals - (Credit)</td>
<td>208</td>
<td>-</td>
<td>-</td>
<td>(1.22)</td>
<td>-</td>
<td>(1.22)</td>
<td>(1.22)</td>
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<tr>
<td>Other Rents - Debit</td>
<td>211</td>
<td>-</td>
<td>-</td>
<td>0.04</td>
<td>-</td>
<td>0.04</td>
<td>0.04</td>
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<tr>
<td>Depreciation</td>
<td>213</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>31.50</td>
<td>31.50</td>
<td>31.50</td>
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<tr>
<td>Joint Facility - Debit</td>
<td>214</td>
<td>-</td>
<td>-</td>
<td>0.00</td>
<td>-</td>
<td>0.00</td>
<td>0.00</td>
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<tr>
<td>Repairs Billed to Others - (Credit)</td>
<td>216</td>
<td>-</td>
<td>-</td>
<td>(0.33)</td>
<td>-</td>
<td>(0.33)</td>
<td>(0.33)</td>
</tr>
<tr>
<td>Other</td>
<td>218</td>
<td>1.73</td>
<td>0.01</td>
<td>-</td>
<td>0.00</td>
<td>1.74</td>
<td>1.74</td>
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<tr>
<td>TOTAL LOCOMOTIVES</td>
<td>219</td>
<td>28.21</td>
<td>39.75</td>
<td>7.17</td>
<td>49.59</td>
<td>124.72</td>
<td>124.72</td>
</tr>
</tbody>
</table>

**Average Locomotive Units in Service**
3,900
Low Cost Carrier for Maintenance

Why are Maintenance Costs Lower at NS?

- No Maintenance Service Agreement (MSA)
  - 10-20 Year Contract Period
  - Significant Profit Margins for Provider
- Services Include
  - Replacement Parts Pricing
  - Technical Support
  - Engine Overhaul
  - Supervision of Shop Craft Employees
Low Cost Carrier for Maintenance

Why are Maintenance Costs Lower?

- No Maintenance Service Agreement
- Steady State “Program” Work
  - Engine Overhaul
  - Truck (Bogie) Overhaul
  - Mid-Life Tune Up
  - Paint
Low Cost Carrier for Maintenance

Engine Overhaul

Mid-Life TuneUp

Truck Overhaul

Paint
Why Would This Be True?

- No Maintenance Service Agreement (MSA)
- Steady State “Program” Work
  - Engine Overhaul
  - Truck (Bogie) Overhaul
  - Mid-Life Tune Up
- Lower Cost Replacement Parts
  - NS Seeks Smaller, Non-traditional Suppliers
  - NS Generates Competition for Component Suppliers
    - Traction Motors
    - Power Assemblies
Fleet Composition

Yard & Local Fleet
1,350 Units

- EMD: 94%
- GE: 6%
- Other: 0%

Road Fleet
2,500 Units

- GE: 74%
- EMD: 26%
- Other: 0%
Road Fleet

**Oldest**
- SD60 M(I) 256 Units
- D8-40C(W) 242 Units

**Largest**
- SD70(M) 148 Units
- D9-40C(W) 1214 Units

**Newest**
- SD70M-2 130 Units
- ES40DC 220 Units
Yard and Local Fleet

SW1500 / MP15 (116)

 Mothers & Slugs (150)

GP 38-2 (500)

SD40-2 (385)

375 hp/TM

500 hp/TM

One line, infinite possibilities.
Low Cost for Replacement Locomotives

Decades Old Industry Practice...

Cascade Oldest Road Units to Yard & Local Fleet

- Increasingly Impractical After Hi Adhesion Six Axle Power
  - Excessive Horsepower
  - Three Axle Trucks Too Rigid for Track Structure of Line Segments

- 1960’s Era Four Axle Locomotive Fleet Continued to Age
  - Out Dated Control System
  - Deteriorated Operators Cabs
  - Control Wiring in Poor Condition
  - Diesel Engines Required Overhaul

Quotes for New 4 Axle Y&L Power = Road Power
Low Cost for Replacement Locomotives

Post Conrail Acquisition - Year 2000
- Leverage Juniata’s Capability for Low Cost Solution

Rebuild Programs Start 2001
- Extend Asset Life
- GP38-2 Locomotives Emerge from GP38 Model (1966-71)
  - Solid State Control
  - New Operators Cab
  - Rebuilt Diesel Engine
- Programs Were Capitalized
Ten Years of Yard & Local Revitalization

- Capital Rebuild of GP38 units begins in 2001
  - 5500 series (80 units)
  - 5600 series (73 units)
  - 5800 series (37 units)
- GP40-2 Program-Higher HP Turbocharged Engines
- SD40E Program Introduces Microprocessor Controls
Replacement Locomotive Costs

Index: 2001 = 1.00

Locomotive Unit Cost vs. CPI
Low Cost Replacement Road Locomotive
SD60E  

E stands for Enhanced

How is the SD60E Program Different?

- Electronic Fuel Injection (EFI)
- New Engine Cooling System
  - Ground breaking work
  - Patent applied to protect technology
Enhancements Include

- Electronic Air Brakes
- Larger Power Cabling
- Upgraded Traction Motors
- Crashworthy Operators Cab
- Motor Driven Air Compressor
SD60E   E stands for Enhanced

Enhancements Include
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Environmental Benefits of Remanufacture
- Steel Platform, Truck Frames and Engine Blocks are Recycled
- 14% of the “Lifecycle” Energy for an Automobile is for Manufacturing
- Remanufacturing Recovers the Energy Invested in Materials
- Remanufacturing Saves more than 75% of the Energy to Build New
Ten Years of SD60E Production

Units per Year

- 2010: 1 unit
- 2011: 8 units
- 2012: 29 units
- 2013: 30 units
- 2014: 36 units
- 2015: 33 units
- 2016: 33 units
- 2017: 25 units
- 2018: 20 units
- 2019: 15 units

SD60E
Ten Years of Capital Savings

Capex Savings in $M

Agenda

- Low Cost Carrier for ...
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- Planning for the Future
Planning for the Future

Low Cost Maintenance

- Continue to Leverage Historical Advantages
  - Locomotive Knowledge is a Core Competency
  - Nurture and Grow Technical Operations
  - Lower Cost Replacement Parts
  - Productivity Improvement

- NS Emissions Solutions for Engine Overhaul
  - Lower engine overhaul costs
  - Promotes parts competition
Planning for the Future

- **Low Cost Maintenance**
  - Continue to Leverage Historical Advantages
  - NS Emissions Solutions for Engine Overhaul

- **Low Cost Replacement Locomotives**
  - Developing First New Platform
  - Evaluating Alternative Control Systems
  - Completed Two Crashworthy Operator Cabs
  - Developing New Air Compressor Arrangement
  - Testing an Electronic Air Brake System for Locomotives
Planning for the Future

Low Cost Fuel Consumption

- 999 Battery Switcher Locomotive
- SD60E Replacement Road Locomotive
  - Significant Improvement Over SD60 Units
  - Fuel Consumption Comparable to New Locomotives
- GP40-2 Mother Slug Combination
  - Saves Up to 40-45% Fuel Compared to Two GP38 Units
Why Slugs?

- Only One Engine
- Less Fuel - Less Idling, Better Engine Speeds
- Improved Diesel Engine - Lower Emissions
- 1 Mother + 1 Slug = 2 GP38 Locos @<25mph
Planning for the Future

Low Cost Fuel Consumption

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- PR43C Locomotives with Dual Engine Concept
Planning for the Future - PR43C
Planning for the Future

Low Cost Fuel Consumption

- 999 Battery Switcher Locomotive
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- PR43C Locomotives with Dual Engine Concept
- Building a Prototype Low Emissions Switcher
Agenda

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System Locomotive Shops
Low Cost Replacement - Yard & Local

SD40E (54)

GP40-2 Mother & Slug

Genset Assembly

SD40-2 Cab Program
Low Cost Replacement Road Unit-SD60E