South to North
Indiana Rail Potential

Indiana Center for Coal Technology Research

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Agenda

- Project 1 Review
- Project 2 Proposal
A Prescriptive Analysis of the Indiana Coal Transportation Infrastructure

- **Project Rationale**
  - Use Indiana coal for economic development

- **Issues**
  - Technology – Coal composition
  - Infrastructure
    - Indiana has the coal
    - Indiana is at the center of the national rail infrastructure
    - Does Indiana have the rail infrastructure to support coal movement?

- **Final Report issued May 2007**
Project Tasks

- Characterize the demand and supply states of Indiana coal usage
- Characterize the transport methods of Indiana coal supply and demand
- Develop a simulated environment of Indiana coal supply and demand
- Develop a set of transportation infrastructure improvements to address bottlenecks in current Indiana coal Transportation Network
- Develop a Return on Investment Methodology and simple Portfolio Optimization Model
Infrastructure Supply Chain Concept

Mine

Time/Cost

Power Plant

South to North: Indiana Rail Potential – CCTR September 2007 Brady
Modeling Process

- Develop a Scenario
  - Source, Destination, Rate
- Overlay the route using timetable information from \textit{10 by 10}
- Determine performance metrics
- Experiment
  - Set parameters
  - Model generates long run expected performance estimates
  - Iterate
## Model Architecture

### Parameter Architecture

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Type</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>Speed Factor</td>
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<td></td>
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<tr>
<td>Weather Factor</td>
<td></td>
<td></td>
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<tr>
<td>Mechanical Delay</td>
<td></td>
<td></td>
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<tr>
<td>Congestion Delay</td>
<td></td>
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<tr>
<td>Station Delay</td>
<td></td>
<td></td>
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<tr>
<td>Train Length</td>
<td></td>
<td></td>
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<tr>
<td>Car Size</td>
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<td></td>
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<tr>
<td>Days of Supply</td>
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</table>

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**Indiana Coal Railroad Timetable: Route 2**

<table>
<thead>
<tr>
<th>Station Name</th>
<th>Mile Post</th>
<th>Owner</th>
<th>Number</th>
<th>Class</th>
<th>Speed</th>
<th>Notation</th>
<th>Interblocks</th>
</tr>
</thead>
<tbody>
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<td>Gary</td>
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<td>CINR</td>
<td>1</td>
<td>1</td>
<td>10</td>
<td>1</td>
<td></td>
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<td>2</td>
<td>25</td>
<td>1</td>
<td></td>
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<tr>
<td>Fort Wayne</td>
<td>7.5</td>
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<td>1</td>
<td>3</td>
<td>35</td>
<td>1</td>
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<td>Indiana City</td>
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<td>4</td>
<td>45</td>
<td>1</td>
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<td>5</td>
<td>55</td>
<td>1</td>
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<td>75</td>
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</tbody>
</table>

**Map Key**

1. TOP 16 Power Stations
2. TOP 18 Coal Mines
3. Railroads
4. Interstates

Source: Comprehensive Railroad Atlas of North America, compiled by Chad Helier
Scenarios
Project 1 Conclusions

- This project was defined as a scoping study to:
  - Demonstrate ‘proof of concept’ for simulation analysis of rail infrastructure
  - Build awareness of the transportation aspect of the coal economy
Project 1: The Future

- Widen the scope to examine import and export rail entry points and routes
- Develop an in-depth scenario with CCTR partner
- Develop/Analyze more scenarios
- Expand the optimization model (Task 5) to the entire 10X10
- Expand to include all coal consumption (Steel Industry)
Project 2 Plan

- A 2 year comprehensive project examining the movement of Indiana coal
  - NiSource
  - INDOT/Energy Office
  - Congressman Joe Donnelly

Main Objectives
- Expand Scope of Project 1
  - From IN coal to IN Power Plants to IN coal to IN export sites (Ports, rail carriers) & industries (steel)
- Expand Modeling Details of Project 1
Project 2 Plan

- Phase I: Detailed Scenario Modeling
- Phase II: “Wicked Problem” definition
- Phase III: Scenario Modeling
Phase I: Nisource Schahfer

- Indiana coal sourcing
- Hypothetical infrastructure investment
Phase II: “Wicked Problems”*

“Wicked Problem” characteristics
- No definitive formulation
- No agreed-upon solution criteria
- Definition determines the solution

Phase II activity
- Develop formulation
- Develop performance criteria

*Harmon, Mayer 1986
Phase III: “Wicked Problem” Modeling

- South to North coal movement
  - Southern coal to Port of Indiana
  - Southern coal to steel mills
  - Southern coal to North Power Plants (Nisource)
- Intermodal Corridors?