INLAND NAVIGATION ECONOMICS
WEBINAR SERIES
#4 Waterway Traffic Projections

Wes Walker
Co-Technical Director, PCXIN
Huntington, WV
13 March 2013
Waterway Traffic Demand Forecasts or Predictions

“The only thing we know for certain is that we’re going to be wrong.”

“We don’t do predictions
Want projections useful for our planning purposes.

“It was for the wrong reasons, but we were right!”

“Part of the trick, part of the art of forecasting figuring out which model is the best model for the situation.”
Waterway Traffic Demand Objective

- Objective: unconstrained waterway traffic demand projections
- Put aside willingness-to-pay for waterway transportation at this point
- Four tier transportation model
  1. Global demands
  2. Flows between trading partners
  3. Routes taken
  4. Mode used on the route
Waterway Traffic Demand
Future Demand vs Future Traffic

- First three tiers and part of the fourth
  - exogenously determined
  - no General Equilibrium Model to internally work through these tiers

- Partial equilibrium models
  - uses set of flows with potential to move by water (waterway traffic demands)
  - builds Wtp/demand schedule to forecast waterway traffic
Scope
How much Voodoo do you do?

- Temporal
- Geographic
- Sectors
- Art and science
- Sense and Sensibility or Credence and Credibility?
- Being SMART
Scope
ER 1105-2-100; Appendix E, E-9


1. Identify the commodity types - susceptible
2. Identify the study area – origins & destinations
3. Determine current commodity flow – land & waterway (WCSC) & interviews
6. Forecast potential waterway traffic by commodity
   ► No more than 10 year intervals
   ► Application of indices to base year
   ► When inappropriate, secondary data, interviews, expert opinions & historical flow patterns
Scope
Can You Have It All? Be SMART

- Press leadership to make sure the PCXs are prepared with:
  - Data
    - Historic Traffic
    - Forecasts
    - Rates, etc
  - Models - Certified
- Be ready to do some of the heavy lifting
- Give some thought to technique used
Scope
Identify the Main Drivers

- Natural resources and reserves
- Economic growth
- Government regulation & tax policy
  - Deregulation – Staggers Act & dereg of utility sector
  - Ethanol credits
  - Transportation safety/infrastructure & food security regulation
  - Environmental regulation
    - Clean air → utilities, refineries, chemical plants, steel mills
    - Clean water → mines, wells, industrial facilities
    - Climate change → exports? utilities?
- Technology → shale gas, emissions,
- Global demands → grain, coal, containers?
- Global infrastructure → Panama canal, world fleet, ports, highway, and rail in competing countries
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Step 1. Susceptible Commodities
Natural Resources Foundation

- COAL
- CRUDE OIL
- SALT
- NAT GAS
- WOOD
- SAND & LIMESTONE
- IRON ORE
- SOILS
Step 1. Susceptible Commodities Resource Linkages

- COAL
- NAT GAS
- SAND & LIMESTONE
- IRON ORE

Linkages:
- Electric utilities
- Lime
- Cement
- Steel (US/global)
- Aluminum smelters
- Construction

Products:
- Fabricators
- Automobiles
- Machinery
- Appliances
Step 1. Susceptible Commodities Resource Linkages (cont.)

- **SOILS**
  - Crude Oil
  - Salt
  - Natural Gas

- **WOOD**
  - Chemicals

- **Grains**
  - Paper & Board

- **Exports**
  - Food Products
  - Poultry & Livestock
  - Syrups, Oils & Feed
Step 2. Study Area - ODs
Domestic Produce/Consume

Figure 6.1. U.S. Consumption Regions.
Step 2. Study Area - ODs
Global Produce/Consume

New Orleans Coal Exports by Destination

- 2006
- 2007
- 2008
- 2009
- 2010
- 2011

- Americas
- Asia
- Europe

Exports to the World
Step 3. Current Commodity Flows

WCSC - Domestic

- WCSC annual census
- These are the prime suspects
- Not enough to make decisions
- Flows – microscopic needs
  - How much?
  - Which locks?
  - Which channels?
Step 3. Current Commodity Flows
WCSC - Export Coal

Exports in Short Tons by Custom District

<table>
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<tr>
<th>Custom District</th>
<th>2007</th>
<th>2011</th>
<th>Difference</th>
<th>% Change</th>
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<tbody>
<tr>
<td>Norfolk</td>
<td>22,159,262</td>
<td>40,415,244</td>
<td>18,255,982</td>
<td>82%</td>
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<td>Mobile</td>
<td>7,622,582</td>
<td>10,094,538</td>
<td>2,471,956</td>
<td>32%</td>
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<td>Charleston, SC</td>
<td>123</td>
<td>358</td>
<td>235</td>
<td>191%</td>
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<tr>
<td>New Orleans</td>
<td>3,980,782</td>
<td>21,376,884</td>
<td>17,396,102</td>
<td>437%</td>
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</tbody>
</table>

- All 100% rail, except New Orleans
- Approx 65% percent of New Orleans by water from ORS
- Export coal traffic has picked-up some of the loss due to utility coal decline
- These four CDs account for 68% of total US coal exports

- Resources/reserves
- Industry trends
  - Global
  - Domestic
- Company plans
  - Plant closures/openings
- High level view

- Company plans
  - Plant closures/ openings
  - Sources & markets
  - Modes and decision process

- Short horizon – 1-3 years, electric utilities 10 years
Step 6. Potential Waterway Traffic
Four Tier Model

- Global demands
- Flows between trading partners
- Routes taken
- Mode used on the route
Step 6. Potential Waterway Traffic Techniques

1. Base (reference) year and index
2. Apportionment by history and survey
3. Expert analysis
4. Extrapolation based upon regression analysis
5. Models
   - Sector models – Global Grain model and Greenmont Energy Model (both LP)
Step 6. Potential Waterway Traffic Base Year and Index

- **Reference Year**
  - Reflective of recent volumes and patterns
  - Adjust based upon industry surveys or other sources

- **Indices**
  - Demographic & earnings – Geographic
  - Government industry forecasts (USDA & DOE)
  - Country & industry – IWR has Global Insight
  - Short term industry forecasts
Step 6. Potential Waterway Traffic Apportionment

- Requires detailed data, appropriate where available & can survey companies
- Example - Utility sector
  - Electricity demands
  - Generation by plant
  - Fuel share by plant
  - Coal consumption
  - Coal source
  - Modal shares
Step 6. Potential Waterway Traffic Apportionment - Advantages

- **Advantage**
  - Improved knowledge of sector – credibility
  - Grounded in company plans & synched with government forecast

- **Disadvantage**
  - Requires lots of data
  - Multiple views of future difficult to ascertain
Step 6. Potential Waterway Traffic Expert Analysis

- Focused assessments of potential
  - New commodities (containers, shale gas)
  - New trends (export coal, Panama expansion)
- Credibility

- Especially useful for scenario development
  - Analyst describe/select scenarios
- Independent analysis does not absolve the analyst
  - Analyst still needs to know WHAT to study
  - Analyst still needs to be able to scope the exercise

- Trend extrapolation – lot of variability at lock level makes microscopic view difficult

By commodity

*Ohio River System, Coal and Total Traffic, 1950-2005*

*By nature of the flow*

- Econometrics – Battelle and Wes Wilson, U of Oregon
  - Struggle to get good fits at the lock level
  - Microscopic forecasts needed – location matters
- Used to extrapolate electricity demands beyond what industry provides - input

- Demands estimated exogenously
- Minimize cost of meeting the given demand
  - Global Grain Model
  - Greenmont Energy Model
- Experience
  - Powerful models, reasonably good job of estimating flows
  - Weak at modal split
Step 6. Potential Waterway Traffic Models – Regional Yield Forecasts

Figure 4.3. (cont.) Soybeans: Actual and Forecast Yields by Production Region (mt/ha)

- Models have capability of capturing effect of price changes
Step 6. Potential Waterway Traffic Advantage - Linear Programming

- Scenario testing
- Spatially based, production cost functions by region
Step 6. Potential Waterway Traffic Disadvantage - Linear Programming

- Lots of data
- Results turn on a mil – volatile micro data
- Absent analyst discretion
- Approval for use – testing & proprietary

Figure 7.3.1d. Comparison of Barge Reach Volumes for Ethanol Scenarios, Base Case, Mid Ethanol and High Ethanol Demand Scenarios, by Crop and Total.
Step 6. Potential Waterway Traffic Uncertainty

- Random walk to build confidence intervals and statistics – requires faith that past is prologue
- Trend analysis – same issue
- Scenario testing
  - Environmental & trade regulations
  - Economic growth
  - Technology
  - Global expansion/contraction
Recent Forecast Reports
NETS & PCXIN

- Upper Miss – Global Grain Model – NDSU
  http://www.corpsnets.us/docs/LongTermForecastCommodity/ReportLongerTermForecastingofCommodityFlowsontheMississippiRiver.pdf

- Panama – Tioga – coal & grain export, COB

- Inland Opportunities

- Shale Gas and Electric Utilities – Mar 2013
- Shale Gas impact – Tioga – June 2013
Comments or questions?
Comments on presentation in your email to Mark Hammond
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<td>Mark Hammond</td>
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<td>Great Lakes Navigation Economics 101</td>
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<td>Summary Series Wrap-up</td>
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