INLAND NAVIGATION ECONOMICS WEBINAR SERIES
#4 Waterway Traffic Projections

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US Army Corps of Engineers
BUILDING STRONG®

Waterway Traffic Demand Forecasts or Predictions

"The only thing we know for certain is that we're going to be wrong."

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

- We don't do predictions
- Want projections useful for our planning purposes.

"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

http://planning.usace.army.mil/toolbox/library/ERs/a-e.pdf

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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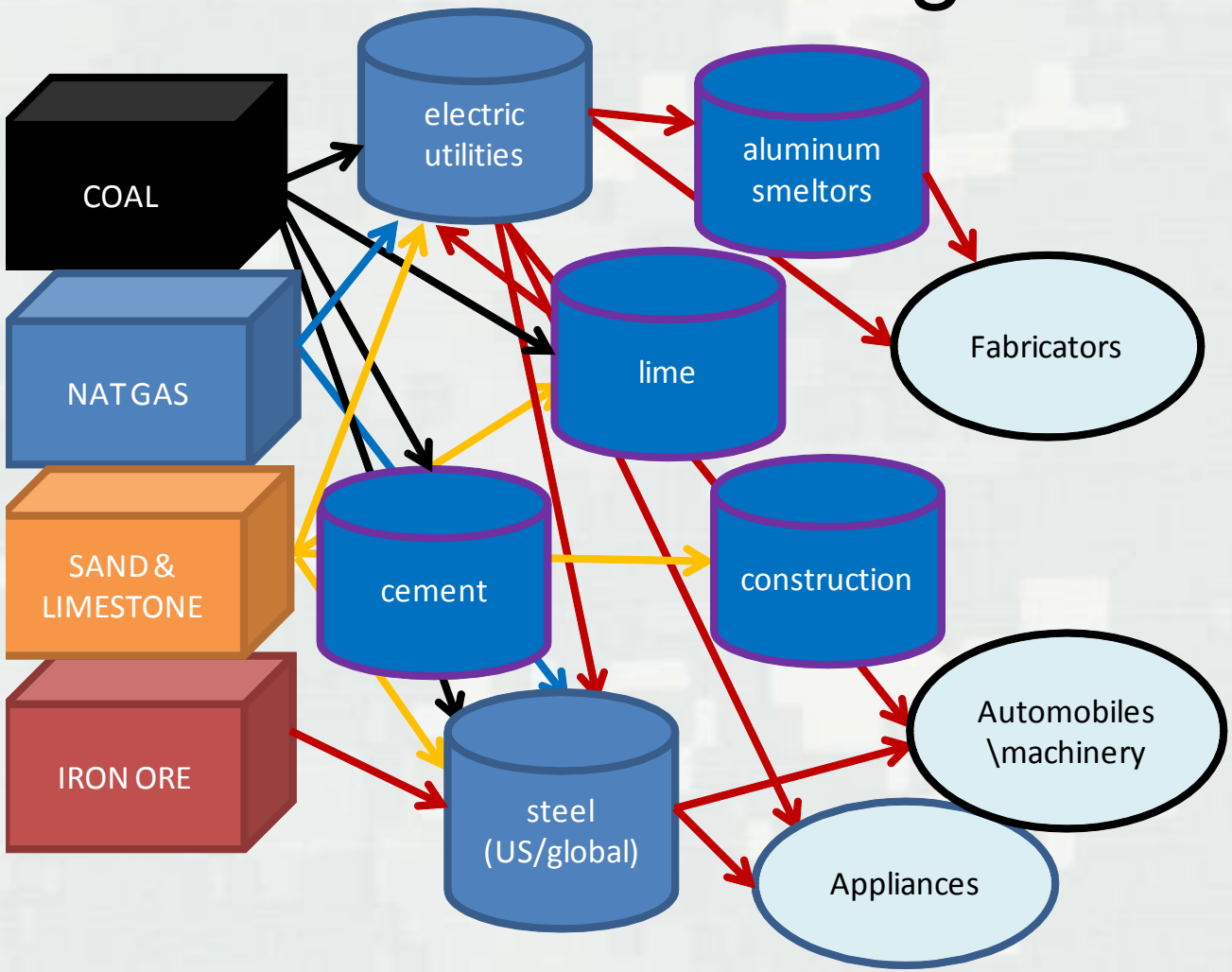
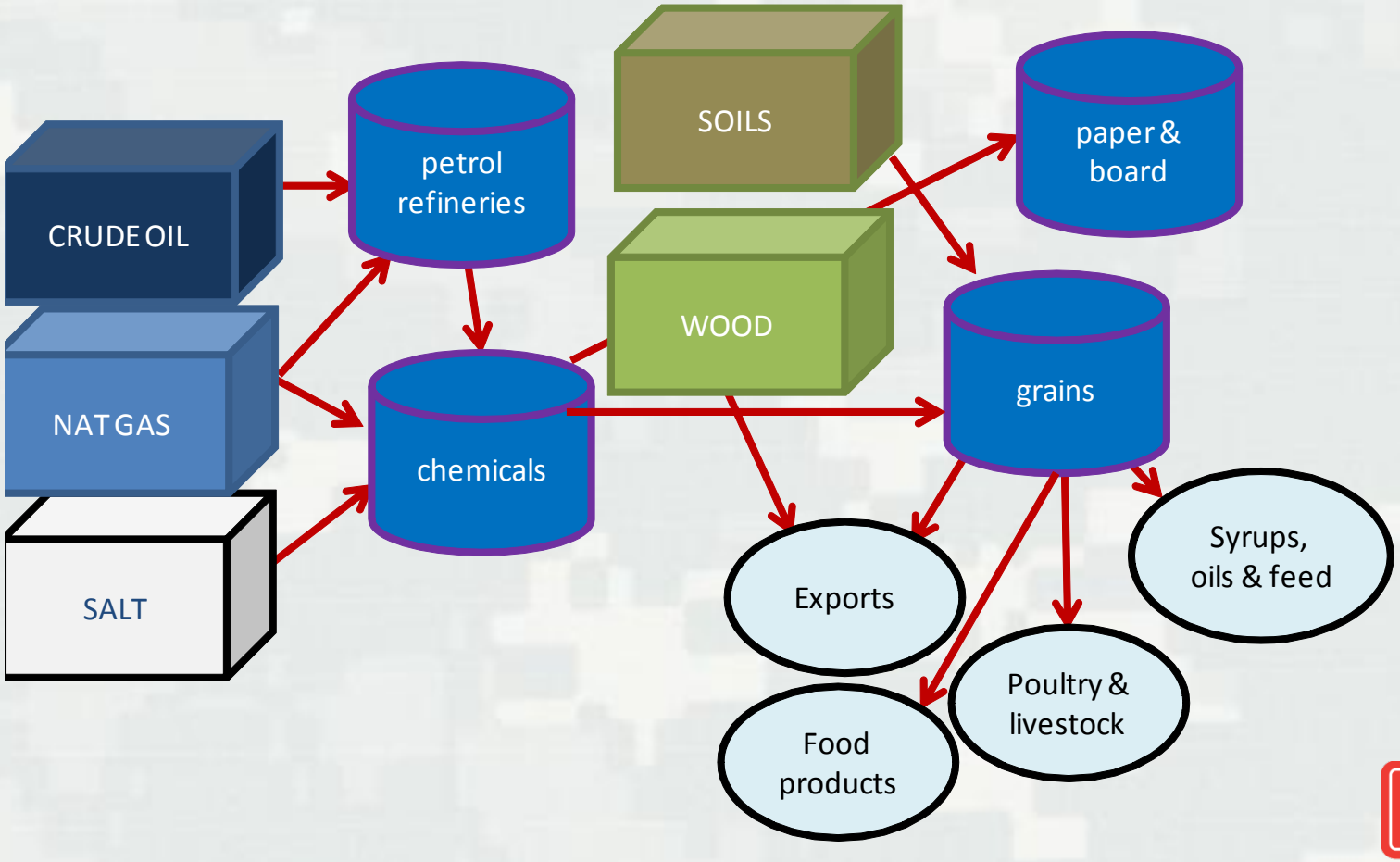
Step 1. Susceptible Commodities Natural Resources Foundation

Step 1. Susceptible Commodities Resource Linkages



Step 1. Susceptible Commodities Resource Linkages (cont.)



Step 2. Study Area - ODs
Domestic Produce/Consume

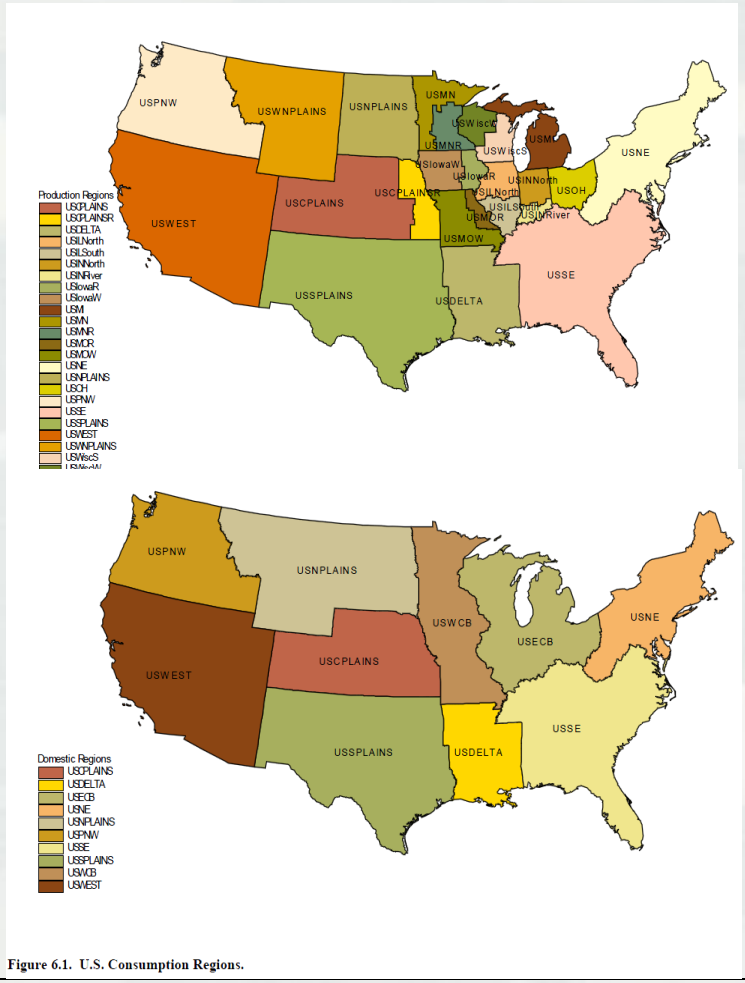
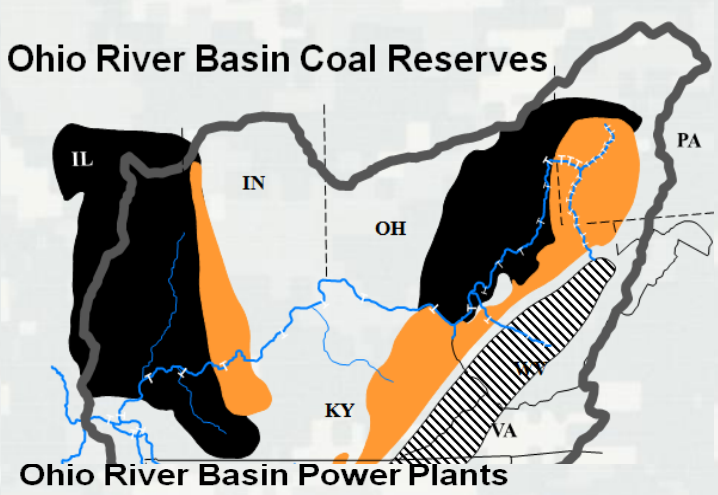
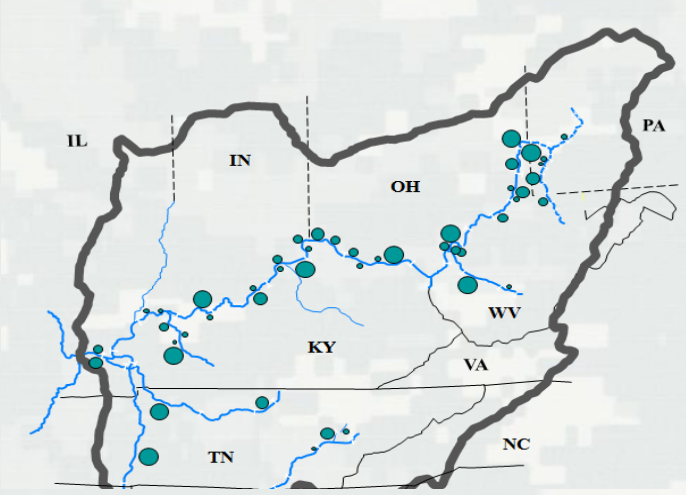
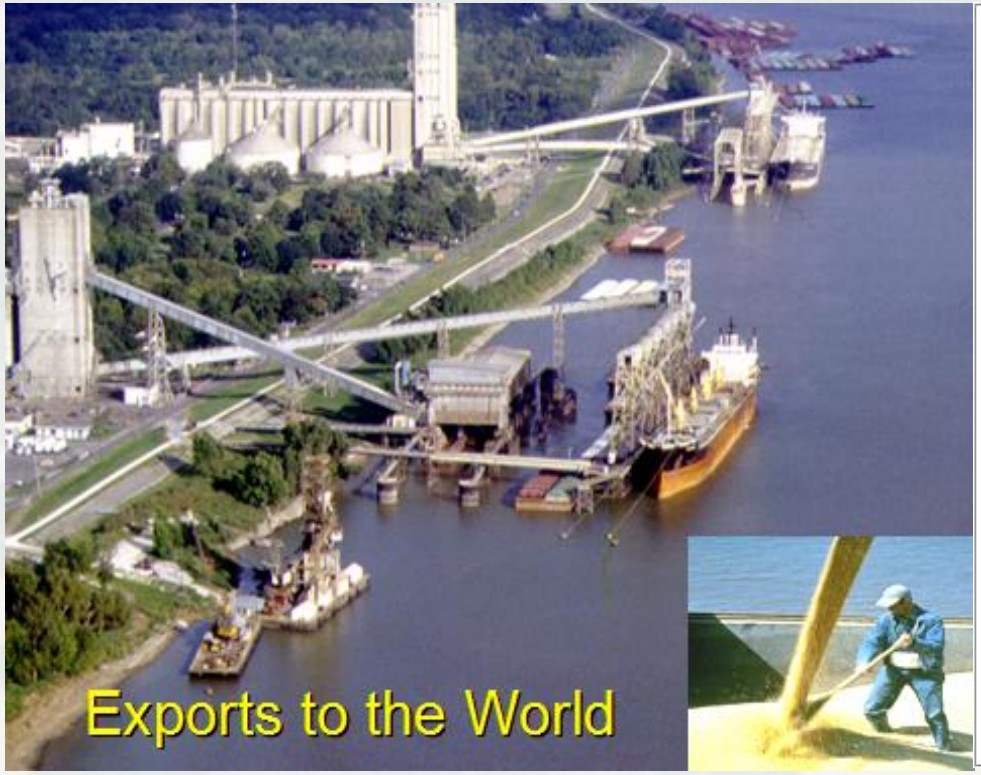


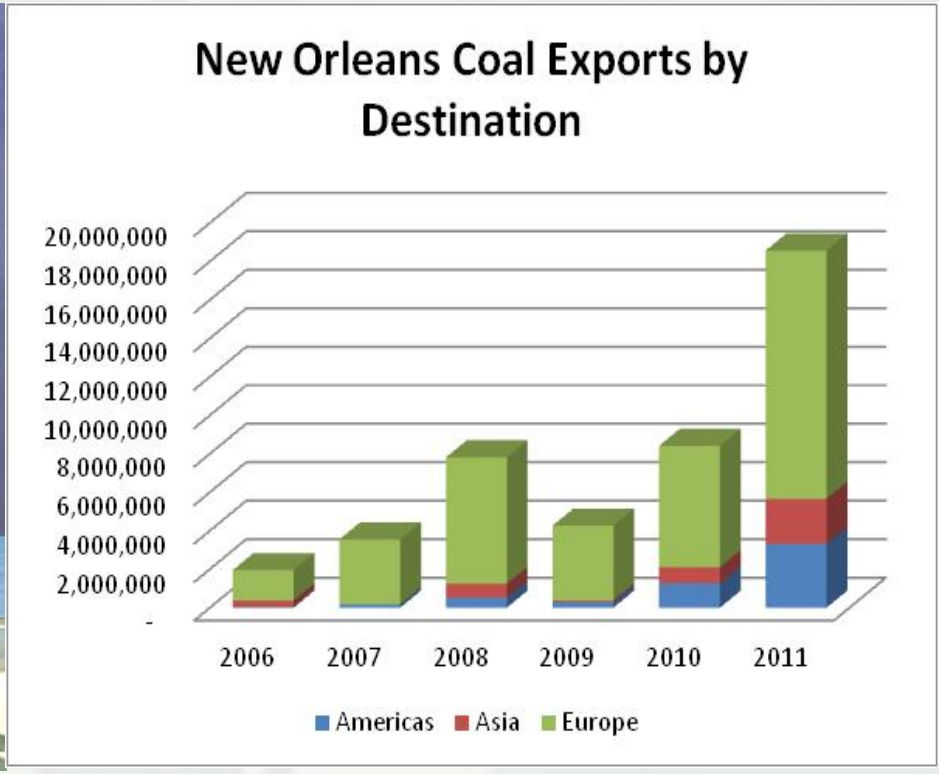
Figure 6.1. U.S. Consumption Regions.



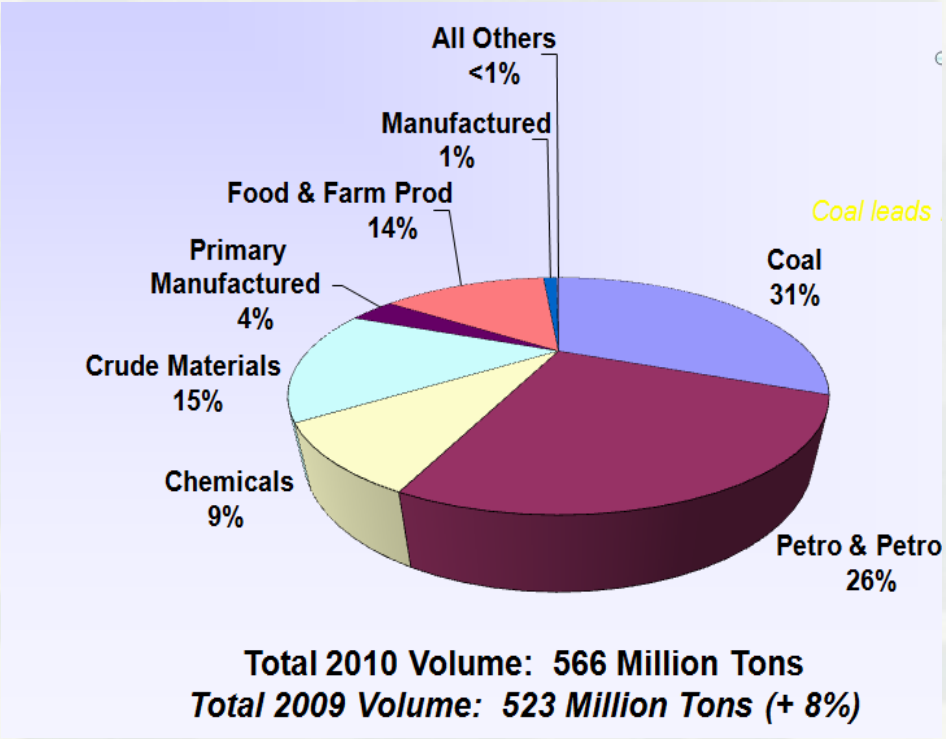


Step 2. Study Area - ODs
Global Produce/Consume





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

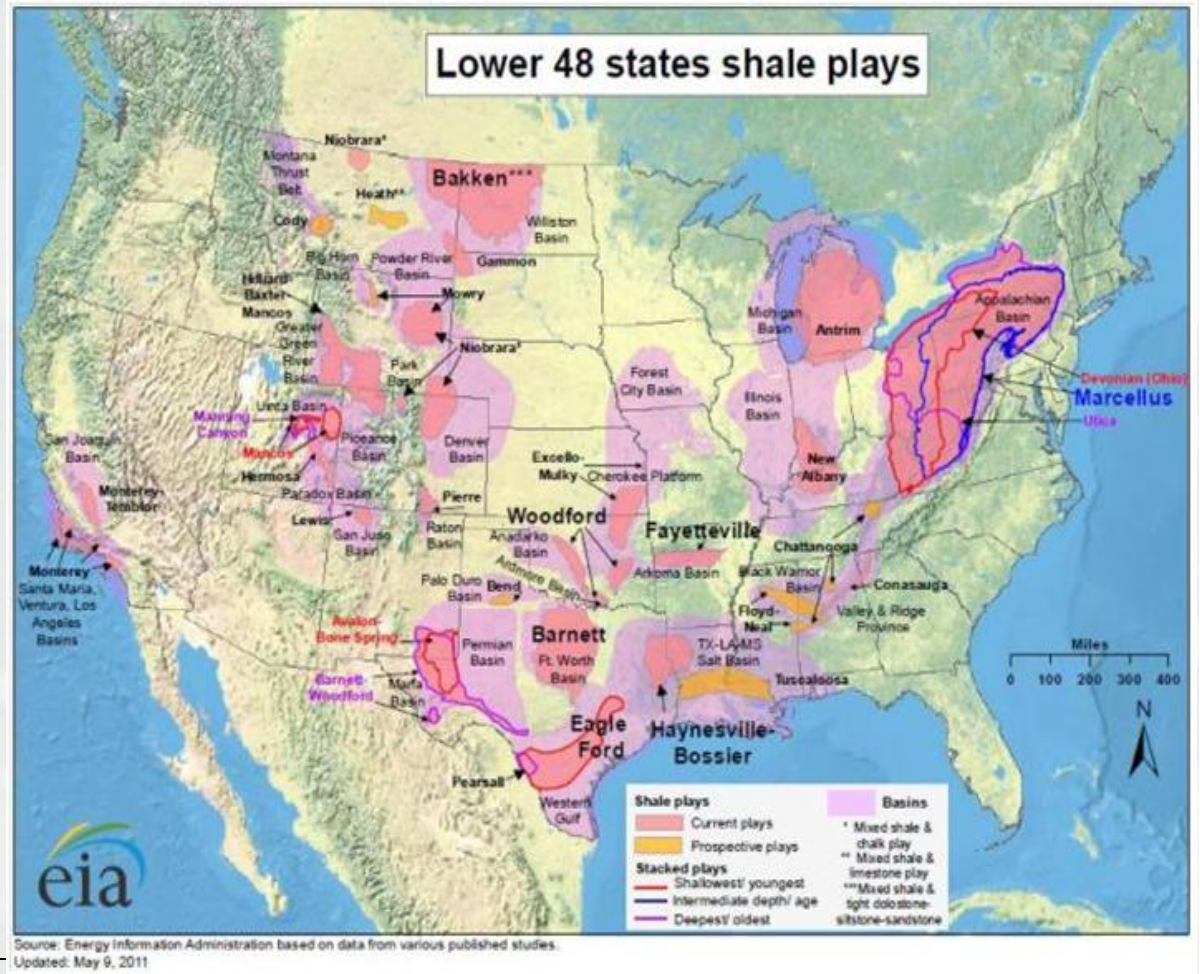
Exports in Short Tons by Custom District

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

- 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

Step 3. Current Commodity Flows Changes? – Govt Publications

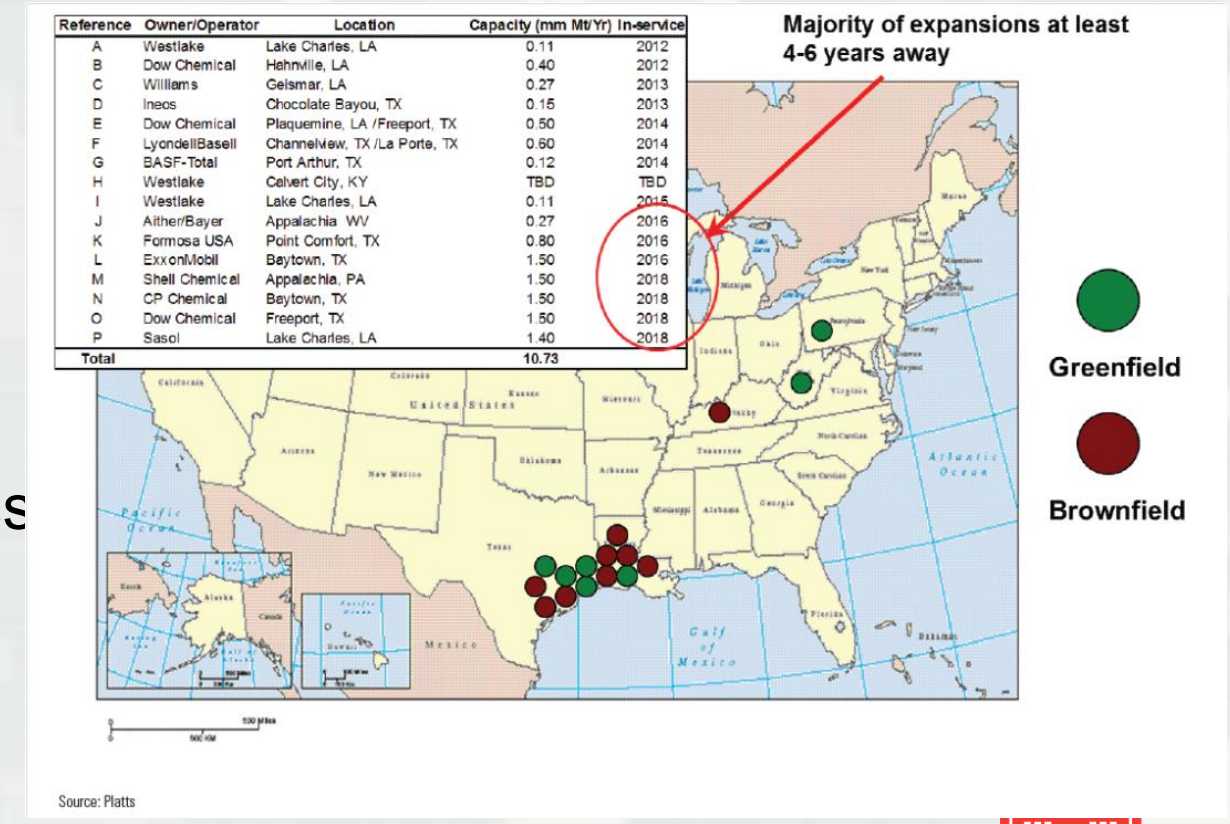
- Resources/ reserves
- Industry trends
  - ► Global
  - ► Domestic
- Company plans
  - ► Plant closures/ openings
- High level view



Step 3. Current Commodity Flows Changes? – Industry Interviews

- Company plans
  - ▶ Plant closures/ openings
  - ▶ Sources & markets
  - ▶ Modes and decision process
- Short horizon – 1-3 years, electric utilities 10 years

Reference	Owner/Operator	Location	Capacity (mm Mt/Yr)	In-service
A	Westlake	Lake Charles, LA	0.11	2012
B	Dow Chemical	Hahnville, LA	0.40	2012
C	Williams	Geismar, LA	0.27	2013
D	Ineos	Chocolate Bayou, TX	0.15	2013
E	Dow Chemical	Plaquemine, LA /Freeport, TX	0.50	2014
F	LyondellBasell	Channelview, TX /La Porte, TX	0.60	2014
G	BASF-Total	Port Arthur, TX	0.12	2014
H	Westlake	Calvert City, KY	TBD	TBD
I	Westlake	Lake Charles, LA	0.11	2015
J	Aither/Bayer	Appalachia WV	0.27	2016
K	Formosa USA	Point Comfort, TX	0.80	2016
L	ExxonMobil	Baytown, TX	1.50	2016
M	Shell Chemical	Appalachia, PA	1.50	2018
N	CP Chemical	Baytown, TX	1.50	2018
O	Dow Chemical	Freeport, TX	1.50	2018
P	Sasol	Lake Charles, LA	1.40	2018
Total			10.73	



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 http://www.woodsandpoole.com/
  - 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

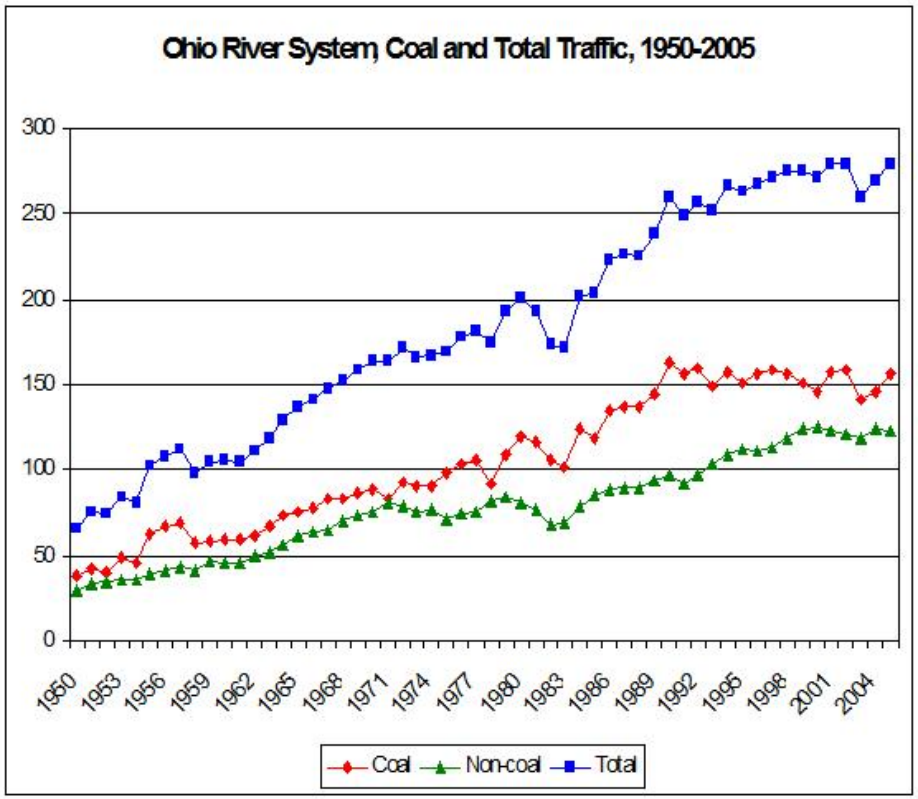
Step 6. Potential Waterway Traffic Expert Analysis - Analyst

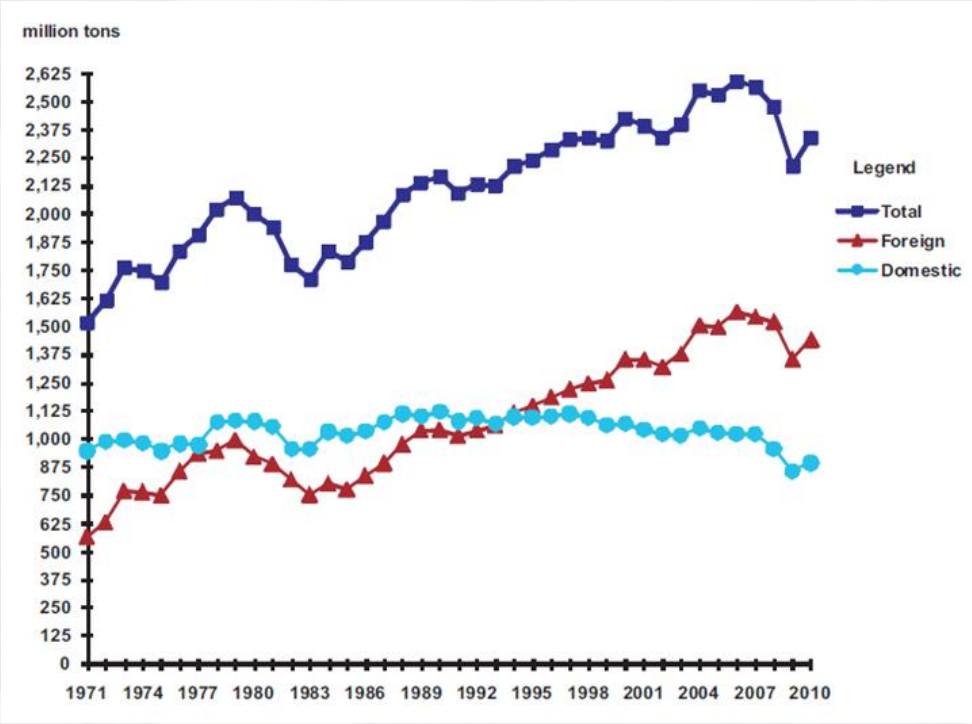
- Especially useful for scenario development
  - ▶ Analyst describe/select scenarios
- Independent analysis does not absolve the analyst
  - ▶ Analyst still needs to know WHAT to study
  - ▶ Analyst still needs to be able to scope the exercise

Step 6. Potential Waterway Traffic Statistics - Trends

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

By commodity





By nature of the flow

Step 6. Potential Waterway Traffic Statistics -Time Series/Cross Sect

- 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

Step 6. Potential Waterway Traffic Models – LP Models

- 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

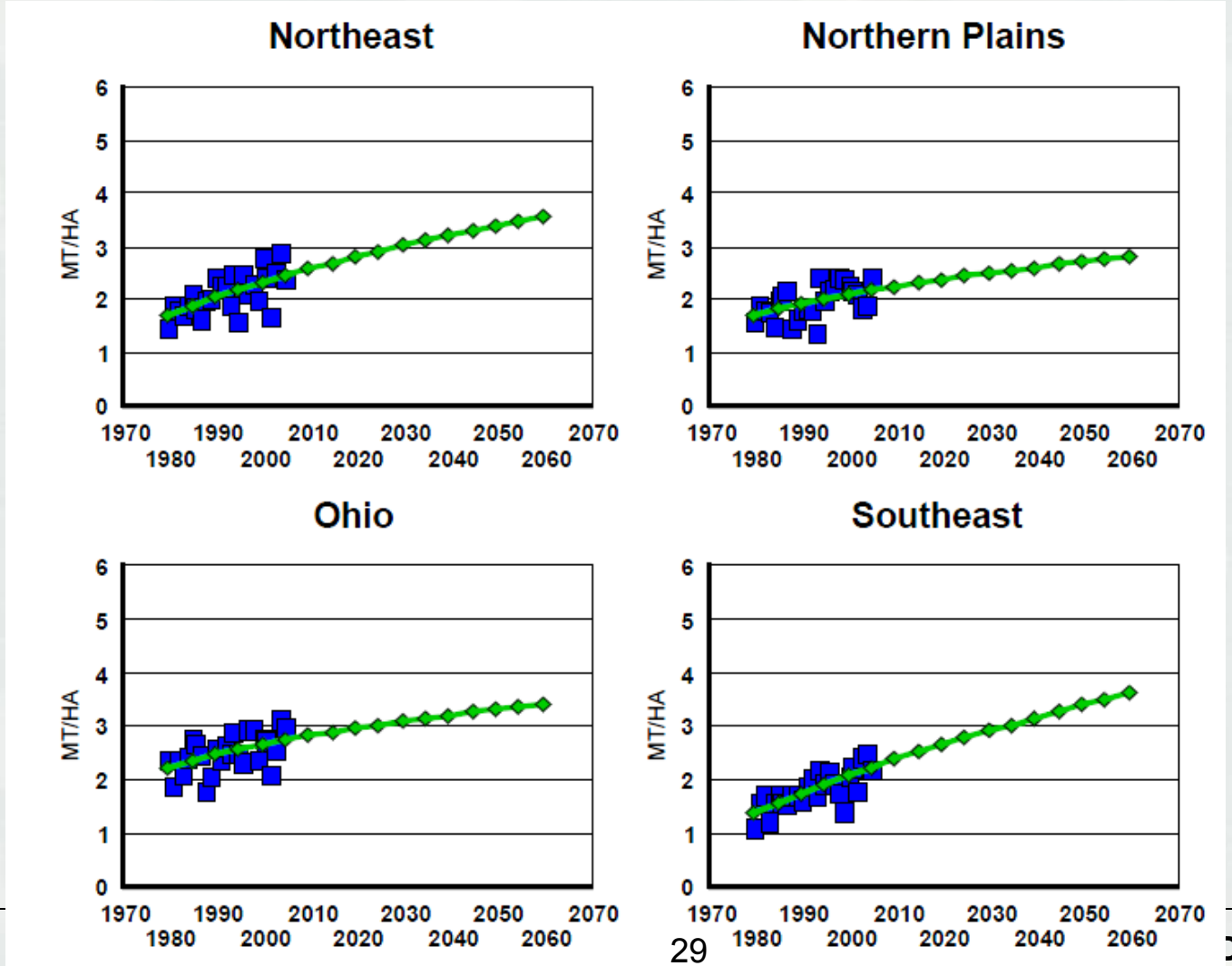


Figure 4.3.(cont.) Soybeans: Actual and Forecast Yields by Production Region (mt/ha)

Step 6. Potential Waterway Traffic Models – Input Price Forecasts

- Models have capability of capturing effect of price changes

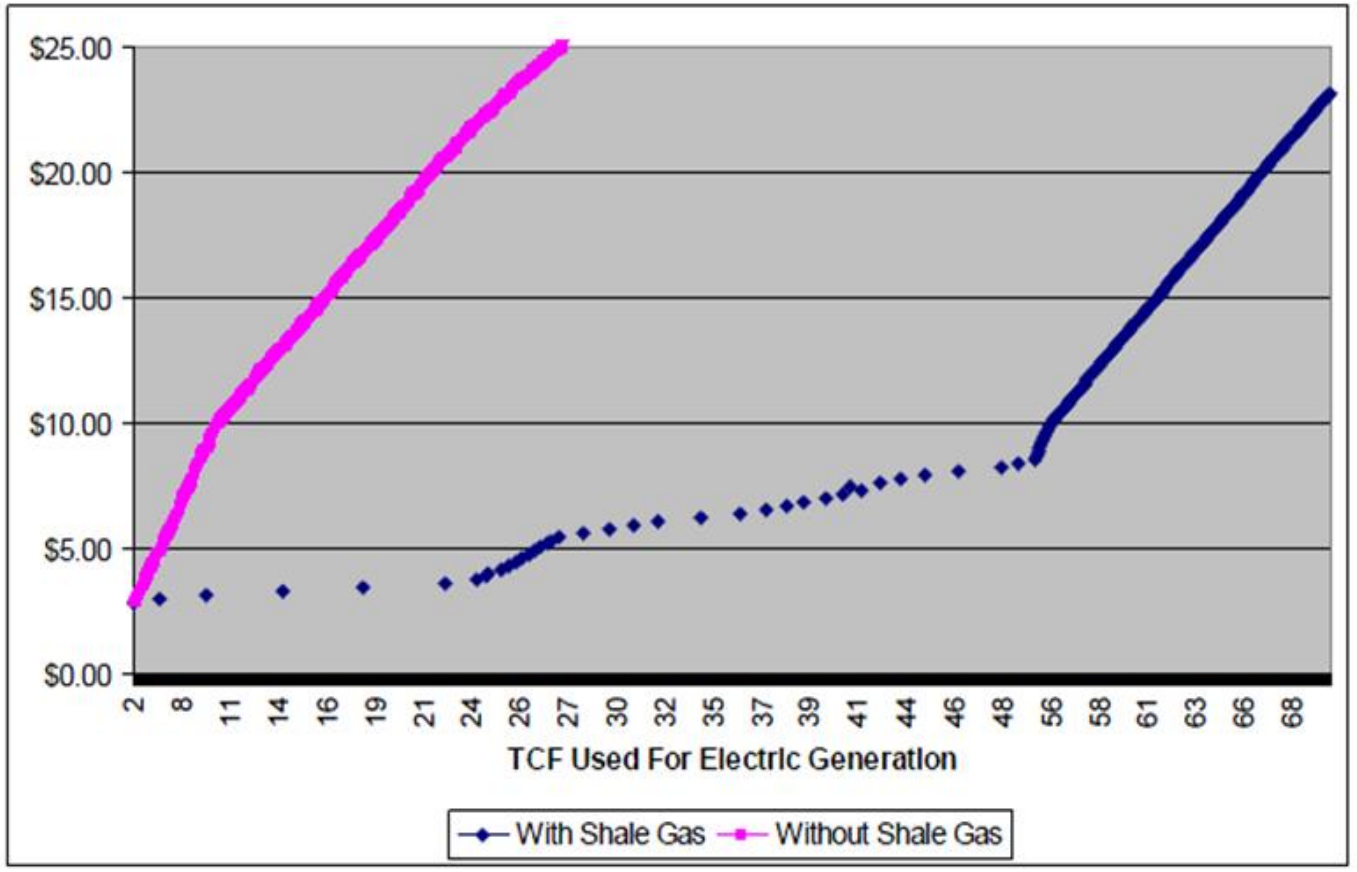


Figure 12: Cost Curve Showing With Shale Gas vs. Without Shale Gas

Step 6. Potential Waterway Traffic Advantage - Linear Programming

- Scenario testing
- Spatially based, production cost functions by region

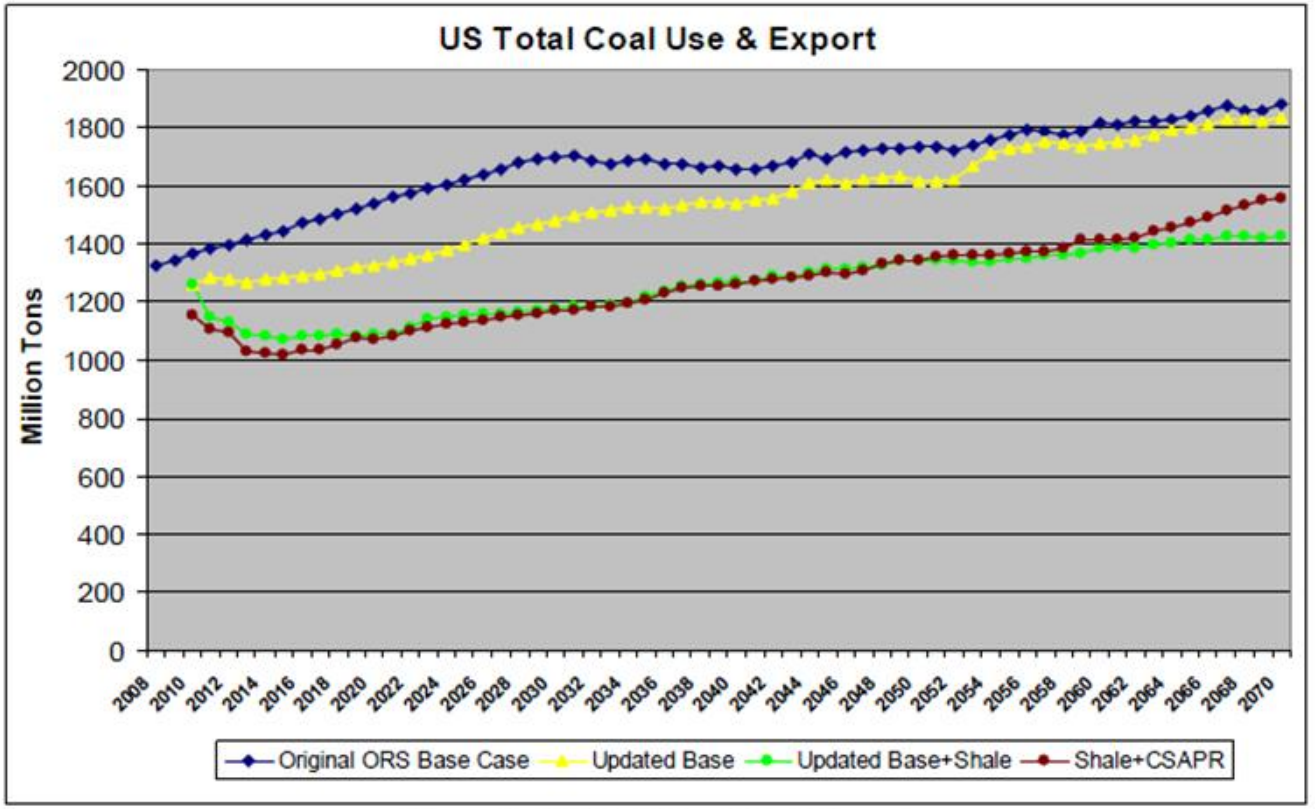


Figure 19: U.S. Total Coal Use & Export

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

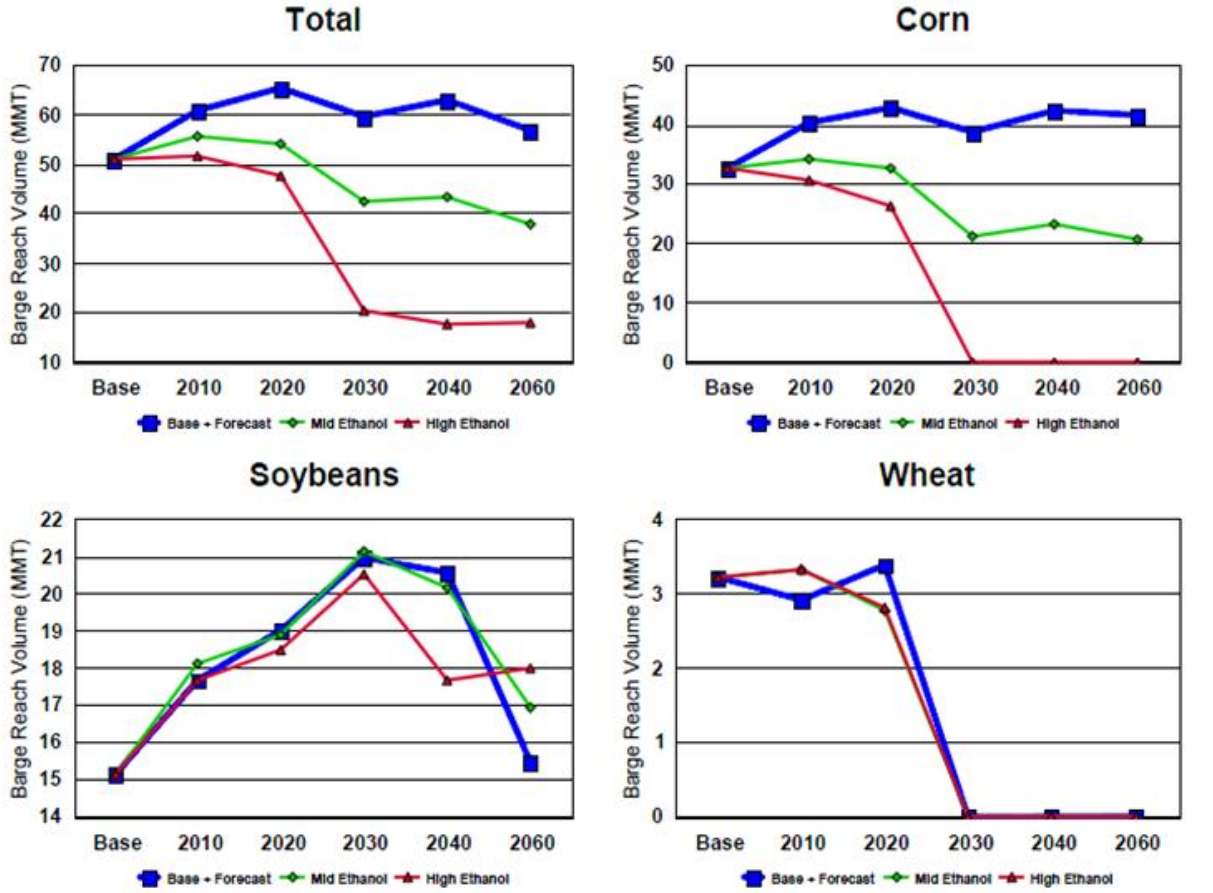


Figure 7.3.1d. Comparison of Barge Reach Volumes for Ethanol Scenarios, Base Case, Mid Ethanol and High Ethanol Demand Scenarios, by Crop and Total.

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

http://inlandwaterways.lrh.usace.army.mil/downloadfile.cfm?file=200B78BA-C72F-C9AA-C04D230CBB746113

- Inland Opportunities

http://inlandwaterways.lrh.usace.army.mil/documentbrowser/?syspage=document&item_id=27906

- 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
- Next week:

Date	Webinar Title	Lead
2/20/2013	Inland Navigation Economics 101	Mark Hammond
2/27/2013	Great Lakes Navigation Economics 101	Roger Haberly
3/6/2013	Navigation Data Resources	Dick Ash
3/13/2013	Waterborne Traffic Demand Forecasting	Wes Walker
3/20/2013	Transportation Rate Analysis & Externalities	Lin Prescott
3/27/2013	Lock Capacity and Engineering Reliability	Mark Lisney
4/3/2013	Navigation Component Engineering Reliability	Greg Werncke
4/10/2013	Elasticity of Demand - Shipper Responsiveness	Mike Hilliard
4/17/2013	Vessel Operating Costs - Inland	Bill Frechione
4/17/2013	Vessel Operating Costs - Great Lakes	Roger Haberly
4/24/2013	Navigation Economic System Modeling	Bud Langdon
5/1/2013	Summary Series Wrap-up	Bill Frechione