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ACP Integrated Demand Model – User Guide

MERCER
Management Consulting

MMC Marsh & McLennan Companies

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Introduction

1.1 Background

Mercer Management Consulting, Inc. (Mercer) was engaged by the Autoridad del Canal de Panamá (ACP) to assist the ACP in developing an investment-grade market demand forecast that will be used to support the investment requirements of the ACP. As part of its assignment, Mercer was asked by the ACP to develop a computer-based analytical and modeling tool that provides executable integrated market demand forecasts for the Panama Canal under a variety of scenarios, encompassing pricing strategies, service standards, and economic drivers.

1.2 Purpose

The purpose of this document is to provide a description of the ACP integrated demand modeling tool as it is implemented in Excel, including an overview of the navigation aspects of the model and the functionality built into each of the model components. The information presented herein is of sufficient detail to enable the knowledgeable user to model and analyze Canal performance under a variety of scenarios.

We would like to note that the screenshots provided in this document are for illustrative purposes only. While it is expected that the navigation links and functionality associated with each screen may change slightly in the final version, the overall features and organization of the model will remain very close the description in this document.

1.3 Document Organization

This model prototype document is organized in nine sections. Section 2 provides a brief description of the model layout and the component screens; Sections 3 through 9 provide a detailed description of each of the screens.

2

Model Layout

2.1 Description

The model has been designed to maximize ease of installation and use and has an intuitive layout and navigation scheme. A single model file incorporates all the input data tables, the analytical models, all the macros which automate the model, and the output data. Currently, it is envisioned that this model data file is the only file a user will need to perform the required market analyses.

2.2 User Interface and Navigation

The integrated model has two major components: the "front end," as represented by the user interface; and the "back end" of analytical driver modeling. The front-end user interface is composed of six screens, each representing a different component of the model.

Navigation within the integrated model has two dimensions:

- Navigation to use the functions of each screen
- Navigation between the various screens

Each screen provides a number of active buttons, which, when clicked on, direct the user to specific functionalities. At each functionality location, users will have a button to return to the main menu for that screen.

To facilitate movement around the six screens of the model, a navigation tool is provided on each sheet in the top right corner (except on the first model screen). This tool provides links to sheets a user would logically navigate to in the model. A brief description of each model user interface screen is provided below, while a detailed description is provided in the following sections.

2.2.1 Main Menu

The Main Menu is the first screen the user views when the model file is opened. This screen provides access to the other key components of the model.

2.2.2 Inputs

The Inputs screen provides access to the drivers of the integrated model. This screen provides the user with the list of drivers for each segment as well as the specific values assigned to the drivers as inputs to the model. The main purpose of this screen is to allow the user to change the values of the input drivers to run custom scenarios.

2.2.3 Scenarios

The scenarios dashboard provides a graphical representation of Canal operations under various scenarios. The main purposes of the screen are to allow the user to test Canal performance under various scenarios and to provide a mechanism to run custom scenarios. This screen also serves to provide a summary forecast of Canal performance in terms of key metrics such as Canal transits, tonnage, and toll revenues.

2.2.4 Model Results

This functionality provides access to key results from the model by individual segment. Forecast output is provided at various levels of detail for each of the components in the model framework (Canal share, fleet mix, transits, etc.).

2.2.5 Reports

The Reports screen enables the user to print key reports or to export key summary tables generated by the model.

2.2.6 Assumptions

The assumptions page details the assumptions built into the base and forecast models for each segment.

2.2.7 Model Update

This module allows users to update key components of the integrated model as needed.

2.3 Analytical Models

The analytical models that translate the input drivers into output data form the engine of the integrated model. These models represent the back end of the integrated model, and while an integral part of the model, are not described in this document. A detailed description of the inner workings of these models is provided as part of the separate segment-specific reports.

3

Main Menu

3.1 Description

The Main Menu is the first screen the user views when the model file is opened. This screen provides access to the other key components of the model.

3.2 Navigation

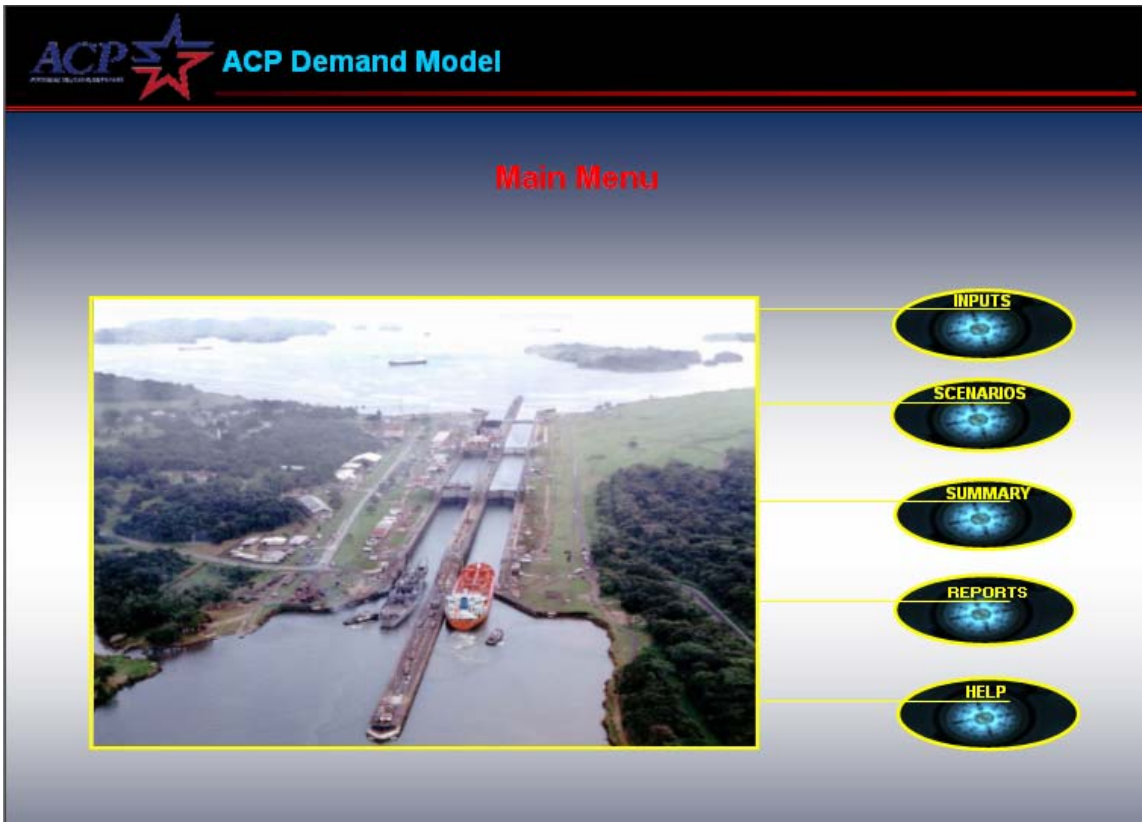
A screen shot of the Main Menu screen is provided for illustrative purposes in Exhibit 1. Active buttons on right side of the screen provide for navigation to key components of the model. The Main Menu screen allows navigation to the following model components:

- Inputs
- Scenarios
- Summary (model results)
- Reports
- Help

Each of these screens in turn have options to return back to the Main Menu screen.

Exhibit 1

ACP Integrated Model Main Menu



4

Input Drivers

4.1 Description

The Inputs screen provides access to the drivers of the integrated model. This screen provides the user with the list of drivers for each segment as well as the specific values assigned to the drivers as inputs to the forecasts. The Inputs screen enables the user to:

- Review the list of drivers applicable to multiple segments
- Review the list of drivers by segment
- Review most probable, optimistic, and pessimistic assumptions associated with each driver
- Review probability distributions of the drivers provided as inputs to the Monte Carlo simulation
- Create custom scenarios, especially to understand sensitivity around a particular pre-defined scenario

4.2 Navigation/Layout of Inputs Screen

An illustration of the Model Inputs menu screen is provided in Exhibit 2. Access to functionality within this feature is provided through the links on the left. The "General" link directs the user to input drivers that are common to and affect all segments, such as fuel prices. Segment-specific links direct the user to the input drivers that correspond to that segment.

Access to other features / screens in the model is provided through the User Menu in the top right corner, where links allow the user to navigate back to the Main Menu or to the

Scenarios screen to view the results of the simulation, including changes made on the Inputs screen.

4.3 Functionality

The Inputs screen provides access to the drivers that are common to all segments as well as those that are specific to individual segments. For ease of interpretation and usage, the input drivers have a consistent layout. Each table specifies input drivers using six columns:

- Driver description: Identifies the driver with a brief description as necessary
- Sources / Units: Provides the source of the data, and units where applicable
- Pessimistic value: Specifies the most likely future value of the driver that has a detrimental impact on Canal business in comparison to the most probable value
- Most probable value: Specifies the base case or the most probable future value of the driver
- Optimistic value: Specifies the most likely future value of the driver that has an incrementally positive impact on Canal business in comparison to the most probable value
- Custom value: Allows the user to specify a custom value for the driver to be used in the model forecasts. In terms of the way driver values are specified, the drivers are of two categories: those that are captured as continuous variables, and those that are captured as discrete states. For continuous variables, user can enter values directly in the model. For variables with discrete states in the future, user can choose among the options provided under the pessimistic, most probable, and optimistic columns, by entering 1, 2, or 3 respectively in the custom column.

  The custom column is the only column that the user will have to or should use to provide inputs to the scenarios on the Inputs page. All other data on the Inputs page should not be changed by the user.

  The custom value column also incorporates the input specifications for Monte Carlo simulation. The probability distribution of the values assigned to each of the input drivers can be specified in these cells.

A screen shot of the Inputs screen is provided for illustrative purposes in Exhibit 2. Exhibit 3 displays the Input driver layout for the General section for illustrative purposes. Notice the button on the top left of the screen next to the section heading titled “Input Menu” – this button directs the user back the Input menu (navigation screen).

Exhibit 2

ACP Integrated Model Input Menu

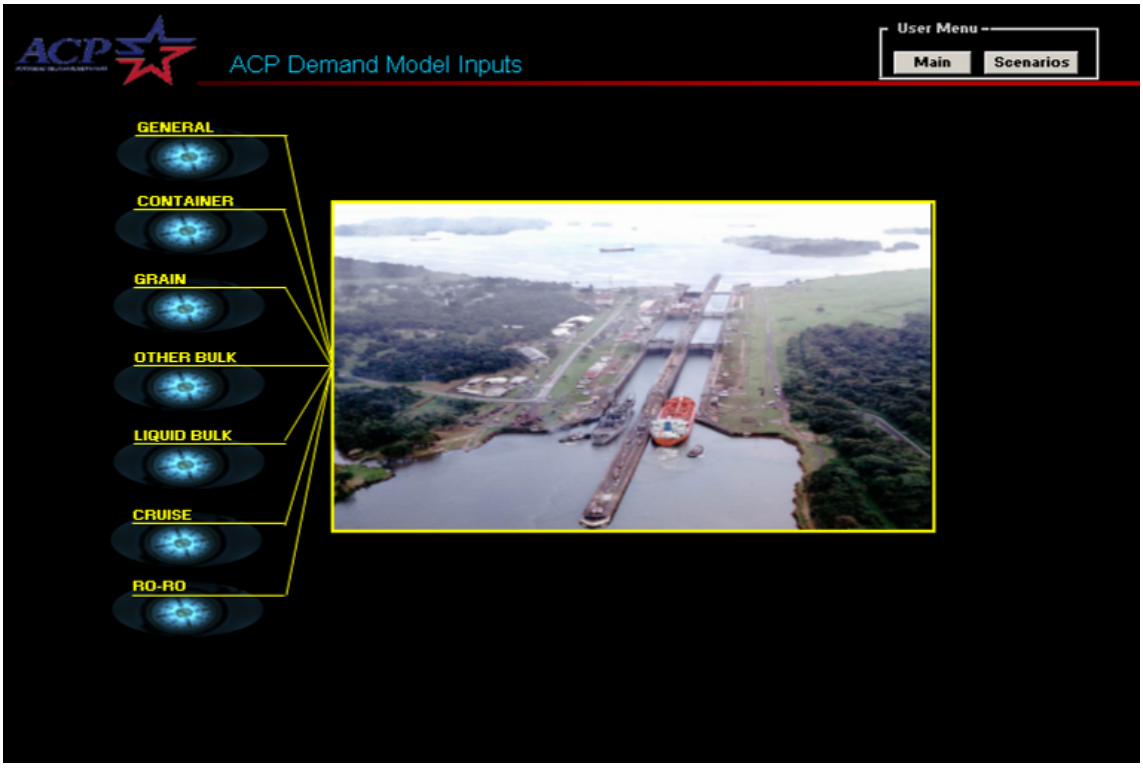


Exhibit 3

ACP Integrated Model Inputs: Illustrative Input Screen

Segment	Input Menu Variable	Units/Comments	Pessimistic	Most Probable	Optimistic	Custom
General						
Vessel & IM	Ship Operating Costs	Base Source: 2002 Drewry	5%	3%	2%	3%
	Port & Port Piloting Costs	Base Source: 2002 Drewry	5%	3%	2%	3%
	Bunker Price Escalation (Annual)	Source: DOE	0.3%	2.4%	3.5%	2.4%
Transit Time	Panama Canal InTransit Time: Booked Vessel	Hours				See CanalService
	Panama Canal InTransit Time: Unbooked Vess	Hours				See CanalService
	Panama Canal Wait Time: Booked Vessels	Hours				See CanalService
	Panama Canal Wait Time: Unbooked Vessels	Hours				See CanalService
	Suez Canal Transit Time	Hours		24		24
Canal Non-toll c	Panama Canal Booking Costs	Annual change		2%		2%
	Panama Canal OMS Costs	Annual change		2%		2%
Transit Cost F	Time Charter Escalation (Annual)	Annual change (Discre	2%	3%	4%	2
	Time Charter Base (% of Forecast)	Discrete input	71%	100%	129%	2
	Suez Canal Toll	Annual change		2%		2%
	Intermodal Cost	Annual change		3%		3%

The following sections briefly detail the general factors and segment-specific drivers on the Inputs screen, including a description of the most probable, optimistic, and pessimistic values. More detailed information about the drivers can be found in the technical documentation for each segment.

4.3.1 Container Segment Inputs

This section details the input drivers specific to the container segment. Exhibit 4 displays the input drivers for the container segment, each of which is explained in further detail below.

Exhibit 4

ACP Integrated Model Container Inputs

Container	Input Meas	Variable	Units/Comments	Pessimistic	Most Probable	Optimistic	Custom
Supply & Dema		Imported Liner products as % of PCE		Pessimistic	Most probable	Optimistic	2
		Country share shift scenario		Pessimistic	Most probable	Optimistic	2
		Supply chain optimization trends		Mild Trends	Observed trends	Aggressive	2
Transit Factor		Panama Canal	Extra days compared to norm	1	0	0	0
		Suez Canal	Extra days compared to norm	0	0	1	0
		US Intermodal System	Extra days compared to norm	0	0	1	0
Vessel Utilizat		NE_Asia to USA (2025)		77%	74%	71%	74%
		SE_Asia to USA (2025)		77%	74%	71%	74%
		Europe to USA (2025)		77%	74%	71%	74%
Fleet Deploym		Post-Panamax deployment scenario (Expansion)			Slow Deployment (2)	Rapid Deployment (3)	2

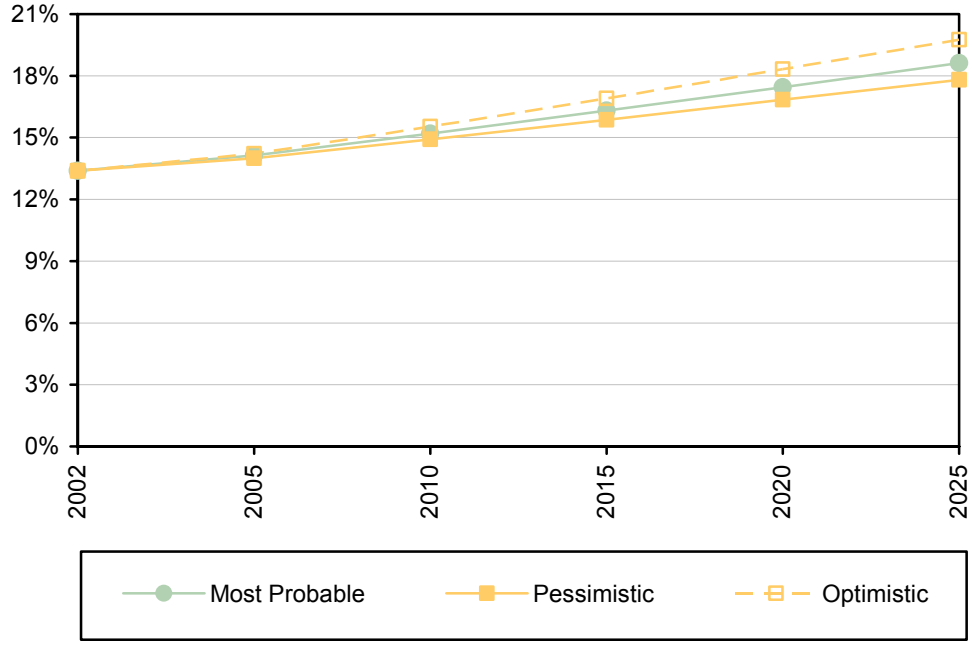
Imported Liner Products as Percent of US Personal Consumption Expenditure

US consumption of goods is the primary driver of container volume transiting the Panama Canal. A standard measure of this aggregate demand is US personal consumption expenditures (PCE), which also includes consumption of oil and services related expenditure. This drivers addresses two components of PCE that impact Canal demand: the proportion of PCE that is consumption of goods, and the percentage of such consumption that is met through imports instead of domestic production.

Propensity of imports of liner products is modeled as scenarios – Exhibit 5 shows the change from 2002 to 2025 for the three scenarios under the most probable macroeconomic scenario. In the most probable import scenario, share of imported liner products as percent of PCE steadily rises from 13.38 percent in 2002 to 18.62 percent in 2025. In the pessimistic and optimistic scenarios, the corresponding values in 2025 are 17.81 percent and 19.75 percent.

Exhibit 5

US Imported Liner Products as Percent of PCE



Source: Mercer analysis.

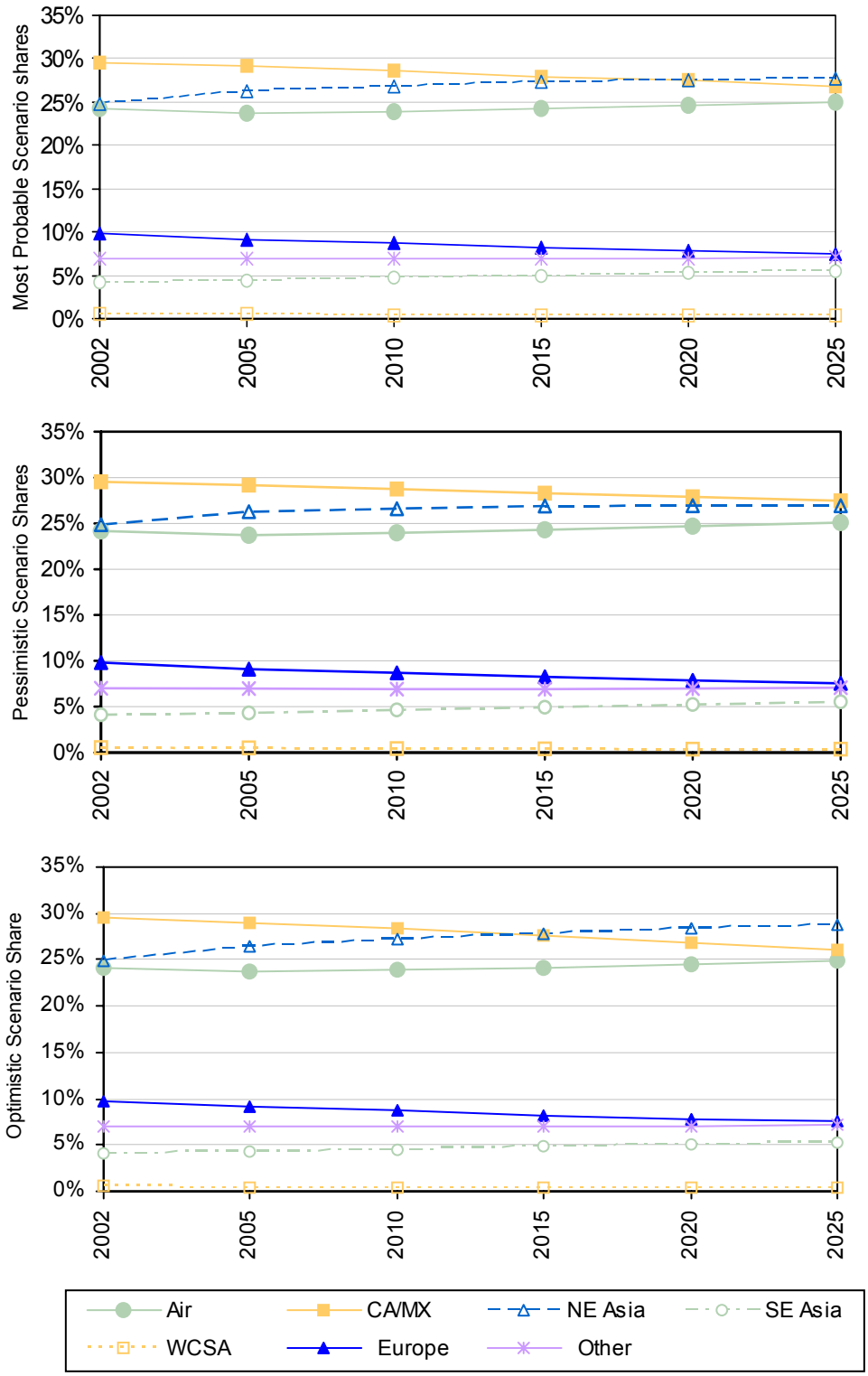
Country Share Shift Scenarios

A major driver of Canal traffic is the share of US imports that are exported by individual countries and regions. Which countries supply demand is very important in determining Canal demand. If US import demands are met by countries that tend to use the Canal for exports (such as China, compared to Mexico which relies on truck or rail), potential Canal demand is increased.

Import share shifts over the forecast period are modeled as scenarios – Exhibit 6 shows the change from 2002 to 2025 for the three scenarios under the most probable macroeconomic scenario. In the most probable import scenario, share of waterborne imports that contribute to Canal demand steadily rises from 46.32 percent in 2002 to 48.23 percent in 2025. In the pessimistic and optimistic scenarios, the corresponding values in 2025 are 47.43 percent and 49.09 percent. In addition, there is a shift in how the waterborne imports are distributed among the Asian countries, as evidenced in the shifts between Northeast and Southeast Asia.

Exhibit 6

Shares of US Imports, 2002-2025



Source: Mercer analysis.

Supply Chain Optimization Trends

This drivers captures shippers' propensity to optimize their supply chains, as evidenced over the last decade. The impact of this behavior is captured using trends that project forward to 2025. While the trends are expected to continue, they are also dependent on the competitiveness of the Canal in relation to the other alternatives such as Suez and the US intermodal system. As such, the impact of the trends is captured in a dynamic fashion that accounts for changes in service levels among competing all-water alternatives.

While the impacts are driven by service level changes, this driver also captures the pace at which optimization occurs. First, it is assumed that the achievement of optimal share occurs over a ten-year period. Second, the speed at which it is achieved is modeled as scenarios – under the most probable scenario, close to 80 percent of the effect is achieved in the first 5 years. In the pessimistic and optimistic scenarios, the corresponding values in year 5 are 40 percent and 90 percent.

Transit Reliability Factors

For the container trade lanes explicitly analyzed, each of the alternate routes considered on a trade lane has an associated reliability factor in terms of the variability associated with promised transit time. This can be thought of as the additional transit time that shippers have to account for to ensure smooth supply chain operations. For all three routes considered (Panama, Suez, US intermodal), the base or the most probable case assumes that shippers do not need to account for any extra time. The pessimistic case for the Canal is a worsening of Canal reliability; the optimistic case for the Canal is a worsening of Suez and US intermodal reliability. Note that as Panama Canal traffic also relies on the US intermodal system to some extent for intra-US movements, the beneficial impact on Canal demand of deterioration in US intermodal system reliability is slightly muted.

Vessel Utilization

This driver represents vessel capacity utilization on the dominant leg or the head-haul leg of the trade lane. The input driver value is the average utilization on typical vessels in 2025. The default value used in the most probable case represents the utilization values in the base year 2002. The changes indicated by the user in the Inputs page are implemented for each of the applicable vessel categories, and also as a gradual change from the base year to 2025. Note that vessel utilization has a dual impact on Canal demand: improved utilization benefits the Canal by reducing transportation costs, but is detrimental insofar as it reduces the number of transits needed for the same level of demand. The net impact on Canal demand depends on the amount of change and the specific routes on which the change occurs.

Fleet Deployment in Canal Expansion Scenario

A variety of factors were considered in determining likely fleet evolution over the forecast period. For the expanded Canal case, fleet evolution is captured in two distinct scenarios:

- Slow deployment of post-Panamax vessels. Under this scenario, deployment of post-Panamax vessels on the main Canal routes happens at a slow pace once the expanded Canal opens. This scenario assumes a constrained ability to redeploy Panamax vessels onto other routes, which forces the lines to continue to use them on the main routes until economically efficient alternatives are found. This scenario represents the base case for fleet evolution under the expanded Canal case.

- *Rapid deployment of post-Panamax vessels.* This scenario assumes that Canal expansion will have significant influence on vessel mix beyond 2014 (presumed opening of the new locks). It assumes that the lines aggressively prepare to take advantage of the expanded Canal by sufficiently planning for availability of post-Panamax vessels as soon as the expanded Canal opens. The end state in 2025 is assumed to be the same as for the slow deployment scenario, with the major difference occurring in the immediate years after the expanded Canal opens.

Exhibit 7 provides the expected vessel mix under the two fleet deployment scenarios once the expanded Canal opens. Exhibit 8 provides the end state for fleet deployment in 2025 for the expanded Canal case.

Exhibit 7

Post-Panamax Fleet Deployment Scenarios in 2015

	Slow Deployment Post-Panamax							Rapid Deployment Post-Panamax						
Trade Route / TEU Capacity	**1500**	**2500**	**3500**	**4500**	**5700**	**6800**	**8000**	**1500**	**2500**	**3500**	**4500**	**5700**	**6800**	**8000**
NE Asia to USA	0%	5%	15%	80%	0%	0%	0%	0%	0%	5%	35%	10%	20%	30%
SE Asia to USA	0%	5%	15%	80%	0%	0%	0%	0%	0%	0%	35%	10%	25%	30%
USA to Oceania	0%	39%	31%	30%	0%	0%	0%	0%	0%	12%	47%	30%	5%	6%
USA to NC/ECSA	0%	45%	35%	20%	0%	0%	0%	0%	0%	20%	50%	30%	0%	0%
WCSA to USA	15%	31%	31%	24%	0%	0%	0%	7%	2%	18%	42%	24%	3%	4%
Europe to USA	0%	10%	20%	70%	0%	0%	0%	0%	0%	10%	35%	10%	20%	25%
WCSA to Carib	5%	40%	35%	20%	0%	0%	0%	0%	0%	18%	50%	33%	0%	0%
NE Asia to ECSA	20%	27%	23%	30%	0%	0%	0%	18%	7%	15%	28%	13%	8%	10%
Europe to WCSA	8%	38%	31%	24%	0%	0%	0%	7%	3%	16%	42%	28%	3%	3%
NC/ECSA to WCSA	60%	20%	20%	0%	0%	0%	0%	55%	20%	25%	0%	0%	0%	0%
Asia to NCSA	0%	15%	15%	70%	0%	0%	0%	0%	0%	0%	35%	10%	25%	30%
Asia to WCSA	30%	18%	18%	35%	0%	0%	0%	28%	10%	13%	18%	5%	13%	15%

Exhibit 8

Post-Panamax Fleet Deployment Scenario in 2025

	Fleet Deployment in 2025						
Trade Route / TEU Capacity	**1500**	**2500**	**3500**	**4500**	**5700**	**6800**	**8000**
NE Asia to USA	0%	0%	0%	0%	10%	30%	60%
SE Asia to USA	0%	0%	0%	0%	10%	30%	60%
USA to Oceania	0%	0%	0%	26%	13%	33%	28%
USA to NC/ECSA	0%	13%	23%	28%	10%	13%	15%
WCSA to USA	0%	13%	20%	25%	13%	15%	15%
Europe to USA	0%	0%	0%	0%	10%	30%	60%
WCSA to Carib	0%	13%	18%	34%	13%	19%	4%
NE Asia to ECSA	0%	25%	25%	0%	5%	15%	30%
Europe to WCSA	0%	13%	13%	20%	10%	25%	20%
NC/ECSA to WCSA	0%	50%	50%	0%	0%	0%	0%
Asia to NCSA	0%	0%	0%	0%	10%	30%	60%
Asia to WCSA	0%	25%	25%	0%	5%	15%	30%

4.3.2 Grain Segment Inputs

This section details the input drivers specific to the grain segment. Exhibit 9 displays the input drivers for the segment, each of which is explained in further detail below.

Exhibit 9

ACP Integrated Model Grain Inputs

Dry Bulk (Grains)	Input Mean	Variable	Units/Comments	Pessimistic	Most Probable	Optimistic	Custom
	Corn/Soybeans	China scenario		Pessimistic	Most Probable	Optimistic	2
	Corn	US Ethanol		MTBE Banned	MTBE Reduced	MTBE Not Reduced	2
	Corn	US Gulf Share of US Corn Exports		64%	72%	79%	2
	Corn	US Gulf Share loss per $1 toll Increase--Corn		1.0%	0.3%	0.10%	2
	Soybeans	US-EU Soybean Export Minimum		5 million tons	4 million tons	3 million tons	2
	Soybeans	US Gulf Share of US Soybean Exports		82%	88%	95%	2
	Soybeans	US Gulf Share loss per $1 toll Increase--Soybeans		1.0%	0.5%	0.1%	2
	Grains	Year of Maximum N. Brazil Shipment %		2025	2020	2015	2
	Grains	Units (Route Allocation Output only)		Metric Tons	Long Tons		2

China Scenario

There is a high degree of uncertainty surrounding future China imports. There are two general views of China's future grain imports: One is that China will require massive levels of imports to feed its people as population and consumption increase. The second is that China can harvest additional land and accelerate technological advances to increase yields, thereby increasing production, while controlling consumption, thus limiting the need to import grain.

A number of factors affecting import levels are analyzed individually, but it is important to understand that they are all linked and will affect each other: increased yields can reduce the need to cultivate additional land, a high rate of population growth would dictate increased yields and harvested area, and a lack of success in increasing production

would compel the government to impose restrictions on consumption. Therefore the factors are combined to represent scenarios as specified in Exhibit 10. A detailed description of each of the individual factors can be found in the grain segment report.

Exhibit 10

Definition of China Grain Scenarios

Grains - China scenario		Definitions for individual factors			Definition of China scenarios		
Commodity	Factor	Pessimitic (1)	Most Probable (2)	Optimistic (3)	Pessimistic	MP	Optimistic
Corn/Soybean	China Population	UN Low	UN Medium	UN High	1	2	3
Corn	China Corn PCC	Nathan	USDA + Slower growth after 2013	USDA extrapolated	2	2	3
Corn	China Corn Yield	25% Increase	USDA	Nathan	2	2	2
Corn	US Corn Export Forecast	Slow growth-Flat from 2010	Flat from 2015	USDA extrapolated	2	2	3
Soybeans	China Soybeans PCC	Nathan	USDA + Slower growth after 2013	USDA extrapolated	2	2	3
Soybeans	China Soybean Yield	50% Increase	25% Increase	USDA Extrapolated	1	2	3
Soybeans	China Soybean Area	25% Increase	USDA Extrapolated	No Increase (Nathan growth)	2	2	3
Grains	N. Brazil Shipments (% of N. Production) in max year	25%	45%	60%	2	2	3

US Ethanol Consumption

The use of corn-based ethanol in the US will affect the amount of corn available for export. The baseline USDA projection calls for growth in ethanol demand for corn. The USDA projections represent the unadjusted base case scenario for US corn exports.

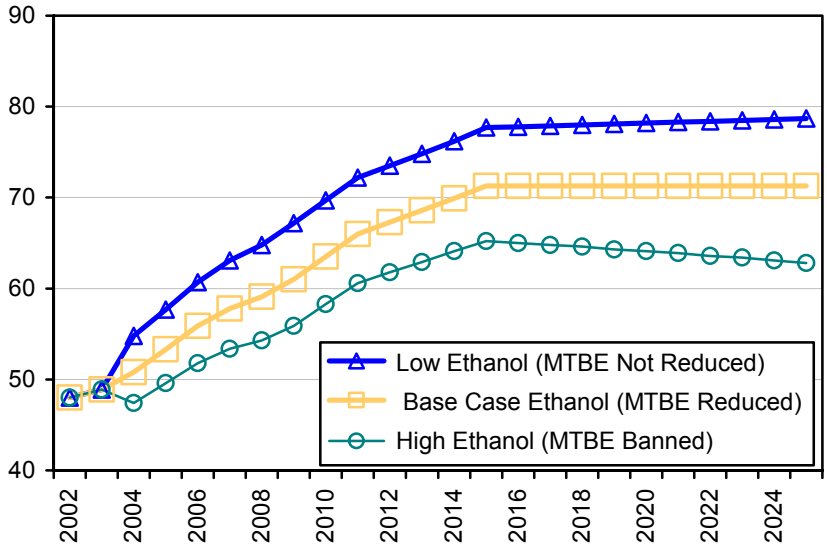
USDA projections were extrapolated to 2025 based on the 2008-2013 growth rate of ethanol consumption (Exhibit 11)

The other scenarios demonstrate the impact of alternative ethanol consumption levels on corn exports. The “Low Ethanol” scenario, in which MTBE use is not reduced, would require a reversal of the current trend and would increase available exports by 8.5 million tons. The “High Ethanol” scenario, in which MTBE is banned, would reduce available exports by 7.4 million tons.

Exhibit 11

US Ethanol Consumption Forecast, 2002-2025

(million metric tons)



Source: USDA, SJH, Mercer analysis.

Allocation of US-Asia Flows to US Gulf or to Pacific Northwest Ports

This represents two input drivers for the model: US Gulf share of US corn exports and US Gulf share of US soybean exports.

For the model, the historical average shares for corn and soybeans, and the frequency and value of deviation from the average were determined and used as the base case. In the base case, 72 percent of corn and 88 percent of soybeans – the 9-year averages – originate in the US Gulf. The high and low cases are one standard deviation above and below the average, about 8 percent for corn and 6 percent for soybeans.

Impact of Canal Tolls on US-Asia Flows to US Gulf Ports

This represents two input drivers for the model:

- Sensitivity of US Gulf share of US corn exports to changes in Canal tolls
- Sensitivity of US Gulf share of US soybean exports to changes in Canal tolls

Canal tolls have a measurable effect on route allocation. For all-water routes, tolls are included in the total transportation cost and affect the choice of the Canal or alternative routes. Tolls also impact the shares of US Gulf and Pacific Northwest origins for corn and soybean shipments to Asia. The historical variation of Gulf and Pacific Northwest shares of corn and soybeans were identified and correlated to ocean freight rates. There is a moderately strong correlation between ocean freight and coastal share (42 percent for

corn and 56 percent for soybeans). In the base case, the effect of a $1 increase in tolls has been forecast for corn and soybeans and causes a shift away from the Canal of 0.3 and 0.5 percentage points, respectively. In the optimistic case for the Canal, the sensitivity is a little less, at 0.1 percent for both corn and soybeans, and in the pessimistic case for the Canal, the sensitivity is modeled at 1 percent.

US-EU Soybean Export Minimum

For analysis of soybeans trades, US and Brazilian exports are considered due to their historical or potential use of the Canal, together with Brazil's emergence as a residual soybean supplier. Argentina is also considered because its exports to Europe and Asia affect US and Brazilian volumes to those regions. The impact on US exports to Europe as a result of these uncertainties is modeled using three scenarios:

- Base or most probable case of a minimum of 4 million tons
- Optimistic case for the Canal of only a minimum of 3 million tons, increasing exports to Asia
- Pessimistic case for the Canal of a minimum of 5 million tons, reducing exports to Asia

Year of Maximum N. Brazil Shipments

This driver captures the variation in future production and logistics solutions in Northern Brazil. The existing infrastructure for shipping grain from the north is minimal and additional projects are in various stages of planning and implementation. Decisions in the private and public sectors will determine the economics and feasibility of shipping from these ports. Based on the pace at which terminals develop, it is assumed that shipments from the north will reach their maximum in 2020 in the base case (2015 and 2025 in the high and low cases) and grow evenly until then.

4.3.3 Other Dry Bulk Segment Inputs

This section details the input drivers specific to the other dry bulk (ODB) segment. Exhibit 12 displays the input drivers for the ODB segment, each of which is explained in further detail below.

Exhibit 12

ACP Integrated Model ODB Inputs

Other Drg Bulk	Input Menu	Variable	Units/Comments	Pessimistic	Most Probable	Optimistic	Custom
ODB		China scenario		Pessimistic	Most Probable	Optimistic	2
Metallurgical Coal		Metallurgical Coal: WC Canada-Europe		Base Case	Decrease in US met coal picked up by Can		1
Petcoke		Petcoke: WCUS-Atlantic		CA uses petcoke fo	CA uses petcoke fo	Base Case	3
Petcoke		Petcoke: ECUS-Pacific		USG Gasification pr	USG Gasification pr	Base Case	3
Salt		Salt: WC Latin America-ECUS		Base Case	Historical highway salt sales growth		1
Cement		Cement: Asia and WC Latin America-ECUS		Decrease to zero	Base Case	Increase at 2X GDP	2
Pulp		Pulp: USEC-Pacific		US Less Competitiv	Base Case	US More Competitive	2
Fertilizers		Fertilizers: All		Low Natural Gas Pri	Base Case	High Natural Gas Pric	2
Sugar		Sugar: All		More government s	Base Case	Less government sub	2
Sugar		Sugar: (Eastbound)		Base Case	Increased Consumption		1
Sugar		Sugar: (Westbound)		Government Chang	Base Case		2
Metallurgical Coke		Metallurgical Coke: Asia-ECUS		New Plants	Base Case		2

China Scenario

Similar to the analysis for the grain segment, all predominantly China related trade and market drivers were combined to capture the correlation among the drivers, and to simplify the driver definitions and usage for Monte Carlo simulations. The factors combined to represent China scenarios are specified in Exhibit 13, along with the definitions of the pessimistic, most probable, and optimistic scenarios using these factors. A detailed description of each of the individual factors can be found in the ODB segment report.

Exhibit 13

Definition of ODB China Scenarios

ODB China Scenario		Definitions for individual factors			Definition of China scenarios		
Commodity	Factor	Pessimitic (1)	Most Probable (2)	Optimistic (3)	Pessimistic	MP	Optimistic
Steel	Steel: (Westbound)	Decreased Demand	Base Case	Increased Demand	1	2	3
Steel	Steel: (Eastbound)	Decreased Demand	Base Case	Increased Demand	2	2	2
Steel	Steel: Asia Imports	China Import Tariff	Base Case		1	2	2
Steel	Steel: US Imports	US Import Tariff	Base Case		1	2	2
Lumber	Lumber: USEC-Pacific	Base Case	Moderate Rebound	Substantial Rebound	1	1	2
Lumber	Lumber: Europe-Pacific	Base Case	Rebound		1	1	2
Lumber	Lumber: WC Canada-Atlantic	Substantial Refocus to Asia	Moderate Refocus to Asia	Base Case	3	3	1
Lumber	Lumber: WCSA-Atlantic	Chile focus on Far East	Base Case		2	2	1
Pulp	Pulp: ECSA-Pacific	Base Case	Moderate Increase	Substantial Increase	1	1	3
Pulp	Pulp: WC Canada-Atlantic	Substantial Refocus to Asia	Moderate Refocus to Asia	Base Case	3	3	1
Pulp	Pulp: Asia-Atlantic	Substantial Refocus within Asia	Moderate Refocus within Asia	Base Case	3	3	1
Fertilizers	Fertizliers: Asia, Latin American Imports	Additional Local Capacity	Base Case		1	2	2
Scrap	Scrap: All	Base Case	Moderate Demand Increase	Substantial Demand Increase	1	1	3
Scrap	Scrap: US-Pacific	Export Restrictions	Base Case		2	2	2
Metallurgical Coke	Metallurgical Coke: Asia-ECUS	Substantial Production Increase	Moderate Production Increase	Base Case	1	3	3

Metallurgical Coal: WC Canada-Europe

This driver addresses the uncertainty in the westbound trade of metallurgical coal. The Nathan forecast was compared US Energy Information Agency[1] forecasts, and the impact of a number of potential events and trends evaluated. The US EIA long-term forecast for

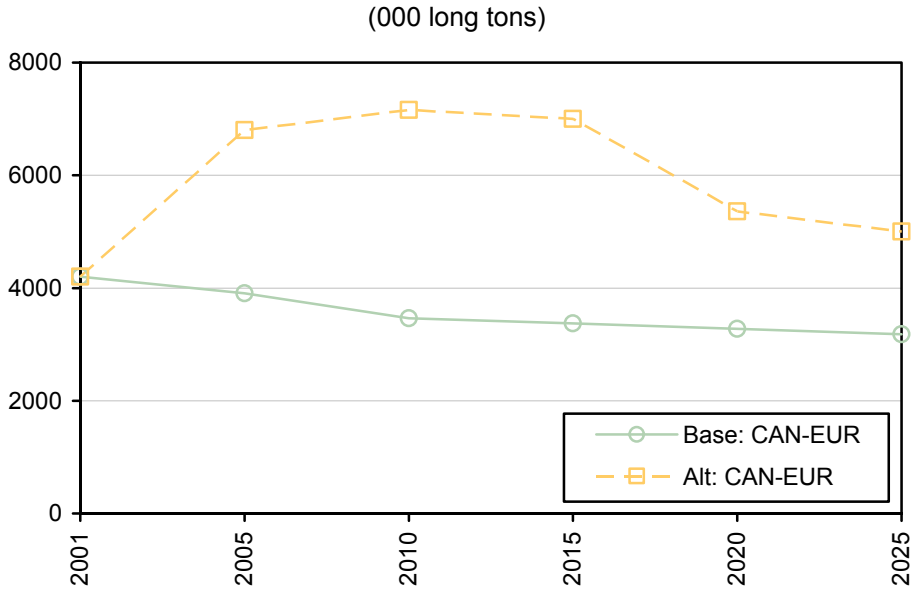
[1] US Energy Information Agency, Annual Energy Outlook, 2004.

metallurgical coal from Canada to Europe shows an annual decrease of 1-1.5 percent, which is used as the base case.

The alternative forecast (Exhibit 14) assumes that Canada's met-coal exports will grow slowly from 26 million tons in 2002 to meet demand created by a reduction in US exports and reflecting a shift in Canadian exports to Asia and the Americas. In this scenario, Canadian exports to Europe recover to 2001 levels and increase through 2005. Of these exports, Mercer assumes that the Canal will capture its historical share in the existing Canal scenario. In the baseline expanded Canal scenario, the Canal captures 25 percent of bypass trade, which increases traffic by about 45 percent.

Exhibit 14

Panama Canal Met-Coal Traffic – Alternative Scenarios for Existing Canal



Source: Nathan Study, Mercer analysis of EIA, AEO2004 National Energy Modeling System data.

Petcoke Westbound

Three gasification projects in various stages of development on the US Gulf Coast will remove petcoke from the export market. At the same time, additional cokers are coming online. Using projected coke production and consumption by the new facilities,[2] the reduction in available exports is calculated to be 30 percent over the 2005-2010 period. The scenario assumes that similar rates of growth in coking and gasification will continue for the 2010-2015 period. The three gasification facilities will consume an estimated

[2] Oil & Gas Journal, November 3, 2003, "Petroleum coke production from US refineries will increase", Edward Swain.

16,000 tons per day by 2006, while coke production is expected to increase by only 3,000 tpd.[3]

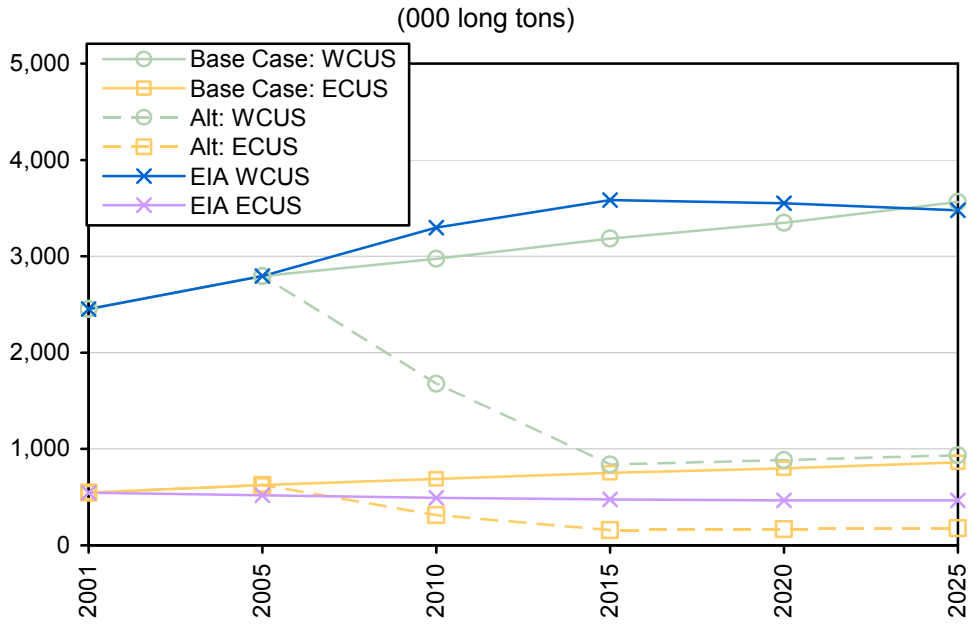
Petcoke Eastbound

The scenario assumes a reduction of 8,000 tpd in the 2005-2010 period due to the LA Basin project, which could be completed in five years if approved. The alternative scenario also assumes a further 8,000 tpd switch from petcoke exports to local gasification in the 2010-2015 period. Petcoke production has been flat for the past five years, and is assumed to remain flat through 2015 in the alternative scenario.

Exhibit 15 shows the base case and alternative scenarios.

Exhibit 15

Panama Canal Petcoke Traffic – Alternative Scenarios, 2001-2025



Source: Nathan Study, Energy Information Agency Energy Outlook 2004, Mercer analysis.

Salt Eastbound

The base case is the Nathan Study forecast, while the alternative is that rather than decline, the salt trade will continue to grow, albeit at a slower rate than GDP. Because road salt sales have been volatile in recent years, the average of three 30-year growth rates for highway salt sales in the US was used to determine the growth rate to 2025. The resulting 1.9 percent growth rate is approximately half of the 4.0 percent real GDP growth

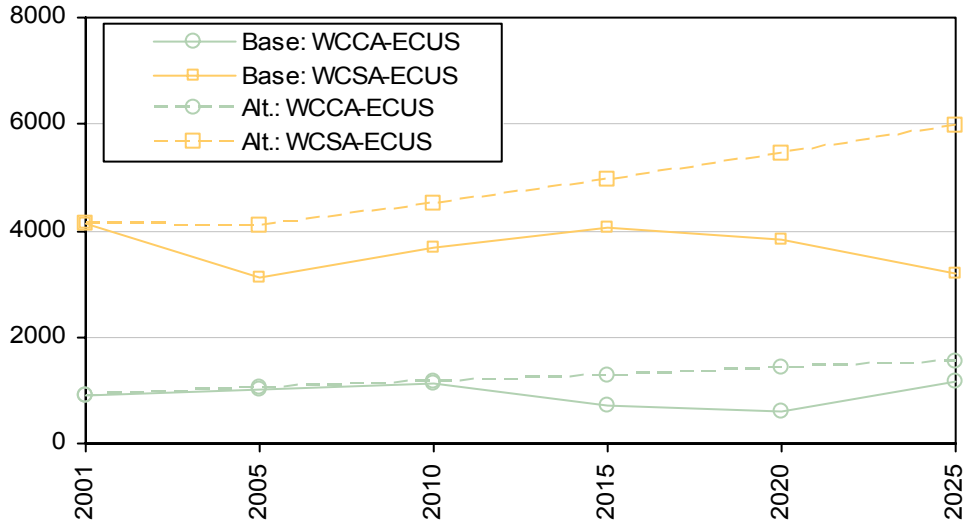
[3] Worldwide Gasification Database, www.netl.doe.gov/coalpower/gasification/ models/dtbs(excel).pdf.

forecast by DRI-WEFA in the most probable case macroeconomic scenario. Exhibit 16 shows the base case and alternative scenarios.

Exhibit 16

Panama Canal Salt Traffic – Alternative Scenarios

(000 long tons)



Source: Nathan Study, Mercer analysis.

Cement Eastbound

While the US Gulf Coast's increasing import demand is based on a real and growing gap between consumption and production, there are many options for sourcing. New Orleans for example receives more than one million tons per year from Thailand, a trade which does not move through the Canal (although it would be a shorter route). Thus while significant growth in Canal transits of cement could occur, it is equally possible that trades could occur with minimal Canal usage.

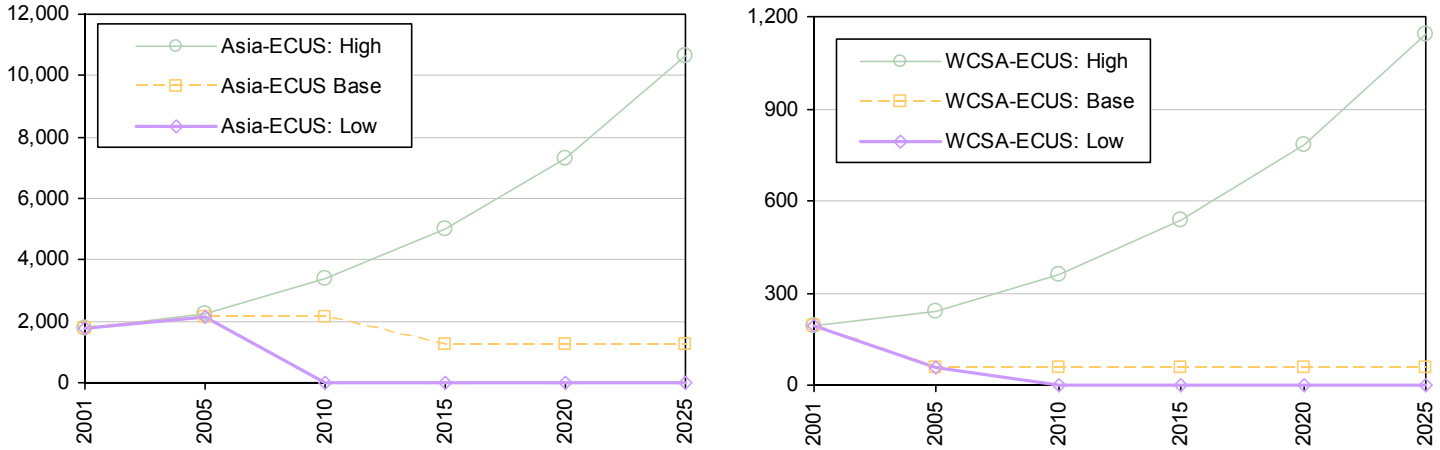
Based on this volatility, two alternatives to the Nathan Study base case have been developed to encompass the range of possibilities (Exhibit 17). The low case assumes that the major trades currently transiting the Canal are eliminated by 2010. This could occur if US imports from South Korea shift to Southeast Asia or South America.

The high case assumes that US imports continue to outpace production, and that the Canal maintains its share of that volume. Cement consumption has mirrored GDP for the last seven years and the forecast assumes that consumption will grow in accordance with DRI-WEFA's projection of GDP. Over this period, import growth has been more than double the growth in consumption; the forecast assumes that import growth will be two times the growth in consumption. At this rate, Canal traffic reaches 11 million tons by the end of the forecast period.

Exhibit 17

Panama Canal Cement Traffic – Alternative Scenarios, 2001-2025

(000 long tons)



Source Nathan Study, Mercer analysis.

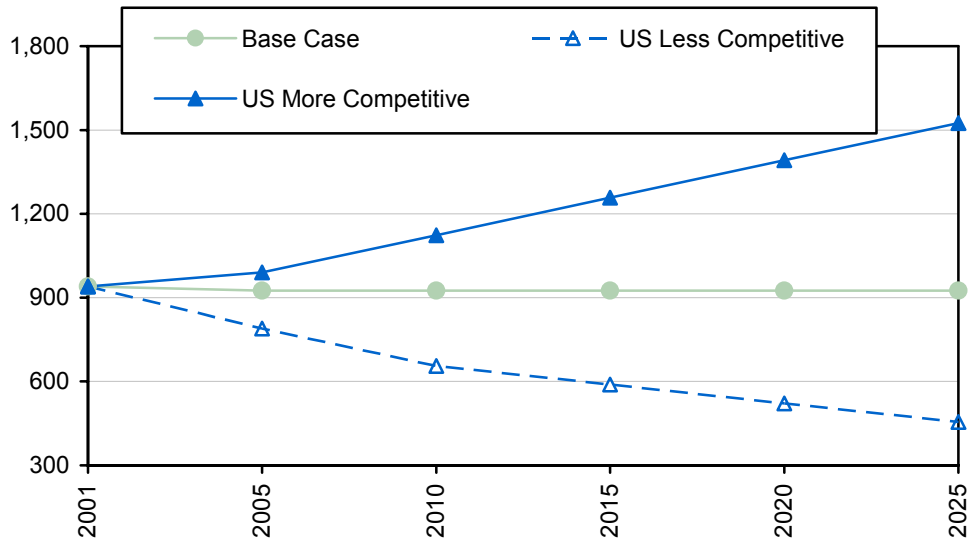
Pulp: US Competitiveness in the USEC – Pacific Market

The westbound pulp trade has been historically dominated by East Coast US exports, which have been hard hit, and for which no growth is projected. The alternatives (Exhibit 18) account for the small likelihood that the US forest products industry will be less competitive in the Far East than at present and the even smaller probability that it will be more competitive.

Exhibit 18

Panama Canal Westbound Pulp Traffic – Alternative Scenarios, 2001-2025

(000 long tons)



Source: Mercer analysis.

Fertilizers

Phosphate shipments from Tampa, Florida to China and nitrogenous fertilizer shipments originating from Russia and Ukraine dominate Canal westbound fertilizer shipments. Westbound shipments also represent 94 percent of total fertilizer volumes transiting the Canal.

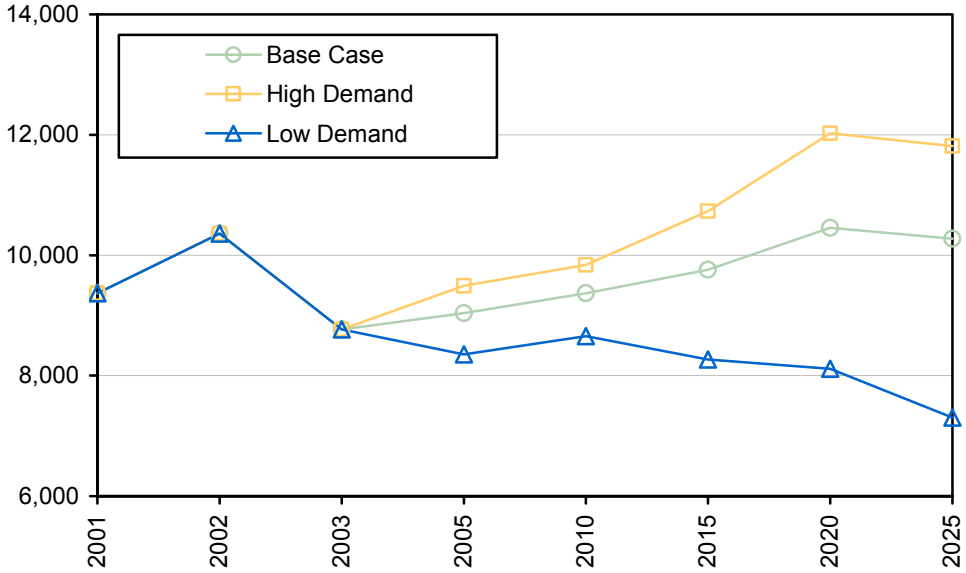
In the base case, it was assumed that DAP shipments from Tampa, Florida will continue to grow, since the US is a major supplier to world markets and Chinese and Indian DAP production capacity is limited. The Nathan Study's growth rates for ECUS and Europe to WCCA and WCSA fertilizer shipments were adjusted based on the FAO's mid-term import projections and available fertilized area.

Mercer also created two alternative scenarios to the base case. The high demand scenario is based on low natural gas prices, which are a key driver for ammonia and fertilizer production, and no domestic production capacity increase. Under this scenario, affordable fertilizer will be traded to developing countries in WCCA, WCSA, and Asia, assuming that they will not build urea and DAP fertilizer plants. The low demand scenario assumes the opposite: Higher natural gas prices for suppliers and domestic capacity increases in demand regions would reduce Canal traffic (Exhibits 19 and 20).

Exhibit 19

Panama Canal Westbound Fertilizer Traffic – Alternative Scenarios, 2001-2025

(000 long tons)

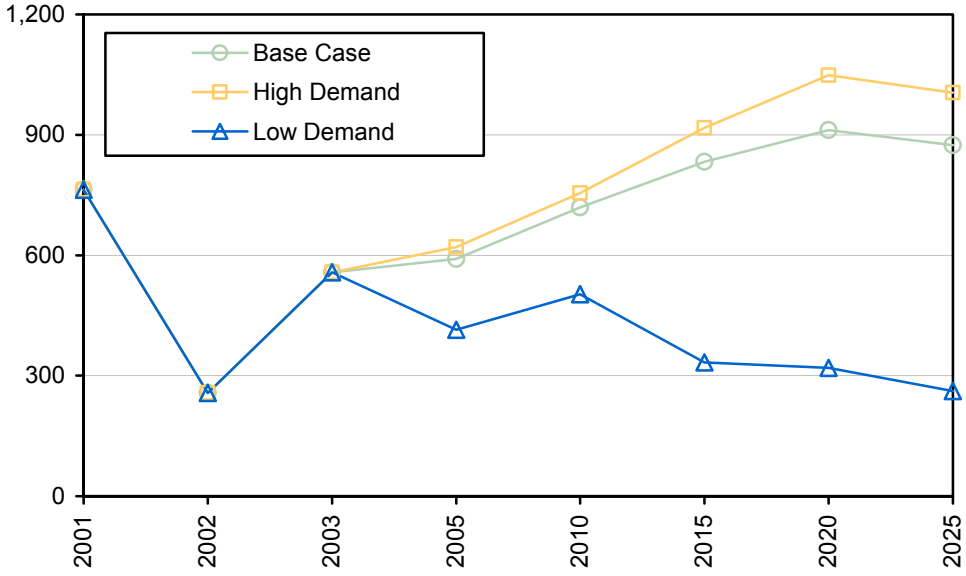


Source: Mercer analysis.

Exhibit 20

Panama Canal Eastbound Fertilizer Traffic – Alternative Scenarios, 2001-2025

(000 long tons)



Source: Mercer analysis.

Sugar

Key drivers that affect sugar trades are government subsidies, policies and import tariffs, consumption changes, and liberalization.

- **Government policies, subsidies, and import quotas:** Sugar is one of the most regulated commodities in the world. The European Union, the United States, and Japan heavily subsidize domestic sugar production. Producers in these countries receive more than double the world market price due to government guaranteed prices, import controls, and production quotas. Despite some liberalization of sugar policies, about 80 percent of world production and 60 percent of world trade is at subsidized or protected prices. Only three major producers (Australia, Brazil, and Cuba) have sugar sectors which produce and operate at world market prices.[4]

  Preferential trading arrangements such as the EU Sugar Protocol and US tariff rate quotas determine import patterns. However, there have been initiatives, such as the European Union's Everything But Arms (EBA) initiative, that allows expanded access to the EU sugar market by the 48 least developed countries and unlimited access after 2009.

- **Population growth** is a key driver in sugar consumption. As an example, Brazil has the fifth largest world population and has high per capita sugar consumption. Growth in consumption of sugar largely reflects Brazil's population growth.

Eastbound sugar shipments represent 83 percent of total sugar transits. Based on the Nathan Study's forecast and above adjustments, Mercer forecasts declining eastbound sugar trades until 2010 due to restrictions on imports in the European Union and the United States (Exhibit 21). However, with trade liberalization initiatives in 2009, sugar trades originating from Latin America will likely lead to an increase in Panama Canal transits between 2010 and 2025.

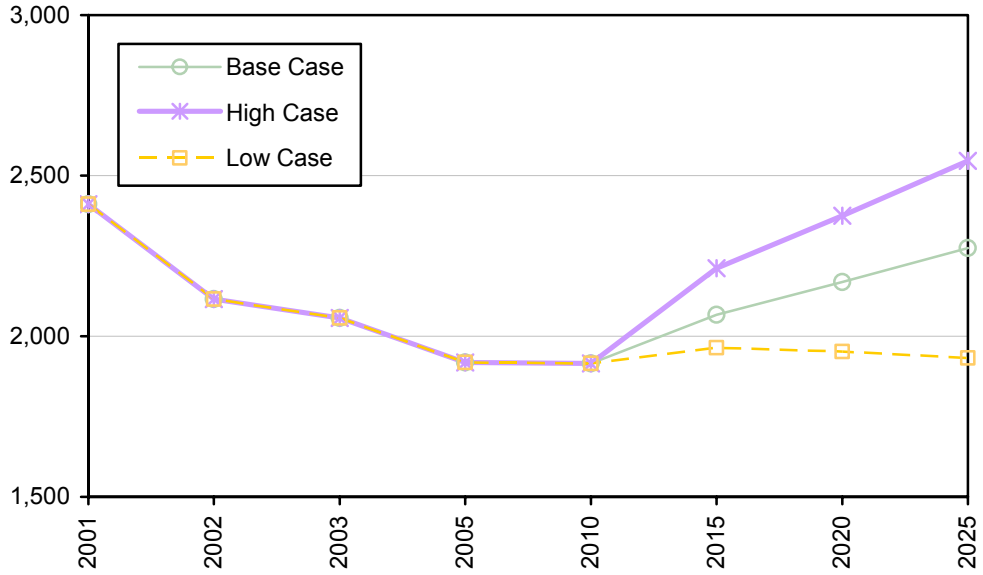
Westbound sugar shipments primarily originate from Cuba. Mercer's alternative forecast for the high case scenario assumes more trade liberalization and government policy change in Cuba (Exhibit 22). For the low case, subsidies continue and no political change in Cuba is assumed.

[4] Source: The World Bank, Development Prospects Group, "Sugar Policies: Opportunity for Change" by Donald Mitchell, World Bank Policy Research Working Paper 3222, February 2004.

Exhibit 21

Panama Canal Eastbound Sugar Traffic – Alternative Scenarios, 2001-2025

(000 long tons)



Source: Mercer analysis.

Exhibit 22

Panama Canal Westbound Sugar Traffic – Alternative Scenarios, 2001-2025

(000 long tons)

Source: Mercer analysis.

Metallurgical Coke: Asia – ECUS

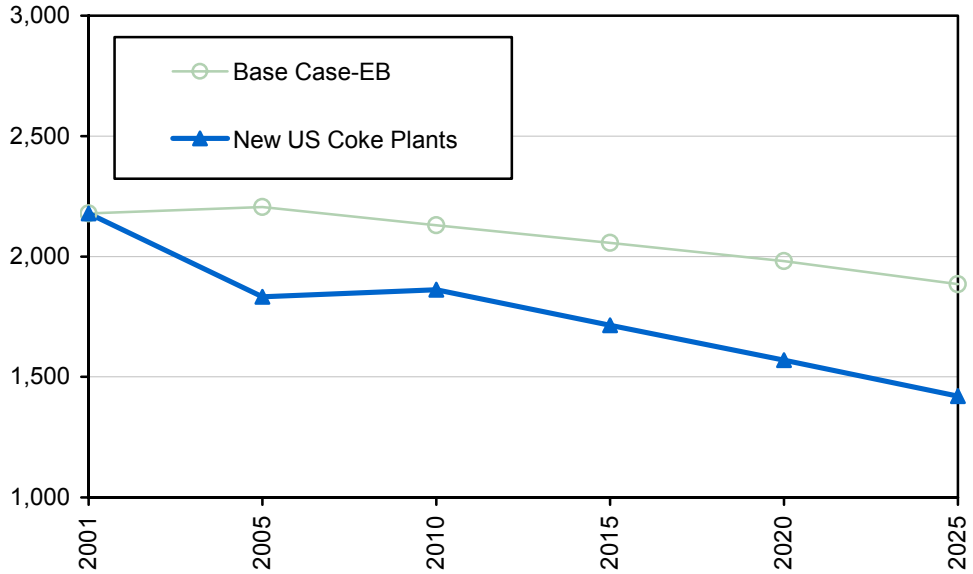
Mercer applied the Nathan Study's forecast growth rates to Panama Canal metallurgical coke actual shipment statistics. The growth rate was adjusted for the period between 2003 and 2005 due to recent shortages in worldwide metcoke supply. The base case assumes that there is no change in overall coke plant capacity.

If there is a policy change enabling new coke plants to be built in the United States, imports from Asia will be reduced. Exhibit 23 presents the Mercer base case and alternative scenarios for eastbound metcoke shipments. Panama Canal westbound metcoke transits are primarily arbitrage trades of around 140,000 long tons per year, and therefore negligible to forecast.

Exhibit 23

Panama Canal Eastbound Metcoke Traffic – Alternative Scenarios, 2001-2025

(000 long tons)



Sources: Mercer analysis.

4.3.4 Liquid Bulk Segment Inputs

This section details the input drivers specific to the liquid bulk (LB) segment. Exhibit 24 displays the input drivers for the LB segment, each of which is explained in further detail below.

Exhibit 24

ACP Integrated Model LB Inputs

Liquid Bulk	Input Mean	Variable	Units/Comments	Pessimistic	Most Probable	Optimistic	Custom
	Crude Oil	Ecuador Crude scenario		Pessimistic	Most Probable	Optimistic	2
	Chemicals	China requirement of chemical imports		Low levels	Most Probable	High levels	2
	Chemicals - WB	Suspension of US Ethanol Requirements		Replacement with A	No Change	No Change (2)	2
	Gas/Diesel/Etc.	Pacific side (WC LAM) growth scenario		Slow growth	Most Probable	Rapid growth	2

The liquid bulk analysis focuses in on the individual sources of product and the potential demand for them on the coasts of the Americas, especially South America for crude and Central America for petroleum products. In each of these cases, the critical driver of the trade (either supply or demand) is identified and analyzed in depth. For example, the future of the crude oil trade from Ecuador to the US Gulf is supply driven; the huge US demand does not drive the trade but, rather, the export opportunities available to Ecuador. Similarly, the analysis focuses not on how much diesel US and Caribbean refineries can supply but on the development of demand on the West Coast of Latin America. The market scenarios adjust the liquids trade forecast for a number of potential developments in Latin America and Asia.

Asia Chemical Supply-Demand Balance

East Asian petrochemical activity is growing rapidly in order to meet the demands of increasing manufacturing and economic well-being in the region, while US activity has barely kept pace with GDP. Furthermore, the fact that the US chemicals industry hardly grew during the past five years demonstrates the increasing self-sufficiency of China and the Far East, and the ability of the Far East to augment its needs for basic chemicals from other sources, including the Middle East. China has been continuously expanding its capacity, but its needs continue to outpace its capacity because of its manufacturing successes, which will drive growth in trade during the forecast period.

The most probable scenario assumes no significant changes the supply-demand balance of chemicals in Asia. Rapid growth in China could have a positive or deleterious effect on westbound chemical shipments, offset by a corresponding reduction or increase in eastbound shipments from China. The westbound trade is larger so the optimistic scenario assumes continuing Asian reliance on chemical imports.

Ecuador Crude Production and Transportation

The Canal's role in the movement of crude oil is very limited. Ecuador has the fourth largest discovered crude oil reserves in Latin America and is a net exporter of crude oil to the world, but ships 75 percent of its exports to Pacific terminals in the US and Asia. The 25 percent that is shipped to the Atlantic supplies small Central American economies and it is a tiny supplier for the US Gulf refinery complex. The recent re-activation of the Trans Panama Crude Oil Pipeline (PTP) threatens the role of the Panama Canal for the eastbound transportation of crude oil.

The most probable scenario assumes no significant changes in Ecuadorian crude production trends. Increased production is associated with the optimistic scenario. In the

optimistic scenario, the TPP will be used for eastbound shipments only; in the pessimistic scenario it opens for westbound cargo as well.

Pacific Coast Refining and Transportation Infrastructure

Petroleum products (gasoline, diesel, and LPG) move primarily from the Atlantic to the West Coast of Latin America to meet local demand. Some arbitrage trades transit the Canal from the Pacific to the Atlantic. The product trades are sensitive to developments in the Pacific basin and in the consuming countries themselves that would reduce the need for Canal-borne product, including the growth of refining capacity on the West Coast of Latin America and the improvement of overland transportation infrastructure that would improve the competitiveness of trucking across Central America.

The most probable scenario assumes no significant changes in Pacific side refining capacity and road infrastructure. Because of the bidirectional nature of the products trades, anything that increases trade in one direction will reduce it in the other. The optimistic scenario assumes that the refining capacity and transportation infrastructure on the west side of Central America will not grow to reduce the region's dependence on shipments through the Canal. In the pessimistic scenario, refinery output grows and roads are built and improved, increasing the competitiveness of overland shipment of products.

Chemicals Westbound: Suspension of US Ethanol Requirements

US domestic trade to the West Coast United States is projected to increase steadily by 2 percent per year throughout the period, following a volatile period of decline over the next few years as MTBE is replaced by ethanol. Future growth is assumed to be tied to continued growth in the California economy, as population and activity increase.

Current mandates regarding US gasoline additive requirements are accounted for in the baseline forecast, in which California phases out MTBE, replacing it with a smaller volume of ethanol. The use of these products is driven by political decisions and modifications to US gasoline additive requirements; the replacement of MBTE with ethanol or the elimination of oxygenates altogether would have the general effect of reducing shipments through the Canal (pessimistic case).

4.3.5 Vehicle Carrier (Ro-Ro) Segment Inputs

This section details the input drivers specific to the vehicle carrier segment. Exhibit 25 displays the input drivers for the segment, each of which is explained in further detail below.

Exhibit 25

ACP Integrated Model Vehicle Carrier Inputs

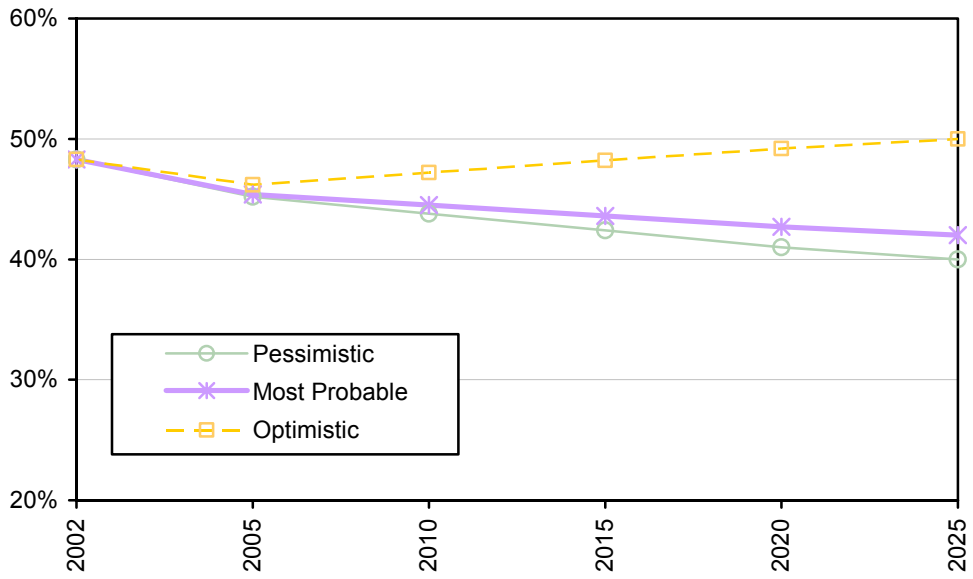
Ro-Ro (P, B, O)	Input Meas	Variable	Units/Comments	Pessimistic	Most Probable	Optimistic	Custom
Supply & Dema		Customer Preferences Scenario		Pessimistic	Most Probable	Optimistic	2
		Plant transplantation Scenario		Pessimistic	Most Probable	Optimistic	2
		Trade Agreements scenario		Pessimistic	Most Probable	Optimistic	2
Fleet Deploym		Fleet Deployment Scenario		Pessimistic	Most Probable	Optimistic	2

Customer Preferences Scenario

The light vehicle demand estimate was allocated to autos and light trucks according to three customer preference scenarios, which basically model different levels of preference for autos versus light trucks (SUVs), both of which have different import shares. The share of autos of total vehicle purchases for the three scenarios for US and Caribbean customers are presented in Exhibits 26 and 27.

Exhibit 26

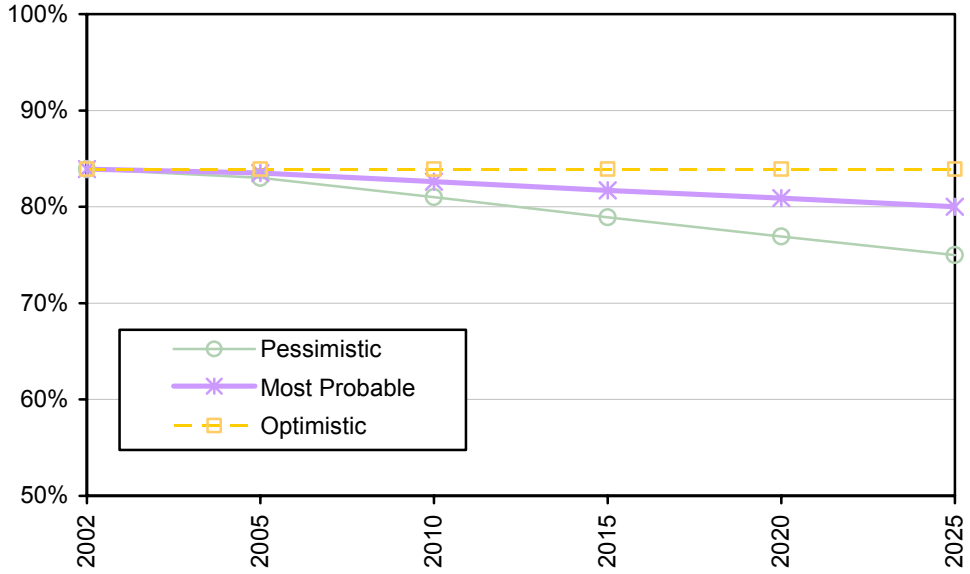
US Customer Preferences – Share of Autos 2002-2025



Source: Mercer analysis.

Exhibit 27

Caribbean Customer Preferences – Share of Autos 2002-2025



Source: Mercer analysis.

Import Shares and Forecast Adjustment

The import share for US/West Indies vehicle demand by vehicle segment (autos, light trucks, and heavy trucks) was estimated by using historic country import shares, based on US and West Indies import data. In the base case, shares were projected to be constant to 2025.

The import shares for the United States were adjusted based on an assessment of two industry trends that impact the trade forecast, to develop a base case and alternative scenarios:

- ***Plant relocation.*** Manufacturers must weigh the costs and benefits of producing vehicles locally versus producing them in countries with lower overheads. The trend has been for Asian manufacturers to move plants to consumer markets like the United States. In 1997, 63 percent of Asian light vehicle sales in the US were imports, versus 46 percent today. Mercer developed three potential plant relocation scenarios to account for this trend, as future plant moves from Asia and Europe to the US would heavily impact potential vehicle carrier trade transiting the Canal. The percentage of Asian light vehicle sales in the US that are imports will decline from the current 46 percent to 35 percent in the most probable scenario and to 25 percent in the pessimistic scenario; imports will remain the same in the optimistic case. For European light vehicle sales, the current import share of 68 percent is expected to be 40, 50, and 68 percent in the pessimistic, most probable, and optimistic scenarios, respectively. For intermediate years, import shares are interpolated.

- ***Trade agreements.*** Future trade agreements between countries will impact vehicle trade flows, as preferred commercial agreements can reduce duties and increase trade. Mercer analyzed current trade agreements between countries in relevant trade lanes to determine potential changes that may occur in agreements and how they would impact trade. Mercer developed three potential scenarios to account for how trade agreements might evolve. However, this scenario variable was found to have only a slight impact on Canal-relevant vehicle trade.

  – For light vehicle imports to the US, trade agreements are assumed to not have any impact on imports in the most probable scenario, and to increase or decrease imports by less than one percentage point in 2025 in the optimistic and pessimistic scenarios.

  – For heavy vehicle imports to the US, trade agreements are assumed to not have any impact on imports in the most probable scenario, and to increase imports by 0.3 percent or decrease imports by 0.3 percent in 2025 in the optimistic and pessimistic scenarios, respectively.

  – For vehicle imports to the Caribbean, trade agreements are assumed to not have any impact on imports in the most probable scenario, and to increase imports by 3.5 percent or decrease imports by 3.5 percent in 2025 in the optimistic and pessimistic scenarios, respectively.

Fleet Deployment

In order to explicitly account for different vehicle carrier deployment scenarios, and given the uncertainty that surrounds the deployment of post-Panamax vehicle carriers, Mercer developed three fleet evolution scenarios for each key Canal route, both for the unexpanded and the expanded Canal cases. For the expanded Canal case, post-Panamax vehicle carriers were explicitly modeled, to account for the existing trend toward the deployment of larger and more efficient vehicle carriers on Canal routes. Exhibit 28 provides the current fleet mix and expected fleet mix in 2025 under different scenarios for the three key trade lanes.

Exhibit 28

Fleet Evolution Scenarios for Vehicle Carrier Segment

Asia to US		2025 Shares					
		Unexpanded canal case			Expanded canal case		
Vessel type	2003 shares	Slow	Moderate	Fast	Slow	Moderate	Fast
Category1: 0-2k CEUs	0%	0%	0%	0%	0%	0%	0%
Category2: 2-3k CEUs	1%	1%	1%	1%	1%	1%	1%
Category3: 3-4k CEUs	4%	4%	4%	4%	4%	4%	4%
Category4: 4-5k CEUs	32%	25%	23%	20%	25%	23%	20%
Category5: 5-6k CEUs	46%	45%	43%	35%	45%	40%	33%
Category6: 6-7k CEUs	17%	25%	30%	40%	23%	28%	35%
Category7: >7k CEUs	0	0%	0%	0%	3%	5%	8%

Europe to US		2025 Shares					
		Unexpanded canal case			Expanded canal case		
Vessel type	2003 shares	Slow	Moderate	Fast	Slow	Moderate	Fast
Category1: 0-2k CEUs	0%	0%	0%	0%	0%	0%	0%
Category2: 2-3k CEUs	1%	1%	1%	1%	1%	1%	1%
Category3: 3-4k CEUs	6%	4%	4%	4%	4%	4%	4%
Category4: 4-5k CEUs	18%	20%	20%	20%	20%	20%	20%
Category5: 5-6k CEUs	37%	35%	33%	30%	35%	30%	27%
Category6: 6-7k CEUs	38%	40%	43%	45%	38%	40%	40%
Category7: >7k CEUs	0	0%	0%	0%	3%	5%	8%

Asia to Caribbean		2025 Shares					
		Unexpanded canal case			Expanded canal case		
Vessel type	2003 shares	Slow	Moderate	Fast	Slow	Moderate	Fast
Category1: 0-2k CEUs	0%	0%	0%	0%	0%	0%	0%
Category2: 2-3k CEUs	0%	0%	0%	0%	0%	0%	0%
Category3: 3-4k CEUs	21%	15%	15%	15%	15%	15%	15%
Category4: 4-5k CEUs	45%	40%	35%	30%	40%	35%	30%
Category5: 5-6k CEUs	26%	35%	38%	40%	35%	38%	40%
Category6: 6-7k CEUs	7%	10%	13%	15%	10%	13%	15%
Category7: >7k CEUs	0	0%	0%	0%	0%	0%	0%

4.3.6 Cruise Segment Inputs

This section details the input drivers specific to the cruise segment. Exhibit 29 displays the input drivers for the segment, each of which is explained in further detail below.

Exhibit 29

ACP Integrated Model Cruise Inputs

Cruise (P, B, O)	Input Menu	Variable	Units/Comments	Pessimistic	Most Probable	Optimistic	Custom
Turnaround		Interest in transiting the canal (Before 2010)	Annual growth rate	-2.0%	4.7%	4.7%	2
Turnaround		Interest in transiting the canal (After 2010)	Annual growth rate	-1.3%	0.3%	4.7%	2
Pendulum		Interest in transiting the canal (Before 2010)	Annual growth rate	-18.6%	-18.6%	3.0%	2
Pendulum		Interest in transiting the canal (After 2010)	Annual growth rate	-18.6%	0.0%	3.0%	2
All canal		Change in cruise vacation attractiveness	Annual growth rate	-1.0%	0.0%	1.0%	2

Interest in the Canal as a Tourist Destination

Future growth in demand for cruise itineraries that visit the Panama Canal (where the Canal is mainly a tourist destination) is estimated in order to predict the number of passengers that will visit the Canal for each forecast year. This factor affects the turnaround and pendulum market segments. This scenario group is formed by factors (from zero to one) that cumulatively will impact future demand for pendulum and turnaround transit types. These factors will be different for each of the transit types and for the 2004-2010 and 2011-2025 periods (Exhibit 30).

Exhibit 30

Growth Rates Under Various Canal Interest Scenarios

	Probable	Optimistic	Pessimistic
Turnaround (until 2010)	4.7%	4.7%	-2.0%
Turnaround (after 2010)	0.3%	4.7%	-1.3%
Pendulum (until 2010)	-18.6%	3.0%	-18.6%
Pendulum (after 2010)	0.0%	3.0%	-18.6%

Change in Cruise Vacation Attractiveness

Future growth in cruise passenger demand depends on the perceived security, entertainment, and "glamour" that the cruise vacation concept conveys to the end customer. Events that undermine cruise vacation attractiveness will reduce growth in the number of cruise passengers. This factor affects all market segments within in the cruise segment. This includes a single factor (0 percent, 1 percent, and minus 1 percent for the probable, optimistic, and pessimistic scenarios, respectively) that cumulatively impacts total cruise passenger demand.

4.4 Monte Carlo Simulation

The model recognizes the fact that the evolution of the input variables cannot be predicted with a high degree of accuracy over a 25 year forecast horizon. In order to capture the potential variability associated with the drivers, values for input drivers in the forecast years are specified with a probability of occurrence. The probability specification differs somewhat with respect to continuous and discrete variables.

For continuous variables, this specification can be in one of two forms:

- Driver values: A continuous probability distribution of the actual values
- Growth rates of driver values: A probability distribution of the growth rate in the values of the drivers from the base year values

For variables that assume discrete states in the forecast period, the probability associated with each of the states is specified, with the sum of probabilities adding to 1.0.

All input drivers used in the model as "Assumptions" in the Monte Carlo runs are highlighted in the Inputs section in a light green color. The variables specified as "Forecasts" for the Monte Carlo runs are highlighted in the VReports sheet in a light blue color.

Once the Assumptions and Forecasts are specified, the user needs to specify the Run Preferences before executing the Monte Carlo simulation. The two key settings in the run preferences include the number of trials (this is important due to the long running time for the simulation), and the sensitivities of the simulation. Based on our tests to balance running time with accuracy of prediction, 500 trials were found to provide the needed confidence levels in the forecasts.

To set the number of trials, from the Crystal Ball menu, choose Run Preferences – Trials – Maximum Number of Trials. To store the sensitivities of forecasts to input drivers, from the Crystal Ball menu, choose Run Preferences – Options – Run Options – Calculate Sensitivity.

The Monte Carlo simulation should be run for the Unexpanded and Expanded Canal cases independently. To set the model for the Unexpanded Monte Carlo simulation, follow the steps below:

- Go to Scenarios screen
- Choose the "Existing" option under Canal Case
- Click Run Scenario in the User Menu to update the settings.

To set the model for the Expanded Monte Carlo simulation, follow the steps below:

- Go to Scenarios screen
- Choose the "Expanded" option under Canal Case
- Click Run Scenario in the User Menu to update the settings.

To start the Monte Carlo simulation, click on the "Start Simulation" button on the Crystal Ball menu.

Once the model is set up, the Monte Carlo simulation needs to be executed only once, for a certain number of iterations, to obtain the needed statistical significance on the variability around the base forecast. Monte Carlo simulations will however be required to be run again in the case of one or more of the following events:

- Drivers that affect forecasts have been added or deleted.
- Impact of the drivers on the forecasts has been changed.

- The probability distributions of the driver values have been updated.
- Assumptions driving the forecast values have changed.
- Base year of the model application has been changed.

5

Scenario Analysis

5.1 Description

The scenario dashboard provides a graphical representation of the Canal operations under various scenarios. This screen serves to provide a summary forecast of Canal performance in terms of key metrics such as transits, tonnage, and revenues.

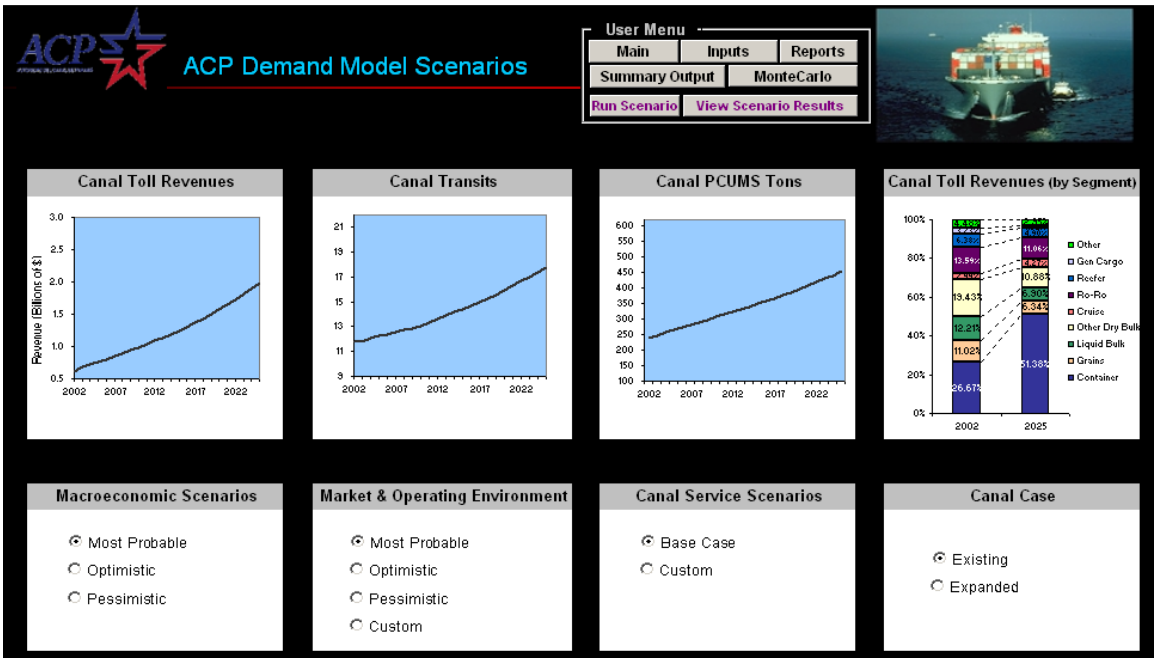
5.2 Navigation (Screen Components)

An illustration of the Model Scenarios screen is provided in Exhibit 31. Access to functionality within this feature is provided through the radio buttons on the lower half of the screen. The radio buttons are organized by the applicable dimensions, and the user can select a scenario using a combination of the four dimensions provided. The display of the forecast outputs on the top half of the screen changes according to the chosen scenario.

Access to other features / screens in the model is provided through the menu in the top right corner, where the links allow navigation back to the Main Menu or to the various output screens.

Exhibit 31

ACP Integrated Model: Illustrative Scenarios Screen



5.3 Functionality

As illustrated in Exhibit 31, the Scenarios screen has three components – the menu bar on top, the forecast display section in the middle, and the scenario selection section at the bottom.

The User Menu at the top of the screen serves two purposes: it provides a navigation tool to access other model screens, and enables the running of scenarios and updating of results on this screen.

The model output on this page focuses on providing an aggregate view of Canal performance. Key metrics included are the forecasts through 2025 of Canal toll revenues, transits, and PCUMS tons. In addition, the change in revenue distribution by segment from the base year to 2025 is shown.

The scenario selection section allows the selection and specification of scenarios along four dimensions:

- Macroeconomic environment
- Market and operating environment
- Canal pricing strategy
- Existing Canal or expanded Canal

Scenarios defined by the base / optimistic / pessimistic options and the two Canal states are labeled as pre-defined scenarios. When any of these scenarios are selected, the corresponding values of the input drivers are automatically set in the Inputs screen for executing the scenario. Dynamic or Custom Scenarios can be defined by the user through the Inputs screen by varying at least one of the input driver values against a particular scenario.

5.3.1 Macroeconomic Scenarios

The ACP integrated model uses the information from the macroeconomic scenarios developed for the ACP by DRI-WEFA. The table below, replicated from the executive summary of the DRI-WEFA report, provides a brief description of the macroeconomic scenarios along with the probabilities assigned to each. The probability distribution is used in the model as an input to the Monte Carlo simulations.

Scenario	Description	Probability
Most Probable Case	A long-term forecast of the major economies and key variables under the assumptions	**60%**
Worst Case	A long-term forecast using assumptions of weaker growth in key economic areas, such as productivity	**25%**
Best Case	A long-term forecast using higher growth assumptions for key areas of each economy	**15%**

5.3.2 Market & Operating Environment Scenarios

The market and operating environment factors capture the drivers (as specified in the Inputs section) that impact Canal demand. These include market drivers that affect potential trade that can pass through the Canal, operational drivers for the Panama Canal and its competing alternatives that impact route and fleet allocation analyses, and fleet deployment options that impact fleet allocation analyses. The individual drivers that define these scenarios are specified in the Inputs screen of the model. Exhibit 32 provides a replica of the Inputs drivers table in the model, with three additional columns at the right that define the pessimistic, most probable, and optimistic operating environment scenario specifications. When the column contains a discrete rather than a continuous value, a value of 1 corresponds to the pessimistic value of the driver, a value of 2 corresponds to the most probable value of the driver, and a value of 3 corresponds to the optimistic value of the driver.

To select one of the pre-defined scenarios (pessimistic, most probable, optimistic), the user clicks on the appropriate option button. To run a custom scenario, the user clicks on the Custom option, which redirects the user to the Inputs screen. The user can then define

the custom scenario and execute the scenario from the Scenario screen. Specific details and steps in running a custom scenario are provided in section 5.3.6.

Exhibit 32

Definition of Market and Operating Environment Scenarios

Market and Operating Environment Scenario definitions			Definitions for individual factors			Definition of Scenarios		
Segment	Variable	Units/Comments	Pessimistic	Most Probable	Optimistic	Pessimistic	MP	Optimistic
General factors								
Vessel & IM	Ship Operating Costs	Source: 2002 Drewry	5%	3%	2%	3%	3%	3%
	Port & Port Piloting Costs	Source: 2002 Drewry	5%	3%	2%	3%	3%	3%
	Bunker Price Escalation (Annual)	Source: DOE	0.3%	2.4%	3.5%	2%	2%	2%
Transit Time	Panama Canal InTransit Time: Booked Vess	Hours		14		14	14	14
	Panama Canal InTransit Time: Unbooked Ve	Hours		14		14	14	14
	Panama Canal Wait Time: Booked Vessels	Hours		10		10	10	10
	Panama Canal Wait Time: Unbooked Vessel	Hours		34		34	34	34
	Suez Canal Transit Time	Hours		24		24	24	24
Canal Non-toll cos	Panama Canal Booking Costs	Annual change		2%		2%	2%	2%
	Panama Canal OMS Costs	Annual change		2%		2%	2%	2%
Transit Cost Fac	Time Charter Escalation (Annual)	Annual change	2%	3%	4%	2	2	2
	Time Charter Base (% of Forecast)		71%	100%	129%	2	2	2
	Suez Canal Toll	Annual change		2%		2%	2%	2%
	Intermodal Cost	Annual change		3%		3%	3%	3%
Container	**Variable**	**Units/Comments**	**Pessimistic**	**Most Probable**	**Optimistic**			
Supply & Deman	Imported Liner products as % of PCE		Pessimistic	Most probable	Optimistic	1	2	3
	Country share shift scenario		Pessimistic	Most probable	Optimistic	1	2	3
	Supply chain optimization trends		Mild Trends	Observed trends	Aggressive	1	2	2
Transit Factors	Panama Canal	Extra days compared to no	1	0	0	0	0	0
	Suez Canal	Extra days compared to no	0	0	1	0	0	0
	US Intermodal System	Extra days compared to no	0	0	1	0	0	0
Vessel Utilizatio	NE_Asia to USA (2025)		77%	74%	71%	74%	74%	74%
	SE_Asia to USA (2025)		77%	74%	71%	74%	74%	74%
	Europe to USA (2025)		77%	74%	71%	74%	74%	74%
Fleet Deploymen	Post-Panamax deployment scenario (Expansion)			Slow Deployment (2)	Rapid Deployment (3)	2	2	2
Dry Bulk (Grains)	**Variable**	**Units/Comments**	**Pessimistic**	**Most Probable**	**Optimistic**			
Corn/Soybeans	China scenario		Pessimistic	Most Probable	Optimistic	1	2	3
Corn	US Ethanol		MTBE Banned	MTBE Reduced	MTBE Not Reduced	1	2	2
Corn	US Gulf Share of US Corn Exports		64%	72%	79%	2	2	2
Corn	US Gulf Share loss per $1 toll Increase--Corn		1.0%	0.3%	0.10%	1	2	2
Soybeans	US-EU Soybean Export Minimum		5 million tons	4 million tons	3 million tons	1	2	3
Soybeans	US Gulf Share of US Soybean Exports		82%	88%	95%	2	2	2
Soybeans	US Gulf Share loss per $1 toll Increase--Soybeans		1.0%	0.5%	0.1%	1	2	2
Grains	Year of Maximum N. Brazil Shipment %		2025	2020	2015	1	2	2
Grains	Units (Route Allocation Output only)		Metric Tons	Long Tons		2	2	2
Other Dry Bulk	**Variable**	**Units/Comments**	**Pessimistic**	**Most Probable**	**Optimistic**			
ODB	China scenario		Pessimistic	Most Probable	Optimistic	1	2	3
Metallurgical Coal	Metallurgical Coal: WC Canada-Europe		Base Case	Decrease in US met coal picked up by Canada (DOE-EIA)		1	1	2
Petcoke	Petcoke: WCUS-Atlantic		CA uses petcoke for gasification--rapid adoption	CA uses petcoke for gasification--moderate adoption	Base Case	2	3	3
Petcoke	Petcoke: ECUS-Pacific		USG Gasification projects-rapid adoption	USG Gasification projects-moderate adoption	Base Case	2	3	3
Salt	Salt: WC Latin America-ECUS		Base Case	Historical highway salt sales growth		1	1	2
Cement	Cement: Asia and WC Latin America-ECUS		Decrease to zero	Base Case	Increase at 2X GDP	1	2	2
Pulp	Pulp: USEC-Pacific		US Less Competitive	Base Case	US More Competitive	1	2	3
Fertilizers	Fertilizers: All		Low Natural Gas Prices	Base Case	High Natural Gas Prices	2	2	2
Sugar	Sugar: All		More government subsidy	Base Case	Less government subsidy	1	2	3
Sugar	Sugar: (Eastbound)		Base Case	Increased Consumption		1	1	1
Sugar	Sugar: (Westbound)		Government Change	Base Case		1	2	2
Metallurgical Coke	Metallurgical Coke: Asia-ECUS		New Plants	Base Case		2	2	2
Liquid Bulk	**Variable**	**Units/Comments**	**Pessimistic**	**Most Probable**	**Optimistic**			
Crude Oil	Ecuador Crude scenario		Pessimistic	Most Probable	Optimistic	1	2	3
Chemicals	China requirement of chemical imports		Low levels	Most Probable	High levels	1	2	3
Chemicals - WB	Suspension of US Ethanol Requirements		Replacement with Alkylates	No Change	No Change (2)	2	2	2
Gas/Diesel/Etc.	Pacific side (WC LAM) growth scenario		Slow growth	Most Probable	Rapid growth	1	2	3
Cruise (P, B, O)	**Variable**	**Units/Comments**	**Pessimistic**	**Most Probable**	**Optimistic**			
Turnaround	Interest in transiting the canal (Before 2010)	Annual growth rate	-2.0%	4.7%	4.7%	1	2	3
Turnaround	Interest in transiting the canal (After 2010)	Annual growth rate	-1.3%	0.3%	4.7%	1	2	3
Pendulum	Interest in transiting the canal (Before 2010)	Annual growth rate	-18.6%	-18.6%	3.0%	1	2	3
Pendulum	Interest in transiting the canal (After 2010)	Annual growth rate	-18.6%	0.0%	3.0%	1	2	3
All canal	Change in cruise vacation attractiveness	Annual growth rate	-1.0%	0.0%	1.0%	1	2	3
Ro-Ro (P, B, O)	**Variable**	**Units/Comments**	**Pessimistic**	**Most Probable**	**Optimistic**			
Supply & Deman	Customer Preferences Scenario		Pessimistic	Most Probable	Optimistic	1	2	3
	Plant transplantation Scenario		Pessimistic	Most Probable	Optimistic	1	2	3
	Trade Agreements scenario		Pessimistic	Most Probable	Optimistic	1	2	3
Fleet Deploymen	Fleet Deployment Scenario		Pessimistic	Most Probable	Optimistic	1	2	3

5.3.3 Pricing Scenarios

The pricing scenarios capture Canal toll pricing policies and Canal transit time specifications. The base case scenario assumes a 2 percent annual toll increase in nominal terms to cover the costs of inflation for all segments. The Canal transit time in the base case is specified to be 24 hours for booked vessels and 48 hours for unbooked vessels.

The Custom option allows the user to change the base settings on Canal tolls and transit times. The user can thus test the impact of various Canal pricing policies and performance and operational improvements on the attractiveness of the Canal.

To select the base case for toll pricing and transit times, the user clicks on the base case option button. To run a custom scenario, the user clicks on the Custom option, which redirects the user to the "Canal Service" screen. The user can then define the custom scenario and execute the scenario from the Scenario screen. Specific details and steps in running a custom scenario are provided in section 5.3.6.

5.3.4 Canal Expansion Scenarios

The Canal expansion scenarios allow the user to specify the existing or expanded Canal option that should be used in the model scenario run. The existing Canal scenario assumes the continuation of Canal operations with the existing locks only. The expanded Canal scenario assumes that the new locks that can transit post-Panamax vessels will open in 2015. Choosing the expanded option automatically triggers the model to use the appropriate base assumptions regarding the Canal operations under an expanded Canal case that are specific to each segment.

The user can choose the desired scenario by clicking on the appropriate option button.

5.3.5 Running a Scenario

The setup and execution of a pre-defined scenario is very straightforward. From the Scenarios page, the user must follow the steps below:

1. Select the macroeconomic scenario desired by clicking on the appropriate option button under Macroeconomic scenarios.

2. Select the operating environment scenario desired by clicking on the appropriate option button under Market & Operating environment scenarios.

3. Ensure the base case option is checked under the Pricing scenarios.

4. Select the Canal expansion case desired by clicking on the appropriate option button under Canal case scenarios.

5. Click on the "Run Scenario" option in the user menu at the top of the screen.

The status bar at the bottom of the screen displays the calculation stage, and once the scenario is executed and calculations are done, the status bar says "Ready." The charts on the Scenarios page are automatically updated with the forecasts corresponding to the scenario executed. To view detailed results of the scenario, click on the "View Scenario Results" option in the user menu at the top of the screen.

5.3.6 Running a Custom Scenario

Running a Custom Operating Environment Scenario

The setup and execution of a custom operating environment scenario involves navigation between the Scenarios and Input screens. The user must follow the steps below:

1. Choose the Market and Operating Environment (MOE) scenario that you want to use as a basis for the custom scenario by clicking on the appropriate radio button. This automatically sets the values for the relevant drivers in the Inputs screen to those corresponding to that scenario. The user can thus avoid the need to set values for each driver individually, and focus on those of particular interest. (This step is needed only if the user wants to start with one of the three pre-defined MOE scenarios. The user is always free to go directly to the Inputs screen to set driver values.)

2. Click the Custom option in the MOE options box. This automatically directs the user to the Inputs screen.

3. Using the navigation options on the Inputs screen, go to the section(s) – general or segment-specific – in which custom driver values are desired.

4. Change the values of the drivers in the Custom column as desired. Note the rules for setting values as detailed in section 4 of this document.

5. Using the navigation options on the Inputs screen, go back to the Scenarios screen.

6. Click on the "Run Scenario" option in the user menu at the top of the screen. (Before you click this button, ensure the Custom option is selected in the MOE options box. If this option is already selected, do not click again.)

Once the calculations are done, the charts on the Scenarios page are automatically updated. To view detailed results of the scenario, click on the "View Scenario Results" option in the user menu at the top of the screen.

Running a Custom Canal Service Scenario

The setup and execution of a custom Canal service scenario involves navigation between the Scenarios and Canal Service screens. The user must follow the steps below:

1. Click the Custom option in the Canal Service options box. This automatically directs the user to the Canal Service screen.

2. The first table on the Canal Service screen titled "Nominal Year-over-Year Canal toll increase" contains the yearly growth rates of Canal tolls starting in 2005 for each of the individual segments explicitly analyzed in the integrated model. Change the values of Canal toll growth for the appropriate years and segments as desired.

3. The second table on the Canal Service screen titled "Canal Transit Time" contains the Canal operational characteristics defined by the Canal transit time for booked and unbooked vessels starting in 2005 for each year. Change the values of the Canal transit times for the appropriate years as desired.

4. Using the navigation options on the Canal Service screen, go back to the Scenarios screen.

5. Click on the "Run Scenario" option in the user menu at the top of the screen. (Before you click this button, ensure the Custom option is selected in the Canal Service options box. If this option is already selected, do not click again.)

The status bar at the bottom of the screen displays the calculation stage, and once the scenario is executed and calculations are done, the status bar says "Ready.. The charts on the Scenarios page are automatically updated with the forecasts corresponding to the scenario executed. To view detailed results of the scenario, click on the "View Scenario Results" option in the user menu at the top of the screen.

6

Model Results

6.1 Description

This functionality provides access to key results from the model by individual segment. Forecast output is provided at various levels of detail for each of the key components in the model framework (transits, revenues, PCUMS tons).

6.2 Navigation

As mentioned earlier in the Scenarios section, the model provides access to three different levels of output:

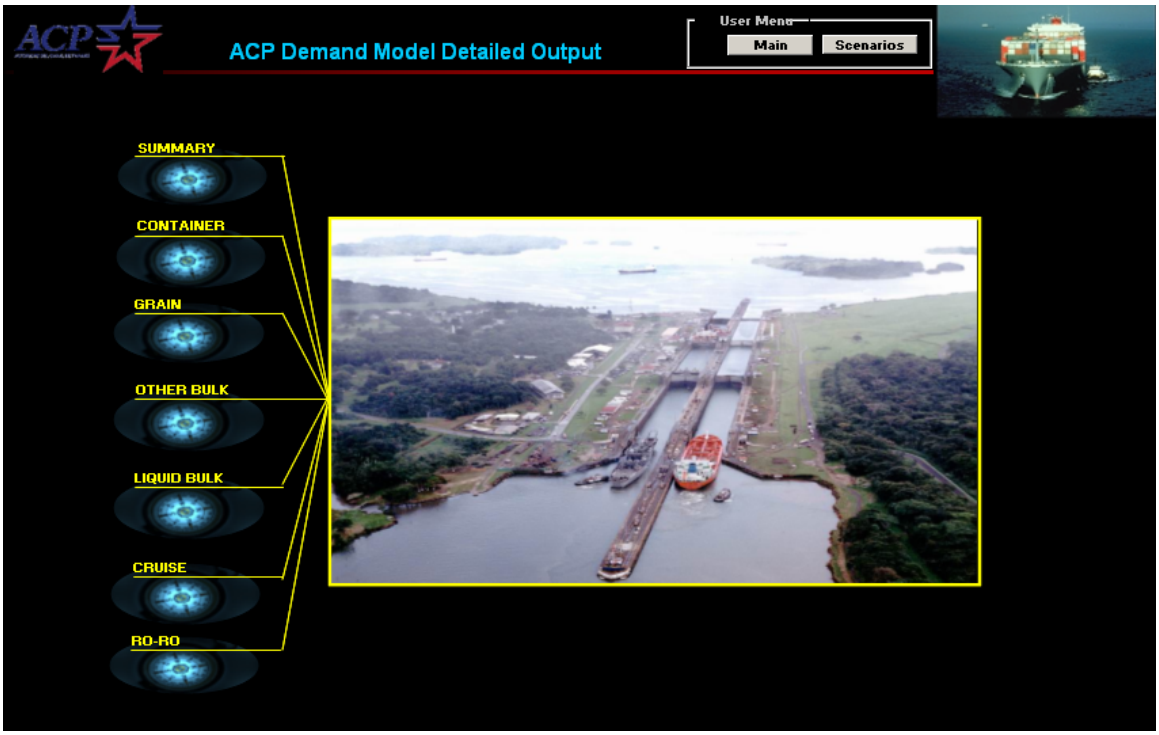
- **Scenario results.** The scenario results can be accessed only from the Scenarios screen, after selecting and executing a particular scenario. The scenario results page details the inputs and outputs of the last executed scenario. Within the scenario results page, the only navigation option available to the user is to return back to the Scenarios screen by clicking the active button on the top left corner of the screen.

- **Summary output.** An illustration of the Detailed Output menu screen is provided in Exhibit 33. Access to functionality within this feature is provided through the links on the left titled with the individual segment names. Clicking one of these active links directs the user to the detailed output for that segment. For each segment table, the user has an option to return back to this navigation menu to access other segment data.

  To access other features / screens in the model, the User Menu in the top right corner has links allowing the user to navigate back to the Main Menu or to the Scenarios screen.

Exhibit 33

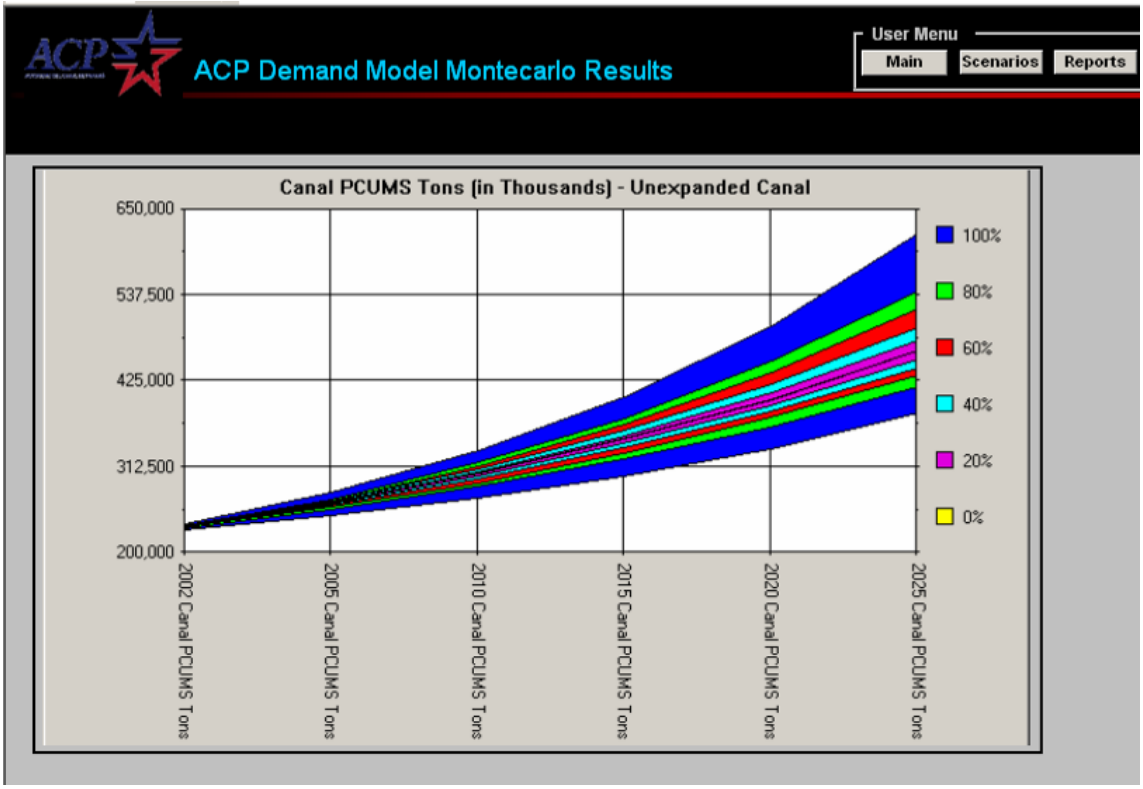
ACP Integrated Model: Detailed Output Menu Screen



- **Monte Carlo results.** The Monte Carlo results screen can be accessed only from the Scenarios menu. To access other features / screens in the model, the User Menu in the top right corner has links allowing the user to navigate back to the Main Menu or to the Scenarios screen. A sample view of the Monte Carlo Results screen is provided in Exhibit 34.

Exhibit 34

ACP Integrated Model: Monte Carlo Results Screen



6.3 Functionality

- **Scenario results.** The scenario results page has two sections: the Inputs section, that lists the values of the input drivers used in the last executed scenario, and the Outputs section, that provides a segment level summary of the last executed scenario results, including cargo tonnage (where applicable), transits, PCUMS tons, and toll revenues.

- **Summary Output.** The Detailed Output results sheet provides a more comprehensive presentation of the model forecasts, arranged in line with the various components identified in the model methodology framework (left to right in each table for 2002 to 2025):

  – Core macroeconomic forecasts

  – Trade adjustment matrix

  – Potential Canal demand

  – Canal shares

  – Canal traffic

- Canal transits
- Canal revenues
- Canal PCUMS tons

Results are summarized for each of the modeled segments and are accessible from the Navigation screen. For each segment, tables for six different macro scenarios will be provided for all relevant major trade lanes (3 macroeconomic demand scenarios x 2 Canal expansion scenarios).

- **Monte Carlo Results.** The Monte Carlo Results sheet contains a number of charts organized along two dimensions:
  - Market segment (container, grain, liquid bulk, etc.)
  - Performance metrics: transits and revenues

  Each chart depicts a trend chart of the performance metric over the forecast period, with an illustration of the baseline forecast for each year along with the probability that the forecasts fall within a certain range for that year. The trend charts provide a comparison of the changes in certainty ranges over the forecast horizon in addition to the extent of potential variability around the base forecasts.

  [Note that the current version of the Model contains only two charts on this screen – the trend charts for Canal PCUMS tons and Canal transits for the unexpanded Canal case.]

7

Reports

7.1 Description

The Model Reports screen provides options to the user to print and export key reports and summary tables generated by the model.

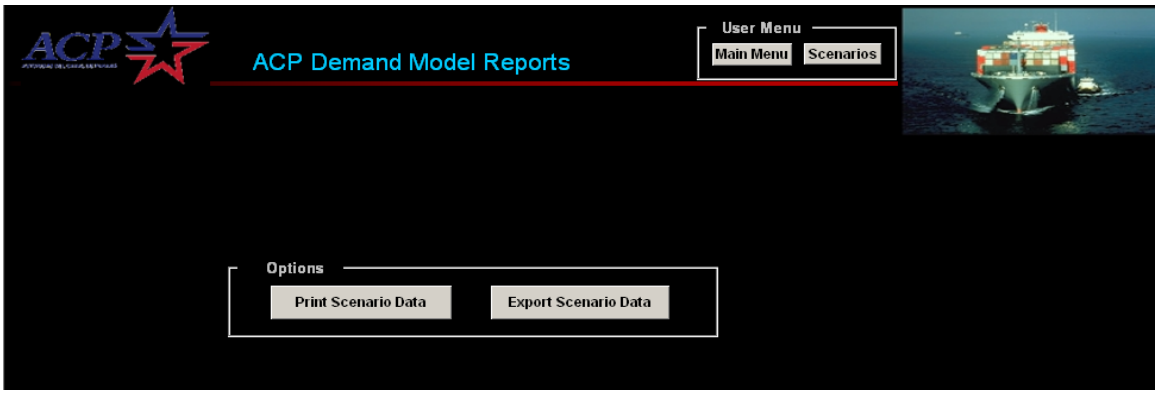
7.2 Navigation

An illustration of the Model Reports menu screen is provided in Exhibit 35. Access to functionality within this feature is provided through the active buttons in the center of the screen. "Print Results" link directs the user to an input menu to select some or all of the model results to be printed. "Export Results" link directs the user to an input menu to select some or all of the model results to be exported for use in other models.

The user can access other features / screens in the model through the User Menu in the top right corner, where the links allow the user to navigate back to the Main Menu or to the Scenarios screen to view the results of the simulation.

Exhibit 35

ACP Integrated Model: Reports Screen



7.3 Functionality

- **Print scenario data.** This feature allows the user to print key model results and summary tables. The exact list of summary tables included in this functionality is shown in Exhibit 36. The Print menu allows user to print four types of data:

  1) Model Inputs: Provides a summary of the values of the input drivers that were used in the scenario run. This includes two categories of data – general factors and those specific to the segments which are unrelated to Canal operations; and inputs that define Canal operations and service such as Canal tolls and transit times.

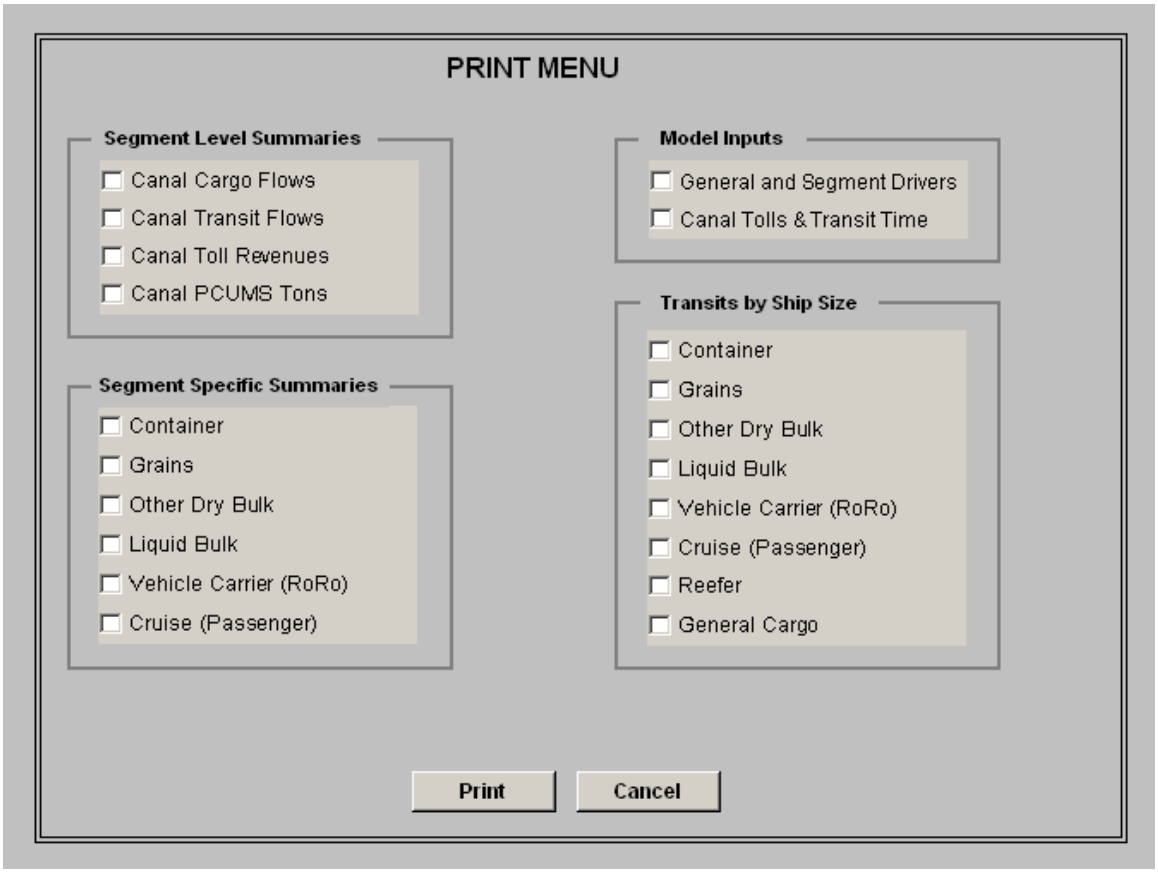
  2) Segment level summaries: This includes the Canal cargo flows (long tons, container TEUs, cruise passengers), transits, toll revenues, and PCUMS tons for the scenario. Data is provided for each of the segments (one line per segment) along with the aggregate value for the Canal for each year from 2002 to 2025.

  3) Segment specific summaries: This includes the Canal cargo flows (long tons, container TEUs, cruise passengers), transits, toll revenues, and PCUMS tons for the scenario for each segment at a more disaggregated level of detail than the segment level summaries. The container and vehicle carrier summaries are disaggregated by the trade lane, bulk segment summaries by commodity, and cruise segment by individual subsegments. Data is provided for each year from 2002 to 2025.

  4) Transits by ship size: These summary tables contain the vessel mix information for each segment – the number of transits by individual ship size specific to each segment. Output is provided at the most disaggregated level of detail available in the model.

Exhibit 36

Reports Functionality: Print Menu

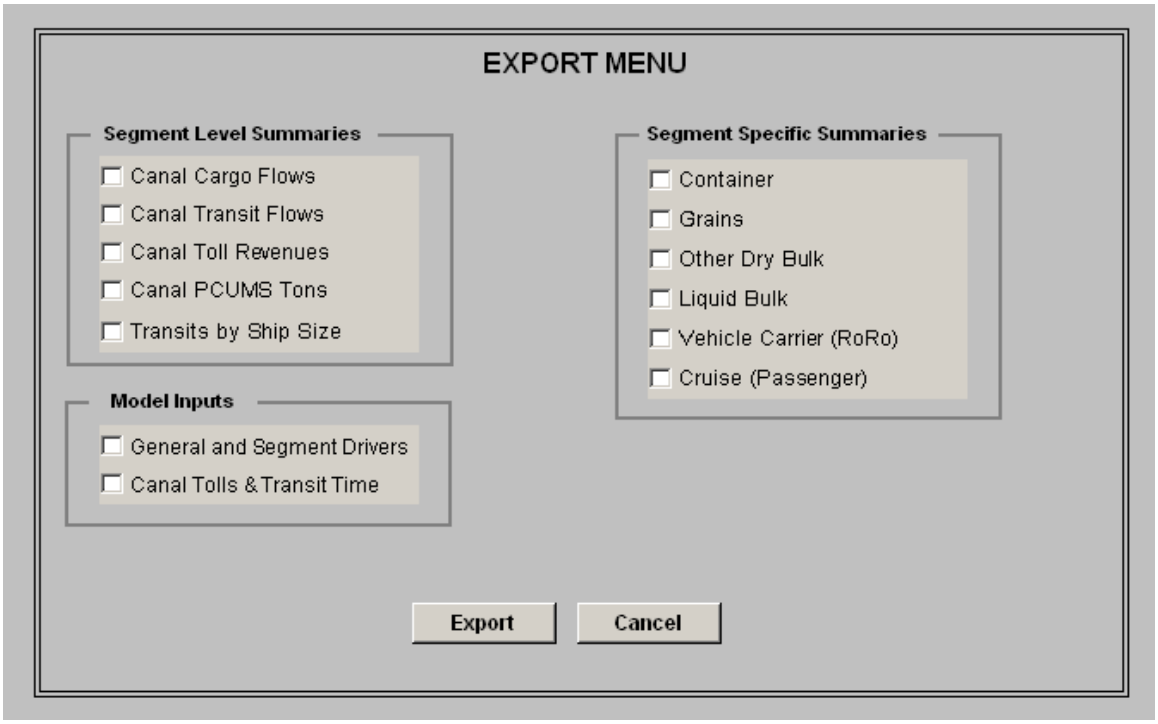


When the user clicks on the "Print Scenario data" option, the user is directed to the Print menu. The user can then choose the set of tables they would like to print by checking the boxes, and print them by clicking on the "Print" button. Once the printing is complete, the user is taken back to the Reports functionality main screen. Clicking on Print without selecting any tables or clicking on Cancel also takes the user back to the Reports functionality main screen.

- **Export results.** This feature allows the user to export key model results and summary tables. The main purpose of the export feature is to create reports that can be fed into other models such as the Capacity and Finance models. The capabilities included in the Export functionality mirror those provided in the Print functionality. The only difference is that the transits by ship size are now grouped under the segment level summaries to allow for exporting the data for all segments with a single click (Exhibit 37).

Exhibit 37

Reports Functionality: Export Menu



When the user clicks on the "Export Scenario data" option, the user is directed to the Export menu as shown in Exhibit 37. The user can then choose the set of tables they would like to export by checking the boxes, and export them by clicking on the "Export" button. Once the export is complete, the user is taken back to the Reports functionality main screen. Clicking on Export without selecting any tables or clicking on Cancel also takes the user back to the Reports functionality main screen.

Note that the data is automatically exported to a file titled "ModelOutput.xls" and stored on the C drive in the "C:\\" directory. The first time the Export module is used, a new file is created. From then on, unless the file is renamed or moved to another location by the user, the user is prompted to overwrite the previous version of the export file. For the Export function to work successfully, the user must click OK to overwrite the file. Otherwise, there will be errors and the user will get a Visual Basic error prompt. User can press the "End" button, and close the new file that is created. If the user does not wish to overwrite the previous output file, that file should be renamed or moved to a different directory before running the Export module again.

8

Assumptions

The model contains all the assumptions built into the base year model and the forecasts. Values for assumption variables affect the model results and can be changed by the user. Assumptions differ from input drivers (as identified in the Inputs section) in that they have a fixed state into the future, which can be changed by the user. Users should not change assumptions for the base year, as this would require recalibration or revalidation of the base year models.

The model incorporates a number of assumptions regarding key variables for each of the segments that affect the base year and the forecasts. The assumptions used in the model can be accessed from the sheet titled "Assumptions." This sheet itself contains a number of the assumptions that are fed into the model calculations. Some of the assumptions for the bulk, vehicle carrier, and cruise segments have been kept in separate assumption sheets or within the individual segment model analysis sheets for simplicity and to minimize calculation time.

Further details on updating assumptions are provided in section 9 of this document.

9

Model Update

This section describes the model update capabilities built into the integrated model with regard to (a) updating assumptions, (b) updating the model forecasts for the six macroeconomic and Canal expansion based pre-defined scenarios in the Summary results, and (c) making changes to the input and output specifications of the Monte Carlo simulations.

Updating Assumptions

The model incorporates a number of assumptions regarding key variables for each of the segments that affect the base year and the forecasts. The assumptions used in the model can be accessed from the sheet titled "Assumptions." This sheet itself contains a number of the assumptions that are fed into the model calculations. Some of the assumptions for the bulk, vehicle carrier, and cruise segments have been kept in separate assumption sheets or within the individual segment model analysis sheets for simplicity and to minimize calculation time.

The user can update any of the assumptions by replacing the values currently used with new values that are deemed more appropriate. It is recommended that the base year assumptions not be changed, as this would require recalibration of the model to ensure the base year reflects the actual observed performance of the Canal.

Updating Pre-Defined Scenarios in the Summary Page

The model provided reflects the summary results for the base market and operating environment scenario and base Canal service options. To update the results for other pre-defined or custom settings, the user must follow the steps below:

- Go to Summary page and click on "Summary" button.
- Ensure that the input driver values for the market & operating environment and Canal service are set to the values desired. The user can set them to the pre-defined

scenarios or custom values from the Scenarios page – more detail on using the Scenarios page is provided earlier in the document.

- Click on the "Update Summary" button that appears on the top right of the page.

- The macro updates the results in the tables and restores the model to the scenario that the user defined from the Scenarios page.

- Important Notes: The update performs seven different model runs (six macroeconomic and Canal expansion runs and a scenario restoration run), with the status continuously updated in the status bar in the bottom left corner. The user should not interrupt this macro run. In the event that the run needs to be interrupted, note that the summary tables may not be up to date and cannot be used. In addition, to restore the values to defaults, the user needs to navigate back to the Scenarios page and click on Run Scenario.

Updating Monte Carlo Simulation Specifications

The user can update the input and output specifications used for Monte Carlo simulations. The method for setting run preferences is explained in section 4.4 in this document. This section provides information on how to change the inputs used (add or delete or change probability distributions) or outputs specified (add or delete) for the Monte Carlo simulations.

Updating Inputs to Monte Carlo Simulations

The user can change inputs to the simulations as follows:

- Add inputs:
  - Click on a cell that needs to be added as an input
  - Click on Define Assumption button in the Crystal Ball menu
  - Follow directions by choosing the desired distribution function and specifying the values. For more help in identifying the right distribution function or specifying values, please refer to the Crystal Ball user guide.
  - Click OK once to convert an input driver into an assumption for the simulation
- Delete inputs:
  - Click on a cell that is currently specified as an Assumption that needs to be deleted as an input to Monte Carlo simulations
  - Click on Clear Data button in the Crystal Ball menu
  - Click OK on the message box to clear the assumption or on Cancel to retain the assumption

Updating Outputs or Forecasts from Monte Carlo Simulations

The user can change the outputs or forecasts from the simulations as follows:

- Add forecast variables:
  - Click on a cell that needs to be added as a forecast
  - Click on Define Forecast button in the Crystal Ball menu
  - Follow directions by providing a name and units for the forecast and choosing the other options provided. For more help, please refer to the Crystal Ball user guide
  - Click OK once to convert a forecast variable into a forecast for the Monte Carlo simulation
- Delete forecast variables:
  - Click on a cell that is currently specified as a Forecast that needs to be deleted as a forecast variable to Monte Carlo simulations
  - Click on Clear Data button in the Crystal Ball menu
  - Click OK on the message box to clear the forecast or on Cancel to retain the forecast