MIT Center for Transportation & Logistics

Future Freight Flows

NCHRP 20-83-01

Regional Transportation Advisory Council

8 February 2012

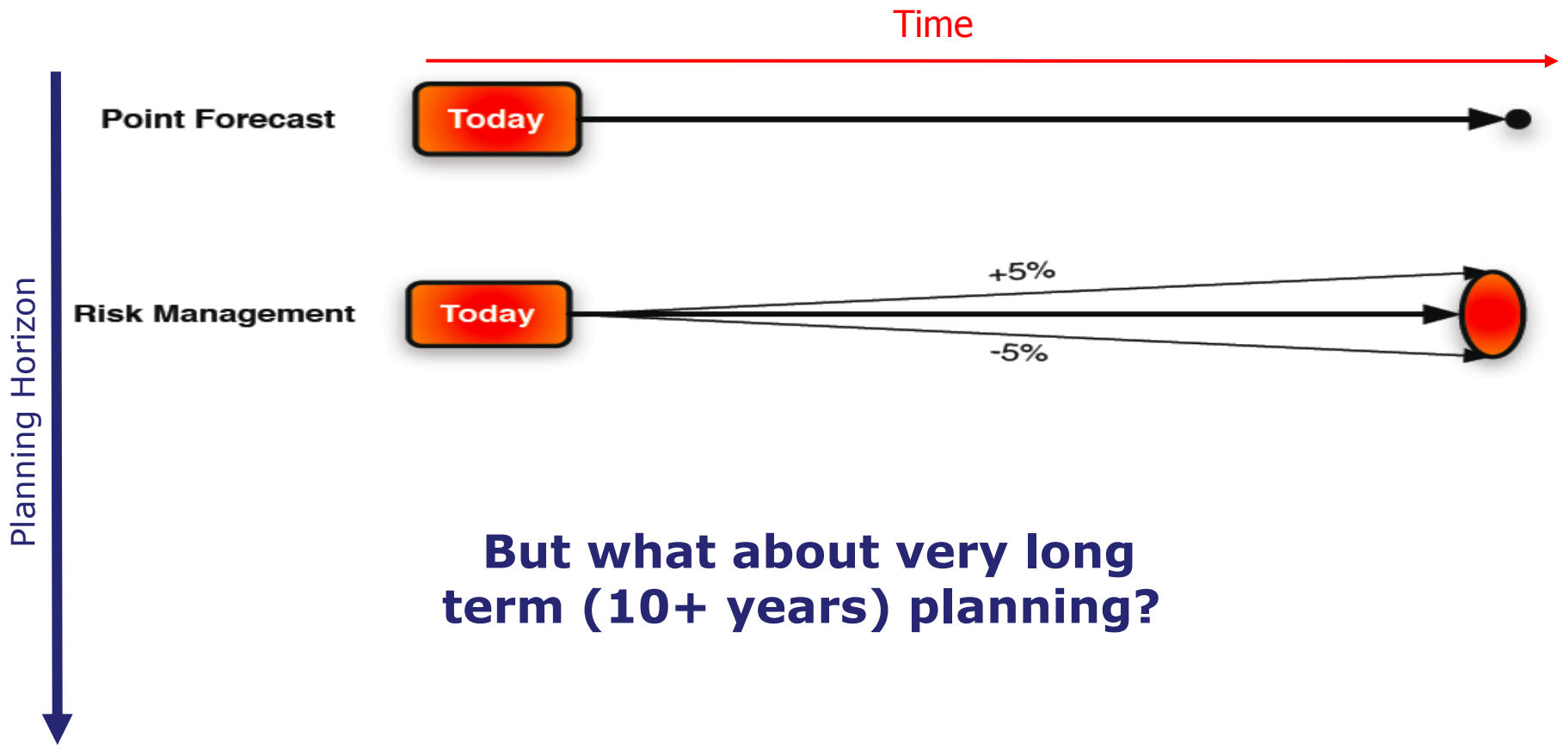
What I'm talking about . . .

- What is NCHRP 20-83-1 – Future Freight Flows?
- Why scenario planning and what is it?
- What scenarios did we create?
- How did we use them?
- What have we learned so far?

NCHRP 20-83(1) Project Objectives

- Two Objectives:
  - "Provide decision makers [state DOTs] with a critical analysis of the driving forces behind high-impact economic changes and business sourcing patterns that may effect the US freight transportation system [in the year 2030 & beyond]."
  - "Better enable informed discussions of national, multi-state, state, and regional freight policy and system investment priorities."
- Three Key Deliverables:
  - Develop a set of Future Freight Flow scenarios
  - Validate scenarios and process in 6 workshops across the US
  - Develop "Scenario Planning in a Box" for any DOT to use

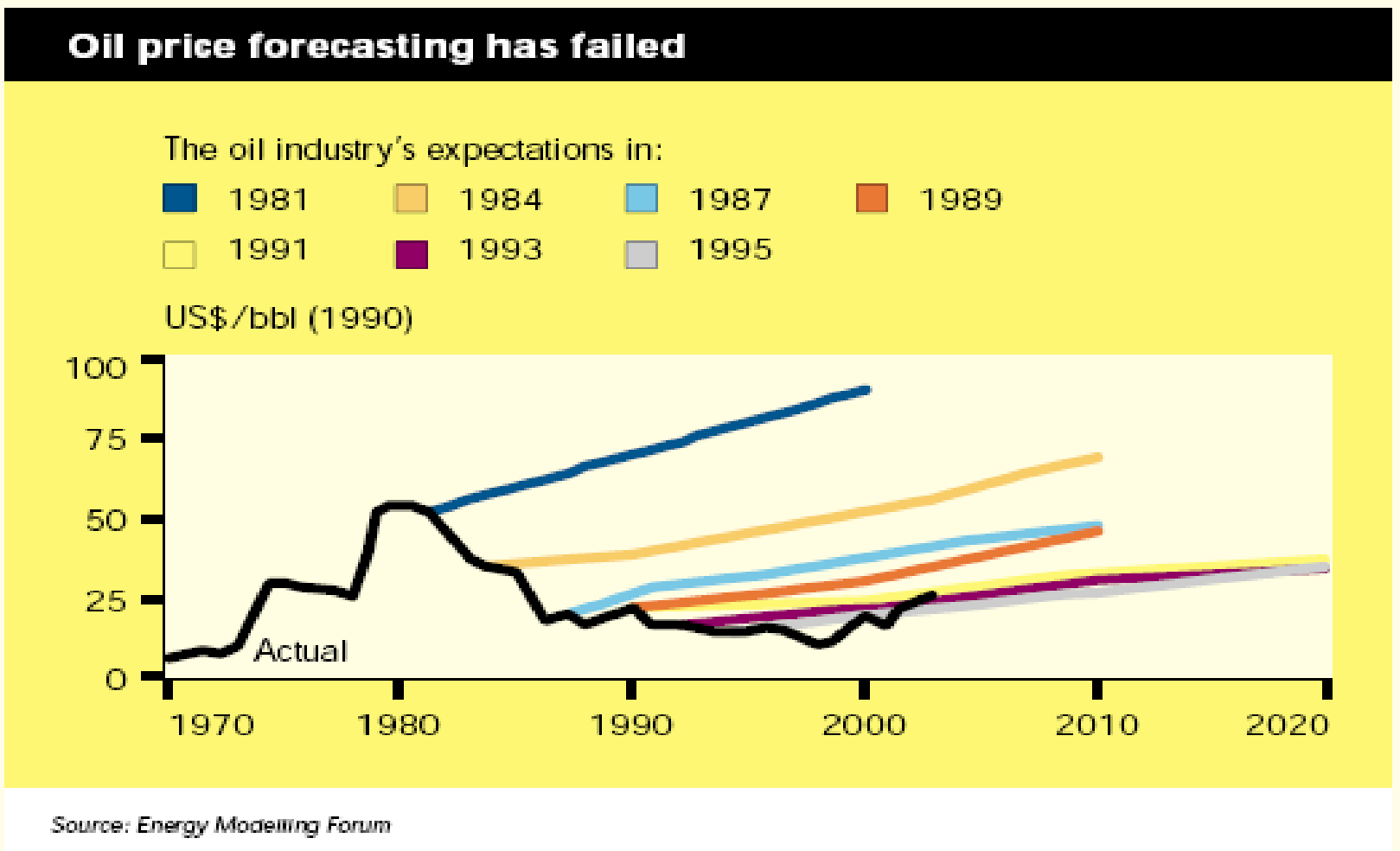
Different Methods for Planning



But what about very long term (10+ years) planning?

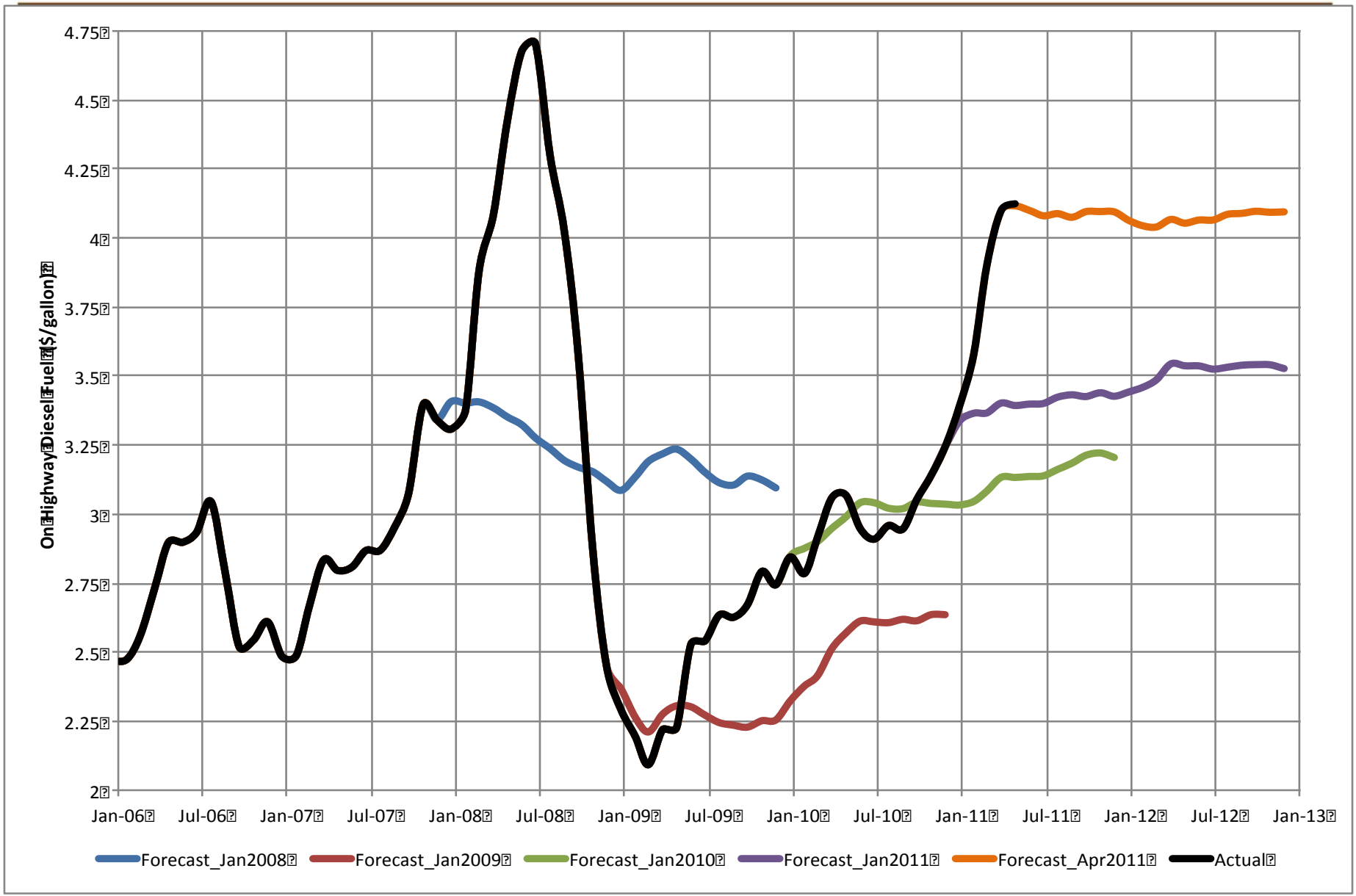
Material adapted from Dr. Mahender Singh SC2020

Longer term planning is impacted by events

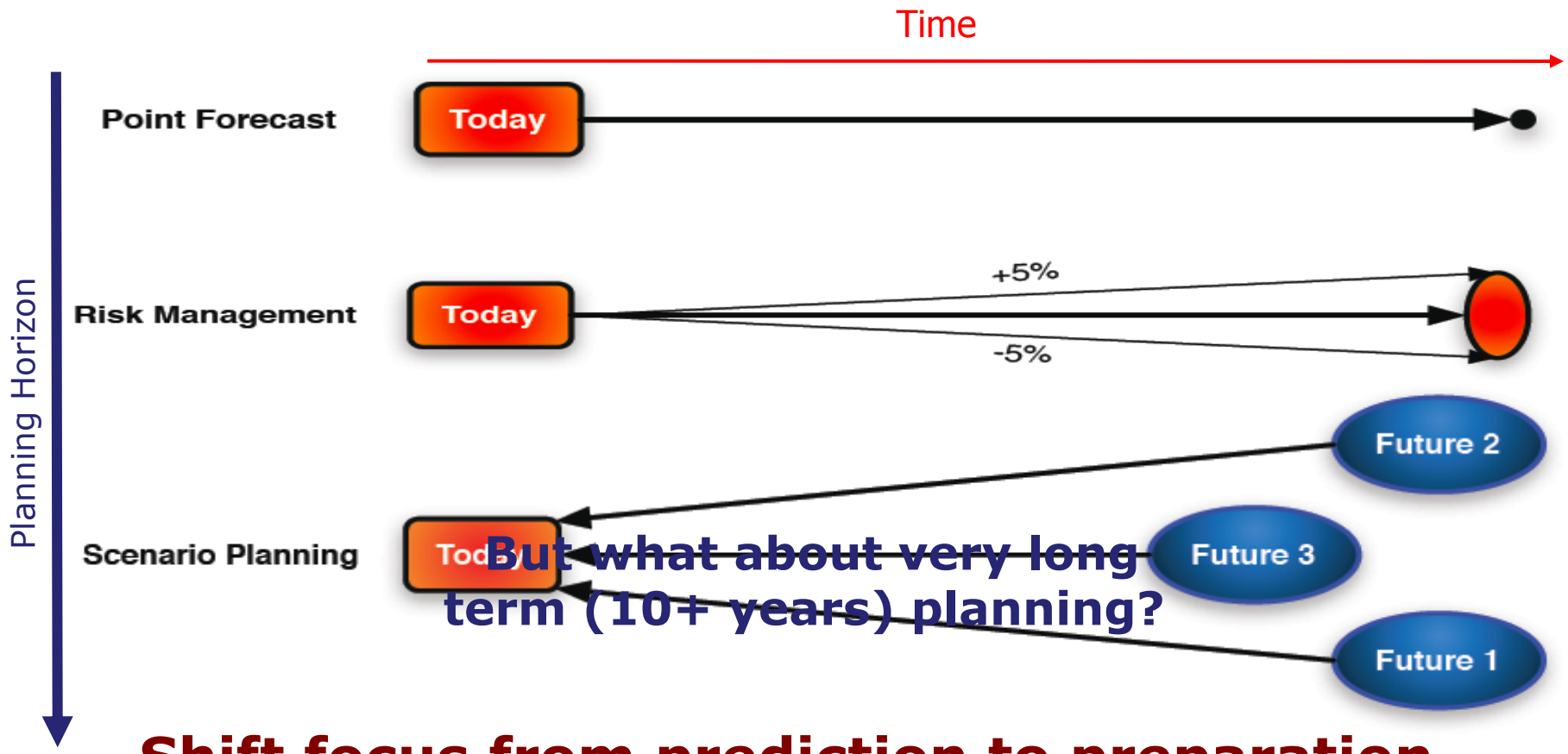


Source: Scenarios: An Explorer's Guide, Shell International 2003.

Poor Forecasting is not a thing of the past . . .



Different Methods for Planning

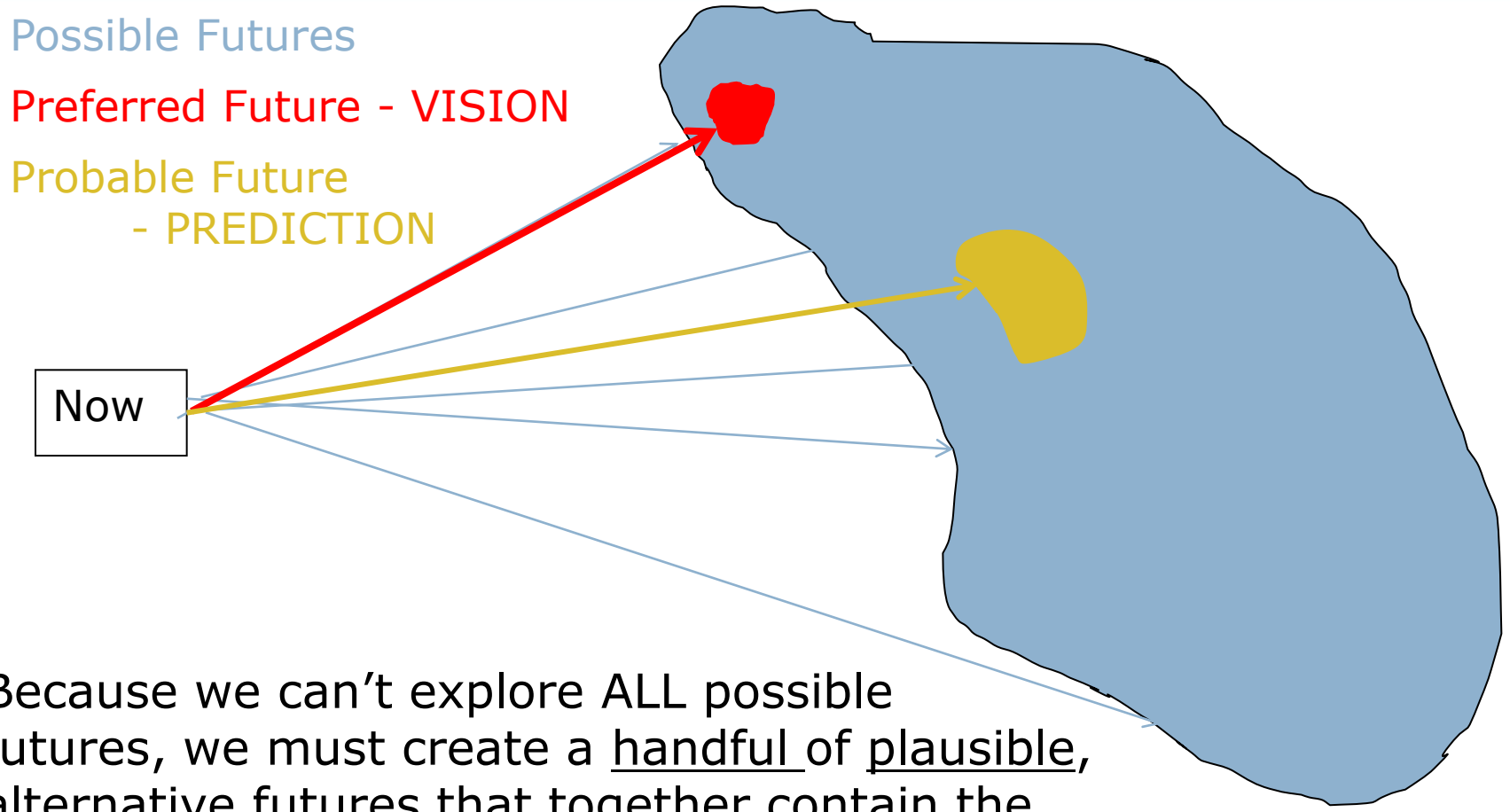


Shift focus from prediction to preparation

Material adapted from Dr. Mahender Singh SC2020

So many potential futures, so little time . . .

Preferred vs. Probable vs. Plausible



Because we can't explore ALL possible futures, we must create a handful of plausible, alternative futures that together contain the most relevant uncertainty dimensions

Scenario Planning

- Criteria for a good set of scenarios
  - Decision Making– capture right decision
  - Plausibility – within realistic limits
  - Alternatives – no favorites or preferred (Unofficial/Official)
  - Consistency – internal logic is aligned
  - Differentiation – structurally different
  - Memorability – easy to recall after event (name helps)
  - Challenge – push against established wisdom
- Accuracy of event forecasting is not important
  - The skill we are developing is preparation not predicting
  - The focus is on effects not on individual events

Effects versus Events

14 April 2010
Eruption of the Eyjafjallajökull Volcano

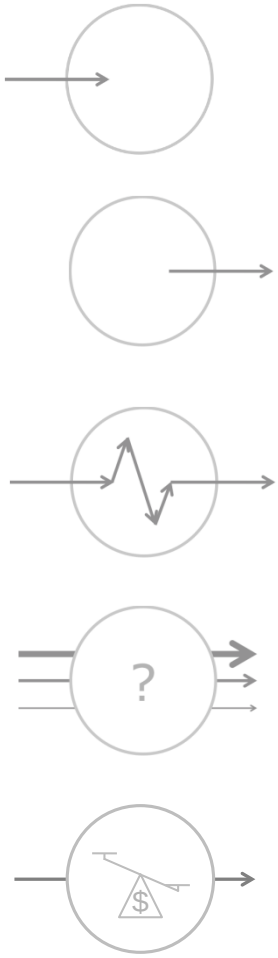
Beijing 2008

Summer 2008
Manufacturing moratorium in Beijing

Translating *Events* into *Effects*

Freight Flow Patterns

How can an event impact freight flows?



Impact on sourcing patterns

Where are raw products and WIP sourced from? Are materials sourced in or out of the region?

Impact on flow destination

Where is the demand located? How are final destination locations distributed?

Impact on routing

How is freight moved within the region? Are there intermediate shipment points or mode switches?

Impact on flow volume

How will the total volume of freight shipped in and through the region change?

Impact on value density

How will the product characteristics change? How does the value density change?

The Real Value of Scenario Planning

- Forecasting Challenges
  - Without step changes, forecasting would be easy!
  - Step changes are driven by events, and . . .
  - Events are next to impossible to predict, but . . .
  - Planners do a pretty good job preparing, so . . .

- Scenario planning allows us to shift from

Predicting future **Events**

To

Preparing for potential **Effects**

Classic Cases of Short Sightedness

Great Horse Manure Crisis of 1894

- More than 150,000 horses in NYC producing over 2,000 tons of manure per day
- Estimates of manure reaching 3rd floors by 1930 & nine feet in London by 1950
- 1st International Urban Planning Conference held in NYC in 1894

Interestingly, over 4000 cars were sold in the US in 1900. By, 1916 more cars than horses were registered in NYC

Classic Cases of Short Sightedness

The Quartz Crisis/Revolution

- Swiss watchmaking industry dominated the global market after WWII
- In 1960, they held over 50% market share
- New quartz technology was introduced in the late 1960's- Swiss firms ignored
- By 1970's, US & Japan firms dominated and Swiss firms had less than 10% of market

Interestingly, the Quartz technology was first developed by Max Hetzel, a Swiss engineer!

Future Freight Flow Scenarios

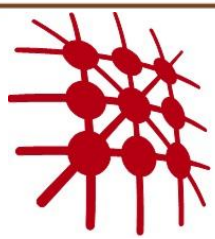
We created 4 FFF scenarios for November 2, 2037

ONE WORLD ORDER

Naftástique!

MILLIONS OF MARKETS

Differences Between Scenarios

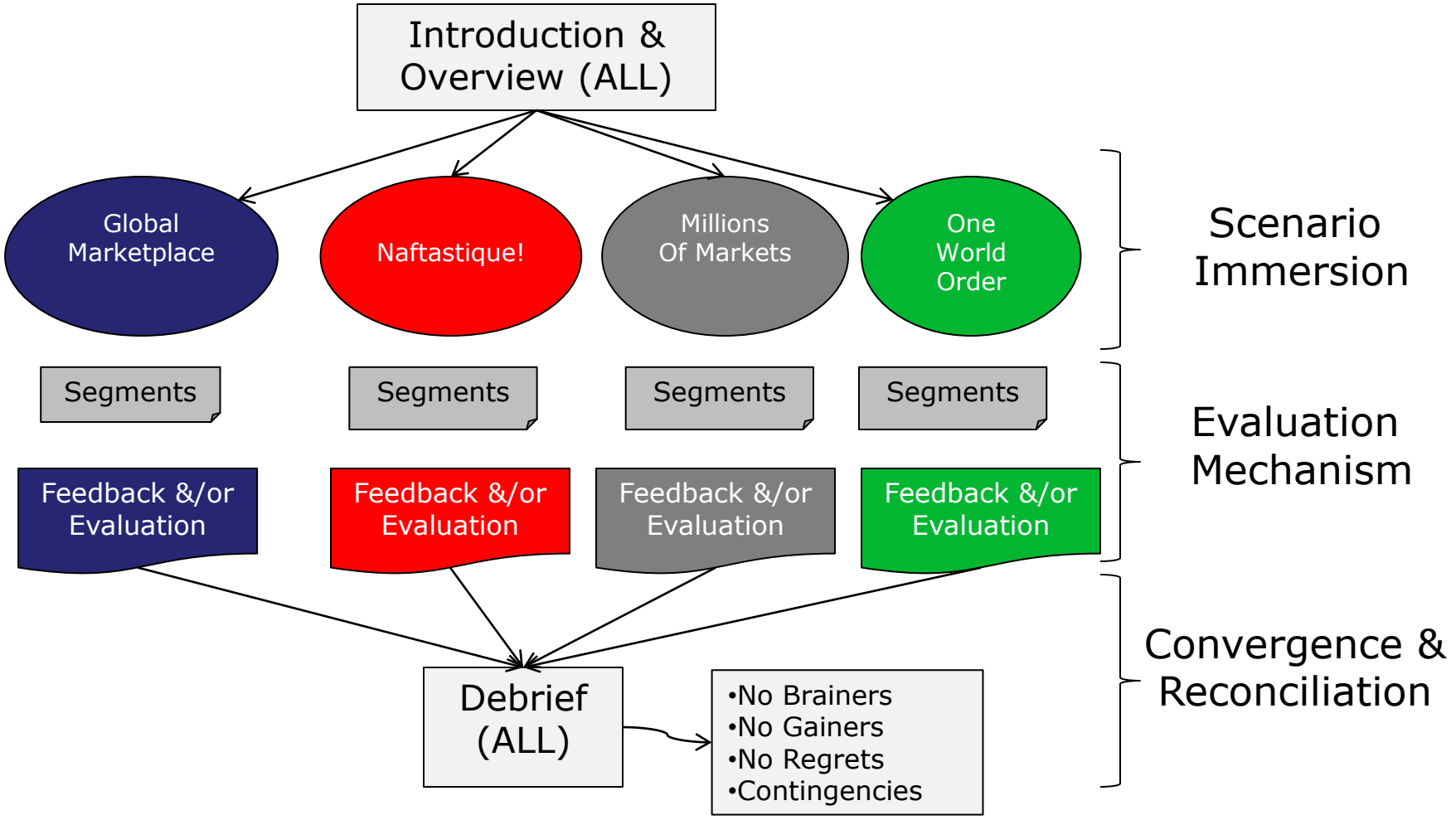
				
Global Trade	**Low**	**High**	**High**	**Low (physical)**
Resource Availability	**Low**	**Low**	**High**	**High**
Energy Cost Level	High	High	Low	Low
Energy Cost Variability	Low	High	High	Low
Level of Environmental Awareness	Same as Today	High	Low	High
Population Dispersion	Growth in SW	Growth in Biggest Cities	Growth in Biggest Cities	Rise in Mid Tiered Cities
Energy Sources	Majority NA	Mix Foreign & Domestic	Majority Foreign	Majority Domestic
Level of Migration	High w/in Bloc, Low between	High	High	Low
Migration Policy	High	High	Low	Low
Currency Fluctuations	Low w/in Bloc	High	Moderate	Low

Italics: indirect effect

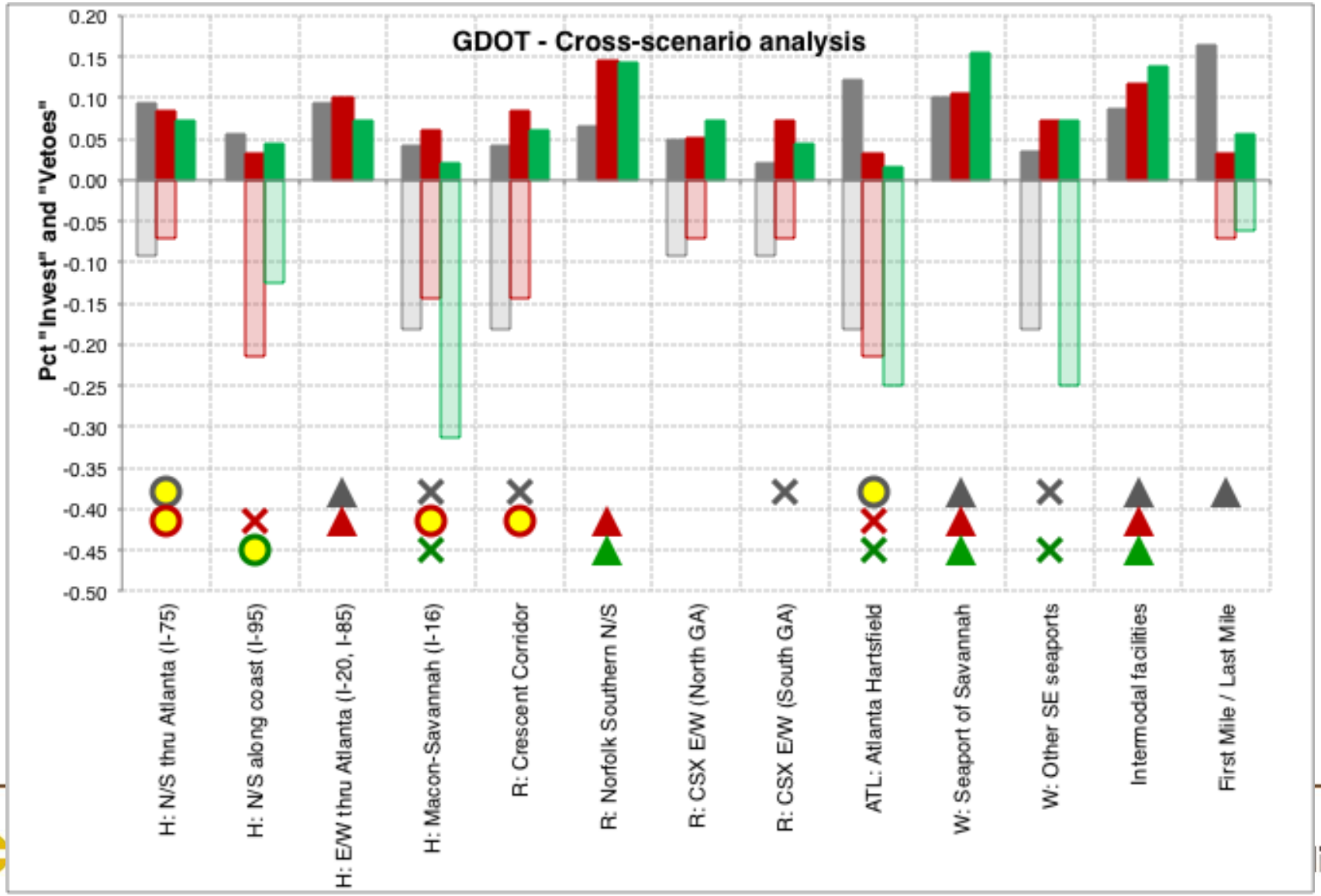
So, what do we do with the scenarios?

- Use them in workshops
  - Invite a diverse set of stakeholders
    - Private Sector: shippers, carriers, 3PLs
    - Public Sector: from Federal, state, & local levels
  - Have them consider a set of strategic options or alternatives
    - Set of potential investments
    - Potential freight corridors
    - Open-ended set of themes to prioritize
- Validated in 6 workshops held across country
  - Delaware Valley Regional Planning Commission
  - Minnesota DOT
  - Washington State DOT
  - Port of Long Beach
  - Georgia DOT
  - Washington DC

FFF Workshop Structure



Sample X-Scenario Analysis



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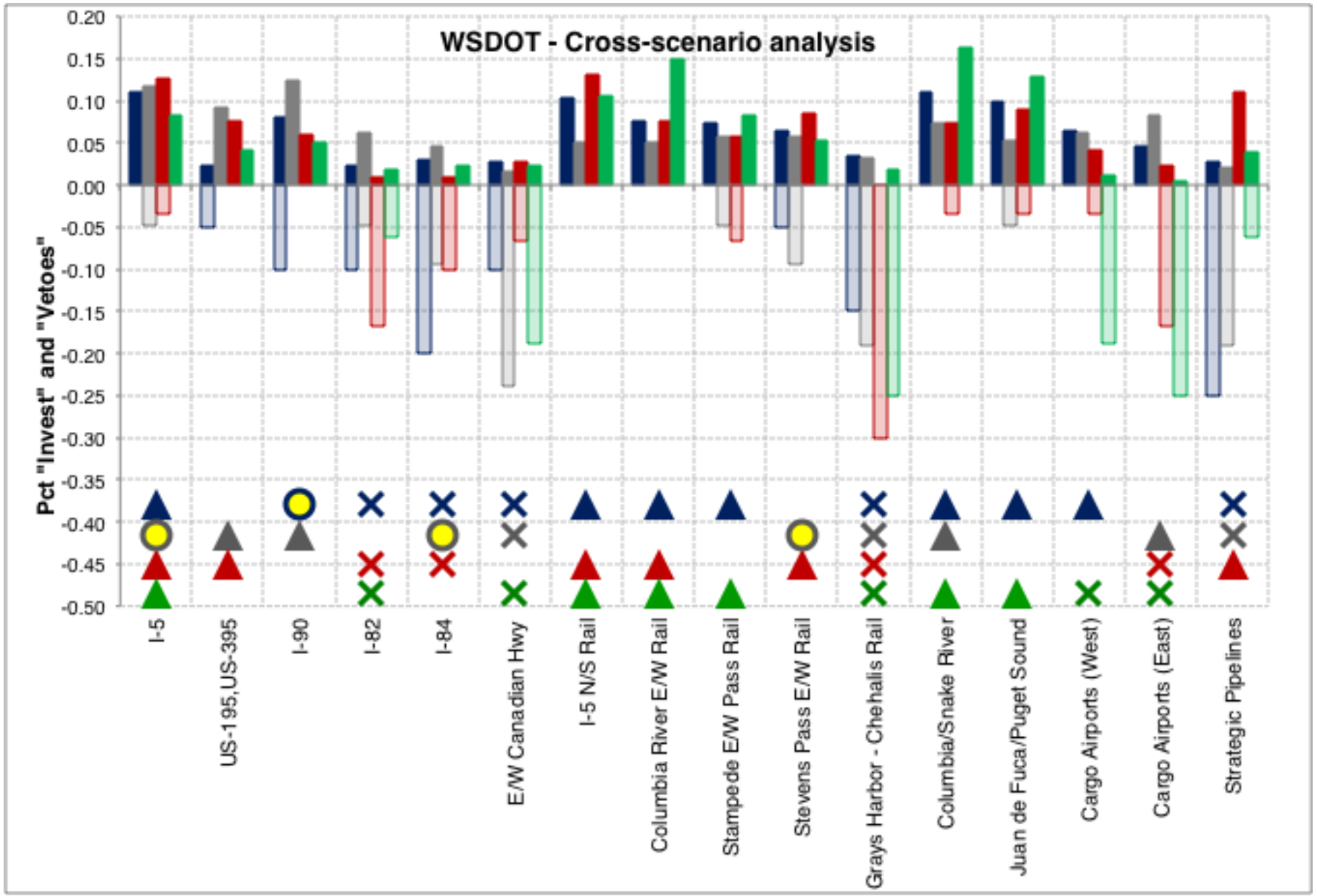

Initial Learnings

- Process & Method
  - Attendee selection is key – group dynamic dictates discussion level
  - Group facilitation is the most critical skill
  - Positive/Negative voting mechanisms work
  - Immersion works with portfolio of collateral – videos especially
  - Debrief in same day is difficult – and not totally worthwhile
- Insights & Outcomes
  - System connections (intermodal) were always robust
  - Flexible use of existing facilities frequently robust
  - Robust perceptions of the four scenarios
    - Global Marketplace – viewed as most like today and most probable to occur
    - One World Order & Naftastique! as "evolutionary"
    - Millions of Markets – revolutionary and most drastic future
- Challenges to Overcome
  - How can we enable DOTs to conduct these workshops by themselves?
  - How can scenario planning be incorporated into existing processes?

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Boston, MA

Dr. Chris Caplice
Executive Director, MIT CTL