



# Domestic Energy Transport Committee

---

Waterways Briefing

Craig Philip

Director, Vanderbilt Center for Transportation and Operational Resilience

May 12, 2016



SCHOOL OF ENGINEERING  
VANDERBILT UNIVERSITY



# Two Types of Barge Movements – Coastal and Inland

- **Coastwise (Blue Water Movements):**

- Larger coastwise tank barges (30K – 195K bbl)
- Distribution along U.S. inter-coastal and regional short-haul trade lanes
- Emerging barge trades:
  - Intra-Gulf movements of Eagle Ford/Permian crude from Corpus Christi to refining markets in Texas and Louisiana
  - West Coast: Bakken crude from Anacortes, WA to West Coast refiners
  - East Coast: Bakken crude out of Albany, NY, down the Hudson River to East Coast refiners

- **Inland (Brown Water Movements):**

- Smaller barges (10K – 30K bbl)
- Marine transportation throughout Mississippi River System and its tributaries, as well as the Gulf Intracoastal Waterway
- Emerging barge trades:
  - Eagle Ford crude along Gulf Intracoastal Waterway.
  - Mid-continent originations of crude to Gulf Coast refining regions
    - Utica/Marcellus crude oil along the Ohio River to the Gulf
    - Bakken and Western Canadian crude (St. Louis, MO; Wood River, IL)
    - Cushing, OK at the Port of Catoosa, trafficking along the Arkansas River system and the Lower Mississippi

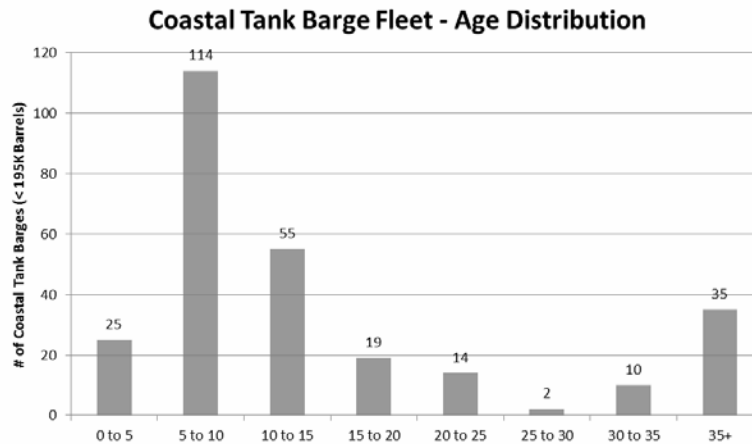
# Shale liquids, especially crude oil, have used both the rail and inland/coastal waterways to overcome limitations in the pipeline system





# Coastal - Snapshot

- **Coastal barge fleet (195K barrels or less) consists of ~270 tank barges:**
  - Average age of the nation's coastal barge fleet is ~16 years
  - 45 barges are 30 years or older and nearing retirement (likely within the next 5 years)
  - Top 5 coastal barge operators account for nearly 75% of the market
  - Approximately 14 new coastal barges (195K-bbl or less range) are on order.



## Coastal Barge Operators

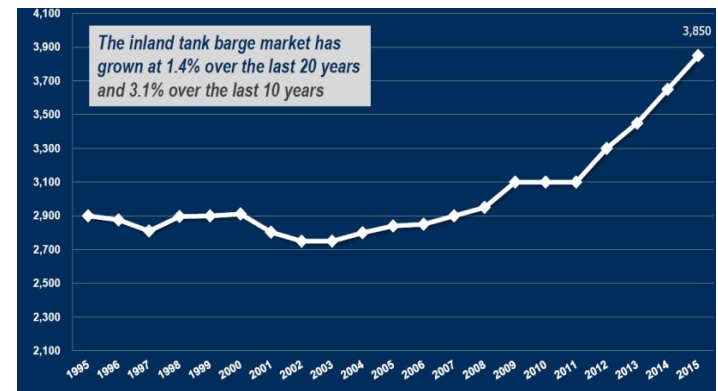
	Coastal Tank Barges Operated *
Kirby Corporation	69
Vane Brothers	63
Olympic Tug & Barge (Harley Marine)	27
Reinauer Transportation	25
Bouchard Transportation	17
Crowley Marine	14
Moran Towing	11
Saltchuk Resources (Foss Maritime)	10
Genesis Energy L.P.	9
Sause Brothers	8
Enterprise Products Partners	7
U.S. Shipping Corporation	4
Martin Gas Marine	3
Poling & Cutler	2
Overseas Shipholding Group	1
	<b>270</b>



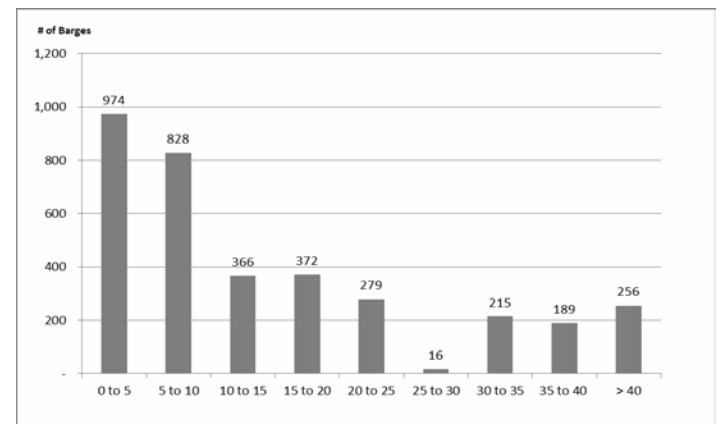
# Inland - Snapshot

- **Inland barge fleet consists of ~3,850 liquid tank barges:**
  - The inland fleet has increased over 24% since 2011
  - Majority of equipment being built are 30K bbl barges vs. 10K bbls (essentially a 5:1 average annual increase in total barrel capacity over the past 5 years)
- **Fragmented, but top-heavy:**
  - More fragmented market relative to coastal with ~40 inland barge operators (both independent and shipper owned)
  - Top-10 operators account for nearly 80% of the market (total barge # basis)

**Inland Tank Barge Fleet - # of Barges**



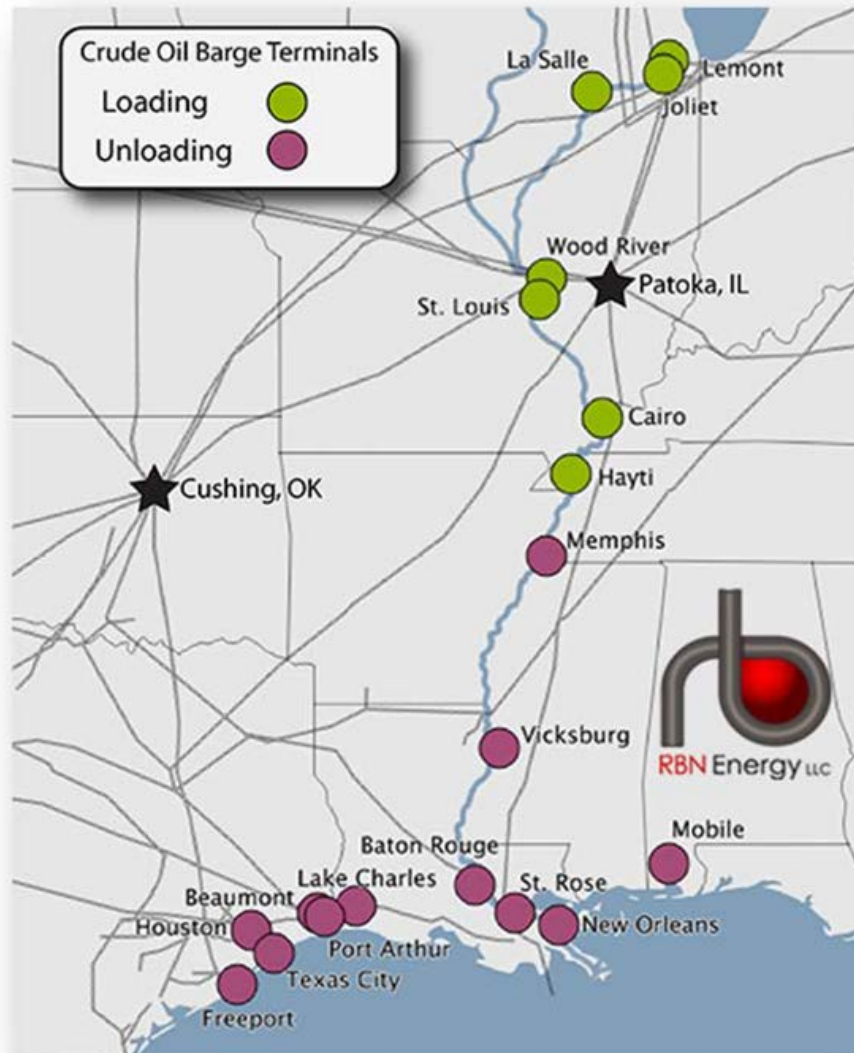
**Inland Tank Barge Fleet – Age Distribution**



Note: inland fleet as of 12/31/15



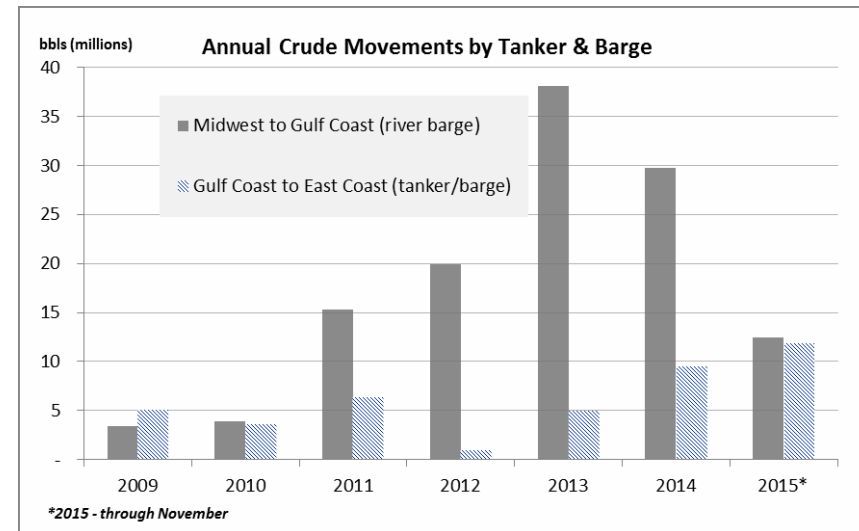
Crude oil is returning to the inland waterway, primarily originating upriver and destined for the gulf coast





# Inland Barge Markets – Crude Shipments Most Likely Peaked

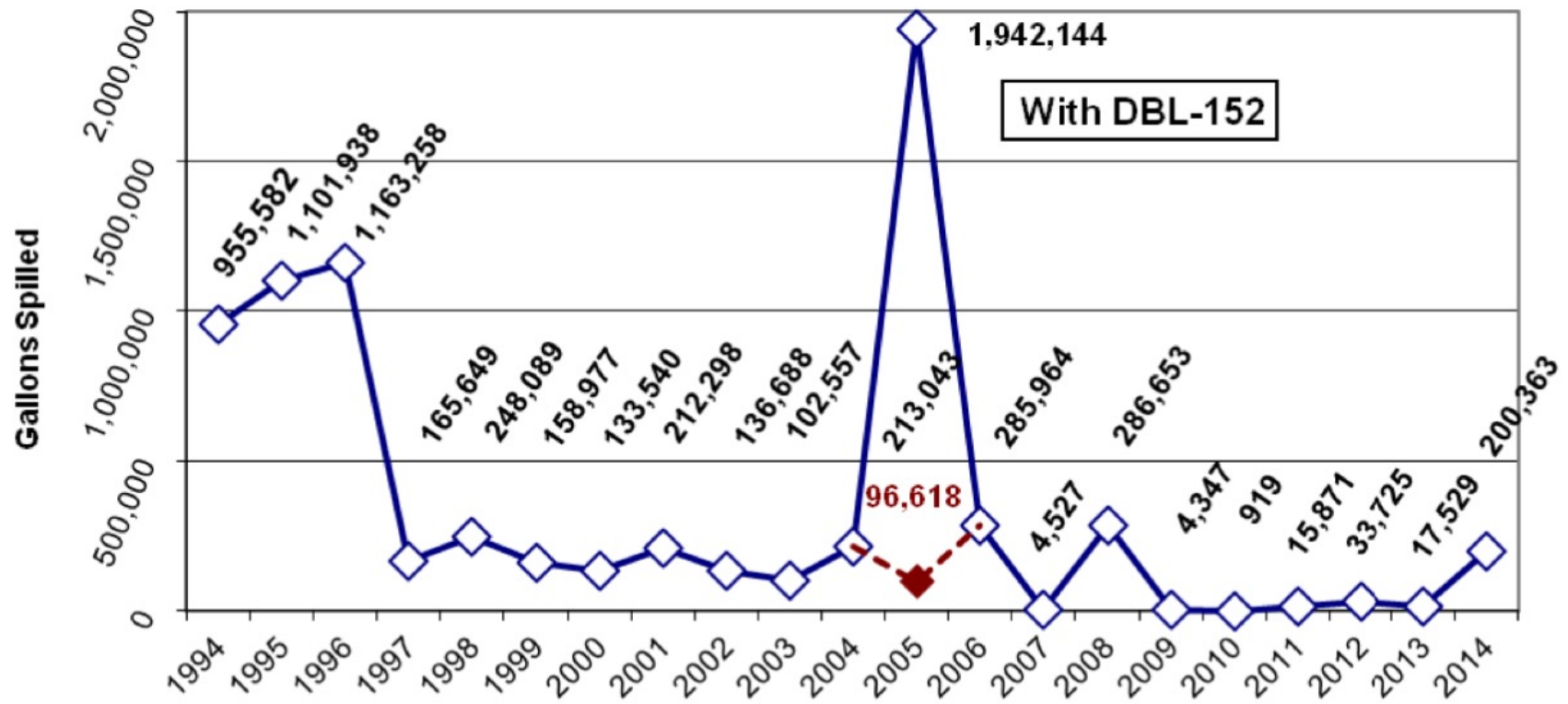
- **Flexible and efficient method of transport:**
  - Most refineries are equipped with waterborne access
  - Barge capacity can more easily respond to changing demand patterns with existing infrastructure
  - Black oil barges are equipped with heating elements, offering shippers optionality
  - Barges serve as a strategic complement to pipeline and rail
  - Mid-continent to Gulf crude oil cost comparison
    - Barge: \$4-\$5/bbl
    - Rail: \$9-\$12/bbl
- **Inland markets – crude momentum losing steam:**
  - Incremental crude oil demand created a tailwind for inland tank barge markets (both Bakken crude and heavier crude originating from Western Canada)
  - However, recent oil price uncertainty and narrowing spreads (WTI-Brent; WTI-Western Canadian) has led to a decline in some Midwest to Gulf Coast volumes





The Industry Safety/Spill Record has been Excellent In Spite of the Dramatic Increase in Crude Shipments ... Why Has This Happened?

*Chart 5 – Oil Spilled from Tanks Barges by CY*







## Movement of Energy Products by Water

- Natural Safety Advantages – Intrinsically Safe
  - Now Fully Double-Hulled Assets
  - Large Ships/Barges – So Small Number of Shipping Units
  - Network is Uncongested, Though Some Ports are Not
  - Routes are usually thru fairly remote or industrial areas
- Relatively Small Number of Operators Today
- Government Oversight Has Proven to Be Effective Since the 1990's
  - Near Exclusive Federal Responsibility and/or Preemption
  - Interplay with International Governance Has also Helped



## Why the Industry's Record Was Not Always So Positive

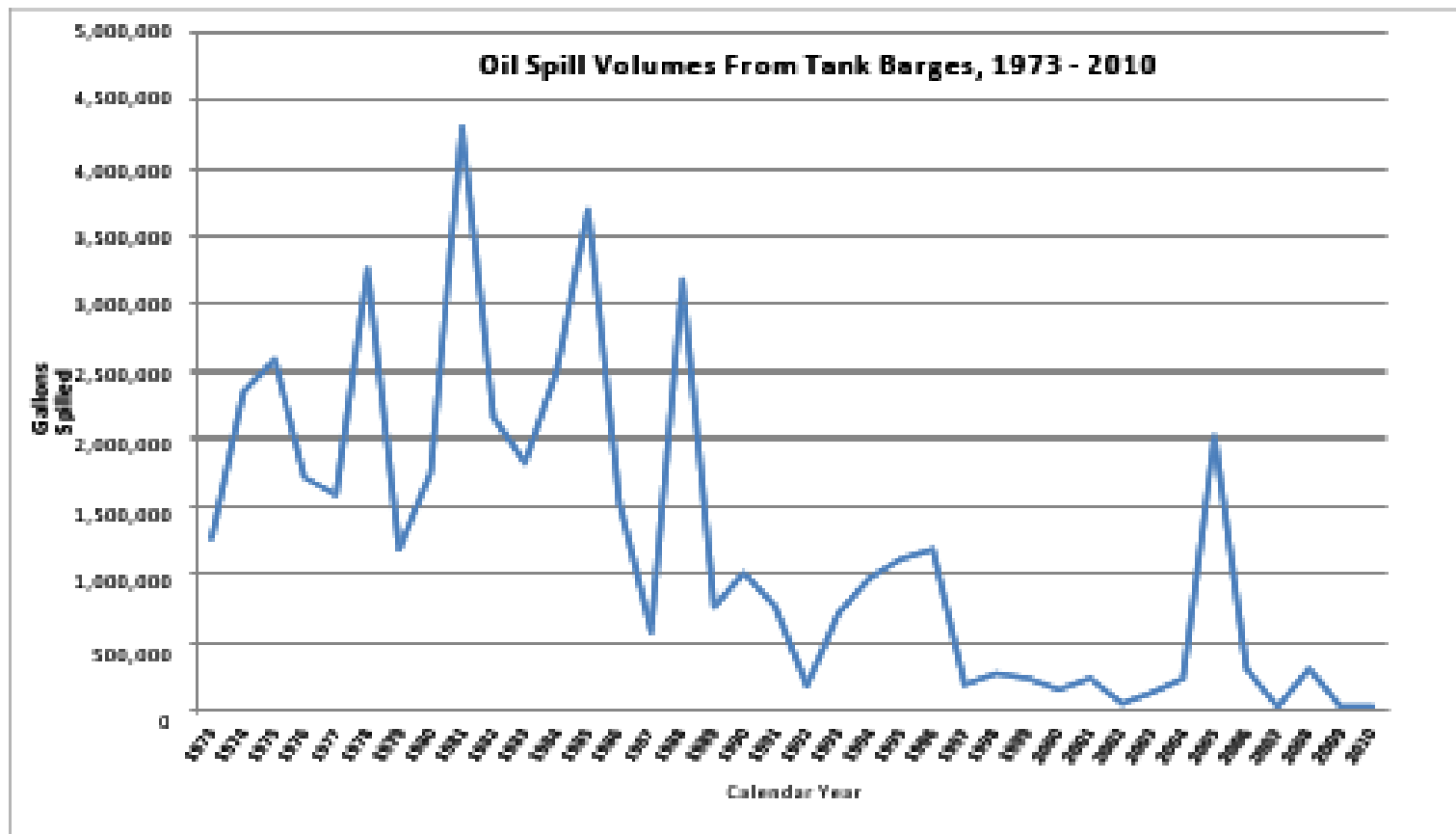


Figure 3: The volume of oil spilled by barges has trended down since the 1970s.



# Four Events over 5 Years ('88-'93) Shaped the Maritime Industry . . .

- **EXTREME WEATHER EVENTS in Heartland**
  - '88 Drought, lowest water ever on the Mississippi
  - '93 Flood, most widespread ever
- **MARITIME ACCIDENTS – UNIMAGINED SCALE**
  - '89 Exxon Valdez
  - '93 Bayou Canot Amtrak Accident

## ...Impacted All Three Major Stakeholder Groups

- **Responsive Infrastructure Owner – US Corps**

Embraced Operating Flexibility ...  
...Especially at the Local Level



- **Progressive Regulator – US Coast Guard**

Empowered by OPA 90, but ...  
...Embraced “Prevention Thru People”



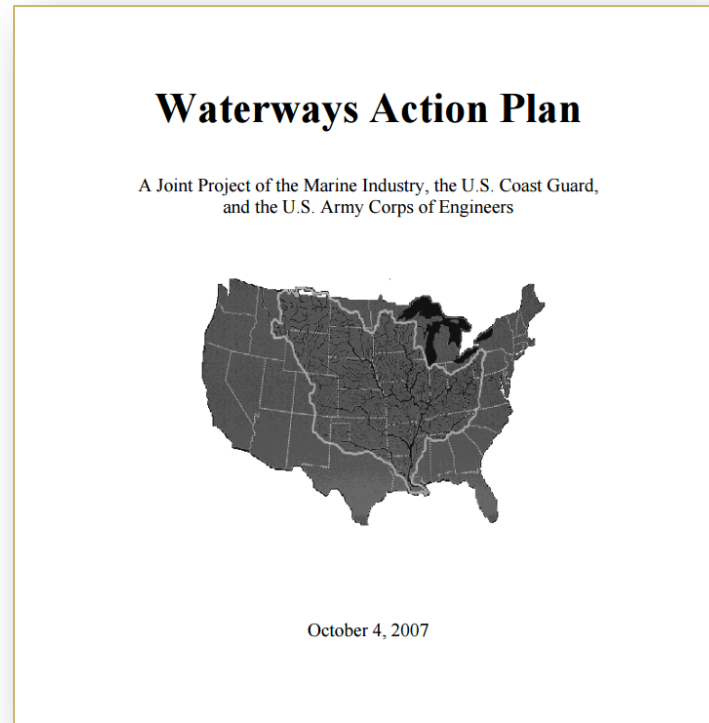
- **Enlightened Towing Industry**

Adopted Responsible Carrier Program ...  
...Ultimately embraced Full Regulation





# A Resilient Governance Framework Has Been Adopted: Non-Regulatory, Locally Implemented



- Network wide application
- Well defined trigger points and responses
  - Activated multiple times annually
- Continually evolving ... becoming Antifragile?



# Network wide WATERWAY ACTION PLANS overseen by designated LOCAL stakeholder groups





## ...Impacted All Three Major Stakeholder Groups

- Responsive Infrastructure Owner – US Corps

Embraced Operating Flexibility ...  
...Especially at the Local Level



- Progressive Regulator – US Coast Guard

Empowered by OPA 90, but ...  
...Embraced “Prevention Thru People”



- Enlightened Towing Industry

Adopted Responsible Carrier Program ...  
...Ultimately embraced Full Regulation





## OPA 90 – A True Game changer: Totally Changed the Operating Culture (From the Perspective of an Operator ...NOT a Lawyer)

- Responsible Party Defined: Owner/Operator of the Vessel
- Strict Liability, and Corporate/Personal Criminal Liability Too
- Must Demonstrate Spill Response Capability
  - Spill Response Plans Certified by the CG
  - QI's (Qualified Individuals) designated and Trained
  - Documented Drills
- Coast Guard is OPA 90 King
  - National Response Center
  - Strike Force Established
  - “Federalization” of Spills Established as the Nuclear Option





## International Maritime Practices Factor in Too

- Marpol (Int'l Convention for Prevention of Oil Pollution from Ships)
  - Affirmative Duty to Report a Spill if:
    - Any Actual Discharge
    - Any Probable Discharge
    - Any Presence of Oil – aka a Sheen in the water, NO MINIMUM Quantity
    - Failure to Report is Criminally punishable, authorizes vessel seizure
- Classification Societies (e.g. American Bureau of Shipping, ABS)
  - Very Prescriptive Standards for Vessel Design, Inspection, and Recertification, Required for almost all International Voyages
- OCIMF (Oil Companies International Marine Forum)
  - SIRE (Ship Inspection Report Programme) established in 2004
  - Expanded to Barges by Most Major Oil Companies



## ...Impacted All Three Major Stakeholder Groups

- Responsive Infrastructure Owner – US Corps  
Embraced Operating Flexibility ...  
...Especially at the Local Level
- Progressive Regulator – US Coast Guard  
Empowered by OPA 90, but ...  
...Embraced “Prevention Thru People”
- Enlightened Towing Industry  
Adopted Responsible Carrier Program ...  
...Ultimately embraced Full Regulation





## Carrier Governance Milestones

- 1994: RCP adopted as code of practice for AWO members
- 1995: Coast Guard establishes its first partnership with AWO
- 1997: RCP third-party audit instituted
- 2000: RCP becomes condition of AWO membership
- 2004: TOWING VESSEL INSPECTION LEGISLATION  
ADVOCATED BY INDUSTRY AND PASSED
- 2011: Subchapter M (Inspection) Rule published
- 2016: Full Inspection Rule Implementation



## How Does the Culture of the Industry Look Today?

- Zero Tolerance for Spills of ANY Quantity
  - From Deck Plate to Board Room
  - Reporting and Response is Automatic and Practiced and now Rare..
- Oil/Chemical Companies have Largely Divested of Boats/Barges, but have Dramatically Increased Oversight of Domestic Maritime Operators
- Partnership Attitude for the Most Part Between Industry, CG, and Corps
  - Tested with the Coast Guard after 9/11



## Other Important Topics

- What types of Spill-Related Accidents are Most Common
  - Allision – most significant
  - Material Failure – most frequent
  - Human Factors – nearly always involved
- Reporting
  - By the Responsible Party to multiple stakeholders
- Training
  - Coast Guard Licensing Of Pilots, Engineers and Tankerman
  - Mix of written exam, apprenticeship, and skills demonstration
- Relationship with Responders
  - Contractual between Responsible Party and Response Contractors
  - Good on-board response capabilities for small spills



# “The Delta”: What Has Changed Since 2010?

- Crude Market

- Coastal:

- At the peak, 30+ of 270 barges in crude
    - Some new builds, < 20

- Inland:

- At the peak, 500+ of 3,700 tank barges in crude
    - Nearly 1000 new builds in last 5 years, many deployed in crude service
    - Demand has declined as fast as it rose
    - Limited NGL activity, estimated at 30-40 barges

- Ethanol Market

- Few dedicated barges, most often a backhaul, mostly inland
  - Demand grew more slowly, hasn't declined yet

- Network Issues

- Growth of Corpus Christi
  - Houston congestion has Increased
  - Minimal impact elsewhere, new movements have been on established traffic lanes



# Kill Chain – Prepare for Service

- Oversight of Tank Barge Construction
  - CG and Possibly ABS Approval of Design
  - CG and Possibly ABS Oversight/Signoff During Construction
- Oversight of Tank Barges After Construction
  - CG In-Service Inspection (Afloat - 2 yrs, Drydock - 10 yrs)
  - OCIMF Inspection Depending on Customer
- Inspection Prior to Loading
  - Person-in-Charge (PIC) Completes Documented Voyage Pre-inspection



# Kill Chain – Underway Operations

- Routine In-Service Inspection
  - OnBoard Paperwork Verified and Logged by Vessel Crew
  - Barge Void Inspection Completed every 6 Hours
- Initial Incident Reporting
  - Ch 16 Distress Frequency Broadcast Likely First
  - Report to CG Sector Watchstander
  - Report to Company Command Center
  - Report to CG National Response Center
- Call-out of Responders
  - As called for in Incident Response Plan, usually Geographic





# Kill Chain: Post Incident Return to Service

- CG Issues a Permission to Proceed
- Incident Command Center Determines when Cleanup is Complete
- Hot-Wash Post Incident Review by CG/Corps/Company is Frequently Conducted