Vessel Speed Reduction (VSR)

- One of Many Options for Reducing Ship Emissions
  - Fuel Switch
  - On-Shore Power
  - Vessel Speed Reduction (VSR)
  - Emission Reduction Technologies
  - Energy Efficiency Measures

- Pollutant Consideration & Effectiveness
  - Port Domain Perspective
    - NO\textsubscript{x}, PM\textsubscript{2.5}, PM\textsubscript{10}, DPM, & SO\textsubscript{x} – Good Option for Reducing Regional & Local Health-Based Emissions/Impacts
Advantages of VSR

- Reduces all pollutants
- All ships can do it
- Short implementation time frame
- Utilizing AIS data a program can be verified
- Administration of VSR compliance can mostly be automated (POLA, POLB, PANYNJ, etc) = low administrative support costs
- Reductions have been studied & estimating methods CARB & EPA accepted
Factors Influencing Magnitude of Benefits

- **Geographical Domain & Geography**
  - Emission Reduction Varies by Port
  - Coastal Ports – Good Potential to Reduce Open-Water Portion of Ship Transit Emissions
    - Limited by Geography & Domain Extent
    - Limited by Transitional Areas
  - Inland Ports – Limited Effect on Constrained Waterway Transit Emissions
    - Vessel Safety is Paramount
    - Speed Typically Already Reduced Due to Constrained Waterways
    - Pilot Time Limits

- **Vessel Related Factors**
  - Average Speeds Prior to Program Start
  - Large Auxiliary Loads are Primary Constraining Factor
  - Fleet Mix & Next Port
<table>
<thead>
<tr>
<th>Port</th>
<th>Driver</th>
<th>Evaluated VSR Program?</th>
<th>Active VSR Program?</th>
<th>Start Distance (nm)</th>
<th>Method</th>
<th>Innovations/Challenges/Barriers to Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port of Los Angeles</td>
<td>NOx/DPM</td>
<td>✓</td>
<td>✓</td>
<td>2001</td>
<td>20/40 Vol/Inc</td>
<td>Dockside work gang assignment moved to VSR boundaries</td>
</tr>
<tr>
<td>Port of Long Beach</td>
<td>NOx/DPM</td>
<td>✓</td>
<td>✓</td>
<td>2001</td>
<td>20/40 Vol/Inc</td>
<td>Marine exchange/USCG participation; Green Flag Program</td>
</tr>
<tr>
<td>Port San Diego</td>
<td>NOx</td>
<td>✓</td>
<td>✓</td>
<td>2009</td>
<td>20 Vol/Inc</td>
<td>Ships already slow to 10 knots @ Bay Bridge; Strong currents</td>
</tr>
<tr>
<td>Port of Oakland</td>
<td>NOx</td>
<td>✓</td>
<td>✓</td>
<td>2009</td>
<td>20 Vol/Inc</td>
<td>Ships gradually slow naturally; Added costs; Strong currents</td>
</tr>
<tr>
<td>Port of Seattle</td>
<td>PM</td>
<td>✓</td>
<td>✓</td>
<td>2009</td>
<td>20 Vol/Inc</td>
<td>Ships gradually slow naturally; Added costs; Strong currents</td>
</tr>
<tr>
<td>Port of Tacoma</td>
<td>PM</td>
<td>✓</td>
<td>✓</td>
<td>2009</td>
<td>20 Vol/Inc</td>
<td>Set VSR speed limit to match right whale</td>
</tr>
<tr>
<td>Port Authority of NY &amp; NJ</td>
<td>NOx</td>
<td>✓</td>
<td>✓</td>
<td>2009</td>
<td>20 Vol/Inc</td>
<td>Ships in nonattainment area already constrained by ship channel</td>
</tr>
<tr>
<td>Port of Houston Authority</td>
<td>NOx</td>
<td>✓</td>
<td>✓</td>
<td>2010</td>
<td>20 Vol/Inc</td>
<td>Set VSR speed limit to match right whale</td>
</tr>
</tbody>
</table>

**Map**

- Port of Seattle
- Port of Tacoma
- Port of Oakland
- Port of Los Angeles
- Port of Long Beach
- Port of San Diego
- Port Authority of New York & New Jersey
VSR Examples – San Diego
VSR Examples – New York/New Jersey

Legend
- Participation Zone (VSR Zone)
- Participation Zone (Non-VSR Zone)

Verrazano Narrows Bridge
Ambrose Channel
COLREGS Line
20 nm Arc Point (40.508, -73.965)
20 Nautical Miles
VSR Examples – Pacific Northwest
VSR Example

- San Pedro Bay Ports (SPBP) Developed First VSR Program –
  - Implementation Date: October 2001
  - Implementation Approach: Voluntary/Incentive
  - Status: Ongoing
  - Vessel Types: All
  - Drivers
    - Extreme NOx Nonattainment
    - Coastal Ports with Beneficial Geographical Domain
    - Public, Regulatory, & Board Pressure to Reduce NOx
  - Participants in Development of Program:
    - Port of Los Angeles (POLA)
    - Port of Long Beach (POLB)
    - Marine Exchange
    - US Coast Guard
    - California Air Resources Board (CARB)
    - South Coast Air Quality Management District
    - Pacific Merchants Shipping Association (PMSA)
VSR Domain

Fairway = entire area outside of Precautionary Zone
VSR Compliance

- SPBP Vessel Speed Reduction (VSR) Program –
  - Compliance History
VSR Monitoring

Vessel Tracking Service – Marine Exchange
- AIS and Radar to track speeds
- Speed measurements taken 5 nm increments

Administration
- Port of LA Environmental Database
- Monthly upload of Marine Exchange Data
Summary

- Effective Emission Reduction Strategy
- Considerations for New VSR Programs
  - Drivers
  - Constraints
  - Fleet Mix
  - Existing conditions/activities
- Monitoring
  - On-going program = automation
Thank You!

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