Established by Congress in 1975

Energy Policy & Conservation Act (EPCA)

Established Mission:
- To Protect the U.S. from Potential Disruptions in Critical Oil Supplies
- To Meet U.S. Requirements under International Energy Program

EPCA Storage Target:
- 90-Day of U.S. Petroleum Imports
Full Drawdown [EPCA Sec 161(d)]
- To address “Severe Petroleum Supply Interruption”, or
- To meet U.S. obligations under IEA Program

Limited Drawdown [EPCA Sec 161(h)]
- Added in 1991
- In preventing or addressing lesser supply shortages
- Limited to 30 Million Barrels and 60 Days

Test Sale [EPCA Sec 161 (g)]
- To conduct evaluations of sales procedures
- Limited to 5 Million Barrels of Oil

Oil Exchanges [EPCA Sec 159(f)]
- Under “Oil Acquisition Authority”
- To acquire oil or to alter mix
- Also used to provide refiners short-term emergency loans to address problems
Texas Storage Sites

SPR Bryan Mound Storage Facility

Location: Freeport, TX
Caverns: 20
Cavern Capacity: 247.1 MMB
Total Inventory: 245.1 MMB
Drawdown Rate: 1.5 MMBD

SPR Big Hill Storage Facility

Location: Winnie, TX
Caverns: 14
Cavern Capacity: 170.0 MMB
Total Inventory: 162.4 MMB
Drawdown Rate: 1.1 MMBD
**Louisiana Storage Sites**

**SPR Hackberry Storage Facility**
- **Location:** Hackberry, LA
- **Caverns:** 22
- **Cavern Capacity:** 220.4 MMB
- **Total Inventory:** 213.7 MMB
- **Drawdown Rate:** 1.3 MMBD

**SPR Choctaw Storage Facility**
- **Location:** Plaquemine, LA
- **Caverns:** 6
- **Cavern Capacity:** 76.0 MMB
- **Total Inventory:** 73.9 MMB
- **Drawdown Rate:** 0.515 MMBD
SPR Oil Distribution

Gulf of Mexico

SPR STORAGE SITES
SPR SALES POINTS
REFINING CENTERS
DISTRIBUTION SYSTEMS
PIPELINES
• Oil initially purchased for the SPR was chosen to represent the crudes being processed by U.S. refineries.

• Each SPR site maintains two common crude oil segregations:
  o Light Low Sulfur (Sweet) Crude
  o Light Medium Sulfur (Sour) Crude

• Light crudes have highest benefit in the event of a crude import disruption:
  – **Universal Crude** – Light crudes can be refined or processed by all refineries.
  – **Increased Refinery Output** – Light crudes can maximize the refinery yield.
  – **Less Crude needed** – Light crudes produce the maximum volumes of gasoline and naphtha for transportation needs.
SPR Crude Oil Receipts
(Cumulative thru 2014)
### SPR Domestic Oil Comparables

<table>
<thead>
<tr>
<th>SPR Crude</th>
<th>API</th>
<th>SULFUR %</th>
<th>U.S.G.C. Domestic Crude</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM SWEET</td>
<td>36.4</td>
<td>0.38</td>
<td>LIGHT LOUISIANA SWEET (LLS)</td>
</tr>
<tr>
<td>BM SOUR</td>
<td>33.3</td>
<td>1.41</td>
<td>BONITO SOUR (BS)</td>
</tr>
<tr>
<td>BH SWEET</td>
<td>35.4</td>
<td>0.40</td>
<td>LLS</td>
</tr>
<tr>
<td>BH SOUR</td>
<td>30.8</td>
<td>1.44</td>
<td>POSEIDON CRUDE (HOUMA)</td>
</tr>
<tr>
<td>WH SWEET</td>
<td>36.9</td>
<td>0.33</td>
<td>LLS</td>
</tr>
<tr>
<td>WH SOUR</td>
<td>33.5</td>
<td>1.38</td>
<td>BS</td>
</tr>
<tr>
<td>BC SWEET</td>
<td>35.4</td>
<td>0.43</td>
<td>LLS</td>
</tr>
<tr>
<td>BC SOUR</td>
<td>31.9</td>
<td>1.46</td>
<td>POSEIDON CRUDE (HOUMA)</td>
</tr>
</tbody>
</table>
Dec. 2012 & Jan. 2013, SPR received 505MB of light sweet oil (Bakken) with high vapor pressure (VP)
  - True Vapor Pressure (TVP) @ 100 F: 21 psia
  - Gas-Oil-Ratio (GOR) @ 100 F: 6.6 scf/bbl
  - Mitigated with cavern oil blend stock

Issues associated with receiving high VP crude oil
  - Compromised deliverability after receipt, due to geothermal effects
  - If significant volumes received, costly to mitigate

Light-ends are the largest contributors to crude oil VP
  - Inerts (N₂, CO₂ & H₂S) & Hydrocarbons (C₁ - C₅)
Oil Specification Light-Ends Limits & Testing

• Surveyed inspection services for industry Light Ends Testing – IP344, ITM 6008 or ASTM D7900
  
  o Utilizes GC with flame ionization detectors to analyze the hydrocarbon light end components
    • Directly measures the compositional breakdown which allows for inferring an oil’s TVP and GOR

• Determination of SPR Light Ends limits
  
  o Developed database of representative crude oils
  
  o Determine the light end components by liquid volume % which contribute to high VP crude oil
    • SPR testing, modeling and analysis as baseline
  
  o Light ends spec limits (C₁-C₃) developed to support acceptability of crude oils suitable for SPR storage
**SPR CRUDE OIL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>SOUR</th>
<th>SWEET</th>
<th>PRIMARY ASTM TEST METHOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>API Gravity [°API]</td>
<td>30-45</td>
<td>30-45</td>
<td>D 1298 or D 5002</td>
</tr>
<tr>
<td>Total Sulfur [Mass %], max.</td>
<td>1.99</td>
<td>0.50</td>
<td>D 4294</td>
</tr>
<tr>
<td>Pour Point [°C], max.</td>
<td>10</td>
<td>10</td>
<td>D 97</td>
</tr>
<tr>
<td>Salt Content [Mass %], max.</td>
<td>0.050</td>
<td>0.050</td>
<td>D 6470</td>
</tr>
<tr>
<td>Viscosity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[cSt @ 15.6°C], max.</td>
<td>32</td>
<td>32</td>
<td>D 445</td>
</tr>
<tr>
<td>[cSt @ 37.8°C], max.</td>
<td>13</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Reid Vapor Pressure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[kPa @ 37.8°C], max.</td>
<td>76</td>
<td>76</td>
<td>D 323 or D 5191</td>
</tr>
<tr>
<td>Total Acid Number [mg KOH/g], max.</td>
<td>1.00</td>
<td>1.00</td>
<td>D 664</td>
</tr>
<tr>
<td>Water and Sediment [Vol. %], max.</td>
<td>1.0</td>
<td>1.0</td>
<td>D 473 and D 4006, or D 4928</td>
</tr>
<tr>
<td>Yields [Vol. %]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Naphtha [28-191°C]</td>
<td>24-30</td>
<td>21-42</td>
<td>D 2892 and D 5236</td>
</tr>
<tr>
<td>Distillate [191-327°C]</td>
<td>17-31</td>
<td>19-45</td>
<td></td>
</tr>
<tr>
<td>Gas Oil [327-566°C]</td>
<td>26-38</td>
<td>20-42</td>
<td></td>
</tr>
<tr>
<td>Residuum [&gt;566°C]</td>
<td>10-19</td>
<td>14 max</td>
<td></td>
</tr>
<tr>
<td>Light Ends [Liquid Vol. %], max</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Methane (C₁)</td>
<td>0.01</td>
<td>0.01</td>
<td>IP 344, ASTM D7900, or ITM 6008</td>
</tr>
<tr>
<td>Ethane (C₂)</td>
<td>0.1</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Propane (C₃)</td>
<td>1.0</td>
<td>1.0</td>
<td></td>
</tr>
</tbody>
</table>

- Highlighted above is the added Specification for Light Ends Content limits and primary test methods
Oil Purchase 2015 – Quality Receipt Summary

• Worked with Seaway/Enterprise Pipeline in implementing Light Ends spec for deliveries to SPR
  o Seaway testing @ Cushing, origin point
  o Seaway segregation of tank @ Jones Creek, as available

• The average results of all deliveries, 25 cargoes
  o Average Methane content – less than 0.01 %LV
  o Average Ethane content – 0.051 %LV
  o Average Propane content – 0.55 %LV

• Five deliveries of Domestic Sweet crude analyzed
  o TVP (psia) – Max. - 19; Min - 17.5; Avg. - 18.5
  o GOR (scf/bbl.) – Max. - 2.4; Min - 0.8; Avg. - 1.7
Seaway to sample at Cushing – Must meet SPR spec to ship

Tanks
600 MB, 100MB bottoms
400 MB, 50 MB bottoms

Jones Creek

Cushing

Echo Terminal

Exxon Mobil Pipeline
(~18MB)

Custody Transfer
Meter/Sampler

Site Meter/
Sampler (Backup)

Bryan Mound
Tanks

SPR Caverns

Texas City

To Texas City
(Path for unacceptable crude oil
delivered to BM)
Thank You!

Questions?

• Further information: http://energy.gov/fe/services/petroleum-reserves/strategic-petroleum-reserve