The Strategic Petroleum Reserve in a Changing Global Market: An Agenda for Economic Research

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Disclaimer

The statements or opinions expressed in this presentation and panel discussion does not necessarily represent the view of the Department of Energy.
Presentation Overview

I. SPR Background and Planned Sales

II. Oil and the U.S. Economy

III. A Changing Global Market

IV. Analyzing the Economic Benefits of the SPR

V. Topics for Future Research
Strategic Petroleum Reserve Program

Established by U.S. Law:
• Energy Policy & Conservation Act (EPCA) (December 1975)

Mission:
• To ensure U.S. Energy Security by reducing the impacts of potential disruptions in U.S. petroleum supplies
• To carry out U.S. obligations under International Energy Program (Treaty)
**Strategic Petroleum Reserve Current Status**

- **SPR Oil Storage Sites:**
  - Texas (2), Louisiana (2)

- **Design Storage Capacity:**
  - 713.5 Million Barrels

- **Current Inventory:**
  - 660 Million Barrels

- **Design Drawdown Capability:**
  - 4.4 Million Barrels/Day
Prior SPR Oil Releases

- **SPR Drawdowns (IEA Actions):**
  - 1991 Iraq War: 17.3 MMB
  - 2005 Hurricane Katrina: 11.0 MMB
  - 2011 Libya Situation: 30.6 MMB

- **SPR Test Sales:**
  - 1985 Test Sale: 1.0 MMB
  - 1990 Test Sale: 3.9 MMB
  - 2014 Test Sale: 5.0 MMB

- **Emergency Exchanges (Loans):**
  - Seaway Emergency (1996): 1.0 MMB
  - Ship Channel Closure (2000): 1.0 MMB
  - Time Exchange (2000): 30.0 MMB
  - Hurricane Ivan (2004): 5.4 MMB
  - Hurricane Katrina (2005): 9.8 MMB
  - Ship Channel Closures (2006): 1.6 MMB
  - Hurricane Gustav/Ike (2008): 5.4 MMB
  - Hurricane Isaac (2012): 1.0 MMB
  - Hurricane Harvey (2017): 5.0 MMB
Upcoming Crude Oil Sales from the SPR

• Bipartisan Budget Act of 2015 (11/2015):
  – Mandates the sale of **58 million barrels** between 2018 and 2025 as a federal government revenue offset
  – Authorizes the sale of up to **$2 Billion** worth of crude oil for SPR modernization between 2017 and 2020
  – Calls for a Long-Term Strategic Review (LTSR) of the SPR

• Fixing America’s Surface Transportation (FAST) Act (12/2015):
  – Mandates the sale of **66 million barrels** between 2023 and 2025 to finance transportation infrastructure
  – SPR inventory cannot be drawn below 530 million barrels

• 21st Century Cures Act (12/2016)
  – Mandates the sale of **25 million barrels** between 2017 and 2019
  – Inventory floor lowered to 480 million barrels

• Bipartisan Budget Act of 2018 – **100 million barrels**
# Planned Sales from the SPR

## Planned Sales from the SPR

(in million barrels)

<table>
<thead>
<tr>
<th>Drawdown Legislation</th>
<th>Fiscal Year</th>
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<tbody>
<tr>
<td></td>
<td>2017</td>
</tr>
<tr>
<td>Bipartisan Budget Act 2015 (Public Law 114-74 Section 404)</td>
<td>6.3</td>
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<tr>
<td>Bipartisan Budget Act 2015 (Public Law 114-74 Section 403)</td>
<td>5</td>
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<tr>
<td>Fixing America’s Surface Transportation Act (Public Law 114-94)</td>
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<tr>
<td>21st Century Cures Act (Public Law 114-255)</td>
<td>9.9</td>
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<tr>
<td>Tax Cuts and Jobs Act of 2017 (Public Law 115-97)</td>
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<tr>
<td>Bipartisan Budget Act of 2018 (Public Law 115-123)</td>
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<tr>
<td>Total Annual Drawdown Volume</td>
<td>16.2</td>
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TBD: ESIM sales in FY19 and FY20 will be determined by revenue targets placed in appropriation bills each year.

For purposes of calculating an annual volume, volumes across multiple years are split evenly across those years. In practice, actual sales may not end up being split evenly.

**Projected SPR inventory by the beginning of 2028 is about 405 MMB**
U.S. Recessions and the World Oil Price

The graph shows the relationship between U.S. recessions and the world oil price from 1974 to 2010. The x-axis represents the years, and the y-axis represents the dollar per barrel. The graph includes shaded areas indicating recession periods, and a line representing the crude oil price. The data points are marked with specific years and oil price levels.
Research on Oil and the Economy

• Historically, shocks to the world oil price have caused recessions in the United States
• This phenomenon raises both academic and policy questions
• Two key research questions:
  – What causes the oil price to fluctuate?
  – What causes the economy to be sensitive to the oil price?
• Thousands of studies over the last 30 years
Key Findings on Oil Shocks and the Economy

• The causal relationship between oil shocks and economic contractions is statistically significant
• Oil price shocks caused by demand increases cause less harm than supply shocks
• Oil price spikes harm the economy through a variety of channels:
  – Escalating input costs slow industrial production
  – Reduced disposable income slows consumer spending
  – Market uncertainty reduces investment
  – Slow reallocation of resources causes adjustment costs
• The economy has grown more resilient over time
U.S. Domestic Crude Oil Production

Source: EIA, *Short-Term Energy Outlook*
SPR Inventory Level vs. Net Oil Imports

Source: U.S. Energy Information Administration.
SPR Days of Net Import Cover

Days Forward Cover

Assessing the Benefits of the SPR

- Economic benefits of the SPR are modeled using a probabilistic simulation model developed by Oak Ridge National Laboratory.
- Key SPR policy questions are evaluated using a cost-benefit framework:
  - How large should the SPR be?
  - What should the SPR’s drawdown capability be?
  - What SPR investments maximize its value?
SPR Economic Benefits Framework

INPUTS
- Reference Market Conditions
- Spare Oil Production Capacity
- U.S. Emergency Oil Stock Capabilities
- Non-U.S. Emergency Oil Stock Capabilities

Oil Supply Disruption Scenario Module (Size and Duration)

BenEStock Model

OUTPUTS
- World State 1: Market & Economics Post Disruption Supply, Demand, & Price Levels
- World State 2: Market & Economics Post Disruption Supply, Demand, & Price Levels
- Combined U.S. Benefits: GDP Loss Avoidance; Oil Import Cost Savings

Net Price Elasticity of World Oil Demand/Supply
Oil Price Elasticity of the U.S. GDP
Changing Inputs and Modelling Questions

• Reference market conditions
  – Major changes to exogenous inputs

• Spare production capacity
  – Continuity: guesswork on OPEC capabilities and behavior
  – Change: to what extent can U.S. tight oil surge?

• Non-U.S. emergency stocks
  – Policy feedback loops with IEA partners?
  – How to treat non-IEA stocks?
Research Agenda: Disruption Modelling

• Stanford Energy Modelling Forum analysis
  – Structured expert elicitation on oil market risk
  – Arrays possible disruptions by size, duration and probability
  – Serves as the “engine” for simulation modelling

• Key research questions
  – Domestic threats in the United States?
  – Demand side shocks?
  – Other approaches?
Research Agenda: Oil Supply and Demand

• Supply
  – Elasticity of tight oil production
  – Impact of reduced investment elsewhere

• Demand
  – Changing consumption patterns
  – Fuel substitution in the transportation sector

• Inventories
  – Changing storage patterns in the United States
Research Agenda: Oil Shocks and the U.S. Economy

• Shifting patterns of economic output
  – Reduced economy-wide and sector-specific energy intensity
  – Natural gas as a petrochemical feedstock
  – Friction in resource re-allocation
  – Increasing significance of exploration and production

• Declining imports; increasing exports
  – Obvious changes in the scale of wealth transfers
  – Less-obvious changes in GDP impact

• Changing consumption patterns
  – The declining role of cars in providing mobility
  – Shifts in urban form