

Covid-19 and the Case for Strategic Petroleum Reserves

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28-30

It is just as I said to Pharaoh: God has shown Pharaoh what he is about to do. Seven years of great abundance are coming throughout the land of Egypt, but seven years of famine will follow them. Then all the abundance in Egypt will be forgotten, and the famine will ravage the land.

32

The reason the dream was given to Pharaoh in two forms is that the matter has been firmly decided by God, and God will do it soon.

34

Let Pharaoh appoint commissioners over the land to take a fifth of the harvest of Egypt during the seven years of abundance.

36

This food should be held in reserve for the country, to be used during the seven years of famine that will come upon Egypt, so that the country may not be ruined by the famine.

Strategic Petroleum Reserves

To protect against supply chain disruptions due to:

- Political events
- Natural disasters.

Examples:

- Switzerland was the first country to start a SPR.
- The U.S. started its SPR in the 1980's.
- China and India also have large petroleum reserves.

International Energy Agency (IEA)

Associated countries need to hold 90 days of net petroleum imports.

West Texas Intermediate (WTI) Daily Prices, 1986 - 2020



- Strong volatility increase since 2000.
- Price increases from 1998 to 2008.
- \$ - 37/*bbl*, on April 20, 2020.

Negative WTI Price: \$ – 37/*bbbl*

Futures market

WTI has a physical settlement. At expiration, whoever holds the contract is delivered physical barrels of oil.

The futures market:

- Traders: buy and sell futures contracts without any intention of holding them at expiration.
- Refineries want to take delivery.

Why were WTI prices negative:

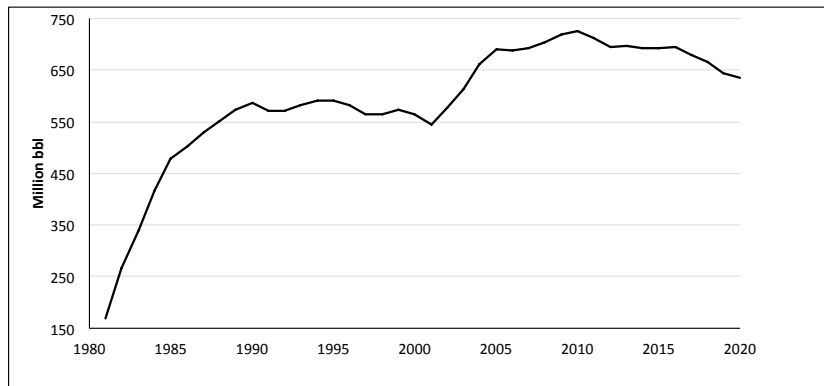
- Onshore tanks in most parts of the U.S. were at capacity.
- The futures market volume was very low.
- Storage cost was high.
- Someone, in despair, payed not to receive a shipment of oil.

West Texas Intermediate (WTI) Monthly Prices, 1981 - 2020, in \$2020



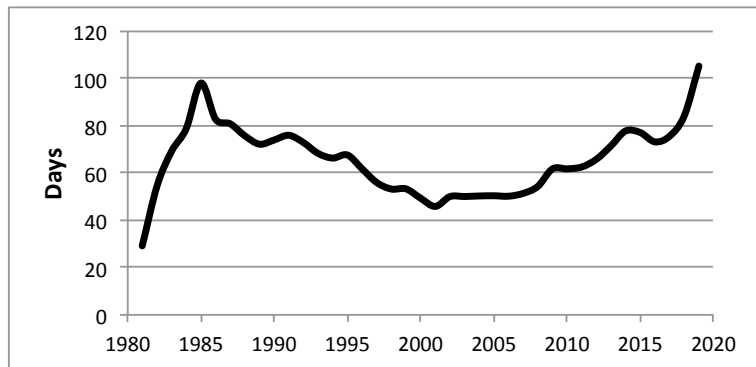
- Bear markets: 1980s-1990s and 2008-2020.
- There is still an increase in volatility from the year 2000 onwards.
- The market stayed in a low price state for over 10 years!

Strategic Petroleum Reserve (Million bbl), 1981 - 2020



- Fill-up during the 1980s (mostly from 1981 to 1985).
- Second fill-up move from 2001 to 2005.
- Planned draw-down since 2010.

Strategic Petroleum Reserve (Days of Net Imports), 1981 - 2020



- By 1985 the SPR had met the 90 days requirement by the IEA.
- By the year 2000, the SPR covered less than 50 days of net imports.
- Currently the SPR holds over 100 days of net imports.

SPR Optimal Policies from the 1980s Perspective

Pricing Assumptions in 1981 (source: Oren and Wan, 1986):

Market State	\$1981	\$2020
Normal	34	69
Minor Disruption	46	94
Moderate Disruption	89	159
Major Disruption	148	302

- The studies overestimate the impact of supply chain disruptions on WTI prices.

What is the Optimal Size for the Reserve?

Optimal size recommended (Sources: Teisberg, 1981; Oren and Wan, 1986):

Authors	Year	SPR Size (Mbbbl)
Teisberg	1981	200 - 2800
Balas	1981	833 - 2292
Chao & Main	1982	1400
Rowen & Weyant	1982	≥ 1500
Oren & Wan	1986	1570

- On average the optimal size is about 1500 Million bbl.
- Teisberg (1981): 700 Mbbbl as base case recommendation!

When should the Strategic Reserve be sold?

Teisberg (1981):

The reserve is expected to last 25 years, by then:

... new technologies are developed to produce oil substitutes (for example, shale oil, liquefied coal, tar sands).

Price at which to sell the reserve:

We assume that when this price is reached, oil market insecurity is no longer a problem: \$50 per barrel.

Shale oil in 2020 (oilprice.com):

- **Five** shale drillers are still profitable at \$31/bbl.

Countries Need Strategic Petroleum Reserves

Average annual benefits over 30 years: \$61/bbl.

Assumptions:

- Normal price: \$83/bbl.
- Countries coordinate reserves drawdown, 9 Mbbbl/day.
- No shale oil is considered.
- The scenarios in which the report is based were never observed in reality.

Disruption Scenarios	Major	Moderate
Price no intervention (\$/bbl)	275	150
Price after Reserve drawdown (\$/bbl)	150	87

Covid-19 and the Strategic Petroleum Reserve

Covid-19 plunged the petroleum market into its biggest crises since the 1970s:

- March 13, the U.S. President Trump announced the SPR would buy 77 Million bbl.
- March 19, an order to purchase 30 Million bbl was issued.
- March 25, due to a lack of funds in the SPR account, this purchase solicitation was canceled.
- April 2, instead, an exchange-for-storage program was started, making 30 million barrels of SPR storage space available to U.S. companies.
- April 20, WTI price at \$ – 37/*bbl*.

Covid-19 and Petroleum Producers

Covid-19 plunged the petroleum producers into a deep crisis:

- Covid-19 confinement.
- Plummeting petroleum prices.
- Decreasing petroleum sales.

Middle East Petroleum Producers

Expected GDP losses between -10% and -20% (oecd.org).

Take-away

Producers are petroleum dependent.

SPR: Take-aways

Teisberg (1980s)

Shutdown the reserve when alternative sources of energy are available.

SPR Operation

Interventions at disrupted market times were rare and timid.

Covid-19

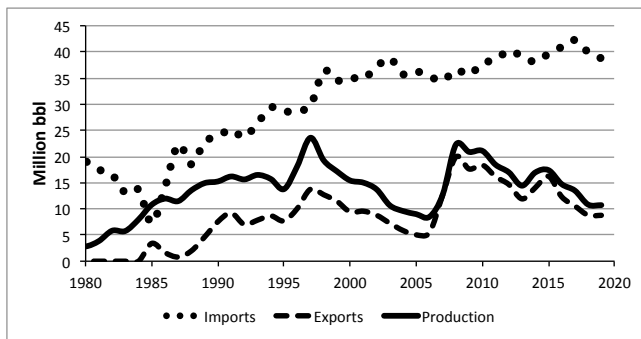
The SPR is now used for private storage.

Joseph & Pharaoh

- Forecasting is the key to good management.
- The purpose and lifespan of the reserve should be well defined.

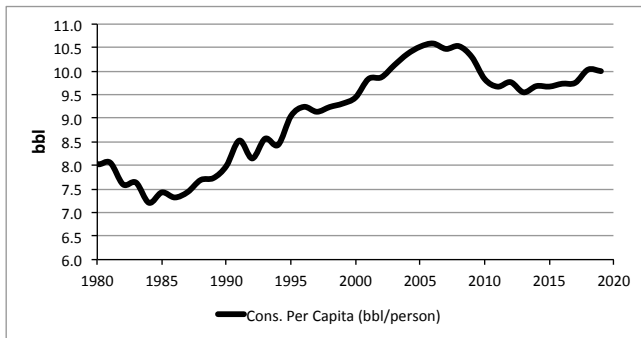
New Zealand

New Zealand: crude oil, condensate, & other refinery feedstocks



- Crude oil imports growing systematically since 1985.
- Unstable production most of which, by 2020, is exported.

New Zealand: Consumption Per Capita of Petroleum Products



- Per capita consumption of petroleum products increased from about 7.3 to 10 bbl, since 1985.
- A 37% increase!

The IEA Requirements

- New Zealand meets the IEA requirements.
- Commercial stocks: 2 Mbbl (?) (IEA Report, 2018).
- Purchasing of option contracts to compensate for reserve shortfalls.

Option Contracts

- New Zealand bought the right to purchase petroleum in case there is an IEA emergency, at **market price**.
- Cost of these contracts:
 - 2013–2017: at NZ\$7.8 Million/year (source: 2012 NZ Report).
 - 2017: at US \$1 bbl/year (source: 2017 NZ Report).

New Zealand: Take-Aways

Petroleum supply chain

An increasing dependence on land transport and petroleum products.

Security of Supply based on:

- Option contracts to meet the requirements of the IEA.
- 2 Mbbl (about 19 days of imports) in reserve.

The future

- Develop alternative fuel sources.
- Re-think transport system and urban development policies.

Data sources:

- U.S. Energy Information Administration, www.eia.gov
- Ministry of Business Innovation & Employment, www.mbie.govt.nz.

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Questions