



U.S. DEPARTMENT OF
ENERGY

Report to the Congress on the Strategic Petroleum Reserve 2008 Emergency Test Exchanges

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I. EXECUTIVE SUMMARY

In September 2008, Hurricanes Gustav and Ike hit the U.S. Gulf Coast impacting oil production, refining, and distribution operations and causing shortages of both crude oil and refined products. The hurricanes also impacted all four Strategic Petroleum Reserve (SPR) storage sites and the Project Management Office in New Orleans through mandatory evacuations as well as by damage caused by wind, power outages and flooding.

Under the authority of section 161(g)(1) of the Energy Policy and Conservation Act (EPCA) (42 U.S.C. 6241(g)(1)), the Secretary of Energy (Secretary) authorized the SPR to respond to the adverse impacts of the hurricanes through emergency test exchanges with affected refiners. Two test exchanges, each up to the statutory limit of five million barrels, were authorized. These test exchanges accommodated requests for emergency exchanges from multiple refiners. The tests also allowed the Department of Energy's (DOE) to evaluate the SPR's emergency response capabilities in a limited emergency logistical supply disruption. In particular, the test exchanges provided an opportunity for the evaluation of the Department's processing of emergency requests from industry and the abilities of the SPR's storm-affected personnel and sites to recover and implement drawdown procedures.

Under the test exchanges, the SPR negotiated exchange agreements with five companies for a total release of 5.4 million barrels of crude oil stocks. The oil was returned, with approximately 120,000 additional barrels in interest, in the period January – early June 2009.

This Report fulfills the requirement in section 161(g)(8) of EPCA that the Secretary transmit to both Houses of the Congress a detailed explanation of the test carried out under the section 161(g)(1) test authority.

II. BACKGROUND

Hurricane Gustav made landfall in the Louisiana coastal area on September 1, 2008. Even prior to striking the coast, the hurricane prompted the shut-in of 100 percent of the 1.3 million barrels per day Gulf of Mexico crude oil production, and the closure of the major Gulf Coast ports and pipelines, including the Louisiana Offshore Oil Port (LOOP). Gustav also caused extensive power supply outages, cessation of pumping operations on the Capline pipeline system to the Midwest and the temporary shutdown of 13 refineries along the lower Mississippi River and in western Louisiana and eastern Texas. These shut-in refineries, which had a total capacity of more than 2.2 million barrels per day (about 12% of the United States refining capacity) mostly recovered operational capability by the time Hurricane Ike threatened more disruption.

Hurricane Ike entered the Gulf of Mexico just days after Gustav, making landfall in Texas on September 13, 2008, and compounding the closure or reduced operational capability of crude oil production, transportation and refining facilities. The few oil production platforms that had restarted after Gustav were shut again. The more westerly path of Ike resulted in the temporary closure of additional refineries in Texas with a capacity of nearly 4 million barrels per day. Ike also resulted in a second closure of LOOP and restricted operations on other waterways which continued to impact the receipt of Gulf production and imports in the region.

As a result of the loss of offshore production and closure of oil ports and pipelines caused by Hurricanes Gustav and Ike, some refiners in the Gulf Coast and Midwest were unable to secure crude oil supplies. Without a secure source of crude oil supplies for refinery operations, many refineries were faced with reducing runs or possibly shutting down.

Unlike the international strategic response to Katrina, this time the United States did not deem it necessary to request that the International Energy Agency initiate a coordinated emergency release of its members' stocks.

Emergency Oil Requests

Over the past several years, the SPR office has developed effective lines of communication with the Nation's refiners. In cases of severe weather or other unexpected physical conditions, SPR personnel establish and maintain contact with refiners to seek information on their refineries' operational status, their supply situation, and the potential impacts of a supply shortage on their refining capability. This information is in turn provided to the Secretary and other Departmental elements responsible for Emergency Support Function #12.

EPCA provides for the drawdown and sale of the SPR only in the event of a Presidential finding of a "severe energy supply interruption" or to carry out the United States' international emergency supply obligations. In recent years, in response to crude oil supply disruptions caused by hurricanes or other unexpected logistical incidents falling short of the EPCA drawdown criteria, the Secretary has utilized his oil acquisition authority to conduct emergency time exchanges. These exchanges provide crude oil to refiners and obtain additional volumes for the SPR. To assist refiners in effectively requesting emergency supplies in these conditions when no alternative supplies are available, the SPR office has posted guidelines on the internet detailing the information to be included in an emergency exchange request. These emergency time exchanges provide refiners with immediate supplies which allow them to continue operations in exchange for the return of the original volume of crude oil to the SPR, plus additional volumes, within an established time period (usually 2-6 months).

Test Exchange Authority

As a result of enactment of the *Strategic Petroleum Reserve Fill Suspension and Consumer Protection Act of 2008*, (Pub.L. 110-232) on May 19, 2008, the SPR was

prohibited from engaging in these types of “acquisitions by exchange” as a method of addressing limited emergency logistical supply disruptions for the remainder of 2008. By its terms, this statute suspended the SPR’s authority to acquire crude oil “through any acquisition method” until after December 31, 2008, unless the weighted average price of petroleum for the most recent 90-day period was \$75 or less per barrel.

EPCA, however, authorizes the Secretary to conduct a test sale or exchange. In fact, section 161(g)(1) requires the Secretary to conduct a continuing evaluation of the SPR drawdown and sales procedures. In conducting an evaluation, “the Secretary is authorized to carry out a test drawdown and sale or exchange of petroleum products from the Reserve.” Each test sale or exchange under this authority is limited to five million barrels.

On September 3, 2008, in response to requests from several refiners for supplies to replace disrupted offshore production or imports due to Hurricane Gustav, the Secretary authorized the SPR to conduct an emergency test exchange of crude oil to avoid the refineries shutting down their operations. In particular, continued operations at the Gulf Coast area refineries that remained on-line were in the public interest due to developing gasoline and diesel shortages in the Southeast United States. A second test exchange was authorized on September 29, 2008, for the continued evaluation of the SPR’s capability to respond to ongoing needs of refiners.

DOE’s authority to conduct this test exchange was not affected by Pub.L. 110-232. However, the return of exchanged oil to the SPR was negotiated to occur after December 31, 2008, which would be consistent with the underlying purpose of that law.

In approving the test exchanges, the Secretary required that the Under Secretary of Energy approve, on a case-by-case basis, the SPR entering into negotiations for individual exchange transactions under the test exchange initiatives. This arrangement facilitated awareness at the highest levels of the Department and allowed an evaluation of accelerated processing of emergency requests.

III. HURRICANES GUSTAV AND IKE IMPACT ON SPR

Hurricane Gustav

As a result of the predicted track of Hurricane Gustav, the SPR Project Management Office in New Orleans was evacuated and locked down on August 31, 2008. Utilizing Continuity of Operations procedures, an alternate Emergency Operations Center (EOC) was established in Monroe, Louisiana. The SPR Emergency Command Vehicle, Emergency Communications Trailer, and emergency management teams were dispatched to the alternate EOC for the duration of the storm. This alternate EOC was demobilized and operations resumed in New Orleans on September 5, 2008.

Following local evacuation orders, the Bayou Choctaw, Big Hill and West Hackberry sites were evacuated before Hurricane Gustav made landfall. The off-site commercial

electrical distribution system feeding into the Bayou Choctaw site was damaged when Hurricane Gustav made landfall on September 1, 2008. Commercial power was restored at Bayou Choctaw on September 6, 2008.

Operations at Bryan Mound were not impacted by Hurricane Gustav, and West Hackberry and Big Hill re-opened on September 2, 2008.

Hurricane Ike

By September 12, 2008, the Bryan Mound, Big Hill and West Hackberry sites had all been evacuated in preparation for Hurricane Ike. All three evacuated sites were impacted by regional electrical outages after Hurricane Ike made landfall on September 13, 2008.

The Big Hill and West Hackberry sites were also affected by the large storm surge that flooded access roads and damaged infrastructure. Temporarily, access to the sites was only available by boat or helicopter.

At Big Hill, a significant amount of debris had to be removed to ensure safe operation. Additionally, the electrical system supporting the operation of Big Hill's raw water intake structure was damaged by the storm and required extensive testing and repair work.

The SPR EOC and Operations Control Center in New Orleans remained operational continuously throughout the storm.

Operations at Bayou Choctaw were not impacted by Hurricane Ike.

Recovery and Repair

All four sites as well as the Project Management Office in New Orleans were impacted by the hurricanes as a result of mandatory evacuations, as well as the result of wind, power outages and flooding. Recovery and repair costs of approximately \$22 million were accumulated. The impact of the hurricanes is shown in Table 1.

Table 1
Operational Impacts of Hurricanes

Site	Hurricane Gustav	Hurricane Ike	Recovery Costs* (\$000)
Project Management Office, New Orleans, LA	No Impact	No Impact	\$440 **
Bryan Mound, TX	No Impact	Recovery Time – 6 Days	\$4,800
Big Hill, TX	No Impact	Recovery Time – 17 Days	\$11,300
West Hackberry, LA	No Impact	Recovery Time – 5 Days	\$4,800
Bayou Choctaw, LA	Recovery Time – 5 Days	No Impact	\$300

* Estimated

** Continuity of Operations, communications, and overtime costs

IV. EMERGENCY EXCHANGE REQUESTS

Hurricane Gustav made landfall on September 1, 2008, having already impacted offshore production, oil ports and terminals, including LOOP, and the pumping operations on the Capline pipeline system. As with Hurricane Katrina, the requests for emergency exchanges following Gustav were predominantly for crude oil from the Bayou Choctaw site to supply lower Mississippi River refineries and upper Midwest refiners deprived of both domestic production and imports. Hurricane Ike impacted further west, shutting down most of the refineries from Lake Charles, LA to Houston, TX. The closure of the Calcasieu Ship Channel impacted import receipt capability at the Lake Charles, LA refinery that did remain operable. The slow recovery of offshore production led to additional requests by operable refiners highly dependent on that source. The output of these refineries was vital in supplying the major product pipelines to the Southeast, prompting the Secretary's authorization of the second test exchange.

The initial exchange request was processed and approved on September 4, 2008, with the first oil delivery completing on September 9, 2008. The last exchange request was approved October 1, 2008, and the deliveries from the SPR oil completed on November 14, 2008.

A summary of the test exchange companies and quantities received is in Table 2.

Table 2
Text Exchange Volumes by Company

Test Exchange 1		
Company	Crude	Volume (000 bbls)
Alon	BC sweet	550
CITGO	WH sweet	83
CITGO	WH sour	917
ConocoPhillips	BC sweet	666.7
ConocoPhillips	BC sour	333.3
Marathon	BC sweet	1,500
Placid	BC sweet	739
TOTAL		4,789
Test Exchange 2		
Alon	BC sweet	100
Placid	BC sweet	500
TOTAL		600

Three additional requests were made, but were withdrawn as the individual refiners' logistical supply problems were resolved independently.

Return of the exchange oil to the SPR commenced on January 5, 2009 and completed on June 4, 2009. The schedule of company returns is in Table 3.

Table 3
Test Exchange Returns by Company by Month

Month	Company	Bayou Choctaw	West Hackberry
		Volume (000 bbls)	
January	Marathon Placid CITGO	710 sweet 240 sweet	81 sweet 938 sour
February	Marathon Conoco Phillips	57 sweet 675 sweet 69 sour	
March	Conoco Phillips Alon Placid Marathon	269 sour 189 sweet 387 sweet 167 sweet	
April	Alon Placid Marathon	375 sweet 123 sweet 518 sweet	
May	Alon Marathon Placid	101 sweet 86 sweet 410 sweet	
June	Placid	101 sweet	
TOTAL		4,477	1,019

V. TEST EXCHANGE EVALUATION

In accordance with the requirements of section 161(g)(1) of EPCA to evaluate drawdown procedures, the SPR assessed a variety of planned and unplanned operational and business aspects during the emergency test exchanges.

Recovery Equipment

The first request was approved on September 3, 2008, prior to restoration of commercial power at Bayou Choctaw. To prepare for the first movement, the SPR mobilized its emergency pipeline contractor to transport and install SPR owned mechanical diesel recovery equipment. The contractor worked an expedited schedule completing installation within the 15-day window allotted for recovery, but power was restored precluding the need for the final tie-in. Notwithstanding this successful mobilization effort, the extraordinary call on manpower and resources to quickly put into place equipment normally given a 15-day lead time to support a drawdown highlights the need to evaluate

the use of portable and/or fixed generators to power systems used for crude oil movements during extended commercial power failures.

Placid Exchange

The DOE-owned pipeline between the St. James, LA Sugarland terminal and the SPR Bayou Choctaw site is currently leased for commercial service. The line is operated as part of the Redstick common carrier system, which also includes an operator-owned extension from Bayou Choctaw to the Placid refinery near Baton Rouge. Placid is currently the only regular Redstick customer. The normal direction of flow in the Redstick system is from Sugarland to Placid, however, when oil is withdrawn from Bayou Choctaw site, the flow in the DOE-owned segment must be reversed from the site to the Sugarland terminal to enable deliveries into the commercial distribution system at St. James.

Under the commercial lease, DOE provided an initial linefill of approximately 239,000 barrels, which reverts to DOE in the event of an emergency requiring reversal of the line. Recognizing the impact on Placid's normal supply movements from such an event, DOE and Placid entered into an operational line transfer agreement in August 2007, which in the event DOE needs to reverse the flow on the leased pipeline (i) provides for the custody transfer to DOE of Placid oil in the DOE line and (ii) allows Placid to receive an equal amount of oil from the Bayou Choctaw site through the operator-owned line extension.

The test exchange enabled the successful exercise of this operational line transfer agreement. As with the other test exchange agreements, the oil received by Placid counted toward the initial five million barrel test exchange authority and Placid returned the oil to Bayou Choctaw with additional premium barrels.

Heat Exchanger Blinds

Heat exchangers are used on the SPR to counteract the heating effect on the oil that occurs during long term storage in underground salt caverns. Hotter oil delivered to terminals or refiners will have larger amounts of vapors released when injected into tanks at atmospheric pressure. Therefore, the heat exchangers provide a means to cool the oil and minimize any vapor release. These heat exchangers are not normally kept on line because of maintenance considerations. During a normal drawdown sales scenario there is sufficient time to place them in service by rotating their piping blinds. However, when these hurricanes hit the Gulf Coast, all exchangers were unavailable. The use of the exchangers was discussed and different options were considered. These options included partial use of the exchanges, full use, or no use of the system. The best decision was to put all of the equipment online, because the full impact on the oil situation in the Gulf and on refineries was not known. This decision would allow the SPR to be able to respond to any future requests from refiners. Therefore, extraordinary measures were taken to get contract and SPR personnel to drain piping systems, rotate the blinds, and re-fill the piping in an extremely short time, so that the SPR could respond to this critical situation. Once online, the systems worked well and the SPR had no operational limitations.

The intensive hours associated with blind removal and the potential shortage of area and site labor to perform this task in hurricane recovery could be offset by installation of isolation valves, implementing a policy of removing the blinds prior to hurricane season, or leaving them in drawdown position all year. An engineering analysis will be performed to evaluate these alternatives. This analysis will be specific for each SPR storage site.

Plains Connection

During 2007 a new connection was constructed between the St. James terminal and the adjacent terminal owned by LOCAP, LLC to enhance the SPR's emergency distribution capabilities. This connection enables unencumbered crude oil distribution to the LOCAP terminal, the ExxonMobil pipeline and the new Plains terminal. The test exchange provided an opportunity to test this connection.

Alternate Delivery Mode from West Hackberry Site

Due to the continued closing of the Calcasieu River that began in advance of hurricane Ike, the SPR received and approved a request from CITGO Petroleum Corporation (CITGO) for delivery of oil to its Lake Charles refinery. The timing of the request was such that not all commercial power had been returned to the West Hackberry SPR site. Because of the electrical system configuration, the main site did not have power, but the remote raw water intake structure did. Therefore options were identified and evaluated for non-standard delivery methods of SPR oil to the marketplace. The best option was decided to be a delivery dependent upon the use of raw water intake pumps only. Normally these pumps supply water to the site's raw water injection pumps that supply water directly to the site's storage caverns. This combination of pumps allows the site to deliver oil to refineries and terminals at very high rates. Because only the offsite raw water intake pumps were available and the refinery required the oil quickly, the decision was made to make the delivery at the lower rates provided by this abnormal delivery mode. The delivery was made with no problems at rates up to 288,000 barrels per day and the refinery was kept on line. It should be noted that commercial power was restored to the main site prior to the delivery, but the decision was made to not use the main site pumps because all planning had not included those pieces of equipment. An additional factor in not using the main site pumps at these lower delivery rates was the savings associated with lower electrical power usage.

Hydrogen Sulfide (H₂S) Scavenger

Because of vapor pressure considerations associated with storing oil in salt domes at slowly increasing temperatures, special actions must be taken during the hottest months of the year. During this period, the local waters used for the cooling of the SPR crude oil before it leaves a site have temperatures elevated enough to warrant using crude oil additives. These additives are used as a safety measure to keep any H₂S from flashing in storage tanks. These H₂S scavenger agents and associated injection systems have been part of the SPR planning for years, but had never been actually activated and used. For

the first delivery to CITGO, the West Hackberry heat exchangers were isolated by piping blinds and could not be put in service in time to support a rapid response to CITGO. The decision was made to activate the H₂S scavenger system for the first time. This activation and use would provide an excellent test of the system, as well as a means to minimize any vapor pressure impacts. The contractor reported to the site with scavenger, pumps, and personnel to inject the chemical into the crude oil stream. Site and New Orleans personnel monitored the entire process and directed adjustments as necessary. The operation went smoothly and a significant amount of training was conducted. In addition, vital information was recorded on the use of the chemical and pumping systems.

Limitations on Rate of Oil Return

The Bayou Choctaw site has only two sweet caverns. One is very near the edge of the salt dome, and presents a risk of major environmental danger from potentially breaching the side of the salt dome with continued use. The SPR has limited the usable volume of the cavern from 7.5 million to 3.2 million barrels to reduce this risk exposure. The slow rate of cavern injection and inherent limitations associated with scheduling of return barrels through the commercial Sugarland terminal have limited the amount that can be received by Bayou Choctaw in a month. Consequently, the return schedule stretched from January through early June 2009. The premium percentages charged reflected this extended schedule.

The limitations of the Bayou Choctaw site during this test exchange reinforce the need to replace the unsound cavern through the purchase of an existing commercial storage cavern that is located within the boundaries of the site.

Premium Percentages

The test exchange provided an opportunity to review and improve the bases for the exchange premiums to be paid as additional barrels with the return of the exchange oil. The primary factors of the exchange premium are the time value of money as related to the value of the SPR oil received and exchange term, the impact on SPR permanent facilities (i.e., the cost of cavern replacement), and the incremental operational costs (e.g., power, pipeline tariffs, H₂S scavenger) of moving oil out and back into the SPR sites. The revised exchange manual describes these relevant factors in detail and provides guidelines for incorporating them into premium calculations.

Letter of Credit Reductions

Time exchange contracts are secured by a requirement that the exchange partner provide a Letter of Credit equal to the total value of the oil received from the SPR. These Letters of Credit are required to remain in force until the base oil quantity and premium barrels are returned to the SPR. In September 2008, the price of crude oil used to establish the Letter of Credit values for the multiple contracts was generally in the range of \$100 dollars per

barrel. Due to the precipitous decline of crude oil prices by more than \$50 dollars in the months following the hurricanes, the policy consistent with Pub.L. 110-232 that no oil be returned prior to 2009, the extended return schedule (see “Return of Oil”), and the general unavailability of credit associated with the economic downturn, some exchange contractors requested a reduction in their Letter of Credit values to be more in line with the Government’s actual risk exposure. In return for such reductions, the SPR negotiated consideration under the contract for the companies’ associated financial savings.

SPR oil sales and exchange contracts secured by Letters of Credit routinely contain provisions allowing the Government to require an increase in value of the Letter of Credit to cover an increase in outstanding risk. This is the first instance in which a reduction was negotiated with financial consideration to the Government. The contract modifications did allow for the Government to credit back to the exchange contractor a proportionate share of additional financing costs in the event the Letter of Credit had to be increased back up to the original contract amount.

Establishment of Exchange Operational Criteria

The interplay of such factors as individual cavern availability and flow rate, inventory level, oil temperature and gas content, ambient air and water temperatures, and use of heat exchangers and/or H₂S scavenger to meet environmental requirements, along with ongoing site operations, maintenance and construction activities, power availability and contract cost structure, and terminal and pipeline receipt limitations must be considered when determining capability to withdraw and real time delivery rates to customers in an emergency exchange.

In addition, negotiation and execution of the exchange oil contracts pointed to the need for a standardized approach to locking in industry commitments for authorized quantities within a reasonable timeframe. Such a commitment would enable the SPR to plan and use resources accordingly. In the event of an ongoing logistical supply disruption, additional requests from refiners would be considered for incremental quantities as needed.

As a result of the test exchange, the SPR office updated and expanded its existing procedural manual for conducting exchanges. The office also developed operational readiness and capability criteria, and contract performance criteria.

VI. CONCLUSIONS

The test exchanges conducted in September and October 2008 were successful in evaluating the SPR drawdown processes while providing emergency petroleum supplies to refiners experiencing shortages caused by Hurricanes Gustav and Ike.

Despite personnel dislocations and damages to SPR sites, approximately 5.4 million barrels of SPR crude oil were delivered through emergency time exchanges to refiners affected by logistical supply disruptions. These emergency supplies helped Gulf Coast

and Midwest refiners continue operations, and thus mitigate the product shortages resulting from hurricane damages to other refiners and the supply system. Beginning in January 2009 and concluding on June 4, 2009, a total of approximately 5.5 million barrels (return barrels plus approximately 120,000 premium barrels) were returned by refiners in accordance with the exchange agreements.

The test exchanges provided the opportunity to test and evaluate SPR operational modes and resource requirements associated with hurricane conditions and to assess their incorporation into future drawdown operations. Likewise, the test exchanges identified new or revised operational performance and exchange contract criteria to be contained in standardized drawdown and exchange procedures, thus improving the ability of the SPR to provide a timely and efficient response when needed. In addition, the test exchanges provided means to improve upon the receipt and approval of refiners' requests for SPR oil in limited logistical supply disruptions.

These test exchanges also demonstrated the capabilities of the personnel associated with the SPR to be flexible, innovative and collaborative in less than ideal conditions. The SPR was receptive to the needs of industry and the American public by delivering crude oil as required, thus diffusing supply disruptions caused by the hurricanes impacting the Gulf Coast. Innovative methods were used to prepare for and accomplish oil delivery despite the loss of commercial power, thereby assuring continued production of refined product. As the market price of oil declined, the SPR listened to the requests from industry to explore ways to reduce costs of credit required of companies involved in the exchange. In summary, the SPR test exchanges helped assure the continued supply of petroleum products to the market during stressful conditions, despite challenges to the SPR personnel and facilities, and yielded benefits in the form of validation and improvements to the SPR drawdown procedures.