

TITLE:

One Gulf – Commitment to Preparedness

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ABSTRACT:

Anadarko Petroleum Corporation partnered with the U.S. Coast Guard Eighth District and the Mexican Navy (SEMAR Zone 1) in a multi-year Mexico-United States (MEXUS) exercise series. The MEXUS Plan is a Joint Contingency Plan between the United Mexican States and the United States of America Regarding Pollution of the Marine Environment by Discharges of Hydrocarbons or other Hazardous Substances. It provides standard operational procedures with respect to bi-national coordination in case of pollution incidents that may represent a threat to coastal waters or the marine environment of the border zone of both countries. The MEXUS Agreement and Plan were developed after the Ixtoc I well blowout in June 1979. This international agreement entered into force on 30 March 1981.

Under the MEXUS Plan there are two regional annexes: Gulf (MEXUSGULF) and Pacific (MEXUSPAC). Each Annex incorporates regional resource and high-level strategic information to assist each country in communication and coordination during an incident that impacts both countries' jurisdiction. The regional annexes are not tactical; tactical planning remains at the local level (Area Contingency Plans in the U.S.; Local Contingency Plans in Mexico), led by the respective Federal On-Scene Coordinator (FOSC). For the U.S., the U.S. Coast Guard is the lead agency serving as the Federal On-Scene Coordinator; the Mexican Navy serves as the lead agency in Mexico.

The U.S. Coast Guard has been working with the Mexican Navy (SEMAR) to update the MEXUS Plan, with a near final draft as of March 2017. The proposed changes incorporate several organizational changes that have occurred over the years while reiterating the core purpose as a communication and coordination plan.

With the impending development of offshore leases in Mexico, coupled with efforts to update the MEXUS Plan, a tabletop exercise was conducted in 2016. This tabletop exercise allowed senior officials from federal and state agencies and industry representatives to openly discuss emerging scenarios and high-level strategies to identify gaps and shortfalls in existing plans, policies and procedures. To achieve this concept, both countries shared procedures and processes to allow for resources to operate in each respective country to minimize impact to natural resources and sensitive shoreline areas. In 2017, the lessons learned were incorporated in a multi-day exercise to demonstrate how industry, the U.S. Coast Guard and other agencies would manage a hypothetical offshore subsea well incident originating from the U.S. with resulting impacts in Mexican waters.

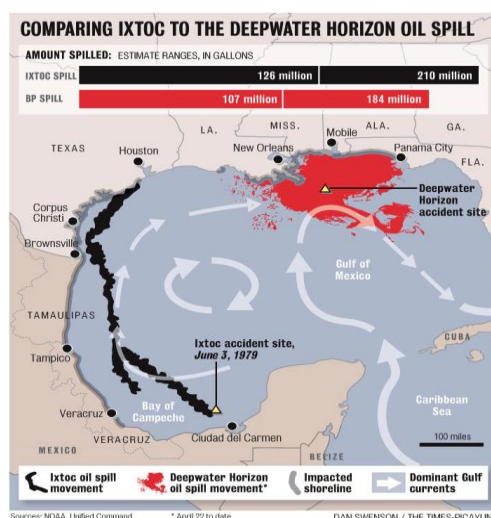
This paper discusses the planning process and shares the lessons learned from both exercises in an effort to promote continued preparedness and improved response coordination. With the help of Mexican Association of Hydrocarbon Companies (AMEXHI), Mexico's newly-formed national oil and gas industry association, these lessons learned will further help promote implementing Mexico's new subsea containment and offshore response requirements.

INTRODUCTION

The Ixtoc I subsea well blowout incident in the Bay of Campeche in June 1979 created the impetus for Mexico and U.S. governments to create a bilateral agreement to cooperate for

pollution preparedness and response if a spill from one country threatens or potentially threatens the other's coastal waters. The subsea well flowed freely for nearly ten months before it was successfully secured. With the predominant northerly currents, tar balls impacted the lower Texas coast by August with heavier coastal impact by September. The Deepwater Horizon incident in 2010 highlighted the continued need for subsea well source control planning, preparedness and response. Figure 1 shows a comparison of the two incidents (Swenson, 2010).

Figure 1



The Deepwater Horizon incident resulted in significant subsea well preparedness, planning, development of regulations, and industry-adopted standards. These new regulations and industry-added standards added subsea well containment equipment and plans similar to spill response improvements after Oil Pollution Act (OPA) of 1990 amended the Clean Water Act after the Exxon Valdez spill in Alaska in 1989. The resulting regulations have effected changes to other countries amending or forming their own guidelines, laws and standards.

According to the Bureau of Safety and Environmental Enforcement (BSEE) website, <https://www.bsee.gov/>, the National Hydrocarbon Commission of Mexico (CNH), BSEE and the

Bureau of Ocean Energy Management (BOEM) regularly exchange programs for officials to continuously share information on regulations and processes. Activities are consistent with the recommendations of the National Commission on the Deepwater Horizon Oil Spill and Offshore Drilling Commission. Specifically, working with our Gulf neighbors toward agreeing on “a common, rigorous set of standards, a system for regulatory oversight, and the same operator adherence to the effective safety culture called for in the[e] report, along with protocols to cooperate on containment and response strategies and preparedness in case of a spill.”

Ongoing communications include: sharing of safety alerts and information on offshore oil and gas regulations, policies and processes; monthly Department of State (DOS)-hosted teleconference calls with the Mexico Energy Working Group; and annual U.S. – Mexico Bilateral Framework on Clean Energy and Climate Change meetings.

As BSEE, BOEM and CNH work together on offshore drilling improvements, U.S. Coast Guard and Mexican Navy lead the bilateral efforts to work on spill response and preparation under the MEXUS Plan and Annexes. The Table 1 highlights key exercise, Plan and Gulf Annex milestones. This paper will focus on the 2016 and 2017 activities with Anadarko as the Responsible Party (RP) for both years.

Table 1

Year	Description	Location
2002	First Full-Scale Exercise	USA
2003	Signing Ceremony Gulf Annex	MX
2004	Tabletop Exercise	MX
2006	Full-Scale Exercise	MX
2007	Workshop	MX
2008	Full-Scale Exercise	USA
2010	Full-Scale Exercise	MX
2011	Knowledge Exchange and Workshop	USA

2012	Tabletop and Gulf Annex Update	USA
2014	Seminar	USA
2015	Workshop	USA
2016	Tabletop Exercise	USA
2017	Full-Scale Exercise	USA

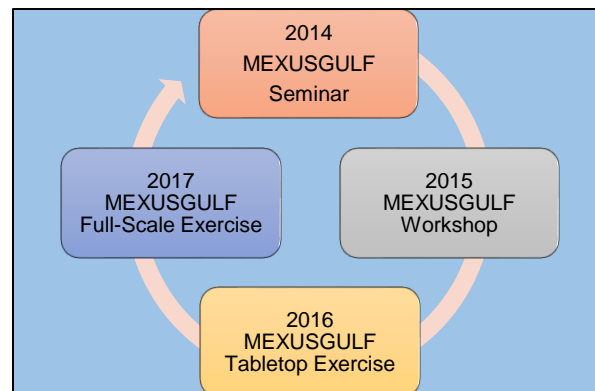
As depicted in Table 1, there have been several exercises since the MEXUS Plan was signed in 2000. UNOCAL (now Chevron) was the first U.S. oil and natural gas operator to participate in a MEXUS exercise (please refer to James, et al, 2003 IOSC paper). Mexican Petroleum (PEMEX) and Shell participated as the oil and natural gas operator for subsequent exercises; Shell has participated in the most MEXUS-related exercises of any operator. Hutto, et al, 2005 explain Shell's experience from their first MEXUS exercise. In 2014, the U.S. Coast Guard (USCG) approached Anadarko to consider participation as oil and natural gas operator for a multi-year MEXUS exercise series consisting of a workshop in 2015; a tabletop exercise in 2016, culminating in a combined National Preparedness for Response Exercise Program (PREP) full-scale exercise in 2017. In the course of exercise planning, Anadarko shared with the U.S. Coast Guard lessons learned from its 2012 BSEE-required annual Oil Spill Response Plan (OSRP) exercise that oil flowing from a subsea well at Keathley Canyon (KC) 919 would likely transit toward Mexican waters.

With post-Deepwater Horizon heightened awareness for Worst Case Discharge (WCD) response, coupled with other U.S. operators near KC 919, Anadarko accepted the challenge to continually improve its subsea well response preparation. Anadarko has adopted a strong commitment to social license to operate, and the MEXUS exercise aligns with that commitment by joining with both Mexico and U.S. to test plans to respond to a WCD during a trans-boundary spill. Over three years, the industry, governments and stakeholders have addressed most of the

issues for incident management as guided by the MEXUS Plan, USCG Area Contingency Plans and the Anadarko OSRP addressing WCD.

In addition to the MEXUS exercise component that offered cross-boundary and international challenges, Anadarko was excited about being able to maximize the investment by combining with Marine Safety Unit (MSU) Morgan City PREP exercise and with industry-required annual BSEE OSRP exercise requirements. The overall process also provided an opportunity for Anadarko to continually raise its preparedness standards building upon the company's own internally mandated unannounced exercise in 2013. Thus, Anadarko became the first independent oil and natural gas operator to participate in a MEXUS exercise. Figure 2 shows the high-level MEXUSGULF schedule between 2014 and 2017 that was laid out and agreed upon at the MEXUSGULF Seminar in 2014.

Figure 2



Planning for both 2016 and 2017 exercises coincided with Mexico's constitutional reform that de-nationalized its entire energy sector and allowed foreign oil and natural gas companies to operate offshore leases. According to <http://www.gob.mx/asea>, the energy reform in Mexico created the Energy, Environmental and Safety Agency (ASEA), a new agency similar to BSEE

and BOEM to focus on regulating, overseeing and enforcing operational safety and environmental standards for the oil and natural gas companies.

TABLETOP EXERCISE - APRIL 2016

The purpose of the April 2016 tabletop exercise (TTX) was to test the MEXUS Plan, MEXUSGULF Annex, Southeast Louisiana Area Contingency Plan and Anadarko's Gulf of Mexico Regional OSRP. This was the third stage in a four-stage exercise cycle and directly supported Marine Safety Unit (MSU) Morgan City's government-led full-scale PREP exercise scheduled for 7-9 March 2017.

As oil and natural gas development in deep-water has expanded the possibility for an international incident along the maritime boundary line, the Eighth U.S. Coast Guard District wanted to use this TTX to heighten awareness with each of the coastal units. Historically, Sector Corpus Christi was the only unit involved in MEXUSGULF Annex discussions / exercises; however, the U.S. Coast Guard believed it was imperative to expand this knowledge and awareness to other Eighth District coastal units.

The TTX was designed to be a facilitated discussion, used to engage senior Mexico and U.S. federal, state and industry stakeholders to generate discussion of various issues regarding a hypothetical large-scale offshore pollution incident that originates in U.S. waters and impacts the marine environment of the border zone of both countries. This facilitated discussion-based exercise was comprised of the following five distinct modules:

Module 1: Anadarko Response Plans and Organization Overview

- Anadarko OSRP Overview

- Anadarko Incident Management Team (IMT) Organization
- Anadarko Source Control Organization

Module 2: Organizational Design

- Scenario Overview
- Notifications
- Incident Command Post (ICP)
- Spill Management Team (SMT)
- Regional Response Team (RRT) Interactions

Module 3: Operational Response

- Source Control
- Response Strategies / Tactics

Module 4: Response Support

- Communications
- Response Information Sharing (RIS)
- Trans-border Resource Movements

Module 5: MSU Morgan City PREP Full-Scale Exercise (FSE) 2017

- General Overview

Tabletop Exercise Objectives

The following were the objectives of the April 2016 TTX:

- **Notifications:** Discuss the ability and process to make proper notifications of an oil spill in accordance with Anadarko's OSRP for U.S. requirements; and MEXUS Plan for spill impacting, or potentially impacting Mexican waters.
- **Incident Command Post (ICP):** Discuss the selection process for choosing the locations of separate command posts (one in each country).
- **Spill Management Team (SMT):** Discuss the ability for the responsible party, their respective spill management team, and Oil Spill Removal Organizations (OSRO) to provide adequate support to each command post.
- **Regional Response Team (RRT) Interactions:** Discuss efficient interaction between RRT, MEXUSGULF Regional Joint Response Team (JRT) and respective unified commands in U.S. and Mexico.
- **Source Control:** Discuss the ability to effectively stop or control the source and minimize the total volume discharged.
- **Response Strategies and Tactics:** Discuss response strategies and tactics to support response efforts to include trigger points for response strategies and tactics use near the maritime boundary line; e.g., surface and subsea dispersants, in-situ burning.
- **Communication:** Discuss ability to effectively communicate between two command posts.
- **Response Information Sharing (RIS):** Discuss the use of RIS to communicate and share key information between U.S. and Mexican command posts and between Source Control Branch and other response positions within the U.S. response management system.
- **Trans-border resource movements:** Discuss U.S. Customs and Border Protection requirements for allowing equipment and personnel to enter U.S. when an emergency occurs (land and maritime) and determine whom from U.S. will ensure safe and secure personnel

and equipment movement. Discuss Mexican requirements for allowing equipment and personnel to enter Mexico when an emergency occurs (land and maritime) and determine whom from Mexican government will ensure safe and secure personnel and equipment movement.

Exercise Scenario

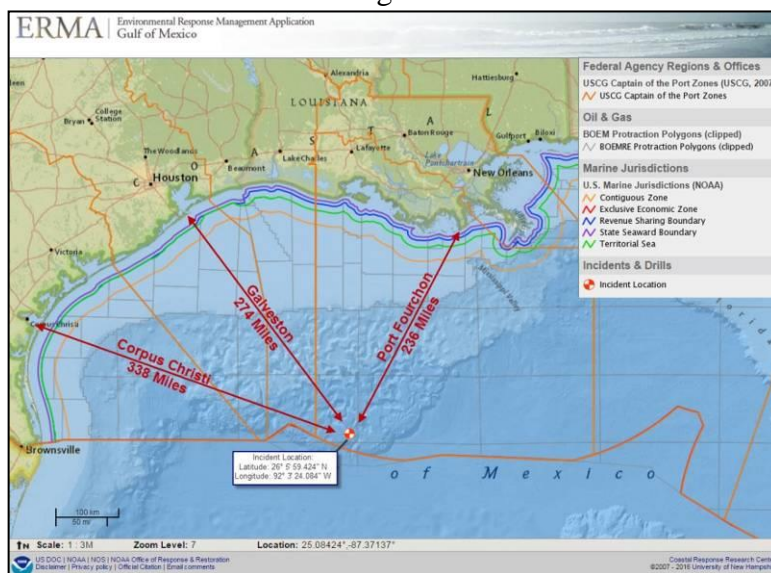
On 26 April 2016, drillship NOBLE BOB DOUGLAS was conducting well completion operations on Anadarko's "Lucius" No 7 well in Keathley Canyon (KC) 919. At 0730, the work crew has just perforated the 9-7/8 inch production liner and was preparing to pull out of the hole to install the gravel pack assembly when the drillship suddenly lost power and drifted away from location which resulted in an un-commanded disconnect. Before the crew could actuate the Emergency Disconnect to close Blowout Preventer (BOP) shear rams remotely, the riser parted on the top of the Lower Marine Riser Package (LMRP).

The drillship's Remotely Operated Vehicle (ROV) was deployed at the time of the incident and used to verify that the BOP/LMRP stack were intact; however, it was unable to manually actuate the BOP rams. With no means to actuate the BOP rams (remotely or manually), hydrocarbons began to flow freely from the parted riser above the LMRP.

By 0745, all initial internal Anadarko notifications of the incident were made as well as external notifications to BSEE, National Response Center and U.S. Coast Guard MSU Morgan City.

Anadarko's Incident Management Team (IMT) was also notified and instructed to assemble at 0830 at Anadarko corporate locations in The Woodlands, Texas. Figure 3 shows the location for the subsea well for the Tabletop Exercise.

Figure 3



Additional Complications

The potential loss of well control has generated significant national and international media due to the size of the spill and the potential impact to Mexico.

Assumptions

- Worst-case discharge: Oil: 206,000 Barrels of Oil Per Day (BOPD); and
Natural Gas: 26 Million Standard Cubic Feet per Day (MM SCF/D) American Petroleum Institute (API) Gravity: 33
- Gas Oil Ratio (GOR): 1,332 Standard Cubic Feet per Barrel (SCF/BBL)
- Depth of Water: 6,823 feet
- Weather: Wind from east northeast at 20 - 30 knots

Key Takeaways from the Tabletop Exercise

Security: The Mexican Navy would provide Navy and Army resources for security for U.S. response resources in addition to Responsible Party security (if needed).

Alternative Response Technologies (ART): The Mexican government will consider all requests for the use of surface and subsea dispersants and in-situ burning if a valid request is presented with proper documentation.

Trans-Border Resource Movements: To assist with trans-border movement of equipment and personnel during a spill response, U.S. Customs and Border Protection will facilitate and / or process all requests 24-hours a day via established phone line. In addition, the U.S. Coast Guard will grant non-Safety of Life at Sea (SOLAS) / Certificate of Inspection (COI) voyage waiver for U.S. flagged Oil Spill Response Vessels (OSRVs) engaged in the emergency response.

Plans: To effectively respond to oil spills in Mexico, an oil and natural gas operator should be familiar with Mexico's national, regional and local plans.

Waste Disposal: In accordance with Mexico government laws and regulations, oil spill waste generated from an incident originating in Mexican waters must be disposed of within Mexico. Likewise, oil spill waste generated from an incident originating in U.S. waters must be disposed of within the U.S.

Mexico and U.S. Exclusive Economic Zone (EEZ) and Territorial Sea: Various national and international laws and treaties will govern incident-specific activities during an actual response – especially those relating to commerce, environmental resources and mineral rights.

FULL-SCALE EXERCISE - MARCH 2017

The Keathley Canyon PREP 2017 exercise was a full-scale exercise (FSE) emphasizing awareness, prevention, response and recovery from a major oil spill incident involving all local, state, federal, tribal and international response teams, focusing on multi-agency notification and initial response coordination and the use of the Incident Command System (ICS).

The exercise was conducted to improve the effectiveness of the Southeast Louisiana Area Contingency Plan (ACP), the Anadarko OSRP and the MEXUSGULF Regional Annex of the MEXUS Plan.

The Keathley Canyon PREP 2017 FSE was the final phase of an interlinked exercise project between Coast Guard MSU Morgan City, Anadarko and the Eighth Coast Guard District conducted from 24 October 2016 to 9 March 2017 in various southeast Louisiana locations and at The Woodlands, Texas. Phase I consisted of a Functional Exercise (FE) conducted by Anadarko on 24 October 2016 at its corporate headquarters in The Woodlands, TX. Phase II consisted of an Oil Spill Response Equipment Deployment Drill conducted on 15 February 2017 at various southeast Louisiana locations. The planning process included working with the Southeast Louisiana Area Committee to select two areas to test Geographical Response Strategies (GRSs) with Clean Gulf Associates (CGA) and Marine Spill Response Corporation (MSRC) equipment and personnel.

The National PREP was developed to establish a workable exercise program, which meets the intent of section 4202(a) of the Oil Pollution Act of 1990 (OPA 90). PREP addresses the exercise requirements for oil pollution response. The purpose of an Area-level exercise is to test the overall preparedness of the response community in a particular area. An area is defined as that geographic area for which a separate and distinct Area Contingency Plan (ACP) has been prepared as described in OPA 90. The response community includes the federal, state, tribal and local government and industry representatives. Using the applicable Southeast Louisiana ACP, the MEXUSGULF Annex and the Anadarko OSRP were tested, the players had the opportunity not only to evaluate their own response and recovery capabilities, but also to forge lasting working relationships with their counterparts.

Objectives of the Full-Scale Exercise

The following objectives were tested during the March 2017 Full-Scale Exercise (FSE):

Demonstrate the ability to assemble the spill response organization identified in the Southeast Louisiana ACP, Anadarko OSRP (BSEE Core Components, D & E) and MEXUS Plan, and:

- Demonstrate an effective oil spill response at the FOSC, SOSC and RP level, appropriately requesting additional guidance / direction from agency representatives.
- Demonstrate the ability for the responsible party, their respective spill management team and OSRO to provide adequate support to each command post.
- Demonstrate the ability to effectively incorporate Source Control into ICS and the Incident Action Plan (IAP).

Exercise the incident response management system (ICS / Unified Command) as identified in the Southeast Louisiana ACP and Anadarko OSRP by effectively utilizing a Unified Command that includes federal, state and industry representation (BSEE Core Components D and E), and:

- Demonstrate Spill Response Air Operations coordination for U.S. and Mexican airspace.
- Utilize a structured planning process to develop an IAP for the next operational period.
- Demonstrate the ability for tracking, ordering and approving resources between Logistics Section, Resources Unit, and Operations Section including Source Control Branch.

Demonstrate effective and efficient management, information flow, and communication by the UC and representatives not present at the ICP (BSEE Core Components A), and:

- Provide media support, via a Joint Information Center (JIC) including press releases and a press conference.

- Incorporate bi-national (U.S. and Mexico) public affairs / messaging processes.
- Actively test the timeliness of information sharing between Source Control and the Unified Command.
- Demonstrate the ability to share information through NOAA's Environmental Response Management Application (ERMA) and Anadarko's Common Operating Picture (COP) systems.
- Demonstrate the ability to effectively communicate between U.S. and Mexican incident command posts using the MEXUSGULF Advisory and Liaison Coordinator (ALC).
- Consult with the Regional Response Team (RRT) on the use of dispersants and available technology for the incident (U.S. and Mexican waters)
- Demonstrate the ability to facilitate trans-border resource movements (land and water).
- Test Mexico's requirements for allowing equipment and personnel to enter Mexico when an emergency occurs (land and maritime), and determine whom from Mexican government will ensure safe and secure personnel and equipment movement in Mexican Exclusive Economic Zone (EEZ) and territorial waters.

Demonstrate deployment of response equipment and personnel, to assemble and deploy on water resources identified in the GRP Annex of the Southeast Louisiana ACP (BSEE Core Components A, B and D.4), and:

- Demonstrate the ability of the response organization to provide an initial assessment of the discharge or potential discharge and provide continuing assessments of the effectiveness of the tactical planning.
- Assess the need for alternative response technology use near the maritime boundary line; e.g., surface and subsea dispersants, in-situ burning, etc.

- Demonstrate strategies needed to mitigate the discharged product using countermeasures (dispersants and mechanical oil recovery).
- Demonstrate the ability to effectively stop or control the source, and minimize the spill for worst case discharge.
- Demonstrate the ability of the response organization to properly dispose of the recovered material and contaminated debris.

Demonstrate the ability to identify the locations of economically sensitive areas, public, environmentally sensitive areas and historic or cultural properties, and develop strategies to mitigate damage caused by the incident (BSEE Core Components D).

Scenario

The scenario built upon the same scenario as the as the April 2016 tabletop exercise. Instead of starting on Day 1, the exercise play dates started on Day 13 and Day 14 respectively to allow the IMT and Source Control Branch to develop and execute work plans not focused on mobilization. With a WCD flow exceeding 200,000 BOPD, the players developed tactical plans and executed all spill response technologies, such as surface and subsea dispersants and in-situ burning in addition to mechanical recovery. Source Control was able to manage operations involving debris removal, capping and shutting in the well, cap and flow to the surface with the Top Hat processing, and storage and transportation with Marine Well Containment Company (MWCC) equipment.

Key Takeaways from the March 2017 Full-Scale Exercise

This paper was submitted before the exercise was conducted, thus, actual takeaways will be discussed during the paper presentation. However, in October 2016, the exercise planning

team agreed to utilize Anadarko's annual BSEE-required OSRP exercise to prepare for the FSE, progressing the same scenario from the April 2016 tabletop exercise for one day of exercise play of the scenario. Although outside participation was very limited, more than 220 Anadarko personnel and vendors participated in the October 2016 exercise. To maintain continuity, the U.S. Coast Guard's Exercise Support Team filled key evaluator roles.

Anticipating similar outcomes from the April 2016 TTX and the Anadarko annual OSRP exercise, key takeaways from the March 2017 FSE are likely to include:

Exercise start where tactical plans can be executed: For this exercise, play started on Day 13 and Day 14 respectively for the two-day exercise. The planning team had to create 12 days of data and plans to provide players enough information to start the exercise. The information provided is similar to that provided during and operations brief conducted prior to ICS staff change-out and all historical information that would be necessary to answers as normally available on days 13 and 14. Since it would be difficult for players to start cold and to enable the start of the exercise more efficiently, planners considered sending players pre-read materials such as the IAP prior to exercise start time/day such as the day before the exercise to allow players to process the simulated state of play and information provided that the players did not actually develop. This pre-exercise briefing will not compromise BSEE regulations as long as exercise injects are not shared with the players.

Challenge Source Control with well containment contingencies. Industry has successfully demonstrated mobilizing equipment and capping operations. Further challenges to better understand operations beyond capping the well such as shut-in process and cap and flow operations will help raise the team's overall preparedness.

CONCLUSIONS

Since the first signed MEXUS Plan in 2000, both countries have adopted essentially a “One Gulf” approach to preparedness and response to a catastrophic event. Both countries have built upon the foundation set under MEXUS to work together and share information to prepare and respond to offshore oil and natural gas incidents. Anadarko’s multi-year commitment as a representation of the oil and natural gas industry enabled a “deeper dive” on critical issues to continually improve subsea spill response and containment. American Petroleum Institute (API) has championed the oil and natural gas industry and has worked with the U.S. government to establish new standards for both government and industry to adopt, including several million dollars in research and development. One excellent example of API working with government agencies and stakeholders has been in subsea dispersants. The Eighth Coast Guard District and Regional Response Team 6 (RRT-6) have partnered with industry to conduct subsea dispersant exercises since 2013. API has focused its efforts on developing a consistent subsea dispersant injection package for industry. RRT-6 has focused its efforts on developing subsea dispersant injection protocols. Since RRT-6 began participating in focused subsea dispersant injection exercises in 2013, the Coast Guard Federal On-Scene Coordinator has approved, with RRT-6 concurrence, five separate subsea dispersant injections as an effective means to mitigate a simulated uncontrolled well blowout. Granted, these exercises and subsequent approvals are notional for exercise purposes, but all participating entities (federal, state and industry) believe that meaningful preparedness and response capability progress is being made. Focusing on preventing these catastrophic incidents remains everyone’s first priority. As of 1 January 2017, 50 oil and natural gas operators having interest in working in Mexico formed AMEXHI as a similar non-profit organization to API to champion creating standards for safe, responsible and

sustainable operations in Mexico. The timing of the Mexican constitutional amendment created opportunities for CNH, BSEE and ASEA to exchange and share information to help keep our “One Gulf” prepared for the next subsea incident. We encourage other industry to take on the challenges and commitment with MEXUS initiatives. Future exercises will undoubtedly tackle the scenario of a major incident originating in Mexico with impact to the U.S.

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