Backgrounder

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How Offshore Oil and Gas Production Benefits the Economy *and* the Environment

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Abstract: *Conventional wisdom holds that offshore oil and gas production harms the surrounding environment. This blanket "wisdom" ignores the fact that the largest source of marine hydrocarbon pollution is offshore natural oil seepage. It also ignores the fact that offshore oil production has* lowered *the amount of oil released into the ocean by reducing natural oil seepage, especially in areas with active offshore oil seeps, such as California's Santa Barbara coast. This Heritage Foundation analysis cites studies, developments, and biological facts that demonstrate often-overlooked benefits of offshore oil and gas production.*

The oceans surrounding the United States hold tremendous oil and natural gas potential, but much of that potential is not being realized. Nearly 85 percent of these waters—the Atlantic, the Pacific, and the eastern Gulf of Mexico—are off-limits to exploration and drilling. Government studies estimate that these restricted areas hold at least 19 billion barrels of oil—nearly 30 years' worth of current imports from Saudi Arabia—and oil estimates are known to increase as exploration occurs. The greatest untapped potential lies in the Pacific. Producing this oil would increase oil supplies, lower prices, and generate large tax revenues—while creating thousands of jobs in the domestic energy industry.

Drilling restrictions in general are imposed due to environmental concerns, despite the fact that offshore environmental damage has been greatly reduced by technologies that minimize the risk of oil spills and

Talking Points

- Nearly 85 percent of the waters surrounding the U.S.—the Atlantic, the Pacific, and the eastern Gulf of Mexico—are off-limits to oil and gas exploration and drilling.
- Government studies estimate that these restricted areas hold at least 19 billion barrels of oil—nearly 30 years' worth of current imports from Saudi Arabia.
- Producing this oil would increase oil supplies, lower prices, and generate large tax revenues—while creating thousands of jobs in the domestic energy industry.
- Drilling restrictions are imposed due to environmental concerns—despite the fact that offshore environmental damages have been greatly reduced by technologies that minimize the risk of oil spills and other hazards to the environment.
- Oil production has *lowered* the amount of oil released into the ocean by reducing natural seepage of oil, especially in areas with active offshore oil seeps, including California's Santa Barbara coast.

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other hazards to the environment. In fact, offshore oil production has *lowered* the amount of oil released into the ocean by reducing natural seepage of oil, especially in areas with active offshore oil seeps, such as California's Santa Barbara coast.

Natural hydrocarbon seeps have historically been used to locate the world's usable sources of oil and tar. Papers published by British Petroleum in the early 1990s[1] show that over 75 percent of the world's oil basins contain surface oil seeps. Most seeps emit small volumes of oil and gas that do not significantly deplete hydrocarbon reservoirs over the short term, but can add up to significant depletion of oil and gas over the longer term.

It is a widely overlooked fact that natural hydrocarbon seeps generally have a larger impact on the marine environment than do oil and gas exploration and production.

The knowledge that surface seepage has a direct link to subsurface oil and gas accumulations is not new and has been the impetus for many of the world's early major oil and gas discoveries by pioneers of oil production—as far back as ancient China, and more recently the 1860s in Pennsylvania and the 1890s in Azerbaijan. Natural seeps were the impetus for early exploration of oil in Iran and Iraq in the early 1900s.

Natural hydrocarbon seeps continue to be an important indicator of economic oil and gas resources. The high cost of deep-water offshore oil and gas exploration has made the identification of hydrocarbon seeps an important consideration in oil-exploration risk-reduction methods.[2]

Natural Seeps: The Largest Source of U.S. Marine Hydrocarbon Pollution

Natural hydrocarbon seeps generally result from pressurized hydrocarbon reservoirs that force oil and gas up through fissures to the earth's surface either on land or the seabed floor where the hydrocarbons escape in the form of oil, tar, and methane-rich gases.

It is a widely overlooked fact that natural hydrocarbon seeps generally have a larger impact on the marine environment than do oil and gas exploration and production. According to the National Academy of Sciences, 63 percent of hydrocarbon pollution in U.S. waters stems from natural seeps, while only 1 percent is due to offshore drilling and extraction.[3] Geologists believe that over the course of millions of years, more oil has seeped naturally into the earth's environment than currently exists in all conventional oil reservoirs combined.

The Gulf of Mexico, for instance, is a major U.S. offshore oil and gas producing region where the environmental impact of natural hydrocarbon seepage appears to far exceed the environmental impact of accidental oil releases due to commercial extraction and transportation.[4]

Onshore hydrocarbon seeps are also pervasive in many areas of the world, and are a source of contamination for many streambeds and rivers. The Santa Susanna Mountains in California are estimated to contain 22,000 active oil seeps that are associated with significant streambed contamination.[5]

One of the most studied offshore oil and gas seep regions over the last 40 years is the Santa Barbara coast of California, which has the world's second most prolific oil seepage areas, extending for about

1. R. H. Clarke and R.W. Cleverly, "Petroleum Seepage and Post-Accumulation Migration," Geological Society, London, *Special Publications*, Vol. 59 (1991), pp. 265–271.
2. Donald F. Saunders and Martin J. Davidson, eds., Surface Geochemical Exploration for Petroleum, Collected Papers, Library Collection (1933–2006), DeGolyer Library, Southern Methodist University.
3. National Academy of Sciences, "Oil in the Sea III," The National Academies, 2002, at *http://books.nap.edu/html/oil_in_the_sea/reportbrief.pdf* (October 15, 2009).
4. Roger Sassen, Alexei. V. Milkov, and Harry H. Roberts, "Environmental Significance of Gas and Oil Seeps, Gulf of Mexico, Continental Slope," American Association of Petroleum Geologists, Conference Report, 2002.
5. "Investigation and Risk Assessment of Significant Natural Seeps in Santa Paula Creek" (SSEP 2008-09), California Department of Fish and Game, 2008.

80 miles along the coastline.[6] The offshore Santa Barbara oil seepage zones result in about 70,000 barrels per year of oil and tar seepage into the Pacific, much of which washes up on California beaches.[7] Every four years, the amount of offshore Santa Barbara oil seepage exceeds the 240,000 barrels that spilled from the *Exxon Valdez* in 1989. By comparison, according to the U.S. Minerals and Management Service, the total amount of oil spilled in California coastal waters due to offshore oil production since 1970 has been less than 870 barrels.[8] Far more birds and wildlife have been killed in the last 40 years by California's offshore oil seepage than by all previous California offshore oil production spills combined, including the 1969 spill.[9]

Seeps are also one of the world's largest methane gas emission sources,[10] and are a major source of air pollution in Santa Barbara County.[11] These coastal California seeps release oil and tar that washes ashore along nearly half the coastline of California, with the highest concentrations in Santa Barbara County. In the winter, the Davidson current washes seep oil and tar ashore as far north as the beaches of Santa Cruz and San Francisco.[12]

The California Department of Fish & Game often receives public calls reporting a possible oil spill on California central coast beaches, which is invariably determined to be natural seepage. The California Department of Fish & Game requires that seep oil and tar collected on California beaches be treated as hazardous waste, the same as for industrial oil spills.

Offshore Production: Significant Reductions in Oil Pollution on California Beaches

One of the side affects of offshore oil production has been the reduction of oil and gas seepage due to decreases in subsea oil-reservoir pressure. Seep oil is chemically the same as commercially extracted oil, although the seep oil and tar have often undergone partial oxidation by the time they move into the water or onshore.

The seepage reductions due to offshore oil and gas extraction have, in some cases, resulted in significant reductions in natural oil and gas seep pollution over the last 40 years.[13]

There are also anecdotal observations and research indicating that oil production around the world is responsible for ongoing reductions in hydrocarbon seepage pollution.[14]

Ironically, the decreased oil and gas reservoir pressure due to ongoing "legacy" offshore oil and gas production (which continued even after the state-wide offshore moratorium was imposed) near the site of the famous 1969 Santa Barbara oil spill is resulting in reductions in California's coastal seep-

6. "Decrease in Natural Marine Hydrocarbon Seepage Near Coal Oil Point, California, Associated with Offshore Oil Production," *Geology*, November 1999.
7. Santa Barbara County, "Natural Oil Seeps and Oil Spills," March 8, 2002, at *http://www.countyofsb.org/energy/information/seepspaper.asp#_ednref33* (October 15, 2009), and Santa Barbara County, "Natural Seep Project Summary," Planning and Development Department, Energy Division and U.S. Geological Survey, Western Coastal and Marine Geology Team, Menlo Park, CA, May 24, 2004, at *http://www.countyofsb.org/energy/information/naturalSeepProjectSummary.asp* (October 15, 2009).
8. U.S. Minerals Management Service, Pacific OCS Region, at *http://www.mms.gov/omm/Pacific/offshore/oil-and-gasfaq.htm* (November 10, 2009).
9. Santa Barbara Wildlife Care Network, at *http://www.sbwcn.org/edu/oiled.php* (November 16, 2009).
10. Martin Hovland, Alan G. Judd, and R. A. Burke, "The Global Flux of Methane from Shallow Submarine Sediments," *Chemosphere*, Vol. 26 (1993), pp. 559–578.
11. "Factor Analysis of Hydrocarbon Species in the South-Central Coast Air Basin," *Journal of Applied Meteorology*, Vol. 30 (May 1991), pp. 733–743.
12. "Families of Miocene Monterey Crude Oil, Seep, and Tarball Samples, Coastal California," American Association of Petroleum Geologists *Bulletin* Vol. 92, No. 9 (September 2008), pp. 1131–1152.
13. "Decrease in Natural Marine Hydrocarbon Seepage Near Coal Oil Point, California," *Geology*, November 1999.
14. "The World's Most Spectacular Marine Hydrocarbon Seeps," *Journal of Geophysical Research*, Vol. 104 (September 15, 1999), pp. 20, 703–720.

age pollution. California beaches have become significantly cleaner over the last 50 years due to offshore oil and gas production.

Modern slant and horizontal drilling is extending these benefits into seep zones located further into the ocean than the areas immediately surrounding existing offshore production platforms. Central and southern California beaches have been polluted by this natural seep oil for well over 100,000 years. A 22-year study of the offshore oil platform "Holly" off the Californian coast concluded that, "Oil production here has resulted in an unexpected benefit to the atmosphere and marine environment."[15] According to peer-reviewed University of California research, if offshore production were expanded in the seep zone areas studied, there would be further reductions in seepage pollution and the associated methane gas and ozone-forming reactive organic compounds (ROCs).[16]

Long-time Santa Barbara residents have also observed for the last 50 years that their beaches have seen significant reductions in seepage oil and tar beach pollution. The simple fact is that California offshore oil and gas production has been the reason why California's prolific natural oil and gas seepage pollution has been declining for decades. California beaches are becoming cleaner thanks to existing legacy offshore oil and gas production. Geologists believe these reductions in seepage pollution will last for thousands of years.

Offshore hydrocarbon seeps are also a naturally dynamic process. In addition to reduced seepage due to reservoir pressure reductions from commercial extraction, seeps can also become active in new areas due to earthquakes and other natural events. In 2007, an earthquake in New Zealand resulted in a new offshore seepage area that led to exploration activity to determine the underlying reservoir's production potential. This seep zone off the New Zealand coast had previously not been explored for the presence of economically recoverable hydrocarbons.[17]

In Santa Barbara, a 6.8 magnitude earthquake in 1925 resulted in a large spontaneous release of undersea reservoir oil off the coast that boiled up from the seafloor and inundated the coastline and beaches with extensive oil slicks.[18] The southern California 1971 Sylmar earthquake also resulted in new offshore seep areas observed in previously unrecorded areas.

In January 2005, an increase in natural seepage off the California coast resulted in oil slicks that covered more than 20 square miles. The increased seepage subsided over the following weeks.

California offshore oil and gas production has been the reason why California's prolific natural oil and gas seepage pollution has been declining for decades.

Since Californian offshore production began in the late 1950s, far more wildlife has been killed (using bird death estimates as a surrogate) by California's offshore natural oil seeps than by all of California offshore oil production spills combined. It is an interesting artifact of the offshore oil debate that large numbers of bird deaths due to natural oil seepage garners no media attention, whereas small numbers of bird deaths due to a small oil spill causes extensive national attention and outrage by opponents of offshore oil production—even in areas where offshore production has been consistently reducing pollution caused by natural seepage.

A new study estimates that oil seepage off the Santa Barbara coast from one seep area alone (Coal Oil Point) has resulted in current oil sediment deposits between 8 and 80 times the amount of oil released from the *Exxon Valdez* spill.[19]

15. "Decrease in Natural Marine Hydrocarbon Seepage near Coal Oil Point, California, Associated with Offshore Oil Production," *Geology*, November 1999.
16. "The World's Most Spectacular Marine Hydrocarbon Seeps," *Journal of Geophysical Research*.
17. Press release, "Tests Identify Oil In Great South Basin," New Zealand Ministry of Economic Development, March 12, 2007.
18. "June 29, 1925 Santa Barbara 6.8 Magnitude Earthquake," *Santa Barbara Daily News*, July 4, 1925.

There are also concerns about air pollution resulting from seepage. Gas emissions from hydrocarbon seeps are estimated to be one of the largest sources of methane released annually into the earth's atmosphere, and studies indicate that existing oil and gas production may be causing ongoing reductions in methane emissions worldwide.[20] Methane is a potent greenhouse gas. Natural offshore seep emissions are one of the largest sources of air pollution in Santa Barbara County.

Oil Seeps: Indicators of Oil and Gas Reserves

The presence of natural oil seeps has led to the discovery of some of the world's largest oil fields. The second-largest oil field ever discovered, the Cantarell "supergiant" field, was discovered after a fisherman, Rudesindo Cantarell, repeatedly complained to the Mexican national oil company PEMEX that his fishing nets were being covered with oil in the Gulf of Mexico. PEMEX had no oil operations in Mr. Cantarell's fishing area. The company investigated the source of the offshore oil and subsequently discovered an offshore oil field in 1976 which had produced more than 12 billion barrels of oil by 2007. Although being depleted rapidly, the Cantarell field is still one of Mexico's largest single sources of oil production.[21]

At current rates of oil seepage off the Santa Barbara coast, about 7 billion barrels of oil may already have seeped into the California coastal marine environment over the last 100,000 years. The lifespan of the Santa Barbara offshore oil seeps is estimated to exceed 400,000 years. Seven billion barrels of oil represents approximately 25 percent of all current U.S. oil reserves. Seven billion barrels of new Santa Barbara offshore oil production would supply all of California's current imported oil needs for the next 25 years.

National Offshore Energy Policy Should Consider Natural Oil and Gas Seepage

Natural oil and gas seeps are by far the largest sources of hydrocarbon pollution released into U.S. coastal waters and are a major source of offshore oil pollution and atmospheric methane emissions worldwide. Oil and gas seeps are also one of the most important indicators for locating recoverable hydrocarbon resources. California's central and south coast has seen significant environmental benefits from the reductions in coastal seepage pollution due to offshore oil and gas production. California's coastal environment would benefit from offshore oil and gas expansion in active seep areas that are currently off-limits in California waters, as well as in federal seep zone waters in the Santa Maria basin in the Outer Continental Shelf. Thus offshore oil and gas production represents both an effective means of addressing the problems of seepage pollution as well as an economic opportunity.

Continued research may also show that the long-term environmental benefits that coastal California has experienced due to offshore oil and gas extraction may be occurring in other regions as well—albeit probably to a lesser degree.

The economic benefits from increased domestic hydrocarbon production are well known, but many erroneously assume they come at an environmental cost. In truth, there are opportunities, off Santa Barbara and elsewhere, to achieve substantial environmental benefits from drilling as a consequence of reduced seepage of oil and natural gas into the air and water. Expanded offshore oil and gas production can genuinely be a win-win proposition.

—Bruce Allen is co-founder of SOS California, an environmental and energy non-profit based in Santa Barbara, California.

19. Press release, "UCSB Scientists Document Fate of Huge Oil Slicks from Seeps at Coal Oil Point," University of California, Santa Barbara, May 13, 2009, at *http://www.instadv.ucsb.edu/pa/display.aspx?pkey=2010* (October 16, 2009).
20. "Decrease in Natural Marine Hydrocarbon Seepage Near Coal Oil Point, California, Associated with Offshore Oil Production," *Geology*, November 1999.
21. L. Cruz and J. Sheridan, "Relative Contribution to Fluid Flow From Natural Fractures in the Cantarell Field, Mexico," Society of Petroleum Engineers, 2009.