



DEEP WATER

**The Gulf Oil Disaster and
the Future of Offshore Drilling**

Report to the President

National Commission on the BP Deepwater
Horizon Oil Spill and Offshore Drilling

Dedication

This report is dedicated to the 11 men who lost their lives on the *Deepwater Horizon* rig on April 20, 2010 and to their families, in hope that this report will help minimize the chance of another such disaster ever happening again.

Jason Anderson

Aaron Dale Burkeen

Donald Clark

Stephen Curtis

Gordon Jones

Roy Wyatt Kemp

Karl Dale Kleppinger, Jr.

Blair Manuel

Dewey Revette

Shane Roshto

Adam Weise

Acknowledgements

We wish to acknowledge the many individuals and organizations, government officials and agencies alike that offered their views and insights to the Commission. We would especially like to express our gratitude to the Coast Guard's Incident Specific Preparedness Review (ISPR) for allowing Commission staff to participate in its interviews and discussions, which was invaluable to the preparation of this report. (A copy of the Coast Guard's ISPR report can be found at the Commission's website at www.oilspillcommission.gov). We would also like to thank Chevron for performing the cement tests that proved so critical to our investigation into the Macondo well blowout.

We also thank the Department of Energy, which served as our supporting agency, and all of the Department employees whose assistance was so essential to the success and functioning of the Commission. In particular, we would like to thank Christopher Smith, Deputy Assistant Secretary for Oil and Natural Gas, who acted as the Commission's Designated Federal Officer, as well as Elena Melchert, Petroleum Engineer in the Office of Oil and Gas Resource Conservation, who served as the Committee Manager.

But most importantly, we are deeply grateful to the citizens of the Gulf who shared their personal experiences as Commissioners traveled in the region, providing a critical human dimension to the disaster and to our undertaking, as well as the many people who testified at the Commission's hearings, provided public comments, and submitted statements to our website. Together, these contributions greatly informed our work and led to a better report. Thank you one and all.

Copyright, Restrictions, and Permissions Notice

Except as noted herein, materials contained in this report are in the public domain. Public domain information may be freely distributed and copied. However, this report contains illustrations, photographs, and other information contributed by or licensed from private individuals, companies, or organizations that may be protected by U.S. and/or foreign copyright laws. Transmission or reproduction of items protected by copyright may require the written permission of the copyright owner.

When using material or images from this report we ask that you credit this report, as well as the source of the material as indicated in this report. Permission to use materials copyrighted by other individuals, companies or organizations must be obtained directly from those sources.

This report contains links to many Web sites. Once you access another site through a link that we provide, you are subject to the use, copyright and licensing restrictions of that site. Neither the Government nor the National Commission on the BP/Deepwater Horizon Oil Spill and Offshore Drilling (Commission) endorses any of the organizations or views represented by the linked sites unless expressly stated in the report. The Government and the Commission take no responsibility for, and exercise no control over, the content, accuracy or accessibility of the material contained on the linked sites.

Deep Water

The Gulf Oil Disaster and the Future of Offshore Drilling

Report to the President

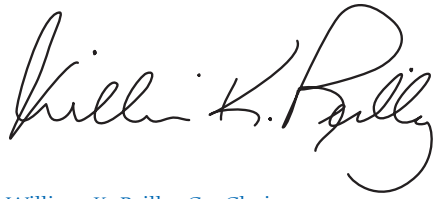
National Commission on the BP Deepwater Horizon
Oil Spill and Offshore Drilling

January 2011

Commission Members



Bob Graham, Co-Chair



William K. Reilly, Co-Chair



Frances Beinecke



Donald F. Boesch



Terry D. Garcia



Cherry A. Murray



Fran Ulmer

Table of Contents

<i>Foreword</i>	vi
PART I: The Path to Tragedy	xiii
Chapter 1	1
"Everyone involved with the job...was completely satisfied...." The <i>Deepwater Horizon</i> , the Macondo Well, and Sudden Death on the Gulf of Mexico	
Chapter 2	21
"Each oil well has its own personality" The History of Offshore Oil and Gas in the United States	
Chapter 3	55
"It was like pulling teeth." Oversight—and Oversight—in Regulating Deepwater Energy Exploration and Production in the Gulf of Mexico	
PART II: Explosion and Aftermath:	
The Causes and Consequences of the Disaster	87
Chapter 4	89
"But, who cares, it's done, end of story, [we] will probably be fine and we'll get a good cement job." The Macondo Well and the Blowout	
Chapter 5	129
"You're in it now, up to your neck!" Response and Containment	
Chapter 6	173
"The worst environmental disaster America has ever faced." Oiling a Rich Environment: Impacts and Assessment	
Chapter 7	197
"People have plan fatigue . . . they've been planned to death" Recovery and Restoration	
PART III: Lessons Learned:	
Industry, Government, Energy Policy	215
Chapter 8	217
"Safety is not proprietary." Changing Business as Usual	
Chapter 9	249
"Develop options for guarding against, and mitigating the impact of, oil spills associated with offshore drilling." Investing in Safety, Investing in Response, Investing in the Gulf	
Chapter 10	293
American Energy Policy and the Future of Offshore Drilling	
Endnotes	307
Appendices	
<i>Appendix A: Commission Members</i>	356
<i>Appendix B: List of Acronyms</i>	358
<i>Appendix C: Executive Order</i>	359
<i>Appendix D: Commission Staff and Consultants</i>	362
<i>Appendix E: List of Commission Meetings</i>	365
<i>Appendix F: List of Staff Working Papers</i>	366
Index	368



Photo: Susan Walsh, Associated Press

Foreword

The explosion that tore through the *Deepwater Horizon* drilling rig last April 20, as the rig's crew completed drilling the exploratory Macondo well deep under the waters of the Gulf of Mexico, began a human, economic, and environmental disaster.

Eleven crew members died, and others were seriously injured, as fire engulfed and ultimately destroyed the rig. And, although the nation would not know the full scope of the disaster for weeks, the first of more than four million barrels of oil began gushing uncontrolled into the Gulf—threatening livelihoods, precious habitats, and even a unique way of life. A treasured American landscape, already battered and degraded from years of mismanagement, faced yet another blow as the oil spread and washed ashore. Five years after Hurricane Katrina, the nation was again transfixed, seemingly helpless, as this new tragedy unfolded in the Gulf. The costs from this one industrial accident are not yet fully counted, but it is already clear that the impacts on the region's natural systems and people were enormous, and that economic losses total tens of billions of dollars.

On May 22, 2010, President Barack Obama announced the creation of the National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling: an independent, nonpartisan entity, directed to provide a thorough analysis and impartial judgment. The President charged the Commission to determine the causes of the disaster, and to improve the country's ability to respond to spills, and to recommend reforms to make offshore energy production safer. And the President said we were to follow the facts wherever they led.

This report is the result of an intense six-month effort to fulfill the President's charge.

From the outset, the Commissioners have been determined to learn the essential lessons so expensively revealed in the tragic loss of life at the *Deepwater Horizon* and the severe damages that ensued. The Commission's aim has been to provide the President, policymakers, industry, and the American people a clear, accessible, accurate, and fair account of the largest oil spill in U.S history: the context for the well itself, how the explosion and spill happened, and how industry and government scrambled to respond to an unprecedented emergency. This was our first obligation: determine what happened, why it happened, and explain it to Americans everywhere.

As a result of our investigation, we conclude:

- The explosive loss of the Macondo well could have been prevented.
- The immediate causes of the Macondo well blowout can be traced to a series of identifiable mistakes made by BP, Halliburton, and Transocean that reveal such systematic failures in risk management that they place in doubt the safety culture of the entire industry.
- Deepwater energy exploration and production, particularly at the frontiers of experience, involve risks for which neither industry nor government has been adequately prepared, but for which they can and must be prepared in the future.
- To assure human safety and environmental protection, regulatory oversight of leasing, energy exploration, and production require reforms even beyond those significant reforms already initiated since the *Deepwater Horizon* disaster. Fundamental reform will be needed in both the structure of those in charge of regulatory oversight and their internal decisionmaking process to ensure their political autonomy, technical expertise, and their full consideration of environmental protection concerns.
- Because regulatory oversight alone will not be sufficient to ensure adequate safety, the oil and gas industry will need to take its own, unilateral steps to increase dramatically safety throughout the industry, including self-policing mechanisms that supplement governmental enforcement.
- The technology, laws and regulations, and practices for containing, responding to, and cleaning up spills lag behind the real risks associated with deepwater drilling into large, high-pressure reservoirs of oil and gas located far offshore and thousands of feet below the ocean's surface. Government must close the existing gap and industry must support rather than resist that effort.
- Scientific understanding of environmental conditions in sensitive environments in deep Gulf waters, along the region's coastal habitats, and in areas proposed for more drilling, such as the Arctic, is inadequate. The same is true of the human and natural impacts of oil spills.

We reach these conclusions, and make necessary recommendations, in a constructive spirit: we aim to promote changes that will make American offshore energy exploration and production far safer, today and in the future.

More broadly, the disaster in the Gulf undermined public faith in the energy industry, government regulators, and even our own capability as a nation to respond to crises. It is our hope that a thorough and rigorous accounting, along with focused suggestions for reform, can begin the process of restoring confidence. There is much at stake, not only for the people directly affected in the Gulf region, but for the American people at large. The tremendous resources that exist within our outer continental shelf belong to the nation as a whole. The federal government's authority over the shelf is accordingly plenary, based on its power as both the owner of the resources and in its regulatory capacity as sovereign to protect public health, safety, and welfare. To be allowed to drill on the outer continental shelf is a privilege to be earned, not a private right to be exercised.

“Complex Systems Almost Always Fail in Complex Ways”

As the Board that investigated the loss of the Columbia space shuttle noted, “complex systems almost always fail in complex ways.” Though it is tempting to single out one crucial misstep or point the finger at one bad actor as the cause of the *Deepwater Horizon* explosion, any such explanation provides a dangerously incomplete picture of what happened—encouraging the very kind of complacency that led to the accident in the first place. Consistent with the President's request, this report takes an expansive view.

Why was a corporation drilling for oil in mile-deep water 49 miles off the Louisiana coast? To begin, Americans today consume vast amounts of petroleum products—some 18.7 million barrels per day—to fuel our economy. Unlike many other oil-producing countries, the United States relies on private industry—not a state-owned or -controlled enterprise—to supply oil, natural gas, and indeed all of our energy resources. This basic trait of our private-enterprise system has major implications for how the U.S. government oversees and regulates offshore drilling. It also has advantages in fostering a vigorous and competitive industry, which has led worldwide in advancing the technology of finding and extracting oil and gas.

Even as land-based oil production extended as far as the northern Alaska frontier, the oil and gas industry began to move offshore. The industry first moved into shallow water and eventually into deepwater, where technological advances have opened up vast new reserves of oil and gas in remote areas—in recent decades, much deeper under the water's surface and farther offshore than ever before. The *Deepwater Horizon* was drilling the Macondo well under 5,000 feet of Gulf water, and then over 13,000 feet under the sea floor to the hydrocarbon reservoir below. It is a complex, even dazzling, enterprise. The remarkable advances that have propelled the move to deepwater drilling merit comparison with exploring outer space. The Commission is respectful and admiring of the industry's technological capability.

But drilling in deepwater brings new risks, not yet completely addressed by the reviews of where it is safe to drill, what could go wrong, and how to respond if something does go awry. The drilling rigs themselves bristle with potentially dangerous machinery. The deepwater environment is cold, dark, distant, and under high pressures—and the oil and gas reservoirs, when found, exist at even higher pressures (thousands of pounds per square inch), compounding the risks if a well gets out of control. The *Deepwater Horizon* and Macondo well vividly illustrated all of those very real risks. When a failure happens at such depths, regaining control is a formidable engineering challenge—and the costs of failure, we now know, can be catastrophically high.

In the years before the Macondo blowout, neither industry nor government adequately addressed these risks. Investments in safety, containment, and response equipment and practices failed to keep pace with the rapid move into deepwater drilling. Absent major crises, and given the remarkable financial returns available from deepwater reserves, the business culture succumbed to a false sense of security. The *Deepwater Horizon* disaster exhibits the costs of a culture of complacency.

The Commission examined in great detail what went wrong on the rig itself. Our investigative staff uncovered a wealth of specific information that greatly enhances our understanding of the factors that led to the explosion. The separately published report of the chief counsel (a summary of the findings is presented in Chapter 4) offers the fullest account yet of what happened on the rig and why. There are recurring themes of missed warning signals, failure to share information, and a general lack of appreciation for the risks involved. In the view of the Commission, these findings highlight the importance of organizational culture and a consistent commitment to safety by industry, from the highest management levels on down.*

But that complacency affected government as well as industry. The Commission has documented the weaknesses and the inadequacies of the federal regulation and oversight, and made important recommendations for changes in legal authority, regulations, investments in expertise, and management.

The Commission also looked at the effectiveness of the response to the spill. There were remarkable instances of dedication and heroism by individuals involved in the rescue and cleanup. Much was done well—and thanks to a combination of good luck and hard work, the worst-case scenarios did not all come to pass. But it is impossible to argue that the industry or the country was prepared for a disaster of the magnitude of the *Deepwater Horizon* oil spill. Twenty years after the *Exxon Valdez* spill in Alaska, the same blunt response technologies—booms, dispersants, and skimmers—were used, to limited effect. On-the-ground shortcomings in the joint public-private response to an overwhelming spill like that resulting from the blowout of the Macondo well are now evident, and demand public and private investment. So do the weaknesses in local, state, and federal coordination revealed by the emergency. Both government and industry failed to anticipate and prevent this catastrophe, and failed again to be prepared to respond to it.

*The chief counsel's investigation was no doubt complicated by the lack of subpoena power. Nonetheless, Chief Counsel Bartlit did an extraordinary job building the record and interpreting what he learned. He used his considerable powers of persuasion along with other tools at his disposal to engage the involved companies in constructive and informative exchanges.

If we are to make future deepwater drilling safer and more environmentally responsible, we will need to address all these deficiencies together; a piecemeal approach will surely leave us vulnerable to future crises in the communities and natural environments most exposed to offshore energy exploration and production.

The Deepwater Drilling Prospect

The damage from the spill and the impact on the people of the Gulf has guided our work from the very beginning. Our first action as a Commission was to visit the Gulf region, to learn directly from those most affected. We heard deeply moving accounts from oystermen witnessing multi-generation family businesses slipping away, fishermen and tourism proprietors bearing the brunt of an ill-founded stigma affecting everything related to the Gulf, and oil-rig workers dealing with mounting bills and threatened home foreclosures, their means of support temporarily derailed by a blanket drilling moratorium, shutting down all deepwater drilling rigs, including those not implicated in the BP spill.

Indeed, the centrality of oil and gas exploration to the Gulf economy is not widely appreciated by many Americans, who enjoy the benefits of the energy essential to their transportation, but bear none of the direct risks of its production. Within the Gulf region, however, the role of the energy industry is well understood and accepted. The notion of clashing interests—of energy extraction versus a natural-resource economy with bountiful fisheries and tourist amenities—misses the extent to which the energy industry is woven into the fabric of the Gulf culture and economy, providing thousands of jobs and essential public revenues. Any discussion of the future of offshore drilling cannot ignore these economic realities.

But those benefits have imposed their costs. The bayous and wetlands of Louisiana have for decades suffered from destructive alteration to accommodate oil exploration. The Gulf ecosystem, a unique American asset, is likely to continue silently washing away unless decisive action is taken to start the work of creating a sustainably healthy and productive landscape. No one should be deluded that restoration on the scale required will occur quickly or cheaply. Indeed, the experience in restoring other large, sensitive regions—the Chesapeake Bay, the Everglades, the Great Lakes—indicates that progress will require coordinated federal and state actions, a dedicated funding source, long-term monitoring, and a vocal and engaged citizenry, supported by robust non-governmental groups, scientific research, and more.

We advocate beginning such an effort, seriously and soon, as a suitable response to the damage and disruption caused by the *Deepwater Horizon* emergency. It is a fair recognition not only of the costs that energy exploitation in the Gulf has, for decades, imposed on the landscape and habitats—and the other economic activities they support—but also of the certainty that Americans will continue to develop the region's offshore energy resources.

For the simple fact is that the bulk of our newly discovered petroleum reserves, and the best prospects for future discoveries, lie not on land, but under water. To date, we have

made the decision as a nation to exploit the Gulf's offshore energy resources—ruling much of the Florida, Atlantic, and Pacific coasts out of bounds for drilling. The choice of how aggressively to exploit these resources, wherever they may be found, has profound implications for the future of U.S. energy policy, for our need to understand and assure the integrity of fragile environmental resources, and for the way Americans think about our economy and our security. Although much work is being done to improve the fuel-efficiency of vehicles and to develop alternative fuels, we cannot realistically walk away from these offshore oil resources in the near future. So we must be much better prepared to exploit such resources with far greater care.

The Commission and Its Work

While we took a broad view of the spill, it could not be exhaustive. There is still much we do not know—for instance, the blowout preventer, the last line of defense against loss of well control, is still being analyzed; and the *Deepwater Horizon* itself, after its explosive destruction, remained out of reach during our investigation. The understandable, immediate need to provide answers and concrete suggestions trumped the benefits of a longer, more comprehensive investigation. And as we know from other spills, their environmental consequences play out over decades—and often in unexpected ways. Instead, the Commission focused on areas we thought most likely to inform practical recommendations. Those recommendations are presented in the spirit of transforming America into the global leader for safe and effective offshore drilling operations. Just as this Commission learned from the experiences of other nations in developing our recommendations, the lessons learned from the *Deepwater Horizon* disaster are not confined to our own government and industry, but relevant to rest of the world.

We wish we could say that our recommendations make a recurrence of a disaster like the Macondo blowout impossible. We do not have that power. No one can eliminate all risks associated with deepwater exploration. But when exploration occurs, particularly in sensitive environments like the Gulf of Mexico or the Arctic, the country has an obligation to make responsible decisions regarding the benefits and risks.

The report is divided into three sections.

Chapters 1 through 3 describe the events of April 20th on the *Deepwater Horizon*, and, more important, the events leading up to it in the preceding decades—especially how the dramatic expansion of deepwater drilling in the Gulf was not met by regulatory oversight capable of ensuring the safety of those drilling operations.

Chapters 4 through 7 lay out the results of our investigation in detail, highlighting the crucial issues we believe must inform policy going forward: the specific engineering and operating choices made in drilling the Macondo well, the attempts to contain and respond to the oil spill, and the impacts of the spill on the region's natural resources, economy, and people—in the context of the progressive degradation of the Mississippi Delta environment.

Chapters 8 through 10 present our recommendations for reforms in business practices, regulatory oversight, and broader policy concerns. We recognize that the improvements we advocate all come with costs and all will take time to implement. But inaction, as we are deeply aware, runs the risk of real costs, too: in more lost lives, in broad damage to the regional economy and its long-term viability, and in further tens of billions of dollars of avoidable clean-up costs. Indeed, if the clear challenges are not addressed and another disaster happens, the entire offshore energy enterprise is threatened—and with it, the nation’s economy and security. We suggest a better option: build from this tragedy in a way that makes the Gulf more resilient, the country’s energy supplies more secure, our workers safer, and our cherished natural resources better protected.

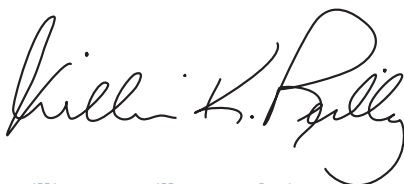
Our Thanks and Dedication

We thank President Obama for this opportunity to learn thoroughly about the crisis, and to share our findings with the American public. We deeply appreciate the effort people in the affected Gulf regions made to tell us about their experiences, and the time and preparation witnesses before the Commission dedicated to their presentations. We have come to respect the seriousness with which our fellow Commissioners assumed our joint responsibilities, and their diverse expertise and perspectives that helped make its work thorough and productive. On their behalf, we wish to recognize the extraordinary work the Commission’s staff—scientists, lawyers, engineers, policy analysts, and more—performed, under demanding deadlines, to make our inquiries broad, deep, and effective; and we especially highlight the leadership contributions of Richard Lazarus, executive director, and Fred Bartlit, chief counsel. Together, they have fulfilled an extraordinary public service.

Finally, to the American people, we reiterate that extracting the energy resources to fuel our cars, heat and light our homes, and power our businesses can be a dangerous enterprise. Our national reliance on fossil fuels is likely to continue for some time—and all of us reap benefits from the risks taken by the men and women working in energy exploration. We owe it to them to ensure that their working environment is as safe as possible. We dedicate this effort to the 11 of our fellow citizens who lost their lives in the *Deepwater Horizon* explosion.



Bob Graham, Co-Chair



William K. Reilly, Co-Chair

Part I

The Path to Tragedy

On April 20, 2010, the 126 workers on the BP *Deepwater Horizon* were going about the routines of completing an exploratory oil well—unaware of impending disaster. What unfolded would have unknown impacts shaped by the Gulf region’s distinctive cultures, institutions, and geography—and by economic forces resulting from the unique coexistence of energy resources, bountiful fisheries and wildlife, and coastal tourism. The oil and gas industry, long lured by Gulf reserves and public incentives, progressively developed and deployed new technologies, at ever-larger scales, in pursuit of valuable energy supplies in increasingly deeper waters farther from the coastline. Regulators, however, failed to keep pace with the industrial expansion and new technology—often because of industry’s resistance to more effective oversight. The result was a serious, and ultimately inexcusable, shortfall in supervision of offshore drilling that played out in the Macondo well blowout and the catastrophic oil spill that followed. Chapters 1 through 3 describe the interplay of private industry and public oversight in the distinctive Gulf deepwater context: the conditions that governed the deployment of the *Deepwater Horizon* and the drilling of the Macondo well.