LNG: An Un-American Energy Source

Liquefied Natural Gas:
An Expensive, Dirty, Foreign Fossil Fuel That Threatens Our Natural Gas Energy Independence

A Clean Ocean Action Report

Prepared by:

David Byer, Esq.
Heather Saffert, Ph.D.

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David Byer received a Juris Doctor, magna cum laude, from Vermont Law School (VLS) where he received many academic and leadership awards, and is a member of the New Jersey Bar. He also received a Bachelor of Science (also magna cum laude) from University of South Carolina in Accounting, with a minor in general sciences. Before joining Clean Ocean Action, he was a Judicial Clerk in Kenai, Alaska. He also was a law clerk for Kaplan Kirsch and Rockwell in Colorado and a Research Fellow for the Sustainable Endowments Institute, Cambridge, Massachusetts.

Heather Saffert received her Ph.D. in Oceanography from the University of Rhode Island. She received a Bachelor of Arts from Wesleyan University in Biology, with honors for coastal ecology research. She has worked as a marine science consultant and instrument developer. Her Ph.D. centered on coastal water quality problems and developing a new instrument with SubChem Systems in Rhode Island to measure fecal bacteria levels. Heather also took part in a survey of the Hudson River and its plume. She has received Surfrider Foundation scholarships and a National Sea Grant Fellowship.

Clean Ocean Action

Founded in 1984, COA is a regional, broad-based coalition of 125 conservation, environmental, fishing, boating, diving, student, surfing, women's, business, service, religious, and community groups with a mission to improve the degraded quality of the marine waters off the New Jersey/New York coast. COA works to identify sources of pollution and mounts a campaign on each source using research, public education, and citizen action to convince our public officials to enact and enforce measures that will clean up and protect our ocean.

Cover photograph: Tim Riley**,** http://timrileylaw.com/LNG_TANKERS.htm

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ACRONYMS

ASIG – Atlantic Sea Island Group

ATBA – Area To Be Avoided

BAU – Business As Usual

Bcf – billion cubic feet

Bcfd – billion cubic feet per day

BHP – BHP Billiton, a primary resources and mining company.

Btu – British thermal unit

CCGTs – Combined Cycle Gas Turbine power plants

CNOOC – China National Offshore Oil Corporation

CO_2 – Carbon dioxide

COZ – Clean Ocean Zone

DOE – Department of Energy

EFH – Essential Fishing Habitat

EIA – Energy Information Administration

EMP – New Jersey's Energy Master Plan

EOG – EOG Resources, Inc., a natural gas producer

EPA – Environmental Protection Agency

FEB – Federal Executive Board

FERC – Federal Energy Regulatory Commission

FSRU – Floating Storage and Regasification Unit

GHG – Greenhouse gasses

LNG – Liquefied Natural Gas

MBtu – one million British thermal units

Mcf – 1000 cubic feet

mg/L – milligram per liter

Mgy – Million gallons per year

MMBtu – million British thermal units

MMcf – 1,000,000 cubic feet, a unit of measure for natural gas

MMS – Minerals Management Service

MMTPA – Million metric tons per annum

MW – Megawatt, one million watts

MWh – Megawatt hour

MWhs – Megawatt hours

NAA – No Anchoring Area

NAAQS – National Ambient Air Quality Standards

NM – Nautical mile. Equal to 1.15 miles or 2,025 yards

NOAA – National Oceanic and Atmospheric Administration

NOx – Nitrogen oxides

NYDOS – New York Department of State

OCS – Outer Continental Shelf

OEP – Office of Energy Projects

OPEC – Organization of the Petroleum Exporting Countries

PFC – PFC Energy, an energy consulting firm

ppm – parts per million

SO_2 – Sulfur dioxide

SOx – Sulfur oxides

Tcf – trillion cubic feet

TNT – Trinitrotoluene, a chemical explosive

USCG – United States Coast Guard

VOCs – Volatile organic compounds

YMS – Yoke Mooring System

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EXECUTIVE SUMMARY

The price of energy has catapulted energy issues to the top of public debate and galvanized the nation. The need to become more energy independent and efficient has become a unifying battle cry. At the same time, the effects of global climate change are apparent, including dramatic swings in weather, sea level rise, and ocean acidification. Consequently, the need to reduce our greenhouse gas (GHG) emissions is also at center stage.

New Jersey (NJ) has already taken steps to address these issues, and has become a national leader in energy conservation, renewable energy, and reducing greenhouse gas emissions. Further, one of Governor Jon Corzine's earliest actions directed New Jersey to develop an Energy Master Plan to, in part, meet goals for renewable energy and emissions reductions by 2020 and beyond. This is an important and critical opportunity to shape NJ's energy future and create tens of thousands of good, high-quality, green jobs in the state. A final plan is expected in the fall of 2008. Similarly, under the leadership of Governor David Paterson, New York has now embarked on its own State Energy Plan and a draft will be available in the Spring of 2009.

Into this volatile, complex, evolving environment a new energy debate is unfolding just off the Jersey Shore where three different companies propose three different projects to import foreign liquefied natural gas (LNG) to the region. What is LNG? Simply put, it is natural gas cooled to minus 260 degrees Fahrenheit, at which point it becomes liquid. In this compressed form, large volumes can be transported, allowing foreign sources to be shipped to the U.S. Indeed, all of these proposals seek to bring LNG from foreign sources. Fortunately for the U.S., and as will be discussed shortly, we don't need it.

First, the Atlantic Sea Island Group, a group of private investors, wants to fill a large area of ocean to attempt to create the world's first open sea island, 19.5 miles east of Sea Bright, New Jersey, and 13 miles south of Long Beach, New York. The island would serve as a home for the LNG port "Safe Harbor Energy." Second, Excalibur (a new conglomerate) seeks to build "Liberty Natural Gas," four turret buoys to receive LNG 15 miles off Asbury Park, New Jersey, using slick and deceptive advertising that LNG will solve the problem of high gasoline prices at the pump. *In fact, LNG is not gasoline.* Finally, Exxon proposes "BlueOcean Energy," an experimental, massive floating storage and regasification unit (FSRU) 20 miles off the Manasquan Inlet, New Jersey.

These facilities beg the question, "Should New Jersey and New York allow offshore Liquefied Natural Gas facilities?" At first glance, it seems intriguing and alluring. Big fat hulking tankers safely offshore, full of compacted natural gas ready when we want it; abundant, reliable, dependable, cheap, and clean. Or is it?

Clean Ocean Action (COA) was curious. As a regional, broad-based coalition of 125 conservation, environmental, fishing, boating, diving, student, surfing, women's, business, service, religious, and community groups with a mission to improve the degraded water quality of the marine waters off the New Jersey/New York coast, it is our

job to evaluate potential ocean threats. These facilities would begin the industrialization of the coast, but perhaps, given the energy needs of the region, LNG may hold interesting opportunities to shift from dirtier forms of energy such as coal. Could the environmental consequences be minor? After all, natural gas has been called a "bridge fuel" to help us transition to energy conservation and green renewable sources of energy.

Thus, COA embarked on a research mission to determine if LNG was a knight in shining armor or a Trojan horse, or maybe something in between. Water Policy Attorney David Byer, and Staff Scientist Heather Saffert, Ph.D., with a host of experts and advisors, carefully researched issues, cross-referenced information, and asked hard questions to uncover the facts about LNG. While not exhaustive, the report, *LNG: An Un-American Energy Source*, is comprehensive. It is well documented and based on sources from government, industry, trade journals, research institutions, non-governmental groups, and news publications.

In short, the research found the following facts.

Thanks to abundant and growing sources, the U.S. is energy independent for natural gas. Importantly, currently 97% of the U.S. need for natural gas is supplied by North American sources with 86% produced by the U.S. Thus, the U.S. is independent for natural gas. Moreover, unlike oil, the U.S. is awash in domestic natural gas, and is the number two producer in the world. The future supplies look rich. In 2003, government sources predicted an abundant U.S. supply of natural gas – enough to last more than 60 years. More recent industry sources that include newly found reserves, including some in Canada, predict supplies lasting 120 years at current consumption rates. While there may be a need to enhance and improve distribution of the domestic sources, many projects are under construction and planned. The report factually describes many of these projects, but COA makes no judgments as to their environmental suitability or merits. However, many of these projects are ongoing and will bring more domestic natural gas sources to the east coast and beyond. To make informed decisions, policy makers need to be aware of the growing domestic supplies and capacity in the region. (Section II)

The growing domestic natural gas reserves can meet all of the growing demand in the U.S. and specifically NJ. As the country continues to grow and natural gas consumption increases, federal sources predict that the rates of use will grow at a slower rate than previously thought. The nation is getting better at energy conservation and efficiency, and NJ is leading the way. The NJ Draft Energy Master Plan predicts that even under the Business-As-Usual scenario (no special efforts to reform energy use), NJ's natural gas consumption levels in 2020 would be only slightly higher than 2006 and below 2004 rates. Under a more proactive approach (the Alternative Scenario), energy conservation and renewables are enhanced and electricity based on natural gas is increased – enough to replace dirty coal and oil facilities. Even with this scenario, NJ consumption of natural gas would fall below 2004 rates with efficiency and conservation savings in other sectors. Some have suggested that NJ's pipeline infrastructure needs improvement. However, NJ has the proven pipeline capacities to meet projected future demands. (Section III)

In the worst-case scenario, should we need LNG, there is already a glut of existing LNG import capacity. Even by 2030, LNG imports are expected to be below 50% of current capacity. The current and under construction U.S. import capacity of LNG, which can supply the east coast, stands at nearly 20 billion cubic feet per day. The most the entire U.S. has ever imported was a little over two billion cubic feet per day—10% of the existing and imminent LNG capacity. With soaring domestic supplies and the high costs of LNG, most ports are twiddling their thumbs waiting for their "ships to come in." In a bizarre twist, with the U.S. market not buying the expensive LNG shipments, two of the newest ports are applying to import just enough LNG to keep the terminal functional and then exporting it when they find a global bidder. This is also a slippery slope toward selling off the U.S.'s own supplies of natural gas. Moreover, the U.S. government estimates that by 2030, the import of LNG at existing and under construction ports will be below 50% of their potential capacity. Clearly, new LNG import facilities are unwarranted and unjustifiable.

However, even with this glut, even more ports are pending along the east coast—beyond the Jersey Shore. This begs the question, "Why would corporations seek to build these terminals?" This is an interesting and reoccurring question. It could be speculation, another proverbial foot-in-the-door, or to enter and corner a market. Whatever the reason, more LNG ports would not be in the public interest and would re-direct limited resources and investments away from green energy. (Section IV)

LNG is foreign and will come primarily from sources in Russia and the Middle East. It is expensive, as much as twice domestic rates, and a global price war is underway, causing prices to soar. As with any commodity, price is largely dependent upon supply and demand. Having abundant domestic sources allows natural gas to be competitively priced here, although these prices have risen over the last few years. However, these prices are still far less compared to the global market for LNG, especially since LNG is often indexed to oil. Markets all over the world that do not have rich domestic sources are vying for LNG and are willing to pay as much as twice as the U.S., and at times even more. Two of the fastest growing markets for LNG are China and India, whose LNG use is exploding. Just for starters, China is building five LNG ports this year, and recently outbid the U.S. and Europe for LNG from Qatar. Most importantly, the loyalty of the supply is to the dollar. The country willing to pay the most gets the gas. The bidding war is constant.

The vast majority, over two-thirds, of natural gas reserves are in Russia and the Middle East. Even if the market price looked reasonable, LNG needs to be shipped over 14,000 miles (five times the width of the U.S.) to get it here, which also increases the price. It is true that one proposal seeks to bring LNG from Trinidad and Tobago, which is closer to the U.S. market. However, the long-term supply there is uncertain and once diminished, would cause suppliers to switch to other major sources, such as Russia and the Middle East.

There are also hidden costs that will be passed onto consumers and taxpayers. For example, the composition of natural gas from foreign sources is commonly different than

domestic sources. Power plants using regasified LNG in New England may need to invest in expensive retrofits to make it compatible with their equipment. Add to these costs the offshore port facilities and ships, which are very expensive. Further, a little known fact is that U.S. taxpayers currently pay the U.S. Coast Guard (USCG) to provide security and patrols for LNG shipments and facilities. Of note, a government report found that the USCG was grossly under budget to meet security demands of LNG shipments and facilities, and this report was before several new ports were added. (Sections V and VI)

LNG is far more polluting than domestic natural gas. LNG can be up to 40% more polluting than domestic natural gas, and has been compared to the burning of coal. The increase is caused by the excessive energy needs that LNG requires during its lifecycle. The process is dirty and requires the cooling of natural gas to negative 259 degrees Fahrenheit, loading it into tanker ships, transporting it thousands of miles (often using ships burning bunker fuel), and then re-heating it to turn LNG back into gas. These polluting steps are in addition to the basic pollution to find, tap, pipe, and burn natural gas supplies. Some argue that the gas used to generate LNG would otherwise be flared off. This is a red-herring issue. In fact, flaring is increasing despite growing LNG exports. Finally, it is important to note that while natural gas is perceived as "clean" and green, it is not. Though it burns cleaner than coal or oil, natural gas is a fossil fuel and has its own significant greenhouse gas footprint, and indeed natural gas is, by far, NJ's largest carbon dioxide source behind gasoline. (Section IX)

The industrialization of the ocean with tankers and facilities would have substantial environmental consequences to the marine environment, threatening our fishing and tourism industries and the economy. The Jersey and South Shore has not always been the treasure that it is today—a source of multibillion-dollar tourism and fishing industries and a thriving ecosystem. Not so long ago, the shore was a national joke with dead and dying dolphins, hundreds of beach closings, medical waste and garbage washing-up on the beaches, as well as having the title of the Ocean Dumping Capitol of the World. We have all worked hard, in a non-partisan effort, to create the improved environment of today, which still requires dedication and steadfast vigilance to continue progress toward a healthy ocean. Indeed, it is why we call the region the Clean Ocean Zone and are working to pass federal legislation to lock in progress and lock out pollution.

The building of an island by an entity that admits no experience in this maritime construction building, or an experimental floating storage-tanker facility brought in by Exxon (a notoriously bad environmental neighbor), or Excalibur's (a new conglomerate formed for this purpose) underwater hoses will each have different, varying degrees of significant and profound effects on the marine environment. However, all of the facilities will cause:

- hundreds of acres of seafloor habitat to be destroyed for infrastructure – including prime fishing grounds;
- death to billions of marine organisms as a result of entrainment and impingement;
- water pollution from wastewater, biocides, nitrogen, and possible spills;

- extensive air pollution, including CO_2 emissions, sulfur dioxide, and nitrogen oxide (particularly bad for marine waters by adding nitrogen);
- death by ship strikes to or harassment of marine mammals and turtles, including threatened and endangered species.

Lest we forget, the mid-Atlantic can often turn turbulent and mean. Nor'easters, tropical storms, and hurricanes are extremely destructive. The impressive waves and winds, during these storms, that we see hit the beach are in fact reduced by near shore shallower waters. Offshore, these waves are giants and can easily destroy infrastructure. Indeed, according the federal records, one rogue wave measured in the area proposed for the island was over 55 feet tall. We need only look to Hurricanes Katrina and Rita, which destroyed or seriously damaged approximately 223 platforms and oil rigs, of which at least 113 platforms were destroyed, and damaged more than 560 pipeline segments in the Gulf of Mexico. Finally, there is the issue of the slippery slope. Where LNG facilities go, other industrial facilities will follow. (Section X)

LNG at Sea--Unsafe and Not Secure. LNG tankers and facilities are security risks and vulnerable to attack. Thus in this regard, it may seem wise to place them offshore. However, as mentioned, the USCG is already spread thin and is unable to adequately police existing facilities. Although large exclusion zones are proposed and will reduce or eliminate public access, these facilities are still vulnerable. These large ocean areas will be challenging to monitor, will be hard to patrol, and are far from aid and support services. Importantly, these LNG facilities are also located at the gateway to the NY/NJ Harbor, the Atlantic coast's premier port and the third largest in the nation. Not to mention the economic importance of the region in finance and commerce industries. Security consultants also raise serious concerns regarding the LNG tanker ships becoming hijacked by unfriendly governments. (Sections VII)

In the end, who will be the boss of NJ's energy future? LNG will shift us from independent to dependent for natural gas—a policy that is antithetical to the national call for Energy Independence—an Un-American Choice. In the 20th century, the U.S. became dependent on foreign oil to drive our cars and heat many of our homes. The consequences are now painfully evident. In stark contrast, today, we are 97% self-reliant with North American sources of natural gas that can be sustained for 60 and perhaps 120 years or more. So, for now, we are the boss of our energy future.

IF New Jersey opens our doors to LNG it will only serve to lock us into another polluting, foreign fossil fuel dependency and addiction—only this time it will be for the energy we need to power our electricity plants, heat our homes, and cook our meals.

IF New Jersey is lured into LNG, other governments, primarily Russia and the Middle East, will control our energy source. These countries are not the friendliest to the U.S., nor are they consistent. The recent aggression by Russia in the county of Georgia is a chilling, alarming, and revealing testament for why the U.S. must maintain energy independence with domestic natural gas while transitioning to a sustainable and clean energy future.

Shifting to a foreign dependency for fossil fuels is not a wise energy policy decision; in fact it is antithetical to the national call for Energy Independence. As today's energy needs prove, been there done that, let's not be fooled again.

In conclusion, while not an easy read, this report is compelling and conclusive, and with over 450 footnotes it is well documented. LNG is not in the public interest; it is only in Big Energy's interest. The answer to the question, "Should New Jersey/New York allow offshore Liquefied Natural Gas facilities?" is clear: No.

Cindy Zipf
Executive Director
Clean Ocean Action
August 2008

I. INTRODUCTION

Liquefied natural gas, or LNG, is a fossil fuel that has been imported to the United States in negligible amounts since the 1970's. However, in recent years, applications for new LNG importation terminals have grown exponentially, catapulting LNG into the national energy policy debate. Yet, LNG still remains relatively unknown.

A. Liquefied Natural Gas 101

LNG is natural gas in liquid form. To achieve this state, natural gas is cooled to minus 259 degrees Fahrenheit (-161 degrees Celsius), at which point it becomes a clear, colorless, odorless liquid. This process compresses natural gas over 600 times from its natural state and allows countries to export it in sea-going vessels and store large volumes. Thus, LNG-producing countries can distribute and sell natural gas to countries and regions that do not have pipeline access to sufficient domestic or foreign natural gas reserves. Today, this includes many countries and LNG has become a highly competitive global commodity subject to bidding wars.

When LNG arrives in a tanker at a port, it is heated back to gaseous state and then transported through pipelines. Thus, LNG is used (after re-gasifying) in the same fashion as domestic natural gas, primarily for heating, industrial uses, and electricity. **LNG is not gasoline, as some LNG companies imply**. This is an essential fact that must not be confused. While both are fossil fuels, gasoline is derived from oil not natural gas.

B. New Jersey/New York Region LNG Ports

The New Jersey and New York region is one of the areas that has seen pervasive growth in applications for proposed LNG ports, both on- and offshore.

In 2003, BP proposed a land-based LNG port in Logan Township, New Jersey. However in 2008, the U.S. Supreme Court put an end to the project as planned by allowing Delaware the right to block the proposal. In addition, in 2004, Shell Oil and TransCanada proposed Broadwater, a floating storage and regasification unit (FSRU), to receive and store LNG in the Long Island Sound. New York Governor Paterson and Connecticut Governor Rell both opposed the project for its environmental impacts, and New York denied a permit necessary for the project, which Broadwater is appealing.

More recently, three new LNG projects are proposed off the beaches of New Jersey and New York. First, the Atlantic Sea Island Group, a group of private investors, seeks to build the world's first open-ocean, man-made island, 13 miles south of Long Beach, Long Island, New York, and 19.5 miles east of Sea Bright, New Jersey. The island would serve as a home for the LNG port "Safe Harbor Energy." Second, Canadian Superior Energy and Global LNG, who combined to create a new conglomerate called Excalibur, seek to build "Liberty Natural Gas," four turret buoys to receive LNG 15 miles off Asbury Park, New Jersey. Finally, Exxon proposes "BlueOcean Energy," a massive floating storage and regasification unit (FSRU) 20 miles off the Manasquan Inlet, New Jersey. For all three projects, extensive new pipelines would be installed in the seafloor for terminals to connect with existing pipelines.

C. The Purpose of "LNG: An Un-American Energy Source"

Clean Ocean Action (COA), is a regional, broad-based coalition of 125 conservation, environmental, fishing, boating, diving, student, surfing, women's, business, service, religious, and community groups with a mission to improve the degraded water quality of the marine waters off the New Jersey/New York coast. Accordingly, COA became concerned about the number of and varied proposals for LNG terminals in the ocean off New Jersey/New York. While COA has opposed the creation of islands and destruction of habitats, COA was unfamiliar with the potential for and environmental consequences of LNG as a fuel and industry. Thus, COA began working on *LNG: An Un-American Energy Source*, which evaluates LNG and reveals many untold facts, issues, and concerns.

This report outlines issues related to the supply, demand, existing importation capacity, and various costs of LNG as a foreign fossil fuel, and presents the associated security, access, environmental, and marine life impacts and risks of building offshore LNG ports in the New Jersey/New York region. This report provides information to guide anticipated and key energy policy choices to be made by federal and state officials in the region and beyond. COA primarily evaluated energy issues for New Jersey as the State has already released a Draft Energy Master Plan, setting forth an energy future for the State. New York recently began the process for a State Energy Plan, but a draft is not expected until March 31, 2009.

D. Green Energy, Green Jobs, Real Solutions

While this report is ultimately a denunciation of LNG, it is not a presentation of COA's alternatives for a sound energy future for the region. Such a discussion is beyond the scope of this paper and is addressed elsewhere by COA.[1] COA supports an energy plan that is based on green energy and green jobs, which first and foremost promotes energy conservation and efficiency measures, as well as renewables. In addition to improving the environmental and economic quality of New Jersey, a plan focused on green energy provides thousands of local, long-term, high quality jobs that will sustain thousands of families. As stated by New Jersey Governor Jon Corzine, "[i]nstead of building more fossil fuel-burning power plants and expensive new transmission lines to meet increasing demand, we should apply those resources to energy efficiency and renewable energy – like solar power and wind energy.… We should be creating jobs in Newark, in Trenton, and throughout New Jersey – not lining the pockets of oil sheiks in Dubai and Riyadh."[2] Under New Jersey's Draft Energy Master Plan, it is projected that 6,026 permanent jobs will be created from 2010 to 2020 from energy efficiency audits and installations.[3] The plan that COA calls for seeks even more energy conservation and efficiency measures and thus more jobs.

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[1] To review COA's plan, go to http://www.cleanoceanaction.org/index.php?id=662 and click on the link for COA's comments on New Jersey's Draft Energy Master Plan.

[2] Jon Corzine, Speech on the Environment (Oct. 7, 2005) (transcript on file with author).

[3] 1,254 annual jobs would be created from energy efficiency audits and 4,772 annual jobs would be created from energy efficiency installations. Modeling Report for the Draft Energy Master Plan, Rutgers, Edward J. Bloustein School of Planning and Public Policy, Apr. 17, 2008, p. 59, Table: Energy Efficiency and Renewables Jobs Assumptions.

Nor is this paper an endorsement of the alternatives to LNG that are discussed within the paper. For example, while COA discusses the abundant U.S. natural gas reserves, the discussion is not an endorsement of those ventures. The information is provided so that decisions on natural gas needs and distribution are made with a full understanding of competing projects, some of which are already in development.

Instead, this report sheds light on many of the numerous areas of LNG. Energy policy decisions must not be made in a vacuum. Thus, this report looks at the greater implications of accepting LNG in the region and the alarming energy future it will create.

II. NORTH AMERICAN NATURAL GAS RESOURCES ARE ABUNDANT AND PROVEN RESERVES CONTINUE TO GROW.

> *It is perhaps a little known fact that 97% of U.S. natural gas consumption is supplied by North American sources,[4] with the U.S. producing 86% of its own needs.[5]*

A. Domestic Natural Gas Supply is Abundant

"Americans are used to hearing that their energy supplies are dwindling. But new discoveries of huge new natural gas fields in the United States and Canada could change that, cutting foreign imports and boosting production."[6] According to our own Department of Energy (DOE), "natural gas production in North America is projected to gradually increase"[7] and "[a]t current rates of consumption, the Nation has at least 60 years worth of natural gas supplies that are recoverable with current technology. Moreover, as our knowledge of resource characteristics

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[4] In 2006, the U.S. consumed 21,653,086 mcf of natural gas. Natural Gas Consumption by End Use (Annual), Natural Gas Navigator, Energy Information Administration, U.S. Department of Energy, at http://tonto.eia.doe.gov/dnav/ng/ng_cons_sum_dcu_nus_a.htm (last visited Aug. 21, 2008). In the same year, the U.S. imported 583,537 mcf of LNG. U.S. Natural Gas Imports by Country (Annual), Natural Gas Navigator, Energy Information Administration, U.S. Department of Energy, at http://tonto.eia.doe.gov/dnav/ng/ng_move_impc_s1_a.htm (last visited July 1, 2008). 583,537/21,653,086 x 100 = 2.69%. In 2007, the U.S. consumed 23,056,814 mfc of natural gas. Natural Gas Consumption by End Use (Annual), Natural Gas Navigator, Energy Information Administration, U.S. Department of Energy, at http://tonto.eia.doe.gov/dnav/ng/ng_cons_sum_dcu_nus_a.htm (last visited July 1, 2008). In the same year, the U.S. imported 770,812 mcf of LNG. U.S. Natural Gas Imports by Country (Annual), Natural Gas Navigator, Energy Information Administration, U.S. Department of Energy, at http://tonto.eia.doe.gov/dnav/ng/ng_move_impc_s1_a.htm (last visited July 1, 2008). 770,812/23,056,814 x 100 = 3.34%. LNG imports are currently down from 2006 and 2007 rates. U.S. Liquefied Natural Gas Imports (MMcf) (Monthly), Natural Gas Navigator, Energy Information Administration, U.S. Department of Energy, at http://tonto.eia.doe.gov/dnav/ng/hist/n9103us2m.htm (last visited July 1, 2008).

[5] In 2006, the U.S. consumed 21.66 tcf of natural gas and produced 18.57 tcf. Annual Energy Outlook 2008, Energy Information Administration, DOE/EIA-0383(2008), June 2008, p. 13. 18.57/21.66 x 100 = 86%.

[6] Steve Hargreaves, *Abundant clean energy in your backyard*, CNNMoney.com, Apr. 18, 2008, at http://money.cnn.com/2008/04/17/news/economy/natural_gas/index.htm?section=money_mostpopular (last visited Aug. 6, 2008).

[7] Department of Energy, Oil & Natural Gas Supply & Delivery, Liquefied Natural Gas, at http://www.fossil.energy.gov/programs/oilgas/storage/index.html (last visited Aug. 6, 2008).

and the potential of new technology increases, estimates of the size of the resource base grow."[8] In fact, in 2006 U.S. proven reserves were 27% higher than they were in 1996,[9] despite ten years of high levels of consumption reducing finite supplies. Now, "[a]s major oil companies search for more oil to meet growing demand, U.S. natural-gas companies face the opposite problem: what to do with all the gas they soon will be producing."[10]

As discussed in the Introduction, Clean Ocean Action advocates an agenda focused on increasing green energy and green jobs and reducing the use of all fossil fuels. Therefore, the following discussion of new supplies, such as shale, and pipeline projects, such as expansions, is not an endorsement of those ventures. Rather, the information is provided so that decisions on natural gas needs and distribution are made with a full understanding of competing projects, some of which are already in development.

B. Untraditional New Sources Are Boosting Supplies

The DOE's 60-year projection of domestic natural gas production was made in 2003. Since then, accessing unconventional natural gas has become economical and just "[o]ver the last few months, big gas discoveries have been announced in the Northeast, Louisiana, and British Columbia. Together, they could boost natural gas reserves in the United States and Canada by up to 10%."[11] "Output from the three new finds could boost production by six billion cubic feet a day over the next three to five years, according to Christopher Ruppel, an energy analyst at Execution LLC, a broker and research firm for institutional investors like hedge and mutual funds. That's about 9% more than the current U.S. output."[12] The DOE's Energy Information Administration (EIA) estimates that "[l]ower-48 production of unconventional natural gas, particularly gas from shale, is expected to be a key contributor to growth in U.S. natural gas supplies, increasing from 8.5 trillion cubic feet in 2006 to 9.5 trillion cubic feet in 2030."[13] "Together, U.S. shale plays could hold as much as 840 trillion cubic feet of gas by one industry estimate – the equivalent of more than 140 billion barrels of oil, more than half the proven reserves of Saudi Arabia."[14] Shale by itself is a resource "that could last decades."[15]

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[8] Natural Gas Fundamentals from Resource to Market, DOE/FE-0457, U.S. Department of Energy, Office of Fossil Energy, June 2003, p. 4.

[9] U.S. Dry Natural Gas Proved Reserves (Billion Cubic Feet), Natural Gas Navigator, Energy Information Administration, U.S. Department of Energy, at http://tonto.eia.doe.gov/dnav/ng/hist/rngr11nus_1a.htm (last visited June 30, 2008). Proven reserves were 211,085 bcf in 2006 and 166,474 in 1996.

[10] Ben Casselman, *Natural-Gas Firms Seek Outlet for Growing Supplies*, The Wall Street Journal, Aug. 11, 2008, p. A4.

[11] Steve Hargreaves, *Abundant clean energy in your backyard*, CNNMoney.com, Apr. 18, 2008, at http://money.cnn.com/2008/04/17/news/economy/natural_gas/index.htm?section=money_mostpopular (last visited Aug. 6, 2008).

[12] Steve Hargreaves, *Abundant clean energy in your backyard*, CNNMoney.com, Apr. 18, 2008, at http://money.cnn.com/2008/04/17/news/economy/natural_gas/index.htm?section=money_mostpopular (last visited Aug. 6, 2008).

[13] Statement of Guy Caruso, Administrator, Energy Information Administration, U.S. Department of Energy, before the Committee on Energy and Natural Resources, U.S. Senate, Mar. 4, 2008, at http://energy.senate.gov/public/index.cfm?FuseAction=Hearings.Testimony&Hearing_ID=5b36f179-e51f-ac22-e7f2-6930233ef767&Witness_ID=d72b1a96-fddb-4581-9d65-1a9206b63ac1 (last visited Aug. 6, 2008).

[14] Ben Casselman, *Natural-Gas Firms Seek Outlet for Growing Supplies*, The Wall Street Journal, Aug. 11, 2008, p. A4.

One particularly important find is the Marcellus shale, which "is especially valuable because it's in the Northeast, where a pipeline bottleneck has constrained supplies and nudged up natural gas prices."[16] "Penn State geologists estimate the Marcellus contains at least 100 trillion cubic feet of gas in a 53,000-square-mile area, about four times the Barnett basin's and enough to supply the USA for about five years."[17] "One estimate from Fredonia State College for the Marcellus Shale [in the Northeast U.S.] field put the number at 500 trillion cubic feet - more than twice the country's current proven reserves."[18]

"Natural gas producers such as EOG, Devon and Chesapeake predict a range of peak production (occurring around 2012) from the Barnett, Fayetteville, Haynesville, and Marcellus shales, just four shales currently under exploration, between 27-39 Bcf [billion cubic feet] per day. The EIA predicts the total for onshore domestic unconventional gas production for this time period to be approximately 26.3 Bcf per day."[19] For reference, in 2006, New Jersey consumed 1.50 bcfd (billion cubic feet per day) of natural gas, including use for heating and electricity.[20]

C. Recent Projections Confirm Long Term Supply

Growing and lower priced domestic supplies are disproving the claims that more LNG terminals are necessary. "US producers delivered more gas in 2007 than in any year since 2001 and the second-highest volume since 1989. Judging by Energy Information Administration (EIA) figures for the first quarter that show an average year-on-year gain of over 3 billion cubic feet per day, producers are on track to top that by as much as 6**%** in 2008 -- much more than the 2.9% the EIA itself is forecasting. This, even more than a shortage of global supply, may pose the biggest threat to the viability of new LNG receiving capacity coming on line along the US Gulf and East Coasts."[21] The industry itself has stated that "[n]ow the pendulum may be swinging back toward ample supply."[22]

Some in the natural gas industry put the technically recoverable gas resource base of North America at "2,705 Tcf [trillion cubic feet] – more than 120 years of supply. And that estimate was just increased by 16.6% in the last 2 years for the U.S., with most of the increase being

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[15] Ben Casselman, *Natural-Gas Firms Seek Outlet for Growing Supplies*, The Wall Street Journal, Aug. 11, 2008, p. A4.
[16] Paul Davidson, *Landowners get windfalls from natural gas drilling*, USA Today, May 20, 2008, at http://www.usatoday.com/money/industries/energy/2008-05-20-natural-gas_N.htm.
[17] Paul Davidson, *Landowners get windfalls from natural gas drilling*, USA Today, May 20, 2008, at http://www.usatoday.com/money/industries/energy/2008-05-20-natural-gas_N.htm.
[18] Steve Hargreaves, *Abundant clean energy in your backyard*, CNNMoney.com, Apr. 18, 2008, at http://money.cnn.com/2008/04/17/news/economy/natural_gas/index.htm?section=money_mostpopular.
[19] Robust U.S. Natural Gas Production, Supply and Storage, All About Natural Gas, The American Clean Skies Foundation, http://www.cleanskies.org/.
[20] New Jersey Natural Gas Total Consumption (MMcf), Natural Gas Navigator, Energy Information Administration, U.S. Department of Energy, at http://tonto.eia.doe.gov/dnav/ng/ng_cons_sum_a_EPG0_VC0_mmcf_a.htm (last visited July 21, 2008). In 2006, New Jersey consumed 547.91 billion cubic feet (bcf). 547.91/365 = 1.50 bcfd.
[21] Barbara Shook, *Unconventional US Gas Offsets Lower Canadian, LNG Imports*, World Gas Intelligence, Energy Intelligence Group, Inc., Apr. 9, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=227860.
[22] Barbara Shook, *Unconventional US Gas Offsets Lower Canadian, LNG Imports*, World Gas Intelligence, Energy Intelligence Group, Inc., Apr. 9, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=227860.

found onshore in the Mid-Continent of the U.S."[23] These projections should be given credit, as government estimates (which are already high), have proven conservative. "In 1978, the government estimated that we had 208 trillion cubic feet of natural gas reserves. In 2007 the government now predicts we have over 211 trillion cubic feet of proven natural gas reserves. Over that 30 year period, U.S. industry has produced at least 540 trillion cubic feet."[24] Thus, the U.S. produced more than two and a half times what was thought to exist, and there is still more remaining reserves than originally predicted in 1978.

D. U.S. Production is Second Largest in the World

Production is not lagging either. The U.S. was the second largest producer of natural gas in the world in 2006 at 18.51 tcf (or 50.71 bcfd), accounting for 18.5% of the world's production.[25] According to the Administrator of the EIA, the U.S. will produce more natural gas in 2030 than in 2006. "Total domestic natural gas production, including supplemental natural gas supplies, increases from 18.6 trillion cubic feet in 2006 to 20.1 trillion cubic feet in 2022 before declining to 19.6 trillion cubic feet in 2030."[26]

In fact, increases in U.S. production will outpace increases in U.S. demand, resulting in net imports declining by 8% between 2006 and 2030.[27] It should be noted that over the same period, the EIA does project an increase in LNG imports as it expects declines in pipeline imports from Canada. However, as discussed later, the EIA finds that existing and under construction LNG capacity is currently sufficient to handle this increase.

E. Pipeline Expansions Increase Supply and Redundancy

While the supply is plentiful, the problem that has contributed to recent higher gas prices in the Northeast is the bottlenecking of the pipelines. "US domestic pipeline gas supply is growing faster than the infrastructure can keep up."[28] But, as the proven reserves grow, eventually the pipelines do as well. "Barnett and other shale plays have already generated the construction of hundreds of miles of new pipelines."[29] "Last year, a record 14.5 billion cubic feet of pipeline

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[23] Robust U.S. Natural Gas Production, Supply and Storage, All About Natural Gas, http://www.cleanskies.org/ (last visited Aug 5., 2008).
[24] Robust U.S. Natural Gas Production, Supply and Storage, All About Natural Gas, http://www.cleanskies.org/ (last visited Aug. 5, 2008).
[25] BP Statistical Review of World Energy 2007, p. 24. In 2006, the U.S. produced 18.51 tcf. 18,510/365 = 50.71.
[26] Statement of Guy Caruso, Administrator, Energy Information Administration, U.S. Department of Energy, before the Committee on Energy and Natural Resources, U.S. Senate, Mar. 4, 2008, at http://energy.senate.gov/public/index.cfm?FuseAction=Hearings.Testimony&Hearing_ID=5b36f179-e51f-ac22-e7f2-6930233ef767&Witness_ID=d72b1a96-fddb-4581-9d65-1a9206b63ac1 (last visited Aug. 6, 2008).
[27] Annual Energy Outlook 2008, Energy Information Administration, DOE/EIA-0383(2008), June 2008, p. 13. Natural gas net imports were 3.46 tcf (9.48 bcfd) in 2006 and are expected to be 3.18 tcf (8.71 bcfd) in 2030.
[28] Barbara Shook, *Unconventional US Gas Offsets Lower Canadian, LNG Imports*, World Gas Intelligence, Energy Intelligence Group, Inc., Apr. 9, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=227860 (last visited Apr. 9, 2008).
[29] Barbara Shook, *Unconventional US Gas Offsets Lower Canadian, LNG Imports*, World Gas Intelligence, Energy Intelligence Group, Inc., Apr. 9, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=227860 (last visited Apr. 9, 2008).

capacity was added in the USA, the EIA says. Much of it transports gas from Texas to a Louisiana hub where it's dispersed to the Southeast, Northeast and Midwest."[30]

1. Rockies Express

One of the biggest pipeline projects is the Rockies Express pipeline ("Rex"), which is "aimed at taking near-overflowing gas supplies in the Rockies directly to high-demand Northeast markets. Initially, Rex had proposed a 375-mile connector from Rex East's terminus in Clarington, Ohio, to Princeton, New Jersey."[31] But the project keeps growing, with a plan to "add 40 more miles, with an extension to Linden, New Jersey."[32] Rex is "the largest pipeline project in the continental USA in the past 25 years."[33] It "ultimately will deliver 2 Bcf/d of gas into the mid-Atlantic states. Completion is slated for late 2009."[34] Capacity for expansions further into the Northeast is 1.2 bcfd with a start-up date scheduled for 2011.[35] However, portions have already been completed and are "delivering that natural gas to the Midwest, where it can free up supplies currently used there for transport to the Northeast."[36]

Even more gas from the Rockies may come to the East Coast from another proposed pipeline, the Rockies Alliance Pipeline (Rap), at a rate of 1.6 bcfd to 2.0 bcfd.[37]

2. Alaska

Rejecting requests for increased LNG exports, the State of Alaska is also looking to deliver gas to the lower-48 states.[38] Alaska is currently working with TransCanada to plan a natural gas pipeline that would bring 4.5 bcfd to the lower-48 states with an expansion capability of 5.9 bcfd.[39] BP and ConocoPhillips have announced an alternative 4.0 bcfd pipeline themselves,[40]

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[30] Paul Davidson, *Landowners get windfalls from natural gas drilling*, USA TODAY, May 20, 2008, at http://www.usatoday.com/money/industries/energy/2008-05-20-natural-gas_N.htm (last visited Aug. 6, 2008).
[31] Lauren O'Neil, *Rex Kicks Tires on Extension to New York Citygate at Linden, NJ*, Energy Intelligence Group, Inc., Feb. 4, 2008, http://www.energyintel.com/DocumentDetail.asp?document_id=222482 (last visited Aug. 6, 2008).
[32] Lauren O'Neil, *Rex Kicks Tires on Extension to New York Citygate at Linden, NJ*, Energy Intelligence Group, Inc., Feb. 4, 2008, http://www.energyintel.com/DocumentDetail.asp?document_id=222482 (last visited Aug. 6, 2008).
[33] Paul Davidson, *Landowners get windfalls from natural gas drilling*, USA TODAY, May 20, 2008, at http://www.usatoday.com/money/industries/energy/2008-05-20-natural-gas_N.htm (last visited Aug. 6, 2008).
[34] Barbara Shook, *Unconventional US Gas Offsets Lower Canadian, LNG Imports*, World Gas Intelligence, Energy Intelligence Group, Inc., Apr. 9, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=227860 (last visited Apr. 9, 2008).
[35] John A. Sullivan and Jeff Gosmano, *Rising Rockies Output Creating Flurry of Gas Pipeline Proposals*, Natural Gas Week, Energy Intelligence Group, Inc., Mar. 17, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=226077 (last visited Aug. 6, 2008).
[36] Kevin Post, *Natural gas again cheapest for heat*, The Press of Atlantic City, Dec. 27, 2007.
[37] Barbara Shook, *Questar CEO: Rockies Will Face Pipe Constraints Again by 2010*, Natural Gas Week, Energy Intelligence Group, Inc., Apr. 14, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=228226 (last visited Aug. 6, 2008).
[38] Press Release, *Palin Recommends TransCanada for AGIA*, Governor's Office, State of Alaska, May 22, 2008, at http://www.gov.state.ak.us/news.php?id=1173 (last visited June 30, 2008).
[39] Press Release, *Palin Recommends TransCanada for AGIA*, Governor's Office, State of Alaska, May 22, 2008, at http://www.gov.state.ak.us/news.php?id=1173 (last visited June 30, 2008).
[40] Robert Dillon, *BP, Conoco Alaska Gas Pipeline Proposal Hailed as Huge Advance*, Natural Gas Week, Energy Intelligence Group, Inc., Apr. 14, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=228217 (last visited Aug. 6, 2008).

with a projected gas flow date of 2018.[41] It is estimated that the North Slope of Alaska holds 35 trillion cubic feet in proven gas reserves and may yield as much as 200 Tcf of gas.[42] However, some predict all the new finds in Canada and the lower-48 states will preclude the need for an Alaskan pipeline.[43]

3. Canadian LNG

New pipelines are also being built to bring natural gas to the Northeast from **existing** LNG terminals, and those under construction. The Brunswick Pipeline, to be operating by early November 2008, "will deliver natural gas from the Canaport LNG facility near Saint John to markets in Canada and the U.S. Northeast."[44] Pipeline and LNG projects north of New Jersey are "freeing supplies there to cascade down the coast to New Jersey."[45]

4. Transco

The Transcontinental Gas Pipeline (Transco) recently filed applications to connect to two existing LNG terminals: the Cheniere Pass LNG terminal in Louisiana[46] and the Golden Pass LNG terminal in Texas.[47] The former will allow Transco to receive up to 0.60 bcfd[48] and the latter 1.683 bcfd.[49] Transco is also working on expansion projects in the Northeast, in order to have the capability to transport these new sources and other extra gas into the region. This includes the Sentinel Expansion project in eastern Pennsylvania and northern New Jersey.[50]

5. Other Expansions

Other pipeline expansion projects include the Iroquois and Algonquin pipelines and the new Millennium Pipeline. The Iroquois is seeking to add 0.30 bcfd capacity to Long Island, New York.[51] The Algonquin pipeline "proposes to modify portions of its existing pipeline system in Massachusetts, Rhode Island, Connecticut, New York, and New Jersey," increasing its capacity by 0.72 bcfd.[52] "This additional capacity would enable Algonquin to accommodate increased receipts of natural gas from emerging natural gas supplies, including liquefied natural gas (LNG) terminals located offshore at the east end of the Algonquin system, for redelivery to high growth markets in the Northeast Region."[53] The Algonquin pipeline is connected at the east end to the

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[41] *Producers Push Alaska Pipeline Plan*, World Gas Intelligence, Energy Intelligence Group, Inc., Apr. 16, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=228361 (last visited Aug. 6, 2008).
[42] *Producers Push Alaska Pipeline Plan*, World Gas Intelligence, Energy Intelligence Group, Inc., Apr. 16, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=228361 (last visited Aug. 6, 2008).
[43] Shaun Polczer, Shale discoveries lead natural gas revival, Calgary Herald, June 17, 2008, at http://www.canada.com/calgaryherald/news/calgarybusiness/story.html?id=dac22cbb-36a5-4d71-98a1-e5e1f8283ead (last visited Aug. 6, 2008).
[44] Mark Taylor, *Pipeline will be finished on time, Brunswick vows*, The Chronicle Herald, June 8, 2008, at http://thechronicleherald.ca/Business/1060869.html (last visited June 8, 2008).
[45] Kevin Post, *Natural gas again cheapest for heat*, The Press of Atlantic City, Dec. 27, 2007.
[46] 73 Fed. Reg. 28452 (May 16, 2008).
[47] 73 Fed. Reg. 36317 (June 26, 2008).
[48] 73 Fed. Reg. 28452 (May 16, 2008).
[49] 73 Fed. Reg. 36317 (June 26, 2008).
[50] 72 Fed. Reg. 73342 (Dec. 27, 2007).
[51] Steve Higgins, *Broadwater Decision Day Looms*, Business New Haven, Mar. 17, 2008, at http://search.blossom.com/geturl?&o=0p&i384&KEY=broadwater&URL=http://www.conntact.com/article_page.lasso?id=41802 (last visited Aug. 6, 2008).
[52] 73 Fed. Reg. 21337 (Apr. 21, 2008).
[53] 73 Fed. Reg. 21338 (Apr. 21, 2008).

Everett LNG terminal in Massachusetts[54] and the Northeast Gateway offshore Boston.[55] The Millennium Pipeline, whose motto is "bringing new energy to New York, New England and New Jersey," is expected to begin delivering 0.50 bcfd[56] by November 2008.[57]

6. Increased Pipeline Pressure Under Consideration

Discussion has also begun on whether U.S. natural gas pipelines should be operated at a higher pressure.[58] Canada operates at 80% pressure and the U.S. operates at 72%.[59] "[T]he 8% difference between the pressure in the Canadian lines and the US systems means extra capacity and that means extra revenue."[60] It also "lowers green house gas emissions and the cost of transporting natural gas."[61]

F. U.S. Abundant Supply Tempting Increased Exportation of Domestic Natural Gas

In sum, the natural gas supply in the U.S. is abundant. In fact, the U.S. has so much supply, that it exports natural gas both through pipelines to Canada and Mexico, as well as in the form of LNG to countries like Japan.[62] "Since 1969 the [Kenai, Alaska] terminal has exported an average of approximately 34 LNG shipments each year."[63]

Further, Chesapeake Energy Chief Executive Aubrey McClendon announced in early 2008 that "the U.S. would benefit from building a liquefaction plant to liquefy and export natural gas to supply the world's increasing thirst for LNG, rather than another import terminal."[64] While not a household name, Chesapeake Energy is the "second-largest independent producer and third-

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[54] Statoil voices concern over pipeline nitrogen level, Energy Current, Sept. 26, 2007, at http://www.energycurrent.com/index.php?id=3&storyid=5538 (last visited Aug. 5, 2008).
[55] Northeast Gateway Deepwater Port, Excelerate Energy, at http://www.excelerateenergy.com/northeast.html (last visited Aug. 5, 2008); Press Release, Excelerate Energy delivers first LNG cargo to Northeast Gateway Deepwater Port, Excelerate Energy, May 20, 2008, at http://www.excelerateenergy.com/2008/05/excelerate-energy-delivers-first-lng.html (last visited Aug. 5, 2008).
[56] Millennium projects 525,000 dekatherms per day. Project Overview, Millennium Pipeline Company, LLC, at http://www.millenniumpipeline.com/news_05_27_08.htm (last visited June 30, 2008).
[57] Press Release, *Millennium Pipeline Launches 2008 Construction*, Millennium Pipeline Company, LLC, May 27, 2008, at http://www.millenniumpipeline.com/news_05_27_08.htm (last visited June 30, 2008).
[58] John Sullivan, *Asking 'Why' Yields Benefit in Increasing US Pipeline Efficiency*, Natural Gas Week, Energy Intelligence Group, Inc., Feb. 11, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=222643 (last visited Aug. 6, 2008).
[59] John Sullivan, *Asking 'Why' Yields Benefit in Increasing US Pipeline Efficiency*, Natural Gas Week, Energy Intelligence Group, Inc., Feb. 11, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=222643 (last visited Aug. 6, 2008).
[60] John Sullivan, *Asking 'Why' Yields Benefit in Increasing US Pipeline Efficiency*, Natural Gas Week, Energy Intelligence Group, Inc., Feb. 11, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=222643 (last visited Aug. 6, 2008).
[61] John Sullivan, *Asking 'Why' Yields Benefit in Increasing US Pipeline Efficiency*, Natural Gas Week, Energy Intelligence Group, Inc., Feb. 11, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=222643 (last visited Aug. 6, 2008).
[62] U.S. Natural Gas Exports by Country, Natural Gas Navigator, Energy Information Administration, U.S. Department of Energy, at http://tonto.eia.doe.gov/dnav/ng/ng_move_expc_s1_m.htm (last visited Aug. 5, 2008).
[63] CRS Report for Congress, *Liquefied Natural Gas (LNG) Infrastructure Security: Background and Issues for Congress*, Congressional Research Service, The Library of Congress, Order Code RL 32073, Sep. 9, 2003, p. CR-5.
[64] *US Terminal Sector Goes Into Overdrive*, World Gas Intelligence, Energy Intelligence Group, Inc., Mar. 5, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=225306 (last visited Aug. 6, 2008).

largest overall producer of natural gas in the United States"[65] and the number one natural gas driller in the U.S. with more drilling at U.S. rigs than Exxon, BP, ConocoPhillips, Chevron, and Shell combined.[66] McClendon continues to advocate exporting U.S. natural gas, including at an August 5, 2008 company earnings conference call. "Noting that natural gas was selling in Europe for roughly double its U.S. price, he said that 'we're trying to get it on a boat and get it to some overseas markets.'"[67]

Even LNG importation facilities are looking to get into the business of LNG exportation. The new Freeport LNG terminal in Texas just received FERC's permission to commence service on July 1, 2008,[68] and then, on August 1, 2008, filed an application for permission "to export previously imported LNG volumes from the United States to the following international destinations: United Kingdom, Belgium, Spain, Japan, South Korea, India, China, Taiwan, France and Italy."[69] Despite the fact that "the capacity in Freeport LNG's facilities is fully subscribed by third-party customers, increasing world-wide demand for LNG, and relatively low market prices in the United States, has resulted in slower than anticipated LNG deliveries to the United States. Freeport LNG anticipates that, so long as such global market conditions persist, supply to the terminal will be in direct competition with global LNG markets."[70] Admittedly, the Freeport terminal could not compete with the "exceptionally large increase" in domestic natural gas supplies.[71]

Fourteen days later, on August 15, 2008, the brand new Sabine Pass LNG terminal in Louisiana filed a similar application to export previously imported LNG, in this case to "the United Kingdom, France, Portugal, Spain, Belgium, Turkey, Italy, Brazil, Argentina, Mexico, Japan, Korea, Taiwan, China, India, Dominican Republic, and Chile" and potentially Puerto Rico.[72] Sabine Pass LNG received its first commissioning cargo ("a test batch") on April 11, 2008,[73] yet it is still "currently being commissioned and will be placed in commercial operation in the near term."[74] Thus, Sabine Pass LNG has not even opened its doors for business, yet the company is already seeking to change its business plans. Inexplicably however, Sabine Pass LNG continues

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[65] Welcome to Chesapeake Energy, Chesapeake Energy, at http://www.chk.com/ (last visited Aug. 18, 2008).
[66] Natural Gas – America's Clean, Abundant, Affordable Energy Solution, American Clean Skies Foundation, July 30, 2008, p. 2-3, at http://www.chk.com/Websites/1/Files/AKM_testimony.pdf (last visited Aug. 18, 2008).
[67] Jim Fuquay, *Natural gas surge fuels worries about glut*, Star-Telegram.com, Aug. 18, 2008, at http://www.star-telegram.com/804/story/840294.html (last visited Aug. 18, 2008).
[68] Application for Blanket Authorization to Export Liquefied Natural Gas on a Short-Term Basis, In the Matter of Freeport LNG Development, Docket No. 08-70-LNG (Department of Energy, Office of Fossil Energy), p. 2.
[69] Application for Blanket Authorization to Export Liquefied Natural Gas on a Short-Term Basis, In the Matter of Freeport LNG Development, Docket No. 08-70-LNG (Department of Energy, Office of Fossil Energy), p. 1.
[70] Application for Blanket Authorization to Export Liquefied Natural Gas on a Short-Term Basis, In the Matter of Freeport LNG Development, Docket No. 08-70-LNG (Department of Energy, Office of Fossil Energy), p. 4.
[71] Application for Blanket Authorization to Export Liquefied Natural Gas on a Short-Term Basis, In the Matter of Freeport LNG Development, Docket No. 08-70-LNG (Department of Energy, Office of Fossil Energy), p. 4.
[72] Application for Blanket Authorization to Export Imported Liquefied Natural Gas, In the Matter of Cheniere Marketing, Inc., Docket No. 08-77-LNG (Department of Energy, Office of Fossil Energy), p. 1.
[73] Ford Gunter, *Cheniere opens Sabine Pass LNG terminal*, Houston Business Journal, April 21, 2008, at http://houston.bizjournals.com/houston/stories/2008/04/21/daily12.html?jst=b_ln_hl (last visited Aug. 22, 2008).
[74] Application for Blanket Authorization to Export Imported Liquefied Natural Gas, In the Matter of Cheniere Marketing, Inc., Docket No. 08-77-LNG (Department of Energy, Office of Fossil Energy), p. 4.

to expand its facility, planning to add an additional 1.40 bcfd of capacity by the second quarter of 2009.[75]

Sabine Pass LNG plans for importation were challenged in part by new finds: "[i]n the absence of such [new U.S. shale] discoveries, natural gas prices in the U.S. likely would have increased to the level of world LNG prices in order to attract foreign-sourced supplies."[76] Like Freeport LNG, Sabine Pass LNG claims that it only wants to export LNG until "U.S. market prices…rise to a point where domestic sale of the LNG held in storage was economic."[77] Thus, they admit that LNG will not lower prices by increasing supply. Moreover, they demand that U.S. citizens agree to pay more for energy before these facilities will import the LNG.

While the two facilities currently only seek to export previously imported LNG, Steve Johnson, president of Houston-based consulting firm Waterborne Energy, reportedly said "it could be a step toward installing equipment to liquefy domestically produced natural gas for export" since "[t]here's a large volume of natural gas production coming on line throughout the country," including in "New York, Ohio and Pennsylvania."[78] Indeed, in Sabine Pass LNG's application, they note that LNG importations don't make sense because of "the new shale formation discoveries here in the U.S., such as the Barnett Shale in Texas, the Fayetteville and Woodford Shales in Arkansas and Oklahoma and the Haynesville Shale in Louisiana."[79] Again, Freeport LNG is in Texas and Sabine Pass LNG is in Louisiana where some of these large domestic finds reside, which makes exporting domestic natural gas more tempting.

III. THESE GROWING DOMESTIC NATURAL GAS RESERVES CAN MEET ALL OF THE GROWING DEMAND IN THE U.S. AND SPECIFICALLY NEW JERSEY.

New Jersey Will Consume Less Natural Gas in 2020 than in 2004.

A. U.S. Natural Gas Demand is Steady

In 1972, the U.S. consumed 22.10 tcf (60.55 bcfd) of natural gas.[80] In 2007, the U.S. consumed 23.06 tcf (63.18 bcfd).[81] Thus, in the last 36 years, U.S. consumption of natural gas has only increased 4%.

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[75] Application for Blanket Authorization to Export Imported Liquefied Natural Gas, In the Matter of Cheniere Marketing, Inc., Docket No. 08-77-LNG (Department of Energy, Office of Fossil Energy), p. 4.
[76] Application for Blanket Authorization to Export Imported Liquefied Natural Gas, In the Matter of Cheniere Marketing, Inc., Docket No. 08-77-LNG (Department of Energy, Office of Fossil Energy), p. 6.
[77] Application for Blanket Authorization to Export Imported Liquefied Natural Gas, In the Matter of Cheniere Marketing, Inc., Docket No. 08-77-LNG (Department of Energy, Office of Fossil Energy), p. 5.
[78] Tom Fowler, *Only stopping in for a while*, Houston Chronicle, Aug. 20, 2008 at http://www.chron.com/disp/story.mpl/headline/biz/5956709.html (last visited Aug. 21, 2008).
[79] Application for Blanket Authorization to Export Imported Liquefied Natural Gas, In the Matter of Cheniere Marketing, Inc., Docket No. 08-77-LNG (Department of Energy, Office of Fossil Energy), p. 6.
[80] U.S. Natural Gas Total Consumption (MMcf), Natural Gas Navigator, Energy Information Administration, at http://tonto.eia.doe.gov:80/dnav/ng/hist/n9140us2A.htm (last visited Aug. 6, 2008).
[81] U.S. Natural Gas Total Consumption (MMcf), Natural Gas Navigator, Energy Information Administration, at http://tonto.eia.doe.gov:80/dnav/ng/hist/n9140us2A.htm (last visited Aug. 6, 2008).

This little overall growth in demand comes despite the fact that "between 1992 and 2003, while coal-fired capacity increased only from 309 to 313 GW, natural-gas-fired capacity more than tripled, from 60 to 208 GW."[82] Further, before 2007, the U.S. consumed *less* natural gas in 2006 (21.65 tcf or 59.32 bcfd) than it had consumed in 1995 (22.21 tcf or 60.85 bcfd) and every year in between.[83]

The EIA projects that increased natural gas consumption will continue, but its most recent estimate for 2030 shows consumption actually declined by 13% from what the EIA predicted just a year ago. Last year, the EIA projected natural gas consumption at 26.12 tcf in 2030.[84] This year the EIA revised their projection to 22.72 tcf for 2030.[85] The EIA also projects consumption of 23.25 tcf in 2010 and 23.33 tcf in 2020.[86] As noted above, U.S. demand will grow at a slower rate than U.S. production.[87]

B. NJ Consumption from 2008-2020 & Existing Capacity Match-Up

In response to an initiative by New Jersey Governor Jon Corzine, a Draft New Jersey Energy Master Plan (EMP) was published in April 2008, open to public comment through July 25, 2008, and will soon be finalized. In its draft form, it reviews two scenarios to meet energy goals in 2020. First is the Business as Usual (BAU) Scenario, which "includes no action by the State other than the policies already in place to address…energy challenges."[88] Second is the Alternative Scenario, which includes five goals:

Goal 1: Maximize the State's energy conservation and energy efficiency to achieve reductions in energy consumption of at least 20% by 2020.
Goal 2: Reduce peak demand for electricity by 5,700 megawatts (MW) by 2020.
Goal 3: Meet 22.5% of the State's electricity needs from renewable sources.
Goal 4: Develop new low carbon emitting, efficient power plants and close the gap between the supply and demand of electricity.
Goal 5: Invest in innovative clean energy technologies and businesses to stimulate the industry's growth in New Jersey.[89]

Under the Draft EMP's Alternative Scenario, New Jersey will need 631,905,950 MMBtu (Million British Thermal Units) of natural gas for electricity, combined heat and power, and

[82] Paulina Jaramillo, W. Michael Griffin, and H. Scott Matthews, *Comparative Life-Cycle Air Emissions of Coal, Domestic Natural Gas, LNG, and SNG for Electricity Generation*, Environ. Sci. Technol. 2007, 41, p. 6290.
[83] U.S. Natural Gas Total Consumption (MMcf), Natural Gas Navigator, Energy Information Administration, at http://tonto.eia.doe.gov:80/dnav/ng/hist/n9140us2A.htm (last visited Aug. 6, 2008).
[84] Annual Energy Outlook 2008, Energy Information Administration, DOE/EIA-0383(2008), June 2008, p. 13.
[85] Annual Energy Outlook 2008, Energy Information Administration, DOE/EIA-0383(2008), June 2008, p. 13.
[86] Annual Energy Outlook 2008, Energy Information Administration, DOE/EIA-0383(2008), June 2008, p. 13.
[87] Annual Energy Outlook 2008, Energy Information Administration, DOE/EIA-0383(2008), June 2008, p. 13.
[88] Draft New Jersey Energy Master Plan, State of New Jersey, Apr. 17, 2008, p. 7.
[89] Draft New Jersey Energy Master Plan, State of New Jersey, Apr. 17, 2008, p. 5.

residential, commercial, and industrial usage in 2020 as part of its energy portfolio.[90] To generate that amount of energy, the State would need 1.68 bcfd of natural gas.[91]

Under BAU projections, New Jersey would need 633,923,030 MMBtu of natural gas for all uses in 2020.[92] This means New Jersey would need roughly 1.69 bcfd of natural gas, an increase of 0.01 bcfd from the Alternative Scenario.[93] The basic reason for the small difference is that under the Alternative Scenario, New Jersey would significantly decrease natural gas for heating and use those savings to significantly increase natural gas for electricity and cogeneration, presumably to offset coal-based electricity. Under the BAU Scenario, New Jersey would see a fractional increase in natural gas for heating and a smaller increase for electricity.

In 2004, New Jersey consumed 1.70 bcfd of natural gas, including for heating (495,180,000 MMBtu[94] or approximately 1.36 bcfd[95]) and electricity (15,986,595 megawatt hours (MWhs)[96] or 0.30 bcfd[97]).[98] In 1999, New Jersey consumed 1.96 bcfd.[99] Therefore, it is demonstrated that New Jersey has the capacity to bring in more natural gas than the State projects it will import in 2020, whether it plans for a greener future (Alternative) or not (BAU). Further, and as noted

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[90] Modeling Report for the Draft Energy Master Plan, Rutgers Edward J. Bloustein School of Planning and Public Policy, April 17, 2008, p. 21.

[91] There are 1,028 Btu per cubic foot for natural gas electric power and 1,030 Btu per cubic foot of natural gas for end use sectors. Annual Energy Outlook 2008, Energy Information Administration, DOE/EIA-0383(2008), June 2008, p. 215. 192,159,575,000,000 Btu of natural gas for electricity divided by 1,028 equals 167,599,270,428.02. 167,599,270,428.02/365 = 459,176,083.36 or 0.46 bcfd. 14,812,991,000,000 Btu of natural gas for CHP divided by 1,028 equals 14,409,524,319.07. 14,409,524,319.07/365 = 39,478,148.82 or 0.04 bcfd. 446,817,989,000,000 Btu of natural gas for RCI divided by 1,030 equals 433,803,872,815.53. 433,803,872,815.53/365 = 1,188,503,761.14 or 1.19 bcfd. 0.46 + 0.04 + 1.19 = 1.69 bcfd. Btu numbers from Modeling Report for the Draft Energy Master Plan, Rutgers Edward J. Bloustein School of Planning and Public Policy, April 17, 2008, p. 21.

[92] Modeling Report for the Draft Energy Master Plan, Rutgers Edward J. Bloustein School of Planning and Public Policy, April 17, 2008, p. 21.

[93] There are 1,028 Btu per cubic foot for natural gas electric power and 1,030 Btu per cubic foot of natural gas for end use sectors. Annual Energy Outlook 2008, Energy Information Administration, DOE/EIA-0383(2008), June 2008, p. 215. 172,292,050,000,000 Btu of natural gas for electricity divided by 1,028 equals 186,925,656,614.79. 186,925,656,614.79/365 = 512,125,086.62 or 0.51 bcfd. 66,921,865,000,000 Btu of natural gas for CHP divided by 1,028 equals 65,099,090,466.93. 65,099,090,466.93/365 = 178,353,672.51 or 0.18 bcfd. 372,824,510,000,000 Btu of natural gas for RCI divided by 1,030 equals 361,965,543,689.32. 361,965,543,689.32/365 = 991,686,421.07 or 0.99 bcfd. 0.51 + 0.18 + 0.99 = 1.68 bcfd. Btu numbers from Modeling Report for the Draft Energy Master Plan, Rutgers Edward J. Bloustein School of Planning and Public Policy, April 17, 2008, p. 21.

[94] Chart from Dr. Bharat Patel, Manager, Planning Unit, New Jersey Board of Public Utilities, May 5, 2008 (on file with author).

[95] 1 bcf is equivalent to 1,000,000 MMBtu. If x/495,180,000 = 1/1,000,000, then x = 495.18 bcf. Divide that by 365 to get 1.36 bcfd.

[96] New Jersey Electricity Profile, Table 5: Electric Power Industry Generation by Primary Energy Source, 1990 Through 2006, Energy Information Administration, at www.eia.doe.gov/cneaf/electricity/st_profiles/new_jersey.html (last visited Aug. 6, 2008).

[97] 1 bcfd equals approximately 6,000 MW of natural gas production. 6,000 MW times 8,760 (the number of hours in a year) equals 52,560,000. 15,986,595 divided by 52,560,000 equals 0.30.

[98] New Jersey Natural Gas Total Consumption (MMcf), Natural Gas Navigator, Energy Information Administration, U.S. Department of Energy, at http://tonto.eia.doe.gov/dnav/ng/ng_cons_sum_a_EPG0_VC0_mmcf_a.htm (last visited July 21, 2008).

[99] New Jersey Natural Gas Total Consumption (MMcf), Natural Gas Navigator, Energy Information Administration, U.S. Department of Energy, at http://tonto.eia.doe.gov/dnav/ng/ng_cons_sum_a_EPG0_VC0_mmcf_a.htm (last visited July 21, 2008).

above, there are significant pipeline expansions planned for the Northeast, including new pipelines in New Jersey, and new sources.

An additional benefit of the Alternative Scenario is that it will reduce peak demand for natural gas. Natural gas consumption currently peaks in New Jersey in the winter months because of its strong role as a heating fuel in the State. Under the Alternative Scenario, New Jersey will decrease its consumption of natural gas for heating by 20%.[100] Even under BAU projections, New Jersey natural gas consumption for heating would only increase by 1% by 2020.[101]

Natural gas consumption is projected to increase for electricity generation under both the Alternative and BAU Scenarios. Peaking for electricity, unlike heating fuels, occurs in the summer. Therefore, New Jersey plans to bring in more natural gas at a time when it is currently not at highest demand in the State. Thus, New Jersey will start to level demand over the year, especially under the Alternative Scenario. As a result, the question remains whether new pipelines are even necessary, let alone LNG.

Presumably, New Jersey is planning to increase its natural gas consumption in part to allow for the closure of coal and petroleum electricity plants. In 2006, New Jersey generated 10,861,873 MWhs from coal.[102] New Jersey would need approximately 0.21 bcfd of natural gas to replace that coal-generated electricity.[103] In 2006, New Jersey generated 277,228 MWhs from petroleum.[104] New Jersey would need approximately 0.01 bcfd of natural gas to replace that petroleum-generated electricity.[105] In 2006, New Jersey generated 15,637,622 MWhs from natural gas.[106] New Jersey would have needed approximately 0.30 bcfd of natural gas for this production.[107] Therefore, New Jersey would need a total of 0.52 bcfd of natural gas to continue burning the same amount of natural gas for electricity and replace all coal and petroleum power plants in the State.

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[100] Chart from Dr. Bharat Patel, Manager, Planning Unit, New Jersey Board of Public Utilities, May 5, 2008 (on file with author). Natural gas for heating in 2004 was 495,180,000 MMBtu and is projected to increase under business-as-usual to 501,000,000 MMBtu.

[101] Chart from Dr. Bharat Patel, Manager, Planning Unit, New Jersey Board of Public Utilities, May 5, 2008 (on file with author). Natural gas for heating in 2004 was 495,180,000 MMBtu and is projected to decrease to 397,050,000 MMBtu.

[102] New Jersey Electricity Profile, Table 5: Electric Power Industry Generation by Primary Energy Source, 1990 Through 2006, Energy Information Administration, at www.eia.doe.gov/cneaf/electricity/st_profiles/new_jersey.html (last visited Aug. 6, 2008).

[103] 1 bcfd equals approximately 6,000 MW of natural gas production. 6,000 MW times 8,760 (the number of hours in a year) equals 52,560,000. 10,861,873 divided by 52,560,000 equals 0.21.

[104] New Jersey Electricity Profile, Table 5: Electric Power Industry Generation by Primary Energy Source, 1990 Through 2006, Energy Information Administration, at www.eia.doe.gov/cneaf/electricity/st_profiles/new_jersey.html (last visited Aug. 6, 2008).

[105] 1 bcfd equals approximately 6,000 MW of natural gas production. 6,000 MW times 8,760 (the number of hours in a year) equals 52,560,000. 277,228 divided by 52,560,000 equals 0.01.

[106] New Jersey Electricity Profile, Table 5: Electric Power Industry Generation by Primary Energy Source, 1990 Through 2006, Energy Information Administration, at www.eia.doe.gov/cneaf/electricity/st_profiles/new_jersey.html (last visited Aug. 6, 2008).

[107] 1 bcfd equals approximately 6,000 MW of natural gas production. 6,000 MW times 8,760 (the number of hours in a year) equals 52,560,000. 15,637,622 divided by 52,560,000 equals 0.30.

These numbers are reflected in the Draft EMP goals. Under the Alternative Scenario, in 2020 New Jersey will use 192,159,575 MMBtu of natural gas for electricity.[108] This means New Jersey would need roughly 0.51 bcfd of natural gas for electricity production.[109] Because the Alternative Scenario would result in less electricity consumption through efficiency and conservation measures by 2020, increased consumption of natural gas for electricity does not need to be directed toward increased generation. Instead, New Jersey can use its desired increase in natural gas consumption for electricity to offset coal- and petroleum-based electricity generation.

Thus, even with offsetting dirtier fossil fuels, New Jersey's demand for natural gas will only increase slightly over 2006 levels, and will be below historical levels, including 2004. The State itself predicts this outcome under either scenario of planning for the future or failing to act. With U.S. net imports of natural gas projected to decrease by 2030 and with the existence of sufficient LNG port capacity (as described below), New Jersey would only need new capacity if it planned for a drastic increase in natural gas consumption. Indeed, the opposite is true. By increasing conservation, efficiency, and renewable measures as planned by the State's Draft EMP, New Jersey will hold the line on natural gas demand even while creating the opportunity to take dirtier fuels offline.

IV. THE LNG INDUSTRY HAS ALREADY OVERBUILT LNG IMPORTATION TERMINALS. AS A RESULT, THERE IS MORE THAN ENOUGH CAPACITY TO IMPORT THE LNG AMERICANS MAY WANT TO BUY TO SUPPLEMENT THE COUNTRY'S OWN NATURAL GAS RESERVES THROUGH 2030.

> *"[C]apacity utilization at the U.S. LNG import facilities is expected to remain below 50 percent through 2030."*[110]

From 1981 to 2005, the U.S. had capacity to import 5.34 bcfd of LNG and an additional 0.5 bcfd came online in 2005.[111] Then, in 2008, 4.9 bcfd of LNG capacity came online,[112] another 8.8

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[108] Modeling Report for the Draft Energy Master Plan, Rutgers Edward J. Bloustein School of Planning and Public Policy, April 17, 2008, p. 21.

[109] There are 1,028 Btu per cubic foot for natural gas electric power. Annual Energy Outlook 2008, Energy Information Administration, DOE/EIA-0383(2008), June 2008, p. 215. 192,159,575,000,000 Btu of natural gas for electricity divided by 1,028 equals 186,925,656,614.79. 186,925,656,614.79/365 = 512,125,086.62 or 0.51 bcfd.

[110] Statement of Guy Caruso, Administrator, Energy Information Administration, U.S. Department of Energy, before the Committee on Energy and Natural Resources, U.S. Senate, Mar. 4, 2008, at http://energy.senate.gov/public/index.cfm?FuseAction=Hearings.Testimony&Hearing_ID=5b36f179-e51f-ac22-e7f2-6930233ef767&Witness_ID=d72b1a96-fddb-4581-9d65-1a9206b63ac1 (last visited Aug. 6, 2008) (emphasis added).

[111] North American LNG Import Terminals – Existing, Office of Energy Projects, Federal Energy Regulatory Commission, June 16, 2008, at http://www.ferc.gov/industries/lng.asp (last visited Aug. 6, 2008). Terminals A through D came online between 1971 and 1981. Some of these terminals were not operating between 1981 and 2005 but they were available to commence operations, as they all eventually did for those that temporarily closed due to lack of imports.

[112] North American LNG Import Terminals – Existing, Office of Energy Projects, Federal Energy Regulatory Commission, June 16, 2008, at http://www.ferc.gov/industries/lng.asp (last visited Aug. 6, 2008).

bcfd is under construction, and an additional 22.25 bcfd is approved.[113] With just completing what is currently under construction, the U.S. will have 19.54 bcfd of capacity to import LNG. All of this capacity is on the East Coast or the Gulf of Mexico, with associated pipeline infrastructure that runs to the Northeast, including New Jersey.
The Northeast also benefits from LNG terminals built in eastern Canada, due to interstate pipelines.[114] The Canaport LNG terminal in New Brunswick will serve the Canadian and U.S. markets with 1.0 bcfd and is currently under construction.[115]

A. Even Now the U.S. Has Excess Capacity

"The regas capacity glut already is in evidence, says Standard & Poor's Tina Vital. 'There are too many LNG terminals in the US. US LNG import capacity amounted to 5 Bcf/d last year [in 2007], but the country imported only 2.5 Bcf/d, which is not enough,' she says."[116]

The U.S. actually imported 2.11 bcfd of LNG in 2007, the most it has ever imported.[117] Further, the U.S. actually had capacity to import 5.84 bcfd.[118] Thus, the LNG ports ran at under 50% capacity. Currently 2008, imports are even less, while the capacity nearly doubled by early 2008.[119]

Recent history demonstrates the evidence of the LNG terminal overbuild in the U.S. By April 2008, "U.S. imports of LNG have slid over the past nine months to a five-year low," putting capacity utilization at a low.[120] Gulf Gateway LNG, the first new LNG terminal of the century, spent 26 of its first 34 months in operation not receiving a single LNG shipment.[121] Even during the few months it did receive shipments, it operated significantly below capacity.[122]

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[113] North American LNG Import Terminals – Approved, Office of Energy Projects, Federal Energy Regulatory Commission, June 16, 2008, at http://www.ferc.gov/industries/lng.asp (last visited Aug. 6, 2008). The Neptune project off Boston began construction in July of 2008, adding an additional 0.4 bcfd. Jay Fitzgerald, Company set to start building its LNG system off N. Shore, Boston Herald, July 23, 2008, at http://www.bostonherald.com/business/general/view/2008_07_23_Company_set_to_start_building_its_LNG_system_off_N__Shore/ (last visited July 23, 2008).
[114] Source: Topic Paper #13, *Liquefied Natural Gas (LNG)*, for *Hard Truths: Facing the Hard Truths About Energy*, National Petroleum Council, July 2007, p. 3.
[115] Rob Linke, *Natural gas worry triggers U.S. hearing*, Telegraph-Journal, June 17, 2008, at http://nbbusinessjournal.canadaeast.com/journal/article/328178 (last visited Aug. 6, 2008).
[116] *Independent US LNG Terminal Plot Thickens*, World Gas Intelligence, Energy Intelligence Group, Inc., Apr. 2, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=227360 (last visited Aug. 6, 2008).
[117] U.S. Natural Gas Imports by Country (Annual), Natural Gas Navigator, Energy Information Administration, U.S. Department of Energy, at http://tonto.eia.doe.gov/dnav/ng/ng_move_impc_s1_a.htm (last visited July 1, 2008). The U.S. imported 770,812 million cubic feet of natural gas in 2007.
[118] North American LNG Import Terminals – Existing, Office of Energy Projects, Federal Energy Regulatory Commission, June 16, 2008, at http://www.ferc.gov/industries/lng.asp (last visited Aug. 6, 2008).
[119] U.S. Liquefied Natural Gas Imports (MMcf) – Monthly, Natural Gas Navigator, Energy Information Administration, U.S. Department of Energy, at http://tonto.eia.doe.gov/dnav/ng/hist/n9103us2M.htm (last visited July 31, 2008).
[120] Ann Davis and Russell Gold, *Surge in Natural-Gas Price Stoked by New Global Trade*, The Wall Street Journal, Apr. 18, 2008, p. A7.
[121] The U.S. Waterborne LNG Report, Waterborne Energy, Inc., Vol. 5, Week 3, Jan. 18, 2008, p. 14.
[122] The U.S. Waterborne LNG Report, Waterborne Energy, Inc., Vol. 5, Week 3, Jan. 18, 2008, p. 14.

As noted above, a month after the new Freeport LNG terminal received permission to start importing LNG, it filed an application to start exporting LNG. In its application, the company stated that "[d]ue to global LNG market conditions, U.S. natural gas demand and prices do not currently support the importation of LNG into the United States."[123] The company also stated that "[g]iven the global increase in demand for LNG and the concurrent disparity in natural gas prices in the United States relative to global markets, it is unclear when a constant and continuing supply of foreign sourced LNG will begin to arrive at the Freeport LNG facility and other U.S. LNG import terminals."[124]

B. The U.S. Will Continue to Have Excess Capacity Next Decade

In a May 5, 2005 speech, Pat Wood, III, then Chairman of Federal Energy Regulatory Commission (FERC), stated that the U.S. only needed six more LNG terminals to meet short term demand.[125] That projection consisted of two terminals each on the East Coast, Gulf Coast, and West Coast.[126] With what has already been built and with what is under construction, the East and Gulf Coasts are already overbuilding. Since 2005, two new terminals have come online,[127] three are under construction,[128] and one expansion at an existing terminal equivalent in size to a new terminal is underway in the Gulf Coast.[129] On the East Coast, one new terminal has come online,[130] one new terminal is under construction,[131] and two expansions equivalent in size to new terminals are taking place.[132] Even if no new projects are begun, there will be six more terminals than deemed necessary, according to Chairman Wood, for the eastern U.S.

"The U.S. will have almost four times more liquefied natural gas import capacity than it can use by 2012 because of a shortfall in fuel supply, according to a report from consultant PFC Energy. Supplies of liquefied gas, or LNG, will fall short of the capacity of U.S. terminals to return the

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[123] Application for Blanket Authorization to Export Liquefied Natural Gas on a Short-Term Basis, In the Matter of Freeport LNG Development, Docket No. 08-70-LNG (Department of Energy, Office of Fossil Energy), p. 6.
[124] Application for Blanket Authorization to Export Liquefied Natural Gas on a Short-Term Basis, In the Matter of Freeport LNG Development, Docket No. 08-70-LNG (Department of Energy, Office of Fossil Energy), p. 4-5.
[125] Pat Wood, III, Chairman, Federal Energy Regulatory Commission, *Stanford Washington Research Group 2005 Institutional Policy Conference*, May 5, 2005, p. 19, at http://www.ferc.gov/news/statements-speeches/2005.asp (last visited August 6, 2008).
[126] Pat Wood, III, Chairman, Federal Energy Regulatory Commission, *Stanford Washington Research Group 2005 Institutional Policy Conference*, May 5, 2005, p. 19, at http://www.ferc.gov/news/statements-speeches/2005.asp (last visited August 6, 2008).
[127] North American LNG Import Terminals – Existing, Office of Energy Projects, Federal Energy Regulatory Commission, June 16, 2008, at http://www.ferc.gov/industries/lng.asp (last visited Aug. 6, 2008).
[128] North American LNG Import Terminals – Approved, Office of Energy Projects, Federal Energy Regulatory Commission, June 16, 2008, at http://www.ferc.gov/industries/lng.asp (last visited Aug. 6, 2008).
[129] North American LNG Import Terminals – Approved, Office of Energy Projects, Federal Energy Regulatory Commission, June 16, 2008, at http://www.ferc.gov/industries/lng.asp (last visited Aug. 6, 2008).
[130] North American LNG Import Terminals – Existing, Office of Energy Projects, Federal Energy Regulatory Commission, June 16, 2008, at http://www.ferc.gov/industries/lng.asp (last visited Aug. 6, 2008).
[131] The Neptune project off Boston began construction in July of 2008. Jay Fitzgerald, Company set to start building its LNG system off N. Shore, Boston Herald, July 23, 2008, at http://www.bostonherald.com/business/general/view/2008_07_23_Company_set_to_start_building_its_LNG_system_off_N__Shore/ (last visited Aug. 6, 2008).
[132] North American LNG Import Terminals – Approved, Office of Energy Projects, Federal Energy Regulatory Commission, June 16, 2008, at http://www.ferc.gov/industries/lng.asp (last visited Aug. 6, 2008).

fuel to gaseous state by 4.35 trillion cubic feet a year by 2012, Washington-based PFC Energy said."[133]

In particular, "[t]he east coast of North America is faced with a significant oversupply of LNG import capacity which will persist well into the next decade. PFC Energy forecasts that as new terminals are constructed the capacity will exceed the supply available from producers in the Atlantic Basin and Middle East with a gap between regasification capacity and available LNG as great as…4.35 tcf [11.92 bcfd]…by 2012. This gap will shrink over the longer term, but by 2017 is still expected to be around…2.4 tcf [6.58 bcfd]."[134]

"Even if all currently uncontracted and flexible LNG in the Atlantic Basin and Middle East were to be added to North American supply, PFC Energy still estimates that the gap between terminal capacity and available LNG on the east coast of North America could reach…3.4 tcf [or 9.32 bcfd]…by 2012. And the gap could become larger as these estimates only include existing and under construction terminals – if additional regasification capacity is added, the gap will be greater."[135]

C. And the U.S. Will Still Have Excess Capacity By 2030 (Even Without New Construction)

The EIA projects that the total capacity of U.S. LNG receiving terminals will increase to 14.25 bcfd, in 2009, "with no further increase through 2030."[136] The EIA then projects LNG imports at 7.67 bcfd in 2030, finding that 14.25 bcfd is more than sufficient capacity for this increased demand, which explains the lack of need for new LNG terminals after 2009.[137] In other words, the U.S. could stop building some of the terminals under construction and still have sufficient capacity to meet projected LNG demand. With a previous projection of 15.62 bcfd of capacity by 2030 (which again is lower than the 19.54 bcfd that is now already built or under construction), the Administrator of the EIA stated that "[g]iven global LNG supply constraints, overall capacity utilization at the U.S. LNG import facilities is expected to remain below 50 percent through 2030."[138]

Even under alternative scenarios, including a low price case, the EIA finds that by the end of next year, the U.S. will have sufficient LNG capacity to last through 2030. "Net U.S. imports of LNG in 2030 are projected to total 2.8 trillion cubic feet [or 7.67 bcfd] in the reference case, 4.5 trillion cubic feet [or 12.33 bcfd] in the low price case, 1.7 trillion cubic feet [or 4.66 bcfd] in the high price case, 2.9 trillion feet [or 7.95 bcfd] in the high economic growth case, and 2.5 trillion

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[133] *U.S. faces LNG shortfall on terminal capacity*, Calgary Herald, March 19, 2008.
[134] Press Release, PFC Energy, North America Facing LNG Regasification Terminal Overbuild, Mar. 18, 2008, at http://www.pfcenergy.com/viewNew.aspx?id=40 (last visited August 6, 2008).
[135] Press Release, PFC Energy, North America Facing LNG Regasification Terminal Overbuild, Mar. 18, 2008, at http://www.pfcenergy.com/viewNew.aspx?id=40 (last visited August 6, 2008).
[136] Annual Energy Outlook 2008, Energy Information Administration, DOE/EIA-0383(2008), June 2008, p. 78. The EIA projects 5.2 tcf, or 14.25 bcfd, for LNG capacity.
[137] Annual Energy Outlook 2008, Energy Information Administration, DOE/EIA-0383(2008), June 2008, p. 78. The EIA projects 2.8 tcf, or 7.67 bcfd, for LNG imports.
[138] Statement of Guy Caruso, Administrator, Energy Information Administration, U.S. Department of Energy, before the Committee on Energy and Natural Resources, U.S. Senate, Mar. 4, 2008, at http://energy.senate.gov/public/index.cfm?FuseAction=Hearings.Testimony&Hearing_ID=5b36f179-e51f-ac22-e7f2-6930233ef767&Witness_ID=d72b1a96-fddb-4581-9d65-1a9206b63ac1 (last visited Aug. 6, 2008).

cubic feet [or 6.85 bcfd] in the low economic growth case."[139] In sum, LNG imports could be as low as 4.66 bcfd or as high as 12.33 bcfd, despite capacity to import at least 19.54 bcfd, and likely more with other terminals approved and ready to begin construction.

D. So Why All The Applications?

One may wonder why there are so many applications for LNG terminals if existing and under-construction capacity suffice. Cornering the market is likely one of the key answers. For example, Exxon does not profit from the LNG terminal in Maryland that buys LNG from Statoil.[140] Canadian Superior Energy does not profit from the LNG terminal in Georgia that has fully contracted all of its capacity to Shell and BG Group.[141] Any imports to new terminals will likely just offset what would have come in through a different terminal. But recall, with that change, the additional capital costs must be passed on, as well as the additional environmental damage from another unnecessary LNG terminal.

Further, energy companies are seeking to monopolize the market through vertical integration. "With an investment of more than $30 billion, ExxonMobil, Qatar Petroleum, their respective affiliates and their international co-venturers are building the industry's first integrated chains to produce natural gas, manufacture LNG, transport it and regasify it at receiving terminals."[142] According to Exxon, "the final links in the chain" include new LNG import terminals in the U.S.[143]

The U.S. also serves as a location for spot market sales for those in the LNG industry, so Exxon and others can sell "what ever is left over."[144] This results in an unstable source of supply for the U.S., but would ensure Exxon one more market to profiteer from in the bidding war. While the U.S. may not be able to afford to compete well for long-term contracts, the current advantage of relatively high storage capacity allows the U.S. to compete for some LNG in the summer months (which, as discussed above, is an advantage that the U.S. is losing). Exxon is not interested in providing a steady, stable, and reliable supply of LNG to the New York metropolitan region. Exxon is interested in having as many import terminals as possible so it can increase the number of bidders to receive its limited LNG supply.

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[139] Annual Energy Outlook 2008, Energy Information Administration, DOE/EIA-0383(2008), June 2008, p. 79.
[140] *Norway: Statoil's LNG Setbacks*, Stratfor, Dec. 6, 2007, at http://www.stratfor.com/products/premium/read_article.php?id=299566 (last visited Aug. 6, 2008).
[141] News Release, El Paso, El Paso Corporation Announces Start of Service From Elba II Expansion, Feb. 1, 2006, at http://investor.elpaso.com/phoenix.zhtml?c=97166&p=irol-newsArticle&ID=811568&highlight (last visited Aug. 6, 2008).
[142] Press Release, *What it takes to link a 9,000-mile LNG chain*, ExxonMobil, June 1, 2007, at http://www.exxonmobil.com/corporate/news_features_20070601_lngchain.aspx (last visited Jun. 29, 2008).
[143] Press Release, *What it takes to link a 9,000-mile LNG chain*, ExxonMobil, June 1, 2007, at http://www.exxonmobil.com/corporate/news_features_20070601_lngchain.aspx (last visited Jun. 29, 2008).
[144] The U.S. Waterborne LNG Report, Waterborne Energy, Inc., Vol. 5, Week 3, Jan. 18, 2008, p. 2.

V. LNG IS GLOBALLY PRICED AND OFTEN INDEXED TO CRUDE OIL, MAKING IT MORE EXPENSIVE THAN DOMESTIC NATURAL GAS.

> *LNG is expensive now, and will only become more so. The whole world competes for LNG, making it globally priced and locked into price wars.*

Due in part to abundant North American reserves, domestic natural gas has remained far more affordable than LNG. U.S. natural gas prices are often based on Henry Hub, a pipeline hub in Louisiana, although prices in the Northeast are generally a little higher than the Hub. According to the EIA, the Henry Hub natural gas spot price averaged $7.17 per MMBtu in 2007 and is expected to average about $11 per MMBtu in both 2008 and 2009.[145] For its Draft EMP, New Jersey is projecting Henry Hub prices at $9.66 per MMBtu in 2020, with a peak natural gas price of $11.36 per MMBtu in the first quarter of 2011.[146] But "US prices will need to move well above current $9-$10 per million Btu levels to interfere with this [LNG] trade as long as Asians are willing to pay upward of $14/MMBtu for spot supply."[147]

"While natural gas prices in the United States have spiked to over $11.80 per thousand cubic feet from $7.50 at the beginning of the year, the price that gas producers can draw in many other countries in the world is several dollars higher."[148] "In Spain, gas is over $13 a thousand cubic feet, and in Asia they pay $16 to $17."[149] While contract prices are usually unavailable, the industry does provide some information. Recently, Argentina reportedly agreed to pay $14 per MMBtu.[150] With rising global coal prices, Spain has found gas-fired power cheaper even when LNG prices are at $12 per MMBtu.[151] Analysts put a recent contract for Singapore at $16/MMBtu for LNG from Indonesia and Qatar.[152] A tanker of LNG "pulling into port in Japan can command close to $20 per million BTUs, roughly double the price of the U.S. benchmark."[153]

"LNG continues to flow unabated to the Far East as landed prices there have risen to the $19.50/mmbtu level. However with increasing pressure coming from Europe we [Waterborne

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[145] Short-Term Energy Outlook, Energy Information Administration, June 10, 2008, p. 1.
[146] Possible Assumption Updates for "Final" NJ Energy Master Plan Modeling Rules, June 13, 2008, p. 1, at http://nj.gov/emp/home/docs/pdf/061608AssumpUpdates.pdf (last visited June 30, 2008).
[147] *Starting On Empty*, World Gas Intelligence, Mar. 26, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=226738 (last visited Aug. 6, 2008).
[148] Clifford Krauss, *Global Demand Squeezing Natural Gas Supply*, New York Times, May 29, 2008, at http://www.nytimes.com/2008/05/29/business/29gas.html?_r=1&oref=slogin (last visited Aug. 6, 2008).
[149] Steve Hargreaves, *Abundant clean energy in your backyard*, CNNMoney.com, Apr. 18, 2008, at http://money.cnn.com/2008/04/17/news/economy/natural_gas/index.htm?section=money_mostpopular (last visited Aug. 6, 2008).
[150] *Argentina Set To Get First LNG -- For $14*, World Gas Intelligence, Apr. 23, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=229044 (last visited Aug. 6, 2008).
[151] *CCGTs Cheaper To Run In Spain Than Coal-Fired Plants*, World Gas Intelligence, Apr. 23. 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=228854 (last visited Aug. 6, 2008).
[152] Erwin Chan and Angus Rodger, *Singapore's Not-So-Secret LNG Hub Trading Ambitions*, World Gas Intelligence, Apr. 23, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=228843 (last visited Aug. 6, 2008).
[153] Ann Davis and Russell Gold, *Surge in Natural-Gas Price Stoked by New Global Trade*, The Wall Street Journal, Apr. 18, 2008, p. A7.

Energy, Inc.] believe there to be further upside and expect to see deals above the $20/mmbtu level if they haven't already been done. The primary drivers in the spot market are spread widely, from the Far East to Europe (primarily Spain) to Mexico which continues to absorb anywhere from 6 to 22 bcf per month. As a result the US will bring in what ever is left over."[154] In "past emergencies, buyers in Japan and other countries have paid $25 [per thousand cubic feet] or more."[155]

As noted by the following table, U.S. terminals are not paying the far higher global prices. Again, this results in the U.S. only being able to import whatever LNG may remain on the global market at a given time.[156]

Quick Glance Netback Table ($/mmbtu)

	Destination Ports								
	Cove Point	Altamira	Lake Charles	Spain	Belgium	UK	India	Japan	Korea
	$8.10[1]	$8.34[1]	$7.32[1]	$14.50[1]	$10.24[1]	$10.56[1]	$17.00[1]	$19.50[1]	$19.50[1]
Source Ports									
Algeria	7.38	7.40	6.38	14.32	9.87	10.19	15.88	17.58	17.64
Egypt	7.03	7.14	6.12	14.14	9.60	9.93	16.20	17.85	17.91
Nigeria	7.10	7.21	6.19	13.76	9.41	9.74	15.70	17.57	17.62
Qatar	6.39	6.40	5.38	13.44	8.90	9.23	16.68	18.30	18.36
Trinidad	7.68	7.86	6.84	13.73	9.47	9.79	15.28	17.02	17.07

[1] Estimated FEB-2008 Landed Price

Note: Cove Point is in Maryland and Lake Charles is in Louisiana. Altamira is in Mexico.
Source: The U.S. Waterborne LNG Report, Waterborne Energy, Inc., Vol. 5, Week 3, Jan. 18, 2008, at 5.

A. Global Competition for LNG is Increasing Fast and Price Wars Will Escalate

Despite high global LNG prices, demand continues to grow at a rapid pace in foreign markets. In fact, "[j]ust about the only place where demand for L.N.G. seems not to be growing is the United States, an abrupt shift from expectations as little as one year ago."[157] Qatar recently signed two separate 25-year contracts with two Chinese energy companies.[158] "China apparently outbid Europe and the U.S. for the last uncommitted volumes from Qatar, the world's leading producer of liquefied natural gas."[159] That same gas was originally expected to go to U.S.

[154] The U.S. Waterborne LNG Report, Waterborne Energy, Inc., Vol. 5, Week 3, Jan. 18, 2008, p. 2.
[155] Reuters, *Japan nuclear shutdown seen adding to LNG demand*, Yahoo! Asia News, July 19, 2007, at http://asia.news.yahoo.com/070719/3/351zm.html (last visited Aug. 6, 2008).
[156] The U.S. Waterborne LNG Report, Waterborne Energy, Inc., Vol. 5, Week 3, Jan. 18, 2008, p. 2.
[157] Clifford Krauss, *Global Demand Squeezing Natural Gas Supply*, New York Times, May 29, 2008, at http://www.nytimes.com/2008/05/29/business/29gas.html?_r=1&oref=slogin (last visited Aug. 6, 2008).
[158] *Qatar in China*, World Gas Intelligence, Apr. 16, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=228458 (last visited Aug. 6, 2008).
[159] Kurt Wulff, *Natural Gas Sold Out: Stage Set for Long-Term Price Doubling*, Seeking Alpha, May 05, 2008, at http://seekingalpha.com/article/75648-natural-gas-sold-out-stage-set-for-long-term-price-doubling (last visited Aug. 19, 2008).

markets.[160] Of course this means little to Qatari Energy Minister Abdullah bin Hamad al-Attiyah who explained, "We are not in the charity business. Whoever will give me the best price, I will follow him."[161] He added, "We are sold out."[162] China currently has five LNG importation terminals "under construction, with more likely to follow."[163]

Europe is also increasing its importation capacity, investing "in as many as 30 European regasification expansion and new build projects that will have a total capacity of about 130 billion [cubic meters] by 2015."[164] "By 2020, natural gas consumption in the E.U. will increase 22 percent to 26.5 trillion cubic feet per year" or 72.60 bcfd.[165] This year the European market saw a victory with Gazprom, the Russian-controlled energy giant, dropping expected plans to instead supply the U.S. market.[166]

Even Middle East oil exporters are entering the market with Dubai purchasing LNG from Qatar.[167] That gas was expected to go to the U.S.'s Elba Island LNG terminal in Georgia.[168]

Further, many exporting countries are starting to realize the benefits of keeping the natural gas for themselves. "[M]any countries that are net LNG exporters have government policies or agreements that promote domestic natural gas consumption."[169] "In 2005, Egypt reduced the portion of natural gas reserves available for export from one-third to one-quarter."[170] In a spiraling effect of less natural gas for LNG export, "[d]omestic reservation requirements promote natural gas consumption by keeping domestic natural gas prices low."[171] On top of that, "[g]overnments are increasing their tax take" because "governments in both the developing and

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[160] *Qatar in China*, World Gas Intelligence, Apr. 16, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=228458 (last visited Aug. 6, 2008).
[161] Kurt Wulff, *Natural Gas Sold Out: Stage Set for Long-Term Price Doubling*, Seeking Alpha, May 05, 2008, at http://seekingalpha.com/article/75648-natural-gas-sold-out-stage-set-for-long-term-price-doubling (last visited Aug. 19, 2008).
[162] Kurt Wulff, *Natural Gas Sold Out: Stage Set for Long-Term Price Doubling*, Seeking Alpha, May 5, 2008, at http://seekingalpha.com/article/75648-natural-gas-sold-out-stage-set-for-long-term-price-doubling (last visited Aug. 19, 2008).
[163] *China Fast-Tracks Five LNG Terminals*, World Gas Intelligence, Apr. 23, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=228844 (last visited Aug. 6, 2008).
[164] Uchenna Izundu, *CO_2 emissions policy to affect LNG imports, report says*, Oil & Gas Journal, June 11, 2008, at http://www.ogj.com/display_article/331424/7/ONART/none/Trasp/1/CO-2--emissions-policy-to-affect-LNG-imports,-report-says/ (last visited Aug. 6, 2008).
[165] Andres Cala, *Europe Looks to LNG*, Energy Tribune, Mar. 20, 2008, at http://www.energytribune.com/articles.cfm?aid=830 (last visited Aug. 6, 2008).
[166] *No Baltic LNG, Fewer Canadian Terminals*, World Gas Intelligence, Energy Intelligence Group, Inc., Feb. 13, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=223564 (last visited Aug. 6, 2008).
[167] *Qatari Dubai Deal -- And More, World Gas Intelligence*, Apr. 23, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=228976 (last visited Aug. 6, 2008).
[168] *Qatari Dubai Deal -- And More, World Gas Intelligence*, Apr. 23, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=228976 (last visited Aug. 6, 2008).
[169] Annual Energy Outlook 2008, Energy Information Administration, DOE/EIA-0383(2008), June 2008, p. 47.
[170] Annual Energy Outlook 2008, Energy Information Administration, DOE/EIA-0383(2008), June 2008, p. 47.
[171] Annual Energy Outlook 2008, Energy Information Administration, DOE/EIA-0383(2008), June 2008, p. 47.

developed world assume that high oil prices mean they can tax with impunity. The result is lower or slower investment."[172]

As a result of all this competition, U.S. LNG terminals are finding that even shipments they had expected are now getting redirected to higher paying markets. For example, "[t]he only potentially firm volumes that might have come to [the new Louisiana LNG terminal known as] Sabine Pass belonged to [French oil giant] Total from its stake in the Qatargas-2 project in the Mideast nation of Qatar. Total recently sold that LNG to Chinese CNOOC under a long-term agreement at a price well above the $10/MMBtu price natural gas is fetching in the US. Because of the tight global market for LNG, commercial cargoes into the facility are unlikely any time this year."[173] Sabine Pass LNG's response was to save money by "laying off more than half of its staff" and use the savings to pay a premium price of over $12.80 per MMBtu just to get a commissioning cargo for the facility.[174] That wasn't enough, as now Sabine Pass LNG has filed an application to export to foreign countries the LNG that it imports.

As another example, "[t]he Snohvit volumes Statoil was expected to deliver from Norway to Cove Point, Maryland, instead went to Europe before mechanical problems caused the liquefaction plant to shut."[175]

Terminal manager Steven Arbelovsky of the new Freeport LNG port in Texas said running near capacity "is unlikely in the foreseeable future because LNG ships are going to greener pastures such as Asia, where the price of LNG is double what it is in the United States."[176] Even contracting the gas supply does not guarantee performance since "[e]ven contracted volumes destined for US regas plants are vulnerable to rerouting when a higher profit can be realized at a plant anywhere else in the world."[177]

B. The U.S. is Losing its (Only) Edge with Increased International Demand

The U.S.'s only strength in LNG purchasing is its relatively large storage capacity. As a result, the U.S. can buy LNG in the summer months when it is "cheaper" and store enough to help supplement its winter demand.[178] But with new LNG importation terminals being built around

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[172] Greg Couturier, *Schlumberger Head: Outlook Good For North American Gas Producers*, Natural Gas Week, April 21, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=228179 (last visited Aug. 6, 2008).
[173] Barbara Shook, *Cheniere Preparing to Celebrate Even as Its Prospects Grow Dim*, Natural Gas Week, Energy Intelligence Group, Inc., Apr. 21, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=228796 (last visited Aug. 6, 2008).
[174] *LNG Pattern Holding*, World Gas Intelligence, Energy Intelligence Group, Inc., Apr. 23, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=228825 (last visited Aug. 6, 2008).
[175] *Topsy Turvy US LNG Import Record Year*, World Gas Intelligence, Energy Intelligence Group, Inc., Jan. 2, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=220465 (last visited Aug. 6, 2008).
[176] Hunter Sauls, *Coast Guard preparing for port shutdowns*, The Facts, Apr. 14, 2008, at http://www.thefacts.com/story.lasso?ewcd=f482d0ca682cb716 (last visited Aug. 6, 2008).
[177] Leslie Palti, *LNG UPDATE: New French LNG Terminals Set to Raise Global NatGas Competition*, Natural Gas Week, Jan. 14, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=221086 (last visited Aug. 6, 2008).
[178] Annual Energy Outlook 2008, Energy Information Administration, DOE/EIA-0383(2008), June 2008, p. 48.

the world, foreign storage will grow and start to compete with the U.S.'s summer imports as well. Furthermore, the southern hemisphere is entering the LNG market and their winters coincide with U.S. summers, thus increasing competition. "Argentina became the first South American country to import LNG, offloading its first partial cargo in May 2008"[179] at a reported price of $14/MMBtu.[180] According to the EIA, "Brazil and Chile also will soon become LNG importers."[181] As a result, the U.S.'s summer purchasing advantage may soon disappear, and the country may see the same high LNG prices in the summer that it often cannot afford in the winter.

C. Future LNG Prices: High, Higher, and Highest

Projections are that LNG prices will only remain high, especially since LNG is commonly indexed to crude oil.[182] As Credit Suisse bluntly states, "[c]heap LNG is a relic of the past."[183] Of course, it's difficult to argue that LNG was ever cheap compared to U.S. natural gas prices.

One Credit Suisse analyst noted $16 per MMBtu "looks to be the level where current prices are moving."[184] (As noted earlier in this document, New Jersey is projecting domestic Henry Hub prices at $9.66 per MMBtu in 2020, with a peak natural gas price of $11.36 per MMBtu in the first quarter of 2011.)[185] French oil giant Total stated that "the industry could face an LNG shortage in five years."[186] The National Petroleum Council predicts that "LNG imports may be affected after 2015, as world natural gas prices rise, attracting LNG to other markets."[187] Further, other countries are likely to out-compete the U.S. for LNG out of sheer necessity. "Japan, for example, imports 97% of its natural gas supply as LNG (over 11 times as much LNG as the United States in 2001)."[188] The E.U. Commission expects that Europe will be "dependent on foreign producers for 85 percent of its gas" by 2020. Those countries that are 85% reliant will certainly compete and pay more for LNG than those well under 20% reliant on foreign

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[179] Annual Energy Outlook 2008, Energy Information Administration, DOE/EIA-0383(2008), June 2008, p. 48.
[180] *Argentina Set To Get First LNG -- For $14*, World Gas Intelligence, Apr. 23, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=229044 (last visited Aug. 6, 2008).
[181] Annual Energy Outlook 2008, Energy Information Administration, DOE/EIA-0383(2008), June 2008, p. 48.
[182] Marianne Lavelle, *Feds Weigh Long Island Sound LNG Terminal*, US News and World Report, Mar. 17, 2008, at http://www.usnews.com/blogs/beyond-the-barrel/2008/3/17/feds-weigh-long-island-sound-lng-terminal.html#Comments (last visited Aug. 6, 2008).
[183] Carl Krist, CFA, and Stuart Weinman, Natural Gas Group – Sector Review – LNG into the US: a Question of When, not If, Credit Suisse, Dec. 31, 2007.
[184] Annika Breidthardt, *Indonesian term LNG deal sets new Asian benchmark*, Reuters India, Mar. 31, 2008, at http://in.reuters.com/article/asiaCompanyAndMarkets/idINSP31415020080331?sp=true (last visited Aug. 6, 2008).
[185] Possible Assumption Updates for "Final" NJ Energy Master Plan Modeling Rules, June 13, 2008, p. 1, at http://nj.gov/emp/home/docs/pdf/061608AssumpUpdates.pdf (last visited June 30, 2008).
[186] Angus Rodger, Perth, and Jill Junnola, *Personnel Shortages, Costs Put Brakes On LNG Projects*, World Gas Intelligence, Apr. 16, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=228345 (last visited Aug. 6, 2008).
[187] *Hard Truths: Facing the Hard Truths About Energy*, National Petroleum Council, July 2007, p. 143.
[188] CRS Report for Congress, *Liquefied Natural Gas (LNG) Infrastructure Security: Background and Issues for Congress*, Congressional Research Service, The Library of Congress, Order Code RL 32073, Sep. 9, 2003, p. CR-2 (citing *World LNG Imports by Origin, 2001*, Energy Information Administration (EIA), Oct. 17, 2002).

sources. At 3% of our imports, the U.S. could survive a global shortage in LNG while others would likely pay the cost.[189]

In addition, the global bidding war will only increase as cost overruns have made LNG liquefaction projects unattractive.[190] As a result, there is a disconnect between supply meeting demand. The EIA projects that world consumption of natural gas in 2030 will be 182 tcf (498.63 bcfd).[191] Yet the EIA also projects that world production on natural gas in 2030 will only be 157.7 tcf (432.05 bcfd).[192] That means demand will be 15% higher than supply. Demand exceeding supply is also the case for 2010, 2015, 2020, and 2025, with global demand for natural gas greater than global production.[193,194] New competitors on the scene include China and India where natural gas consumption is expected to increase from 2003 to 2030 by 483%[195] and 350%, respectively.[196]

If the U.S. wants more LNG, the answer is clear, the U.S. has to pay much more for natural gas. "Two economists for the U.S. Federal Reserve Bank of Dallas predict that, as LNG imports to the United States increase, gas prices in the U.S. market will trend towards the higher prices seen in the global LNG market…. [T]he economists wrote that '[o]nce LNG imports become the marginal source of U.S. supply, much higher international natural gas prices should prevail.'"[197] It was also recently reported that "several energy industry experts told the Offshore Technology Conference in Houston this week that the U.S. market may have to pay prices indexed to crude oil in order to attract LNG cargos to North America. One analyst noted that U.S. LNG importers may have to begin signing long-term supply agreements that are not linked to Henry Hub prices."[198] As analysts with Barclays Capital reportedly found, "if the United States becomes dependent on LNG to meet natural gas demand increases, tightness in the global liquefaction

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[189] James Kraus, *U.S., Canada Dispute Intensifies Over LNG Terminals, WSJ Says,* Bloomberg.com, Dec. 21, 2007, at http://www.bloomberg.com/apps/news?sid=atHZgIyEDpVs&pid=20601082 (last visited Aug. 6, 2008).
[190] Deepa Babington, Exxon says rising costs risk derailing LNG boom, Reuters UK, Dec. 4, 2007, at http://uk.reuters.com/article/oilRpt/idUKL0414043020071204 (last visited Aug. 6, 2008).
[191] International Energy Outlook 2006, Energy Information Administration, p. 88, at http://www.eia.doe.gov/oiaf/ieo/pdf/ieoreftab_5.pdf.
[192] Energy Information Administration, Report #:DOE/EIA-0484(2008), June 2008, at http://www.eia.doe.gov/oiaf/ieo/excel/figure_5data.xls (last visited Aug. 6, 2008).
[193] Energy Information Administration, Report #:DOE/EIA-0484(2008), June 2008, at http://www.eia.doe.gov/oiaf/ieo/excel/figure_5data.xls (last visited Aug. 6, 2008).
[194] International Energy Outlook 2006, Energy Information Administration, p. 88, at http://www.eia.doe.gov/oiaf/ieo/pdf/ieoreftab_5.pdf.
[195] From 1.2 tcf in 2003 to 7.0 tcf in 2030. International Energy Outlook 2006, Energy Information Administration, p. 88, at http://www.eia.doe.gov/oiaf/ieo/pdf/ieoreftab_5.pdf.
[196] From 1.0 tcf in 2003 to 4.5 tcf in 2030. International Energy Outlook 2006, Energy Information Administration, p. 88, at http://www.eia.doe.gov/oiaf/ieo/pdf/ieoreftab_5.pdf.
[197] *Economists Predict Higher Natural Gas Prices with Increased LNG Imports*, LNGlawblog.com, May 1, 2008, at http://www.lnglawblog.com/BlogEntry.aspx?_entry=32870640-35c8-4b2a-becc-640da38cbcf7 (last visited Aug. 19, 2008).
[198] *Industry Analysts: U.S. Market May Have to Pay Oil-Based Prices to Attract LNG*, lnglawblog.com, May 9, 2008, at http://www.lnglawblog.com/BlogEntry.aspx?_entry=4929784a-3602-488f-9537-09633302e2df (last visited Aug. 5, 2008).

market and strong demand in Japan, South Korea, and Spain could trigger 'substantial price spikes' for natural gas in the U.S. market."[199]

Paying higher prices for LNG will also serve as a bad investment by diverting resources from actions that could potentially lower natural gas prices. Unlike LNG, pipeline investments to increase access to domestic reserves can actually lower prices. The study by the Federal Reserve Bank of Dallas found "that a lack of pipeline capacity contributes to the volatility of regional natural gas prices in the United States."[200] The study also noted that increased storage might bring down prices.[201] But pipeline capacity expansions and storage from LNG terminals will not solve these problems, because they will only distribute and store more expensive, globally priced LNG.

Investing in domestic infrastructure and **retaining natural gas independence** will help to ensure a more dependable supply of lower cost natural gas. Currently, there are no LNG exportation facilities in the lower-48, so any domestically produced natural gas has only slight competition from Canada and Mexico. In other words, U.S. natural gas is in a pipeline that cannot change course like a ship seeking the highest bidder. As a result, U.S. natural gas is less exposed to global price dynamics, such as the high and growing cost of LNG.

If New Jersey invests in LNG infrastructure instead of domestic infrastructure, like New England which is reliant on LNG for 20% of its natural gas demand (and 35-40% on peak days),[202] it will be reliant on an international natural gas supply that has far greater competition and is vulnerable to global bidding wars.

Finally, one must consider the inherent volatility in LNG pricing, since so much of it comes from unstable regions. "So those who fear damage to [the environment from LNG terminal siting], or adding another terrorist target near New York, should add to their worries the possibility that we are carving out an energy future even more reliant on imports, where power for our homes is just as volatile in price as the fuel for our cars."[203]

D. Significant Hidden and Unknown Costs of LNG Use: More Devil in the Details

Added to the going rate for global LNG, more costs will be incurred with new LNG terminals. First, there are potential expensive retrofit costs for existing natural gas electricity plants. Recently, operators of gas-fired power plants in New England raised concerns that regasified

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[199] Analysts: Tight Global Liquefaction Market Could Result in Price Spikes for U.S. Natural Gas, LNG Law Blog, July 10, 2008, at http://www.lnglawblog.com/BlogEntry.aspx?_entry=d14d0ed2-8ca3-42f7-b230-6060874ce014 (last visited Aug. 6, 2008).
[200] Stephen P.A. Brown and Mine K. Yucel, *Deliverability and Regional Pricing in U.S. Natural Gas Markets*, Research Department Working Paper 0802, Federal Reserve Bank of Dallas, 2008, p. 2.
[201] Stephen P.A. Brown and Mine K. Yucel, *Deliverability and Regional Pricing in U.S. Natural Gas Markets*, Research Department Working Paper 0802, Federal Reserve Bank of Dallas, 2008, p. 13.
[202] Testimony of Clay Harris, President and CEO, SUEZ LNG, NA, Before the Select Committee on Energy Independence and Global Warming, U.S. House of Representatives, July 30, 2008.
[203] Marianne Lavelle, *Feds Weigh Long Island Sound LNG Terminal*, US News and World Report, Mar. 17, 2008, at http://www.usnews.com/blogs/beyond-the-barrel/2008/3/17/feds-weigh-long-island-sound-lng-terminal.html#Comments (last visited Aug. 6, 2008).

LNG could harm their equipment, affect the reliability of their plants and customer reliability, and force them to make expensive modifications.[204] This is because "foreign gas introduced into the nation's transportation system is often different from domestic supply in its heat content and physical composition. Those variables, according to electric power generation companies, could potentially cause disruptions for equipment that is calibrated to precise specifications."[205] All of these costs paid by power plant operators will be passed onto the consumer.

Second, the costs of the LNG terminals themselves must also be passed on to consumers. These costs are skyrocketing with construction costs for regasification terminals increasing "by more than 50 percent over the past 5 years."[206] Tom Cordano, president of Exxon's LNG Market Development unit, went to an LNG summit and reportedly said that a "sharp surge in costs to develop liquefied natural gas projects risks halting a growth boom in the industry that has been driven by soaring demand."[207] "'There is a cloud hanging over this very optimistic picture for the LNG business and it's the cloud of project cost escalation,' Cordano told an LNG summit in Rome. 'This is a very significant concern. It has the potential to really derail the great growth that we see coming along in our business.'"[208] Whatever projects do move forward will pass on these escalating expenses. Placing terminals offshore results in additional costs, according to Bill Cooper, executive director of the Center for Liquefied Natural Gas, and "generally cost twice what it takes to build on-shore."[209]

Being farther from most LNG exporters than other LNG importers, the U.S. also has to cover increased shipping costs. LNG from "Atlantic Basin and Middle East supplies face an additional $0.30-0.80/MMBtu transportation cost for deliveries to the US market."[210]

Then there are the bills that all taxpayers have to pay, even if they do not ultimately consume the LNG. Coast Guard protection of LNG tankers can run in the tens of thousands of dollars per ship.[211] In a report for Congress, the Congressional Research Service projected security costs at $25,000 per shipment.[212] Security costs for a terminal in Everett, MA, near Boston, run at

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[204] Rob Linke, *Natural gas worry triggers U.S. hearing*, Telegraph-Journal, June 17, 2008, at http://nbbusinessjournal.canadaeast.com/journal/article/328178 (last visited Aug. 6, 2008).
[205] Katie Teller, *LNG Lowdown: New York rejects Broadwater; British Columbia may hold advantage over Oregon*, Power & Natural Gas – Operations and Strategy, April 16, 2008, at http://www.snl.com:80/InteractiveX/article.aspx?CDID=A-7636216-11619&KPLT=2 (last visited Aug. 6, 2008)..
[206] Annual Energy Outlook 2008, Energy Information Administration, DOE/EIA-0383(2008), June 2008, p. 46.
[207] Deepa Babington, Exxon says rising costs risk derailing LNG boom, Reuters UK, Dec. 4, 2007, at http://uk.reuters.com/article/oilRpt/idUKL0414043020071204 (last visited Aug. 6, 2008).
[208] Deepa Babington, Exxon says rising costs risk derailing LNG boom, Reuters UK, Dec. 4, 2007, at http://uk.reuters.com/article/oilRpt/idUKL0414043020071204 (last visited Aug. 6, 2008).
[209] Tom Johnson, *Natural gas terminal is proposed off Jersey*, Star-Ledger, Dec. 12, 2007.
[210] Press Release, PFC Energy, North America Facing LNG Regasification Terminal Overbuild, Mar. 18, 2008, at http://www.pfcenergy.com/viewNew.aspx?id=40 (last visited Aug. 6, 2008).
[211] CRS Report for Congress, *Liquefied Natural Gas (LNG) Infrastructure Security: Background and Issues for Congress*, Congressional Research Service, The Library of Congress, Order Code RL 32073, Sep. 9, 2003, p. CR-17.
[212] CRS Report for Congress, *Liquefied Natural Gas (LNG) Infrastructure Security: Background and Issues for Congress*, Congressional Research Service, The Library of Congress, Order Code RL 32073, Sep. 9, 2003, p. CR-17.

$80,000 per shipment, excluding costs covered by the terminal owner.[213] "Coast Guard staff acknowledge that resources dedicated to securing maritime LNG might be otherwise deployed for boating safety, search and rescue, drug interdiction, or other security missions."[214] Unfortunately, those resources currently dedicated to LNG do not even provide adequate security. In 2007, the Government Accountability Office found that "units of the Coast Guard…report insufficient resources to meet its own self imposed security standards, such as escorting ships carrying liquefied natural gas."[215] Thus, taxpayers are paying high security costs to under-enforce the necessary security measures at existing terminals.

VI. LNG IS ANTITHETICAL TO ENERGY INDEPENDENCE — THE PEDESTAL ON WHICH NEARLY ALL AMERICANS AND PUBLIC POLICY LEADERS PURPORT TO STAND.

> *Currently, the U.S. is energy independent for natural gas with 97% of supply coming from North America. If New Jersey opens its doors to LNG, the State will become reliant on Russia and the Middle East, who possess over two-thirds of the world's natural gas reserves.*

Proven U.S. reserves annually supply about 80% of the country's consumption, with additional natural gas coming from Canada and Mexico.[216] As the world's second largest producer of natural gas (Russia is the largest),[217] the U.S. also produces and exports additional natural gas. In total, the U.S. actually produces 86% of its annual consumption.[218] LNG accounts for only about 3% of the U.S.'s natural gas supply.[219] Again, the U.S.'s proven reserves and production

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[213] CRS Report for Congress, *Liquefied Natural Gas (LNG) Infrastructure Security: Background and Issues for Congress*, Congressional Research Service, The Library of Congress, Order Code RL 32073, Sep. 9, 2003, p. CR-17.

[214] CRS Report for Congress, *Liquefied Natural Gas (LNG) Infrastructure Security: Background and Issues for Congress*, Congressional Research Service, The Library of Congress, Order Code RL 32073, Sep. 9, 2003, p. CR-17.

[215] Government Accountability Office, Report to Congressional Requesters, Maritime Security, *Federal Efforts Needed to Address Challenges in Preventing and Responding to Terrorist Attacks on Energy Commodity Tankers*, GAO-08-141, Dec. 2007, p. 2.

[216] In 2007, the U.S. consumed 23,056,814 mcf. Natural Gas Consumption by End Use (Annual), Natural Gas Navigator, Energy Information Administration, U.S. Department of Energy, at http://tonto.eia.doe.gov/dnav/ng/ng_cons_sum_dcu_nus_a.htm (last visited Aug. 6, 2008). In 2007, the U.S. imported 4,602,035 mcf of natural gas. U.S. Natural Gas Imports by Country (Annual), Natural Gas Navigator, Energy Information Administration, U.S. Department of Energy, at http://tonto.eia.doe.gov/dnav/ng/ng_move_impc_s1_a.htm (last visited July 2, 2008).

[217] World Dry Natural Gas Production, Energy Information Administration, U.S. Department of Energy, June 30, 2008, at http://www.eia.doe.gov/emeu/international/RecentNaturalGasProductionTCF.xls (last visited Aug. 27, 2008).

[218] In 2006, the U.S. consumed 21.66 tcf of natural gas and produced 18.57 tcf. Annual Energy Outlook 2008, Energy Information Administration, DOE/EIA-0383(2008), June 2008, p. 13. 18.57/21.66 x 100 = 86%.

[219] In 2006, the U.S. consumed 21,653,086 mcf of natural gas. Natural Gas Consumption by End Use (Annual), Natural Gas Navigator, Energy Information Administration, U.S. Department of Energy, at http://tonto.eia.doe.gov/dnav/ng/ng_cons_sum_dcu_nus_a.htm (last visited Aug. 21, 2008). In the same year, the U.S. imported 583,537 mcf of LNG. U.S. Natural Gas Imports by Country (Annual), Natural Gas Navigator, Energy Information Administration, U.S. Department of Energy, at http://tonto.eia.doe.gov/dnav/ng/ng_move_impc_s1_a.htm (last visited July 1, 2008). 583,537/21,653,086 x 100 =

are continuing to grow with the EIA expecting the U.S. to increase production at a greater rate than consumption between now and 2030. Thereby, the U.S. can continue to remain energy independent for natural gas.

If the U.S. increases its reliance on LNG, it will increase its reliance on those countries with the greatest reserves. The Middle East and Russia together have over two thirds of the world's proven reserves.[220] While the United States is in the top ten of proven natural gas reserves, the other nine are Russia, Iran, Qatar, Saudi Arabia, United Arab Emirates, Nigeria, Algeria, Venezuela, and Iraq.[221] Americans are already dependent on many of those same countries for driving their cars. Increasing LNG imports as much as the energy companies want would make Americans reliant on those same countries for generating electricity and heating their homes.

In addition to the other problems associated with LNG and discussed throughout this report, there are numerous problems with becoming reliant on the foreign countries that possess the greatest quantities of natural gas. Problems of relying on the Middle East for fossil fuels are well known, and a topic of great concern to countless Americans. Nigerian rebels are known to attack offshore oil and gas rigs, which threatens supply stability and will "put upward pressure on the prices."[222] Russia has a history of cutting off natural gas exports when buyers would not agree to higher prices.[223] The more recent clash in the country of Georgia showed "how the conflict, which includes the prospect of a major Russian power grab in Georgia, could wreak havoc with the West's hopes of diversifying its supply sources. The United States and the EU have become increasingly alarmed at how a resurgent Russia is using its vast energy wealth as a tool for expanding its influence — and getting its way — on the world stage."[224]

The LNG tankers frequenting the U.S. are commonly staffed by crew from these same foreign countries, many of which the U.S. considers hostile to American interests and security. State run corporations from the Middle East are also gaining controlling interests in U.S. LNG terminals.[225] Finally, there is the threat of an OPEC-like group (Organization of the Petroleum Exporting Countries) for natural gas: "The big exporters [of natural gas] include Russia, Iran

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2.69%. In 2007, the U.S. consumed 23,056,814 mfc of natural gas. Natural Gas Consumption by End Use (Annual), Natural Gas Navigator, Energy Information Administration, U.S. Department of Energy, at http://tonto.eia.doe.gov/dnav/ng/ng_cons_sum_dcu_nus_a.htm (last visited July 1, 2008). In the same year, the U.S. imported 770,812 mcf of LNG. U.S. Natural Gas Imports by Country (Annual), Natural Gas Navigator, Energy Information Administration, U.S. Department of Energy, at http://tonto.eia.doe.gov/dnav/ng/ng_move_impc_s1_a.htm (last visited July 1, 2008). 770,812/23,056,814 x 100 = 3.34%. LNG imports are currently down from 2006 and 2007 rates. U.S. Liquefied Natural Gas Imports (MMcf) (Monthly), Natural Gas Navigator, Energy Information Administration, U.S. Department of Energy, at http://tonto.eia.doe.gov/dnav/ng/hist/n9103us2m.htm (last visited July 1, 2008).

[220] 40.5% of the world's natural gas reserves are in the Middle East. 26.3% of the world's natural gas reserves are in the Russian Federation. BP Statistical Review of World Energy 2007, BP, p. 22.

[221] "Hard Truths," National Petroleum Council, p. 133, Figure 2-45 (July 2007).

[222] Ron Scherer, *Some signs of relief on gasoline prices*, The Christian Science Monitor, June 23, 2008.

[223] Andres Cala, *Europe Looks to LNG*, Energy Tribune, Mar. 20, 2008, at http://www.energytribune.com/articles.cfm?aid=830 (last visited Aug. 6, 2008).

[224] George Jahn, *Georgia conflict stokes energy supply concerns*, Associate Press, Aug. 11, 2008.

[225] Welcome to the Golden Pass LNG (Liquefied Natural Gas) web site, Golden Pass LNG, at http://www.goldenpasslng.com/ (last visited Jun. 29, 2008).

and Venezuela, countries now talking about forming a cartel. Basically, we are re-creating the same mistake we made with oil."[226]

VII. LNG IS A SECURITY RISK.

> *LNG "is more than just a potential weapon of mass destruction in the right locale. It also offers terrorists an awesome economic target wherever in the world it can be found--even on the high seas."*[227]

The true threats of an accident or attack on an LNG port or tanker are unquantifiable at this stage. LNG transportation only recently began to significantly grow as an industry and there have been limited incidents that provide any insight into the true scale of harms. Due to LNG having a volume 620 times smaller than in its natural gaseous state,[228] LNG represents highly compressed energy. As a result, "[t]he energy content of a single standard LNG tanker (one hundred twenty-five thousand cubic meters) is equivalent to seven-tenths of a megaton of TNT, or about fifty-five Hiroshima bombs."[229] While the energy content might not be released at the same rate and in the same format as a Hiroshima bomb, not enough is known as to the full-scale results of a large LNG release.

"Impact estimates for LNG tanker attacks are largely based on engineering models, however, each with its own input assumptions–so it is difficult to assert definitively how dangerous a real attack would be."[230] In citing LNG terminals, researchers rely primarily on modeling reports, which can vary largely. [231] But researchers have found the threats to be real.

A Congressional Research Service Report for Congress found that LNG "is a hazardous fuel,"[232] "poses a serious hazard of explosion or fire,"[233] and "can be vulnerable to terrorist attack." [234] The Congressional Report also discusses the various hazards that LNG terminals pose, including what follows.

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[226] Mike Thomas, Guest Op Ed, *Offshore drilling could reduce global warming*, Orlando Sentinel, Jan. 31, 2008.
[227] Lieutenant Commander Cindy Hurst, Is Liquified Natural Gas an Economic Target?, Spero News (adapted from a report for the Institute for the Analysis of Global Security and a contributor to The Cutting Edge News), June 30, 2008, at http://www.speroforum.com/site/article.asp?id=15596 (last visited July 20, 2008).
[228] Amory Lovins and L. Hunter Lovins, Brittle Power (Jack Howell ed., Brick House Publishing Co. 1982) (1982), p. 87.
[229] Amory Lovins and L. Hunter Lovins, Brittle Power (Jack Howell ed., Brick House Publishing Co. 1982) (1982), p. 88.
[230] CRS Report for Congress, *Liquefied Natural Gas (LNG) Infrastructure Security: Background and Issues for Congress*, Congressional Research Service, The Library of Congress, Order Code RL 32073, Sep. 9, 2003, p. CR-12.
[231] Government Accountability Office, Report to Congressional Requesters, Maritime Security, *Public Safety Consequences of a Terrorist Attack on a Tanker Carrying Liquefied Natural Gas Need Clarification*, GAO-07-316, Feb. 2007, p. 2 of 45.
[232] CRS Report for Congress, *Liquefied Natural Gas (LNG) Infrastructure Security: Background and Issues for Congress*, Congressional Research Service, The Library of Congress, Order Code RL 32073, Sep. 9, 2003, Summary.
[233] CRS Report for Congress, *Liquefied Natural Gas (LNG) Infrastructure Security: Background and Issues for Congress*, Congressional Research Service, The Library of Congress, Order Code RL 32073, Sep. 9, 2003, p. CR-8.
[234] CRS Report for Congress, *Liquefied Natural Gas (LNG) Infrastructure Security: Background and Issues for Congress*, Congressional Research Service, The Library of Congress, Order Code RL 32073, Sep. 9, 2003, p. CR-8.

First, there are the threats of pool fires that would spread and burn "far more hotly and rapidly than oil or gasoline fires. They cannot be extinguished–all the LNG must be consumed before they go out. Because LNG pool fires are so hot, their thermal radiation may injure people and damage property a considerable distance from the fire itself. Many experts agree that a pool fire, especially on water due to thermal effects, is the most serious LNG hazard."[235] According to a Coast Guard review of the proposed Calypso LNG port offshore Florida, "[i]n the worst-case scenario, with tanks breached and the pooled gas catching fire, the blaze could kill people half a mile a way and cause second-degree burns at 1.6 miles, according to the review. If the leaked gas vaporized, the flammable cloud could extend 3.7 miles from the leak."[236]

Second, there are flammable vapor clouds that result if an LNG spill does not immediately ignite as in a pool fire. A vapor cloud "would not likely explode all at once, but the fire could still cause considerable damage. An LNG vapor cloud fire would gradually burn its way back to the LNG spill where the vapors originated and would continue to burn as a pool fire."[237] One government study put the hazard range for a vapor cloud up to more than one and a half miles.[238] Researchers from a Pentagon commissioned study found that a gas cloud "might extend at least three miles downwind from a large tanker spill within ten to twenty minutes. It might ultimately reach much farther – perhaps six to twelve miles. If not ignited, the gas is asphyxiating. If ignited, it will burn to completion with a turbulent diffusion flame reminiscent of the 1937 *Hindenberg* disaster but about a hundred times as big. Such a fireball would burn everything within it, and by its radiant heat would cause third-degree burns and start fires a mile or two away."[239] "[A] single cubic meter of spilled LNG can make up to twelve thousand four hundred cubic meters of flammable gas-air mixture."[240] An LNG tanker holding 125,000 cubic feet of LNG "can form between about twenty and fifty billion cubic feet of flammable gas-air mixture."[241]

A vapor cloud explosion at an LNG liquefaction plant in Algeria, which killed 27 people and injured dozens, took eight hours to extinguish. According to scientific studies, including one by Sandia National Laboratories in New Mexico, the radiated heat from an ignited vapor cloud

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[235] CRS Report for Congress, *Liquefied Natural Gas (LNG) Infrastructure Security: Background and Issues for Congress*, Congressional Research Service, The Library of Congress, Order Code RL 32073, Sep. 9, 2003, p. CR-8.
[236] David Fleshler, *Floating gas plant proposal off Fort Lauderdale 'crazy idea'*, South Florida Sun-Sentinel, May 17, 2008.
[237] CRS Report for Congress, *Liquefied Natural Gas (LNG) Infrastructure Security: Background and Issues for Congress*, Congressional Research Service, The Library of Congress, Order Code RL 32073, Sep. 9, 2003, p. CR-8-9.
[238] Mike Hightower, *et al.*, *Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water*, Sandia Report, Sandia National Laboratories, SAND2004-6258, Dec. 2004, p. 15.
[239] Amory Lovins and L. Hunter Lovins, Brittle Power (Jack Howell ed., Brick House Publishing Co. 1982) (1982), p. 88.
[240] Amory Lovins and L. Hunter Lovins, Brittle Power (Jack Howell ed., Brick House Publishing Co. 1982) (1982), p. 88.
[241] Amory Lovins and L. Hunter Lovins, Brittle Power (Jack Howell ed., Brick House Publishing Co. 1982) (1982), p. 88.

"could burn skin on those outside up to a mile away."[242] "Jerry Havens, a professor of chemical engineering at the University of Arkansas, said the Federal Energy Regulatory Commission…[has] misused two models he devised to calculate how far a vapor cloud would travel should LNG spill from an import terminal. He also said the data FERC has used assumes a relatively small spill, which skews projections for how far vapor rising off leaking LNG could spread."[243]

Third, there is the potential for flameless explosions that could result from LNG spills on water. Known as a "rapid phase transition," LNG could heat up and regasify almost instantly in a "flameless explosion."[244]

Other threats include vapor clouds causing asphyxiation by displacing breathable air, as well as cryogenic injuries and equipment damage.[245] Cryogenic injuries are less of a threat "as a major spill would likely result in a more serious fire."[246]

Historically, one frequently cited accident was the shattering of an LNG storage tank in Cleveland, Ohio in 1944. While this is an old accident, it provides insight into the potential scale for an LNG accident. When the storage tank shattered, "LNG spilled over the containment dikes, into the streets, and into the sewer system, where it vaporized and ignited. A large area of Cleveland was destroyed, and 133 people died."[247] "The subsequent explosion shot flames more than half a mile into the air. The temperature in some areas reached three thousand degrees Fahrenheit."[248] That incident involved a small storage tank with a capacity of only 5,000 cubic meters.[249] A modern-size storage tank is 160,000 cubic meters.[250] The Atlantic Sea Island Group island terminal proposed off New York and New Jersey would have four 180,000 cubic meter storage tanks for a total of 720,000 cubic meters.[251] Exxon, another company proposing an LNG terminal off New Jersey, has ordered the world's largest LNG tanker, which has 266,000 cubic meters of capacity.[252] That is over fifty times larger than the storage tank in Cleveland.

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[242] Armen Keteyian and Phil Hirschkorn, *Safety Concerns Tie Up LNG Development*, CBS News, Oct. 27, 2007, at http://www.cbsnews.com/stories/2007/10/27/cbsnews_investigates/main3419576.shtml?source=search_story (last visited Aug. 6, 2008).
[243] Tony Lystra, *LNG expert: Vapor model misused*, The Daily News, Nov. 10, 2007, at http://www.tdn.com/articles/2007/11/10/area_news/doc47361c0aeee88838169808.txt (last visited Aug. 6, 2008).
[244] CRS Report for Congress, *Liquefied Natural Gas (LNG) Infrastructure Security: Background and Issues for Congress*, Congressional Research Service, The Library of Congress, Order Code RL 32073, Sep. 9, 2003, p. CR-9.
[245] CRS Report for Congress, *Liquefied Natural Gas (LNG) Infrastructure Security: Background and Issues for Congress*, Congressional Research Service, The Library of Congress, Order Code RL 32073, Sep. 9, 2003, p. CR-9.
[246] CRS Report for Congress, *Liquefied Natural Gas (LNG) Infrastructure Security: Background and Issues for Congress*, Congressional Research Service, The Library of Congress, Order Code RL 32073, Sep. 9, 2003, p. CR-9.
[247] Theo van de Kletersteeg, *LNG: Birth of a New Industry*, Canadian Sailings, June 23, 2008.
[248] Amory Lovins and L. Hunter Lovins, Brittle Power (Jack Howell ed., Brick House Publishing Co. 1982) (1982), p. 89.
[249] Theo van de Kletersteeg, *LNG: Birth of a New Industry*, Canadian Sailings, June 23, 2008.
[250] Theo van de Kletersteeg, *LNG: Birth of a New Industry*, Canadian Sailings, June 23, 2008.
[251] Terminal Design Specifications, Safe Harbor Energy, Atlantic Sea Island Group, at http://www.atlanticseaislandgroup.com/terminal_design_specifications.shtml (last visited July 20, 2008).
[252] Jeff Florian, Exxon to get world's biggest LNG tanker, AME Info, July 8, 2008, at http://www.ameinfo.com/162819.html (last visited July 20, 2008).

A. LNG is a Security Risk Whether Onshore or Offshore

Due to the security risks inherent in the LNG business, many ports are now proposed offshore to reduce risks to human lives. But instead of asking which of two locations is better, the question must be whether the risks are acceptable in either location. LNG facilities are considered terrorist targets not just due to their threat to public safety, but also because of the economic devastation that could result. First, there are economic impacts from destroying an energy source after a region has become dependent upon it. Second, there are the secondary impacts from a disruption of marine traffic at the entrance to New York Harbor, the largest port on the east coast and the third in the nation. This port traffic also serves the most densely populated urbanized area in the country and the gateway to the financial world markets.

As Cindy Hurst, a U.S. Navy Reserve Lieutenant Commander and political-military research analyst with the Foreign Military Studies Office (a research and analysis center under the U.S. Army), notes, LNG "is more than just a potential weapon of mass destruction in the right locale. It also offers terrorists an awesome economic target wherever in the world it can be found--even on the high seas."[253] "Should terrorists destroy or damage ports and facilities handling LNG, whole regions could be economically devastated."[254] As the Congressional Research Service explains, "[s]ince LNG is fuel for power plants, heating, military bases, and other uses, disruption of LNG shipping or storage poses additional 'downstream' risks, especially in more dependent regions like New England."[255]

Lieutenant Commander Hurst also explains that, "as time passes and the role of LNG grows worldwide, the potential impact of a terrorist attack on these tankers or terminals increases."[256] If LNG infrastructure continues to replace growth in domestic infrastructure, as it has in New England, "were an LNG disaster to occur in the U.S., it would have an immediate impact. Natural gas serves over 64 million customers and provides around 24 percent of all energy consumed. Not only is this energy essential for home heating, it is also increasingly used toward power generation and serves as a major feedstock for the chemical industry. Every one of these sectors could be subject to price hikes, shortened productivity and even increased dependence on foreign trade."[257]

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[253] Lieutenant Commander Cindy Hurst, Is Liquified Natural Gas an Economic Target?, Spero News (adapted from a report for the Institute for the Analysis of Global Security and a contributor to The Cutting Edge News), June 30, 2008, at http://www.speroforum.com/site/article.asp?id=15596 (last visited July 20, 2008).

[254] Lieutenant Commander Cindy Hurst, Is Liquified Natural Gas an Economic Target?, Spero News (adapted from a report for the Institute for the Analysis of Global Security and a contributor to The Cutting Edge News), June 30, 2008, at http://www.speroforum.com/site/article.asp?id=15596 (last visited July 20, 2008).

[255] CRS Report for Congress, *Liquefied Natural Gas (LNG) Infrastructure Security: Background and Issues for Congress*, Congressional Research Service, The Library of Congress, Order Code RL 32073, Sep. 9, 2003, p. CR-10-11.

[256] Lieutenant Commander Cindy Hurst, Is Liquified Natural Gas an Economic Target?, Spero News (adapted from a report for the Institute for the Analysis of Global Security and a contributor to The Cutting Edge News), June 30, 2008, at http://www.speroforum.com/site/article.asp?id=15596 (last visited July 20, 2008).

[257] Lieutenant Commander Cindy Hurst, Is Liquified Natural Gas an Economic Target?, Spero News (adapted from a report for the Institute for the Analysis of Global Security and a contributor to The Cutting Edge News), June 30, 2008, at http://www.speroforum.com/site/article.asp?id=15596 (last visited July 20, 2008).

"Should terrorists somehow manage to damage or destroy this infrastructure, or the ports that lead to the processing plants, it would be detrimental to those regions which have become highly dependent on LNG. Finally, when it comes to LNG as an economic target, the best measure to mitigate this possibility is simply to ensure that appropriate measures are taken to keep dependency on LNG at a reasonable level."[258]

In addition, the disruption of traffic is enough to "cause severe economic impact" in the New Jersey/New York region.[259] As the Port Authority of New York/New Jersey found, "[b]ecause of its location, an incident or occurrence associated with the operations at the ASIG island would have the potential to seriously disrupt marine traffic in and out of the Port of New York/New Jersey. Any such occurrence has the potential to cause severe economic impact to the State of New Jersey, the region and the nation."[260]

The Congressional Research Service Report found that placing LNG terminals offshore "may increase the risks to the terminals themselves. Because offshore oil and gas facilities are remote, isolated, and often lightly manned, some experts believe they are more vulnerable to terror attacks than land-based facilities."[261]

Finally, offshore siting does not guarantee public safety for coastal communities. The Congressional Report found that tankers may be "commandeered for use as weapons against coastal targets."[262] A hijacking may not be necessary as no LNG tanker is American flagged,[263] and many come from countries considered hostile to the U.S. or are home to strong terrorist networks. Indeed, before 9/11/01 "al Qaeda operatives had been infiltrating Boston by coming in on liquid natural gas tankers from Algeria."[264]

B. U.S. Coast Guard Under-Funded to Serve and Protect

What is also troubling is that "units of the Coast Guard…report insufficient resources to meet its own self imposed security standards, such as escorting ships carrying liquefied natural gas."[265]

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[258] Lieutenant Commander Cindy Hurst, Is Liquified Natural Gas an Economic Target?, Spero News (adapted from a report for the Institute for the Analysis of Global Security and a contributor to The Cutting Edge News), June 30, 2008, at http://www.speroforum.com/site/article.asp?id=15596 (last visited July 20, 2008).

[259] *Atlantic Sea Island Group, LLC. v. Connaughton*, Civil Action No. 08-00259, D.C. District Court, Declaration of Dennis Lombardi, Mar. 11, 2008 (on file with author).

[260] *Atlantic Sea Island Group, LLC. v. Connaughton*, Civil Action No. 08-00259, D.C. District Court, Declaration of Dennis Lombardi, Mar. 11, 2008 (on file with author).

[261] CRS Report for Congress, *Liquefied Natural Gas (LNG) Infrastructure Security: Background and Issues for Congress*, Congressional Research Service, The Library of Congress, Order Code RL 32073, Sep. 9, 2003, p. CR-20.

[262] CRS Report for Congress, *Liquefied Natural Gas (LNG) Infrastructure Security: Background and Issues for Congress*, Congressional Research Service, The Library of Congress, Order Code RL 32073, Sep. 9, 2003, p. CR-10-11.

263 A message from Maritime Administrator Sean T. Connaughton, Deepwater Port Licensing for LNG and Oil, U.S. Maritime Administration, July, 2008.

[264] Richard A. Clarke, Against All Enemies: Inside America's War on Terror, Free Press, New York, NY, 2004, p. 15.

[265] Government Accountability Office, Report to Congressional Requesters, Maritime Security, *Federal Efforts Needed to Address Challenges in Preventing and Responding to Terrorist Attacks on Energy Commodity Tankers*, GAO-08-141, Dec. 2007, p. 2 of 112.

Most troubling, is that this report was written when only five LNG terminals were online. There are now eight, and as they continue to grow, the Coast Guard and their resources will only become further stretched thin.

LNG terminals can also over-burden local first responders. Indeed, "some local firefighters said that they may not be able to effectively respond to marine fires because they do not have enough fire boats or are not sufficiently trained for shipboard firefighting. Port officials also said they lacked resources for improving emergency response capabilities."[266]

VIII. OFFSHORE LNG FACILITIES AND TANKERS REQUIRE MASSIVE EXCLUSION ZONES.

> *"It's not your ocean, it's the federal government's ocean." - Howard Bovers, Chairman, Atlantic Sea Island Group, responding at a public hearing to a citizen's concern about industrializing the public's ocean.*[267]

Due to the inherent security risks with LNG, the federal government sets exclusion zones around both LNG terminals and LNG tankers that vary with each project. These security zones represent a *de facto* privatization of public resources. Coastal waters are held in trust by the government for its citizens. The public loses access to the site *occupied* by the project, large zones *around each project facility* and its extended infrastructure, and large areas during transports by LNG tankers. This results in significant losses to recreational boating, commercial and recreational fishing, diving, and commercial ship traffic, among others.

There are generally three forms of zones that form concentric circles around an offshore LNG terminal. First, there is the Safety Zone, also known as an Exclusion or Security Zones. All vessels other than LNG tankers, Coast Guard ships, or other vessels associated with the LNG operations "are prohibited from entering into or moving within this safety zone."[268] Second, there is the No Anchoring Area (NAA), in which no anchoring is allowed.[269] Third, there is the Area To Be Avoided (ATBA), which "is recommendatory in nature and does not restrict vessels from transiting the area. However vessel operators are strongly urged to seek alternate routes outside the ATBA."[270] In addition to zones for LNG terminals, there are Safety Zones around LNG tankers that move with the tankers when they are in transit.

Currently, only turret buoys have been built for offshore LNG projects, so they are the only terminal technology for which exclusion zones have been permanently set. For the Northeast Gateway LNG port off of Boston, which is two turret buoys, the Coast Guard set an Exclusion Zone of 500 meters.[271] When LNG tankers connect to the turret buoy, the 500-meter safety zone

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[266] Government Accountability Office, Report to Congressional Requesters, Maritime Security, *Federal Efforts Needed to Address Challenges in Preventing and Responding to Terrorist Attacks on Energy Commodity Tankers*, GAO-08-141, Dec. 2007, p. 10.
[267] Public Meeting on the Atlantic Sea Island Group's Proposed Safe Harbor Energy LNG Port, held by New York State Assemblyman Harvey Weisenberg, Nov. 19, 2007 (audio available with author).
[268] 70 Fed. Reg. 24708 (May 11, 2005).
[269] 70 Fed. Reg. 24707 (May 11, 2005).
[270] 70 Fed. Reg. 24707 (May 11, 2005).
[271] 73 Fed. Reg. 34192 (June 17, 2008).

will extend from the circle formed by the tanker's stern based on a 360-degree rotation.[272] This results in a total of an 800-meter zone for a 300-meter tanker. In addition, the Coast Guard established a No Anchoring Area of 1,000 meters, or 0.62 miles, around each buoy.[273] Finally, the Coast Guard still plans to set an Area to Be Avoided.[274]

Moving an LNG port further offshore does not necessarily reduce the size of the exclusion zones. In the case of the Gulf Gateway LNG port, a single turret buoy 116 miles offshore Louisiana, there is a 500-meter Safety Zone, a 1.5 nautical mile No Anchoring Area, and a 2.0 nautical mile Area to Be Avoided.[275]

As has been stated throughout this report, the other facilities proposed off the Jersey Shore are untested anywhere in the world, and thus factual information regarding exclusion/security zones is unknown. From some of the *proposals* in other regions, however, one may glean the potential sizes of the exclusion zones, which can also be expected to be very large.

Exxon proposes a floating storage and re-gasification unit (FSRU) off New Jersey. A FSRU, known as Broadwater, was previously proposed in Long Island Sound. There, "a fixed circular zone with a radius of 1,210 yards (0.7 mile) from the center of the YMS [yoke mooring system] has been proposed for the duration of the Project."[276] That is a 1,106 meter Safety Zone.

No Anchoring Areas and Areas to be Avoided were not set for Broadwater at the time New York State denied a coastal zone permit for the facility, so the potential sizes of the areas were not revealed. But the Cabrillo LNG port proposed off of California would have had a 4,000 meter Area to be Avoided from the pivot point of the 300 meter long FSRU.[277]

As to the LNG tankers frequenting Broadwater, the federal government found the "moving safety and security zone would extend about 2 nautical miles (2.3 miles) in front of the bow, about 1 nautical mile (1.2 miles) behind the stern, and 750 yards (about 0.4 mile) to each side of the vessel."[278] Including the width of an LNG tanker itself, the width of the exclusion zone would be 1,560 yards, or 0.9 miles.[279]

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[272] 73 Fed. Reg. 34192 (June 17, 2008); Cabrillo Port Liquefied Natural Gas Deepwater Port Final Envtl. Impact Statement/Envtl. Impact Report, U.S. Coast Guard, U.S. Maritime Administration, and California State Lands Commission, Docket Nos. USCG-2004-16877, p. 4.3-18 (Mar. 16, 2007).
[273] 73 Fed. Reg. 34192 (June 17, 2008).
[274] 73 Fed. Reg. 34192 (June 17, 2008).
[275] 70 Fed. Reg. 24707-24708 (May 11, 2005).
[276] Broadwater Final Envtl. Impact Statement, Fed. Energy Regulatory Comm'n, Docket Nos. CP06-54-000, *et al*., p. 5-11 (Jan. 11, 2008).
[277] Cabrillo Port Liquefied Natural Gas Deepwater Port Final Envtl. Impact Statement/Envtl. Impact Report, U.S. Coast Guard, U.S. Maritime Administration, and California State Lands Commission, Docket Nos. USCG-2004-16877, p. 4.3-18 (Mar. 16, 2007).
[278] Broadwater Final Envtl. Impact Statement, Fed. Energy Regulatory Comm'n, Docket Nos. CP06-54-000, *et al*., p. 5-11 (Jan. 11, 2008).
[279] Broadwater Final Envtl. Impact Statement, Fed. Energy Regulatory Comm'n, Docket Nos. CP06-54-000, *et al*., p. 5-7 (Jan. 11, 2008).

In addition to operations, exclusion zones occur during construction, which implicate areas beyond the port location. For example, the Atlantic Sea Island Group proposes a 9,306-acre exclusion zone during the eight-month pipeline construction period.[280]

The 500-meter Safety Zones in many waters is based not on what is determined to be safe, secure, or appropriate, but rather what is the maximum size allowed by international law. "According to the United Nations Convention on the Law of the Sea and the Continental Shelf Act of 1964 (No. 28 dated November 3, 1964, as amended by the Continental Shelf Act Amendment Act, No. 17 dated November 14, 1977), a safety zone can extend to 0.27 NM [nautical miles] (1,640 feet or 500 m) as 'measured from each point of the outer edge of the installation or device, around any such installations or devices in, on, or above the outer continental shelf.'"[281] It is unknown what the Coast Guard would deem the appropriate safety range if it were allowed to under law. Instead, the Coast Guard follows the law, while a speedboat could get through the 500-meter zone in less than a minute and vapor clouds and pool fires are projected to exceed this "safety zone" boundary.

IX. LNG IS DIRTIER THAN DOMESTIC NATURAL GAS AND WILL CONTRIBUTE TO CLIMATE CHANGE.

> *"[T]he range of life-cycle GHG [greenhouse gas] emissions of electricity generated with LNG is significantly closer to the range of emissions from coal than the life-cycle emissions of natural gas produced in North America."*[282]

LNG is far dirtier than domestic natural gas, which is already "one of the largest sources of greenhouse gas emissions in the United States."[283] At times, LNG can be more polluting than coal. LNG significantly increases pollution as compared to domestic natural gas due to its energy intensive lifecycle. In addition to the same stages that get domestic natural gas from the ground to the consumer, LNG must be cooled to -259°F, shipped across the ocean, and then heated into a gaseous state. One evaluation of the effects of importing LNG to California demonstrated that "[t]he combined impact of venting CO_2 [carbon dioxide] during processing and the energy penalty of the LNG supply chain would increase CO_2 emissions by roughly 20 to 40 percent over California's current emissions from domestic sources of natural gas."[284]

A study by Carnegie Mellon showed that under existing circumstances, the lifecycle from natural gas plants fueled by LNG can actually result in more overall CO_2 emissions than the lifecycle from coal plants. The lower bound lifecycle emission factor for coal is 2000 pounds (lb) CO_2

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[280] Safe Harbor Energy Project Deepwater Port License Application, Volume Five, Part One, Supplemental Environmental Report, Atlantic Sea Island Group, Aug. 2007, p. 16-17.
[281] Cabrillo Port Liquefied Natural Gas Deepwater Port Final Envtl. Impact Statement/Envtl. Impact Report, U.S. Coast Guard, U.S. Maritime Administration, and California State Lands Commission, Docket Nos. USCG-2004-16877, p. 4.3-18 (Mar. 16, 2007).
[282] Paulina Jaramillo, W. Michael Griffin, and H. Scott Matthews, *Comparative Life-Cycle Air Emissions of Coal, Domestic Natural Gas, LNG, and SNG for Electricity Generation*, Environ. Sci. Technol. 2007, 41, p. 6293.
[283] Paulina Jaramillo, W. Michael Griffin, and H. Scott Matthews, *Comparative Life-Cycle Air Emissions of Coal, Domestic Natural Gas, LNG, and SNG for Electricity Generation*, Environ. Sci. Technol. 2007, 41, p. 6290.
[284] John Coequyt, *et al.*, *Liquid Natural Gas: A Roadblock to a Clean Energy Future*, Greenpeace, p. 3.

equivalent per megawatt hour (MWh).[285] The upper bound lifecycle emission factor for LNG is 2400 lb CO_2 equivalent per MWh.[286] When looking at the upper bound life-cycle emission factor for coal, 2550 lb CO_2 equivalent per MWh, one sees that "the range of life-cycle GHG emissions of electricity generated with LNG is significantly closer to the range of emissions from coal than the life-cycle emissions of natural gas produced in North America."[287] The process of liquefaction of natural gas into LNG alone produces more CO_2 emissions than the whole lifecycle of coal prior to combustion, including production, processing, and transport.[288]

Also, a study was conducted of the lifecycle emissions resulting from BHP Billiton's proposed Cabrillo LNG terminal off California. "Compared to the emissions from end-use combustion of the gas — which is a common measure of the global warming contribution of natural gas — the rest of the supply chain emits an additional 44 percent."[289] These "supply chain emissions from production through end-use of the delivered natural gas equal to 4.3 to 4.9 percent of California's total GHG emissions, and 5.3 to 5.9 percent of CO_2 emissions using Energy Information Administration state emissions data. Broadening the comparison — again accounting for emissions from production in Australia to combustion of the gas delivered to end-use customers in California — shows that emissions from BHP's proposed LNG project are equivalent to 0.30 to 0.34 percent of total U.S. emissions (using EIA data for 2004)."[290] All these numbers could be higher because the full range of increased emissions ran from 35 to 53 percent.[291]

The study of the Cabrillo port, which planned on receiving LNG supplies from Australia, was based on a trade route of 9,100 miles, or 7,908 nautical miles, one way.[292] An LNG shipment from Qatar to the East Coast would be roughly 14,200 miles, one way.[293] The longer journey would increase emissions even more.

States must consider the global impact from increasing LNG consumption, including air emissions. It is a sad story at the global level. Maryland has an LNG facility that has contracted

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[285] Paulina Jaramillo, W. Michael Griffin, and H. Scott Matthews, *Comparative Life-Cycle Air Emissions of Coal, Domestic Natural Gas, LNG, and SNG for Electricity Generation*, Environ. Sci. Technol. 2007, 41, p. 6293.
[286] Paulina Jaramillo, W. Michael Griffin, and H. Scott Matthews, *Comparative Life-Cycle Air Emissions of Coal, Domestic Natural Gas, LNG, and SNG for Electricity Generation*, Environ. Sci. Technol. 2007, 41, p. 6293.
[287] Paulina Jaramillo, W. Michael Griffin, and H. Scott Matthews, *Comparative Life-Cycle Air Emissions of Coal, Domestic Natural Gas, LNG, and SNG for Electricity Generation*, Environ. Sci. Technol. 2007, 41, p. 6293.
[288] Paulina Jaramillo, W. Michael Griffin, and H. Scott Matthews, *Comparative Life-Cycle Air Emissions of Coal, Domestic Natural Gas, LNG, and SNG for Electricity Generation*, Figure 3Midpoint Life-Cycle GHG Emissions Using Advanced Technologies with CCS, Environ. Sci. Technol. 2007, 41, p. 6295.
[289] Richard Heede, *LNG Supply Chain Greenhouse Gas Emissions for the Cabrillo Deepwater Port: Natural Gas from Australia to California*, Climate Mitigation Services, May 7, 2006, p. 7.
[290] Richard Heede, *LNG Supply Chain Greenhouse Gas Emissions for the Cabrillo Deepwater Port: Natural Gas from Australia to California*, Climate Mitigation Services, May 7, 2006, p. 19.
[291] Richard Heede, *LNG Supply Chain Greenhouse Gas Emissions for the Cabrillo Deepwater Port: Natural Gas from Australia to California*, Climate Mitigation Services, May 7, 2006, p. 20.
[292] Richard Heede, *LNG Supply Chain Greenhouse Gas Emissions for the Cabrillo Deepwater Port: Natural Gas from Australia to California*, Climate Mitigation Services, May 7, 2006, p. 14.
[293] *Starting On Empty*, World Gas Intelligence, Energy Intelligence Group, Inc., Mar. 26, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=226738 (last visited Aug. 6, 2008).

with Statoil to receive LNG from Norway's Melkoya Island.[294] Norway's liquefaction "facility initially was supposed to emit no more than 15,000 metric tons of carbon gas a year. Statoil had to apply for an additional 200,000 metric tons a year earlier in the year [2007]; the company now projects that the plant's ultimate annual emissions could reach 1.2 million metric tons. The initial burn alone between Aug. 23 and Oct. 23 reached more than 1 million metric tons of emissions, and subjected the nearby town of Hammerfest to a soot-filled 30-minute rain shower in late August. Norway's obligations under the Kyoto Agreement have come under serious strain from the Snovit LNG project alone."[295]

A. New Jersey and Natural Gas, Imperfect Together

Indeed, LNG exacerbates the existing problem that New Jersey has with fossil fuel consumption and emissions. In New Jersey, natural gas emissions result in almost four times as much carbon dioxide (CO_2) emissions as coal.[296] If imported electricity is included and it was assumed all of that came from coal generation, New Jersey would still be responsible for one and a half times more CO_2 from natural gas than coal.[297] Natural gas is the second biggest contributor to CO_2 emissions in New Jersey, accounting for 27% of all CO_2 emissions and second only to gasoline.[298]

As noted by New Jersey Governor Jon Corzine in 2005:

> "Experts predict that unless we take bold action, weather will become more severe: winters colder, summers hotter, and hurricanes more frequent and more powerful. For a state with 127 miles of coastline, this is more than an academic debate. If the polar ice cap melts – a prospect that may be only 65 years away – some scientists say that sea levels in New Jersey will rise by nearly two and a half feet – flooding our barrier islands and changing the very shape of New Jersey. The results would spell disaster for our coastal communities, our coastal habitats, and our shore economy. Global warming represents the worst symptom of a chronic disease: an addiction to fossil fuel.

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[294] *Norway: Statoil's LNG Setbacks*, Stratfor, Dec. 6, 2007, at http://www.stratfor.com/products/premium/read_article.php?id=299566 (last visited Aug. 6, 2008).
[295] *Norway: Statoil's LNG Setbacks*, Stratfor, Dec. 6, 2007, at http://www.stratfor.com/products/premium/read_article.php?id=299566 (last visited Aug. 6, 2008).
[296] Draft New Jersey Greenhouse Gas Inventory and Reference Case Projections 1990-2020, New Jersey Department of Environmental Protection, Feb. 2008, Table ES-1 New Jersey Historical and Reference Case GHG Emissions, by Sector, p. vi. In 2005, New Jersey emitted 36.74 million metric tons of CO_2 from natural gas, not including from natural gas vehicles which are grouped with other emitters and not broken down separately (8.32 millions metric tons from electricity, 26.4 from residential/commercial/industrial, and 2.02 from the natural gas industry. In 2005, New Jersey emitted 9.62 million metric tons of CO_2 from coal (9.59 from electricity and 0.03 from residential/commercial/industrial). 36.74 is 3.82 times more than 9.62.
[297] Draft New Jersey Greenhouse Gas Inventory and Reference Case Projections 1990-2020, New Jersey Department of Environmental Protection, Feb. 2008, Table ES-1 New Jersey Historical and Reference Case GHG Emissions, by Sector, p. vi. In 2005, New Jersey's net imported electricity were responsible for 14.8 million metric tons of CO_2. 14.8 plus 9.62 is 24.42. 36.74 is 1.50 times greater than 24.42.
[298] Draft New Jersey Greenhouse Gas Inventory and Reference Case Projections 1990-2020, New Jersey Department of Environmental Protection, Feb. 2008, Table ES-1 New Jersey Historical and Reference Case GHG Emissions, by Sector, p. vi. In 2005, New Jersey's net emissions were 138.3 million metric tons CO_2.

> …
> "Our over-reliance on fossil fuels represents the biggest challenge of our lifetime, and New Jersey must take the lead in addressing it.
> …
> "Instead of building more fossil fuel-burning power plants and expensive new transmission lines to meet increasing demand, we should apply those resources to energy efficiency and renewable energy – like solar power and wind energy.
> …
> "We should be creating jobs in Newark, in Trenton, and throughout New Jersey – not lining the pockets of oil sheiks in Dubai and Riyadh."[299]

New Jersey is proposing an increase in natural gas consumption for electricity production, indicating that it wants to replace some coal-generated electricity. It is likely that the State's primary intention is to move toward cleaner energy. Thus, New Jersey must consider the emissions from the entire lifecycle of its energy choices. Indeed, much money would be spent to make little, if any, difference if LNG is used to replace coal. New Jersey must decide whether it wants to use limited resources to replace coal with renewables or LNG, with minimal pollution reductions.

An analysis by McKinsey & Co. supports Governor Corzine's focus on how best to apply limited resources. The analysis shows that a coal to gas switch is one of the least cost effective measures for abating CO_2, at over $60 per ton of CO_2, and it would have minimal effect.[300] McKinsey & Co. lists many CO_2 abatement methods that actually have a bigger impact and pay for themselves over time, with savings (as opposed to costs) of as much as nearly $120 per ton of CO_2. Better public policy would direct investments to energy conservation, efficiency, and renewables, getting greater CO_2 reductions with less money.

B. The Flaring Folly – "LNG is from Natural Gas that would otherwise be burned off"

Some say that there is the opportunity to address climate change by using natural gas that would otherwise be flared off in foreign countries. Natural gas flaring is a major problem and a contributor to climate change. Unfortunately, the evidence does not demonstrate that increased LNG imports reduce flaring. Indeed, as Russian, Iran, and Qatar, who hold 58% of the world's natural gas, increased their natural gas exports over the past ten years,[301] they also increased their flaring.[302] International demand for LNG has only grown and so has natural gas flaring.[303] This

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[299] Jon Corzine, Speech on the Environment (Oct. 7, 2005) (transcript on file with author).
[300] Jon Creyts, *et al.*, *Reducing U.S. Greenhouse Gas Emissions: How Much at What Cost?*, U.S. Greenhouse Gas Abatement Mapping Initiative, Executive Report, McKinsey & Company, Dec. 2007, p. xiii, Exhibit B U.S. Mid-Range Abatement Curve – 2030, at http://www.mckinsey.com/clientservice/ccsi/greenhousegas.asp (last visited Aug. 6, 2008).
[301] World Dry Natural Gas Exports, 1990-2005, International Energy Annual 2005, Energy Information Administration, U.S. Department of Energy, June 21, 2007, at http://www.eia.doe.gov/pub/international/iealf/table44.xls (last visited July 21, 2008).
[302] Wendel Broere, The elusive goal to stop flares, Shell World, May 5, 2008, p. 4.
[303] Reported Flaring Data – 2004-2005, Global Gas Flaring Reduction Partnership, The World Bank, at http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTOGMC/EXTGGFR/0,,contentMDK:21348978~pagePK:64168445~piPK:64168309~theSitePK:578069,00.html (last visited July 21, 2008).

all comes at a time when other markets have paid at times more than twice what the U.S. paid for LNG. It is unclear how the U.S. further entering the market can provide the economic resources that will result in reduced flaring, even if the U.S. doubled what it pays for LNG. Flaring is a part of doing business in the fossil fuel industry and it appears that the real reductions, until the world breaks its addiction to fossil fuels, come through actions such as political pressure from the World Bank's Global Gas Flaring Reduction Partnership and incentives from the Kyoto Protocol's Clean Development Mechanism.[304] Finally, it is worth noting that the U.S. is one of the world's major gas flarers. In 2006, the U.S. vented and flared 98 bcf of natural gas.[305] Between 1996 through 2006, the U.S. vented and flared 1,439 bcf of natural gas.[306]

X. LNG FACILITIES AND OPERATIONS IN THE MARINE ENVIRONMENT DAMAGE HABITAT, POLLUTE THE WATER AND AIR, AND DESTROY SEA LIFE.

> *Just two LNG turret buoys located in the Boston Harbor, half of what Liberty Natural Gas proposes off New Jersey, would harass 732 dolphins and whales per year,[307] "adversely affect…the continued existence of the northern right, humpback, and fin whales,"[308] destroy 10.4 trillion phytoplankton, 342 billion zooplankton, 27,000 lobster larvae, two million fish eggs, and 743,000 fish larvae each year,[309] and "result in long-term effects on the marine environment."[310]*

The ocean and its living resources are held in public trust for all people. Elected officials and government agencies are charged with the protection of these important and valuable resources for the public and the marine life that depend on the ocean.

LNG facilities and operations cause substantial environmental harms that are common among all LNG projects. Specific projects add further harms to the marine ecosystem. This section of the report in particular is written with attention to the three LNG terminals proposed off the shared coasts of New Jersey and New York. It is important to note that two of these projects are experimental. No one has ever built an island in the open ocean, and Exxon's floating barge technology is a trial at best.

This summary provides an overview of marine environmental impacts but is by no means an exhaustive environmental impact assessment of LNG operations. Certain environmental impacts, such as building onshore support facilities for offshore LNG ports, were not even considered. In addition, sources of information on some of the proposed LNG projects are currently limited. For example, Exxon and Excalibur have not filed their applications for their proposed terminals, BlueOcean Energy and Liberty Natural Gas, respectively.

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[304] Wendel Broere, The elusive goal to stop flares, Shell World, May 5, 2008, p. 4.
[305] Annual Energy Review 2006, Table 6.2 Natural Gas Production, Selected Years, 1949-2006, Energy Information Administration, p. 185.
[306] Annual Energy Review 2006, Table 6.2 Natural Gas Production, Selected Years, 1949-2006, Energy Information Administration, p. 185.
[307] 73 Fed. Reg. 29489 (May 21, 2008).
[308] 73 Fed. Reg. 29490 (May 21, 2008).
[309] Northeast Gateway Final Environmental Impact Statement, Docket No. USCG-2005-22219, p. 4-33 – 4-35 and p. 4-37 (Oct. 2006) (emphasis added).
[310] 73 Fed. Reg. 29489 (May 21, 2008).

A. An Overview of the Clean Ocean Zone (NY/NJ Bight)

1. A Rich and Vibrant Ocean Realm

The coasts of New York and New Jersey and the Gulf Stream, a strong ocean current, create a triangular mini-sea "wedge" within the big ocean, known as the NY/NJ Bight. Hereafter, the NY/NJ Bight will be referred to as the NY/NJ Clean Ocean Zone (COZ), after the proposed citizen initiative and pending federal legislation to protect this vital region. The physical, biological, and hydrodynamic characteristics of this 19,000 square-mile area are extraordinary as more than 300 species of fish, nearly 350 species of birds, 7 species of sea turtles, and many marine mammals, such as 10 species of whales and several species of seals and porpoises, frequent and inhabit this region. The unique topography of the region includes extensive canyons and the Hudson Shelf Valley, which also contributes to the astounding ecological richness of the region.[311] In fact, "the Bight has one of the highest diversities of marine mammals and sea turtles reported anywhere in the United States."[312] This fantastic seaway also provides resources to sustain multi-billion dollar industries in tourism and fisheries, and property values along the shore are among the highest in the region. Protection of these ecological resources is essential to maintaining and improving quality of life for millions of citizens.

2. The COZ - A Fish Magnet

The northern COZ, where all three LNG facilities are proposed, is Essential Fish Habitat (EFH) for numerous species. EFH is a federal designation that requires the National Oceanic and Atmospheric Administration (NOAA) to review fisheries operations and proposed federal projects in order to reduce impacts and protect these important habitats.[313] Federally managed fish species that depend on the COZ include Atlantic cod, whiting, red hake, flounders (5 species), ocean pout, Atlantic sea herring, monkfish, bluefish, scup, sea bass, king and spanish mackerel, cobia, as well as various species of shark and tuna.[314] The COZ supports one of the largest recreational fisheries in North America,[315] in addition to a substantial commercial shell fishing industry that harvests surf clams, quahogs, and sea scallops.[316]

There are micro-regions within the COZ with their own special features that attract and support a variety of important species, including the Cholera banks and the Mud Hole. LNG terminals are proposed in both of these unique locations. "The Cholera banks have been historically the best inshore fishing ground for Summer Flounder, during the fall along the whole east coast."[317] The

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[311] J.B. Pearce, The New York Bight, *Marine Pollution Bulletin*, 2000, 41(1-6) p. 44-55.

[312] Significant Habitats and Habitat Complexes of the NY Bight Watershed, U.S. Fish and Wildlife Service, published Nov. 1997 at http://training.fws.gov/library/pubs5/web_link/text/int_fish.htm#Marine%20Mammals%20and%20Sea%20Turtles (last visited July 24, 2008).

[313] Who is involved in conserving EFH and how does it work? Essential Fish Habitat, Office of Habitat Protection, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, at http://www.nmfs.noaa.gov/habitat/habitatprotection/efh/index_e.htm (last visited Aug. 4, 2008).

[314] Summary of Essential Fish Habitat Designations, National Oceanic and Atmospheric Administration, at http://www.nero.noaa.gov/hcd/STATES4/conn_li_ny/40207340.html (last visited Aug. 1, 2008).

[315] J.B. Pearce, The New York Bight, *Marine Pollution Bulletin*, 2000, 41 (1-6) p. 44-55.

[316] J.B. Pearce, The New York Bight, *Marine Pollution Bulletin*, 2000, 41 (1-6) p. 44-55.

[317] Letter from James Lovgren, FV VIKING II, to Tom McCloy, New Jersey Department of Fish and Wildlife, Bureau of Marine Fisheries, Mar. 7, 2008, p. 1 (on file with author).

Mud Hole, known for "some of the best big-game fishing in the world," is a soft-bottom 250-feet deep trench about 100 feet offshore.[318] "[T]he Mud Hole has historically been one of the richest inshore fishing grounds on the east coast, and is the only reason that the fishing Co-ops exist in this area. As short a time as 10 years ago, fully 80% of [one fishing Co-op's] landings came from the Mud Hole area, with about half of that coming from an area within 5 miles of the proposed" artificial island by ASIG.[319]

3. The COZ - A Haven for Endangered Species

Many federally-listed endangered and threatened species live and migrate in the vicinity of the proposed offshore facilities, pipeline routes, and shipping lanes. These include "several species of whales (sperm whale, finback whale, sei whale, humpback whale, North Atlantic Right whale), turtles (Atlantic loggerhead turtle, Atlantic leatherback turtle, Kemp's ridley turtle, Atlantic hawksbill turtle), and the shortnose sturgeon."[320] Also, the Roseate tern and piping plover are found along the nearby coastlines.

4. The COZ - Resilient and Healing Yet Vulnerable

Due to pollution and industrial insults, the ocean off the Jersey Shore and southern Long Island was in poor condition from the mid-1970's through the 1990's. Ocean dumping of industrial wastes, sewage sludge, and contaminated sediments as well as the discharge of raw sewage and toxic pollutants resulted in massive fish kills, contaminated fish, and hundreds of beach closures. Years of dedication and hard work by citizens, elected officials, government agencies, and businesses turned the tide, and today, these ocean waters are much improved, vibrant, and ecologically exceptional.[321] Despite the resilience and improved health of the COZ, the ecosystem is still stressed. The COZ is at the receiving end of the Hudson River and the most densely populated urbanized area in the country, and its coastline has experienced extensive development. While sources have been reduced, toxins and excessive nutrients still enter the COZ from runoff, wastewater treatment facilities, and stormwater outfalls, and the legacy of past pollution remains in contaminated sediments. Efforts are ongoing to continue to remediate and restore the region, protect marine life, and reduce pollution sources to coastal waters.

B. Marine Impacts from LNG Operations, Transport, and Activities

LNG operations, transport, and activities have numerous, detrimental impacts that will further stress the marine ecosystem of the COZ. One of the most immediate and direct harms comes from offshore LNG terminals and their destruction of seafloor habitats. On-site LNG terminal construction and pipeline installation smother seafloor (benthic) habitat, alter the seafloor substrate, and cause re-suspension of sediments. Impacts to benthic and planktonic (water column) habitats can interfere with animal migration patterns and destroy marine life that serves as the base of the food chain. During construction and operations, LNG terminals and tankers

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[318] Keith Meyers, *Hooked: A Magnificient Obsession; the Mudhole*, New York Times, Aug. 4, 1995, at http://query.nytimes.com/gst/fullpage.html?res=990CE7D9143DF937A3575BC0A963958260 (last visited Aug. 3, 2008).

[319] Letter from James Lovgren, FV VIKING II, to Tom McCloy, New Jersey Department of Fish and Wildlife, Bureau of Marine Fisheries, Mar. 7, 2008, p. 1-2 (on file with author).

[320] Crown Landing Final Environmental Impact Statement, Federal Energy Regulatory Commission, Docket Nos. CP04-411-000, *et al*., p. 3-31 (Apr. 26, 2006).

[321] J.B. Pearce, The New York Bight, *Marine Pollution Bulletin*, 2000, 41 (1-6) p. 44-55.

degrade water and air quality and emit noise, light, and thermal pollution, all of which affect marine life. Normal operations result in massive amounts of sealife entrained in water used for regasification processes, ballast water removal, and tanker engine cooling. Some of this water is discharged onsite along with added biocides and other contaminants. The elevated temperature of the discharged water creates thermal pollution, as do the hot pipelines and flexible pipe risers that connect to LNG tankers and terminals. Also, LNG facilities increase the risk and occurrence of invasive species, harmful algal blooms, and low dissolved oxygen and anoxia conditions. Since all the LNG facilities are being proposed in prime fishing grounds, these harms will severely impact both commercial and recreational fisheries.[322] Increased traffic from LNG tankers also elevates the risk of vessel strikes to marine mammals and turtles, many of which are threatened or endangered species. Natural hazards and human fallibility also increase the environmental risks of LNG facilities and tankers.

1. Seafloor (Benthic) Habitat Impacts

a. Pipeline Impacts

All the LNG facilities currently proposed will require extensive installation of new pipelines from the terminal site to existing on-shore or submerged natural gas pipelines. Pipeline installation is disruptive to hundreds of acres of seafloor and causes re-suspension of sediments that negatively impacts water quality. While the pipes are three to four feet in diameter and require three feet of overlying sediment for proper burial, to install the pipes "[t]he subsea plow is expected to create a 25 foot wide trench with a 25 foot wide pile of excavated sediment on either side (75 foot wide swath of disturbance)."[323] "[L]obsters present along the pipeline route during construction could be injured or suffer mortality during trenching and anchoring activities… The adult lobster population…may be inactive during winter due to colder water temperatures, which could inhibit their ability to avoid the construction activity."[324] Other shellfish, surf clams, ocean quahogs, shrimp, and sea scallops, may also be buried, injured or killed during trenching. Any dredging through gravel or rocky areas and blasting through exposed outcrops for pipeline installation will cause additional seafloor disruption and environmental harms.

b. Anchoring Impacts

Anchoring is needed during pipeline installation, LNG facility construction, and possibly by tankers during storm events. To construct the island that would cover 116 acres of seafloor, numerous vessels would require anchoring in the adjacent area, impacting at least an additional 65 acres.[325] A floating terminal, called a Floating Storage and Regasification Unit (FSRU), and turret buoys also require anchors or an anchoring seafloor platform. For constructing the two

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[322] Letter from James Lovgren, FV VIKING II, to Tom McCloy, New Jersey Department of Fish and Wildlife, Bureau of Marine Fisheries, Mar. 7, 2008, p. 2 (on file with author).

[323] Comments of Save the Sound, A Program of CT Fund for the Environment Regarding the Coastal Zone Management Act Consistency Certification of Broadwater Energy/Pipeline, Federal Energy Regulatory Commission, Docket Nos. CP06-54-000, *et al*., Submission 20070706-5010, p. 109 (July 6, 2007) (citing Memorandum from Drew A. Carey, Ph.D., Principal Scientist, CoastalVision, to Save the Sound, p. 7 (Jan. 25, 2007).).

[324] Broadwater Final Environmental Impact Statement, Federal Energy Regulatory Commission, Docket Nos. CP06-54-000, *et al*., p. 3-73 (Jan. 11, 2008).

[325] Safe Harbor Energy Project Deepwater Port License Application Vol. Three, Part One, Topic Report Three, Biological Resources, Atlantic Sea Island Group, Aug. 2007, p. 3-49.

turret buoys for the Northeast Gateway LNG terminal off Boston, 16 suction-embedment anchors were installed, impacting 33 acres.[326] When LNG tankers connect to the turret buoys at the Northeast Gateway terminal, their anchor chains move and drag across the seafloor repeatedly impacting up-to-38 acres that result in "long-term reduction to benthic productivity."[327] The proposed Liberty Natural Gas project has four turret buoys and associated anchors resulting in an even greater impact than Northeast Gateway. "[A]nchor damage is the greatest threat to live-bottom areas… Anchor damage could include crushing and breaking of live/hard bottoms and associated communities. Anchoring can destroy a wide swath of habitat if the anchor is dragged or the vessel swings at anchor, causing the anchor chain to drag the seafloor… Accidental anchor impacts, however, could be extensive, with recovery taking longer than 20 years, and they could be permanent, depending on the severity of the impact."[328]

Moreover, entanglement of marine mammals or turtles in anchor lines or other equipment during construction and operation is also a potential threat.[329]

c. Artificial Island Construction Impacts

In addition to pipeline and anchoring impacts, the proposed artificial island by the Atlantic Sea Island Group (ASIG) would smother 116 acres of seafloor.[330] For perspective, more than 10 Giant Stadiums would fit into the base of the island. Seafloor inhabitants, such as surf clams, ocean quahogs, sand dollars, lobster, worms, crabs, and macroalgae would be destroyed.[331] Resuspension of sediments during construction would also negatively affect these creatures and others in the larger region surrounding the island. Many of these organisms are important to recreational and commercial fisheries, while others are critical components of the marine food web providing prey for larger fish, marine mammals, and turtles.

2. Seawater Use: Entrainment and Impingement of Marine Life

Entrainment of sealife during extensive water uptake is another major harm associated with LNG terminals and tankers. Start-up and construction activities alone require as much as 37.6 million gallons of seawater for hydrostatic testing of pipelines and storage tanks and other start-up processes.[332] Additional seawater is required for daily operations. While the proposed closed-loop heating systems used to vaporize the very cold LNG require much less water than open-loop systems, seawater is still withdrawn and heated for use in these regasification systems.

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[326] Northeast Gateway Final Environmental Impact Statement, Docket No. USCG-2005-22219, p. 4-2 and 4-3 (Oct. 2006).
[327] 73 Fed. Reg. 29489 (May 21, 2008).
[328] Brief Overview of Gulf of Mexico OCS Oil and Gas Pipelines: Installation, Potential Impacts, and Mitigation Measures OCS Report MMS 2001-067, Minerals Management Services, Department of the Interior, 2001, p. 14, at http://www.mms.gov/itd/pubs/2001/2001-067.pdf (last visited Aug. 26, 2008).
[329] Northeast Gateway Final Environmental Impact Statement, Docket No. USCG-2005-22219, p. 6-29 (Oct. 2006).
[330] Safe Harbor Energy Project Deepwater Port License Application Vol. Three, Part One, Topic Report Three, Biological Resources, Atlantic Sea Island Group, Aug. 2007, p. 3-50.
[331] Safe Harbor Energy Project Deepwater Port License Application Vol. Three, Part One, Topic Report Three, Biological Resources, Atlantic Sea Island Group, Aug. 2007, p. 3-4.
[332] Safe Harbor Energy Project Deepwater Port License Application Vol. Three, Part One, Topic Report Three, Biological Resources, Atlantic Sea Island Group, Aug. 2007, p. 3-52.

Daily LNG operations utilize seawater for engine cooling and ballast water, among other uses. Ballast water for LNG tankers results in the most seawater use – and it is vast. As LNG tankers (some nearly four football fields long) unload their cargo, each needs to be filled with millions of gallons of seawater to refill ballasts to stabilize the ship. Depending on the size of the tanker, each one can take 7 to 27 million gallons per visit, resulting in over two billion gallons per year for ballast water for ASIG's island.[333] Based on the Northeast Gateway's projected impacts, which also uses tankers that can regasify onboard, the Liberty Natural Gas project could use over 2.6 billion gallons per year.[334] Exxon's BlueOcean Energy projected water use is unknown. But proposed operations at Broadwater, which would have used the same basic technology in the Long Island Sound, was estimated to require up to ten billion gallons per year.[335] The FSRU requires ballast water exchanges to compensate for the mass of LNG loaded from tankers and then unloaded as natural gas to the pipeline.

For operations, seawater is routinely pumped through metal mesh screens, entraining, impinging, and killing sealife. Sealife that is small enough to fit through the screens become entrained, flowing in with the seawater through the system. Larger sealife, such as squid, fish, seals, and turtles, can become impinged, colliding with the screen and becoming stuck, injured, or killed as a result. A study of the Northeast Gateway LNG facility estimated that ship operations would destroy **10.4 trillion phytoplankton**, **342 billion zooplankton**, **27,000 lobster larvae**, **two million fish eggs, and 743,000 fish larvae each year**.[336] During entrainment, many organisms die due to fluctuations in environmental conditions, such as temperature and pulses of chlorine or other biocides. All organisms entrained during tanker ballast water intake are permanently removed from the local ecosystem, transported by the tanker, and released in distant waters during refueling. Thus, "the daily removal of seawater will reduce the food resources for those planktivorous organisms"[337] and the transfer of organisms from one ecosystem to another can devastate local food webs when non-native species that survive are released into receiving waters from the ballast.

3. Water Pollution Impacts

a. Pollutants in Discharges

The enormous volumes of water used by LNG terminals and tankers are degraded in the process and then released back into the environment, negatively impacting the surrounding water quality. Biocides, such as chlorine, are commonly used to prevent biofouling of pipes and tanks during testing, storage, and operations and are toxic to marine life at low concentrations by design.[338,339]

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[333] Safe Harbor Energy Project Deepwater Port License Application Vol. Three, Part One, Topic Report Three, Biological Resources, Atlantic Sea Island Group, Aug. 2007, p. 3-52.

[334] Northeast Gateway Final Environmental Impact Statement, Docket No. USCG-2005-22219, p. 4-7 (Oct. 2006). This estimate was calculated based on Northeast Gateway using 873 million gallons year (mgy). Because Liberty Natural Gas project will triple the volume proposed for import at Northeast Gateway, 873 mgy was multiplied by three.

[335] Broadwater Final Environmental Impact Statement, Federal Energy Regulatory Commission, Docket Nos. CP06-54-000, *et al*., p. 3-90 (Jan. 11, 2008).

[336] Northeast Gateway Final Environmental Impact Statement, Docket No. USCG-2005-22219, p. 4-33 – 4-35 and p. 4-37 (Oct. 2006) (emphasis added).

[337] 73 Fed. Reg. 29490 (May 21, 2008).

[338] Northeast Gateway Final Environmental Impact Statement, Docket No. USCG-2005-22219, p. 6-18 (Oct. 2006).

[339] Broadwater Final Environmental Impact Statement, Federal Energy Regulatory Commission, Docket Nos. CP06-54-000, *et al*., p. 3-56 (Jan. 11, 2008).

Biocides may impact plankton and present "a high seasonal risk to planktonic larvae (lobsters, shellfish, finfish)."[340] Because the entrainment process and use of biocides would result in the death and decay of organisms, discharge waters would be expected to have increased nutrient levels relative to ambient waters. At many of the facilities, the discharge of wastewater can also contribute to elevated nutrient concentrations in the surrounding water. Higher nutrient levels could promote prolific algal growth and potential blooms of harmful algal species. The resulting decay of associated organic matter (from dead organisms and algae) reduces dissolved oxygen concentrations in the surrounding water. Therefore, the proposed LNG facilities would further contribute to the recurrent dissolved oxygen depletion that typically occurs in the summer in the COZ, notably in the northern region near the proposed facility sites.[341,342] In addition, "spills, leaks, or accidental releases of fuels, lubricants, or other hazardous substances" can occur during construction and operations even with preventative measures in place.[343]

b. In Hot Water: Thermal Pollution

Discharges from LNG terminals and tankers are typically above ambient water temperatures.[344,345] Warming of coastal waters has been shown to result in decreased dissolved oxygen levels as well as shifts in population distributions and detrimental changes in ecological dynamics.[346] Increased water temperatures can also change the composition of the phytoplankton community and contribute to more harmful algal blooms.[347]

Pipelines and risers also emit thermal pollution to overlying waters and sediments. Gas entering the pipeline riser is projected to be 100 ºF – 130 ºF.[348] The top and warmest portion of the riser would increase ambient water temperatures by 3 ºF.[349] The rapid increase in both water and sediments near the LNG facility could negatively impact marine organisms that depend on the relatively stable water and sediment temperatures of the open ocean. Laboratory studies report

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[340] Comments of Save the Sound, A Program of CT Fund for the Environment Regarding the Coastal Zone Management Act Consistency Certification of Broadwater Energy/Pipeline, Federal Energy Regulatory Commission, Docket Nos. CP06-54-000, *et al*., Submittal 20070706-5010, p. 108 (July 6, 2007) (citing Memorandum from Drew A. Carey, Ph.D., Principal Scientist, CoastalVision, to Save the Sound, p. 6 (Jan. 25, 2007).).

[341] Glenn, *et al.*, Biochemical impact of summertime coastal upwelling on the New Jersey Shelf, *Journal of Geophysical Research*, 2004, 109 (C12S02): 1-15.

[342] Glenn, *et al.*, Wind-driven response of the Hudson River Plume and its effect on dissolved oxygen Concentrations, *Environmental Research, Engineering and Management*, 2007, 1 (39): 14-18.

[343] Broadwater Final Environmental Impact Statement, Federal Energy Regulatory Commission, Docket Nos. CP06-54-000, *et al*., p. 3-63 (Jan. 11, 2008).

[344] Broadwater Final Environmental Impact Statement, Federal Energy Regulatory Commission, Docket Nos. CP06-54-000, *et al*., p.3-52 and 3-62 (Jan. 11, 2008).

[345] Northeast Gateway Final Environmental Impact Statement, Docket No. USCG-2005-22219, p. 4-6 (Oct. 2006).

[346] C. Rosenzweig, *et al.*, 2007: Assessment of observed changes and responses in natural and managed systems, in *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, (M.L. Parry, *et al.*, Eds.), Cambridge University Press, Cambridge, UK, p. 79-131.

[347] Edwards, *et al.*, Regional climate change and harmful algal blooms in the northeast Atlantic, *Limnology and Oceanography,* 2006, 51 (2) p. 820–829.

[348] Broadwater Final Environmental Impact Statement, Federal Energy Regulatory Commission, Docket Nos. CP06-54-000, *et al*., p. 3-59 p (Jan. 11, 2008).

[349] Broadwater Final Environmental Impact Statement, Federal Energy Regulatory Commission, Docket Nos. CP06-54-000, *et al*., p. 3-59 p (Jan. 11, 2008).

even slight increases in water temperature (1 to 3 ºF) during peak summer ambient temperatures can negatively impact fish growth and metabolism.[350,351] In addition, "the temperature of the sediments over portions of the pipeline would be two degrees over ambient temperature", which "could be detrimental to lobsters during the summer."[352]

A much more serious impact would occur if the pipelines are not backfilled properly or become exposed due to erosion, because water temperatures in contact with the pipe are estimated to "increase by as much as 20 ºF above ambient temperatures."[353] Erosion of sediments in proposed pipeline regions is probable given the physical dynamics of the COZ as evident in "rippled scour depressions" on the seafloor.[354] For example, "monitoring of the bathymetry along the Eastchester Expansion route [installed in 2004 in Long Island Sound] has shown that attempts at mechanically backfilling the trench were not successful and that natural backfilling of the trench had not substantially occurred along most of the pipeline route approximately 18 months after installation."[355] Similar backfilling problems may be encountered in the COZ.

c. Increased Water Column Turbidity and Re-suspension of Sediments

It is estimated that about 176,000 cubic feet of sediment will be re-suspended for each kilometer of pipeline trenched.[356] Therefore, ASIG's proposed artificial island project would result in a minimum of 7.27 million cubic feet of suspended sediment for trenching only the two parallel pipelines. Even higher sediment concentrations (5,000-20,000 mg/L in fine sands) have been projected where specialized plowing, called jetting, is necessary for tie-ins and cable crossings.[357] The island pipeline connection will require at least 12 cable crossings, so a conservative estimate of re-suspension from only tie-ins and the cable crossings would be 160,000 mg/L.[358] Pipeline maintenance, estimated to be required every five to seven years, will also cause high turbidity along pipeline route.[359] In addition, when LNG tankers are attached to

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[350] Dockray, *et al*., Effects of elevated summer temperatures and reduced pH on metabolism and growth of juvenile rainbow trout (*Oncorhynchus mykiss*) on unlimited ration *Canadian Journal of Fisheries and Aquatic Science*, 1996, 53 (12) p. 2752–2763.

[351] Nakano, *et al*., Changes in the Cellular and Organismal Stress Responses of the Subtropical Fish, the Indo-Pacific Sergeant, *Abudefduf vaigiensis*, due to the 1997–1998 El Niño/Southern Oscillation *Environmental Biology of Fishes*, 2004, 70 (4) p. 321-329.

[352] New York State Department of Environmental Conservation's Petition for Rehearing of the Order of the Commission Dated March 20, 2008, Federal Energy Regulatory Commission, Docket Nos. CP06-54-000, *et al*., Submittal 20080418-5106, p. 9 (Apr. 18, 2008).

[353] Broadwater Final Environmental Impact Statement, Federal Energy Regulatory Commission, Docket Nos. CP06-54-000, *et al*., p. 3-59 (Jan. 11, 2008).

[354] W.C. Schwab, *et al*., Seafloor Characterization Offshore of the NewYork-New Jersey Metropolitan Area using Sidescan-Sonar, 2000, *derived from Open File Report 00-295*, at http://pubs.usgs.gov/of/2000/of00-295/report.htm (last visited Aug. 26, 2008).

[355] Broadwater Final Environmental Impact Statement, Federal Energy Regulatory Commission, Docket Nos. CP06-54-000, *et al*., p. 3-32 (Jan. 11, 2008).

[356] Brief Overview of Gulf of Mexico OCS Oil and Gas Pipelines: Installation, Potential Impacts, and Mitigation Measures OCS Report MMS 2001-067, Minerals Management Services, Department of the Interior, 2001, p. 14, at http://www.mms.gov/itd/pubs/2001/2001-067.pdf (last visited Aug. 26, 2008).

[357] Northeast Gateway Final Environmental Impact Statement, Docket No. USCG-2005-22219, p. 4-10 (Oct. 2006).

[358] Safe Harbor Energy Project Deepwater Port License Application Vol. Three, Part One, Topic Report Three, Biological Resources, Atlantic Sea Island Group, Aug. 2007, p. 3-56.

[359] Broadwater Final Environmental Impact Statement, Federal Energy Regulatory Commission, Docket Nos. CP06-54-000, *et al*., p. 3-37 (Jan. 11, 2008).

the turret buoys at the existing Northeast Gateway LNG facility, anchor cables move continually, re-suspending sediments over an area up-to-38 acres.[360] Because the Liberty Natural Gas project is proposing double the buoy turrets as at the Northeast Gateway, the anchor chain impact area will be even greater.

The construction of ASIG's artificial island will also cause extensive re-suspension and turbidity. A bedding layer of stone will be dumped onto the seafloor and leveled to form the 116 acre island base, resulting in re-suspension of sediments.[361] Once the caissons are placed into this layer, sand will be disposed into the hollow caisson interior, displacing the water within and increasing the turbidity of surrounding waters.[362] Next, 7.3 million tons of quarry run materials will be disposed along the exterior of the island causing further disturbances.[363] Large amounts of dredged material containing sand (8.4 million cubic yards) will be disposed in the interior of island.[364] Additional fill material will be needed to raise the island to 25 feet above sea level.[365] These construction activities will increase water column turbidity and most probably levels of contaminants.[366]

Seafloor disturbances and increases in turbidity negatively impact water quality in multiple ways. "Resuspended sediments may obstruct filter-feeding mechanisms and gills of fishes and sedentary invertebrates."[367] Turbid conditions and resuspended sediments can also cause habitat avoidance by finfish, delay their development, and injure their surface membranes.[368] Resting cells and cysts of diatoms and dinoflagellates could also be resuspended and become active in the water column forming harmful algal blooms.[369] Also, sediment-bound contaminants and nutrients can be released, increasing the biological and chemical oxygen demands and depleting dissolved oxygen levels.[370]

4. Invasive Species Impacts

The massive size of LNG tankers and their growing use intensifies the risks of transporting invasive species by ballast water or by attachment of organisms to tankers from one coastal

[360] 73 Fed. Reg. 29489 (May 21, 2008).
[361] Safe Harbor Energy Project Deepwater Port License Application Vol. Two, Exhibit I, Terminal Construction Description, Atlantic Sea Island Group, Aug. 2007, p. I-2 – I-3.
[362] Safe Harbor Energy Project Deepwater Port License Application Vol. Two, Exhibit I, Terminal Construction Description, Atlantic Sea Island Group, Aug. 2007, p. I-3.
[363] Safe Harbor Energy Project Deepwater Port License Application Vol. Two, Exhibit I, Terminal Construction Description, Atlantic Sea Island Group, Aug. 2007, p. I-3.
[364] Safe Harbor Energy Project Deepwater Port License Application Vol. Three, Part One, Topic Report One, General Project Description and Location, Atlantic Sea Island Group, Aug. 2007, p. 1-9.
[365] Safe Harbor Energy Project Deepwater Port License Application Vol. Three, Part One, Topic Report One, General Project Description and Location, Atlantic Sea Island Group, Aug. 2007, p. 1-11
[366] Safe Harbor Energy Project Deepwater Port License Application Vol. Three, Part One, Topic Report Three, Biological Resources, Atlantic Sea Island Group, Aug. 2007, p. 3-56 and 3-60.
[367] Brief Overview of Gulf of Mexico OCS Oil and Gas Pipelines: Installation, Potential Impacts, and Mitigation Measures OCS Report MMS 2001-067, Minerals Management Services, Department of the Interior, 2001, p. 14, at http://www.mms.gov/itd/pubs/2001/2001-067.pdf (last visited Aug. 26, 2008).
[368] Broadwater Final Environmental Impact Statement, Federal Energy Regulatory Commission, Docket Nos. CP06-54-000, *et al*., p. 3-87 (Jan. 11, 2008).
[369] Northeast Gateway Final Environmental Impact Statement, Docket No. USCG-2005-22219, p. 4-3 (Oct. 2006).
[370] Broadwater Final Environmental Impact Statement, Federal Energy Regulatory Commission, Docket Nos. CP06-54-000, *et al*., p.3-36 and 3-76 (Jan. 11, 2008).

region to another. The invasion of the zebra mussel, transported to the Hudson River and the Great Lakes from Europe by ballast water, brought much attention to the damage and economic costs that an invasive, or non-native, species can cause.[371] In the COZ, LNG tankers will remove large volumes of ballast water full of local sealife and return to supply ports. When these tankers refill with new LNG, they discharge ballast water along with surviving organisms, increasing the spread of invasive species to those regions.

Vessels also may transport invasive species on the surface of their hulls, anchors, and anchor chains into the COZ. Regasification takes time and ships may be docked at facilities for up to seven to eight days to unload, allowing time for transfer of non-native sessile organisms to terminals, turret buoys, anchoring platforms, or other structures that all potentially represent new hard substrates introduced to the ecosystem. ASIG's artificial island, for example, would create 30 acres of hard surface along the underwater slopes of the island.[372] This would be prime habitat for an invasive species, such as the nuisance tunicate, or seasquirt (*Didemnum sp.*), which has already been spreading across the east coast and is now found in regions of the west coast.[373,374] This invader overgrows and overtakes habitat, preventing larval settlement of shellfish and decreasing diversity of seafloor life.[375,376] *Didemnum sp.* spreads rapidly, prefering "hard-substrates such as docks, lines, and ships hulls" and rocky areas and shells of bivalves.[377] In the COZ region, there is only anecdotal evidence of the tunicate, which was sited in 2004 in Shinnecock Bay of Long Island, New York.[378] If *Didemnum sp.* is transported by LNG tankers and takes hold in the COZ, as it has in Georges Bank and other nearby regions, important shellfish resources would be lost.

5. Air Pollution Impacts Beyond Carbon Dioxide (CO_2)

a. Emissions

In addition to the CO_2 emissions and impacts as described previously in section IX, other significant pollutants are emitted from the terminals, tankers, and the numerous support vessels needed for construction and operations, negatively impacting air and water quality. LNG tankers and terminals burn fossil fuels for energy and emit many air pollutants including: particulate

[371] D. Pimento, *Biological Invasions: Economical and Environmental Costs of Alien Plant, Animal, and Microbe Species*, p. 292 (CRC Press, Boca Roton, FL) (2002).
[372] Safe Harbor Energy Project Deepwater Port License Application Vol. Three, Part One, Topic Report Three, Biological Resources, Atlantic Sea Island Group, Aug. 2007, p. 3-72.
[373] Bullard, *et al.*, *Journal of Experimental Marine Biology and Ecology*, 2007, Vol. 342, Issue 1, p. 99-108.
[374] Marine Nuisance Species, USGS National Geographic Studies of Benthic Habitat, Northeastern U.S., Woods Hole Science Center, USGS, at http://woodshole.er.usgs.gov/project-pages/stellwagen/didemnum/ (last visited Aug. 26, 2008).
[375] Bullard, *et al.*, *Journal of Experimental Marine Biology and Ecology*, 2007, Vol. 342, Issue 1, p. 99-108.
[376] Marine Nuisance Species, USGS National Geographic Studies of Benthic Habitat, Northeastern U.S., Woods Hole Science Center, USGS, at http://woodshole.er.usgs.gov/project-pages/stellwagen/didemnum/ (last visited Aug. 26, 2008).
[377] Marine Nuisance Species, USGS National Geographic Studies of Benthic Habitat, Northeastern U.S., Woods Hole Science Center, USGS, at http://woodshole.er.usgs.gov/project-pages/stellwagen/didemnum/ (last visited Aug. 26, 2008).
[378] Didemnum sp. – New York Coast Occurrences and Images, Woods Hole Science Center, USGS, at http://woodshole.er.usgs.gov/project-pages/stellwagen/didemnum/htm/newyork1.htm (last visited Aug. 26, 2008).

matter, methane, nitrogen oxides (NO_x), sulfur oxides (SO_x), volatile organic compounds (VOCs), and other toxins.[379,380]

Construction of LNG facilities and installation of pipelines are energy intensive and require significant vessel activity and transport. All of this results in widespread air pollution. For example, according to New York's Department of Environmental Conservation, ASIG would need at least 700,000 truckloads of sand from upstate New York just for that one construction material.[381] ASIG has not accounted for these air emissions.[382]

The FSRU and island terminals require on-site energy for electricity and regasification. The fuel-source is typically natural gas and its combustion releases the same pollutants described above for fossil fuels in general. In fact, the U.S. Environmental Protection Agency (EPA) criticized the Broadwater project because "[a]ir quality modeling for the project indicates that the 24-hour average particulate matter of 2.5 National Ambient Air Quality Standard (NAAQS) would be exceeded with the construction and operations of the Broadwater terminal and pipeline. The 3-hour and 24-hour average NAAQS for sulfur dioxide (SO_2) would also be exceeded."[383] Emissions also result from flaring of natural gas that may be necessary for pressure control safety purposes.[384]

Projects that include regasifying terminals, such as, Broadwater, have continual terminal and frequent on-site tanker air pollution. Projects without regasifying terminals, such as Northeast Gateway, require up to eight days for each tanker to regasify and unload the LNG. This onboard process demands continual tanker engine operations for energy use that also emits air pollutants. Therefore, both processing scenarios contribute to substantial increases in air pollution.

On-site tanker activities and long transit distances emit extensive pollution. Indeed, "[l]arge vessels are among the fastest-growing sources of air pollution" and a "single ship coming into harbor can generate the smog-forming emissions of 350,000 new cars."[385] "[F]oreign-registered ships – the majority of commercial ships – do not operate under any EPA emissions standards while in U.S. waters,"[386] and no LNG tankers are U.S. flagged.[387] "Ships are the last major

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[379] Crown Landing Final Environmental Impact Statement, Federal Energy Regulatory Commission, Docket Nos. CP04-411-000, *et al*., p. 3-4 (Apr. 26, 2006).
[380] Statement by Lisa P. Jackson, Commissioner, New Jersey Department of Environmental Protection, Before the United States Senate Committee on Environment And Public Works On S.1499, the Marine Vessel Emissions Reduction Act of 2007, (Feb. 14, 2008).
[381] Letter from John J. Ferguson, Project Review Coordinator, Division of Environmental Permits, New York Department of Environmental Conservation, to M.A. Prescott, Chief, Deepwater Ports Standards Division, U.S. Coast Guard (Dec. 14, 2007) (available at www.regulations.gov, docket 28535), p. 8.
[382] Letter from John J. Ferguson, Project Review Coordinator, Division of Environmental Permits, New York Department of Environmental Conservation, to M.A. Prescott, Chief, Deepwater Ports Standards Division, U.S. Coast Guard (Dec. 14, 2007) (available at www.regulations.gov, docket 28535), p. 8.
[383] US Environmental Protection Agency comments in response to Broadwater Liquefied Natural Gas (LNG) terminal and pipeline (CEQ # 20080020) Final Environmental Impact Statement, Federal Energy Regulatory Commission, Docket Nos. CP06-54-000, *et al*., Submission 20080306-0069, p. 2 (Feb 19, 2008).
[384] Crown Landing Final Environmental Impact Statement, Federal Energy Regulatory Commission, Docket Nos. CP04-411-000, *et al*., p. 2-8 (Apr. 26, 2006).
[385] Gregory Richards, *Ships are an increasing source of air pollution*, The Virginian-Pilot, Nov. 2, 2007.
[386] Gregory Richards, *Ships are an increasing source of air pollution*, The Virginian-Pilot, Nov. 2, 2007.

sulfur dioxide (SO_2) source category that burns high sulfur fuels in New Jersey."[388] "Researchers report that international shipping emissions could be responsible for more than 60,000 deaths a year."[389] Factors contributing to the premature mortalities include "exposure to particulate matter, nitrogen oxides (NO*x*), and sulfate in global ship emissions."[390]

In the same way that LNG results in greater CO_2 emissions, the liquefication, shipping, and regasification stages of LNG results in far greater emissions of other pollutants than from domestic natural gas consumption. A study by Carnegie Mellon researchers on lifecycle emissions from LNG states that "[f]or SO_x and NO_x we find there are significant emissions in the upstream stages of the NG/LNG life-cycles, which contribute to a larger range in SO_x and NO_x emissions for NG/LNG than for coal."[391] Significant NO_x emissions particularly come from LNG liquefication plants.[392] The LNG lifecycle can result in NO_x emissions of up to 15.4 pounds (lb) per megawatt hour (MWh), while it is only 9.69 lb/MWh for the lifecycle of coal.[393]

b. Onshore Air Pollution

"SO_2 and oxides of nitrogen (NO_x), and the particles formed from SO_2, and NO_x, as well as direct emissions of fine particles, can be transported over long distances and deposited far from their point of origin, contributing to air quality problems far beyond the areas where they were emitted. Emissions from sources in the New Jersey – New York Metropolitan area are blown by the winds along the coast many miles, impacting [Long Island, Connecticut], Rhode Island, Massachusetts and beyond."[394] Therefore, placing LNG terminals and their tanker traffic offshore will simply relocate onshore air pollution problems, not eliminate them. Given the variability in wind directions, LNG facility emissions in the COZ would also be blown toward the Jersey Shore by northeast winds.

c. Air Pollution Impacts on Water Quality

Air pollution from natural gas combustion negatively impacts water quality. Because LNG facilities are often in coastal waters that are already polluted by excess nitrogen, increased NO_x emissions can exacerbate the frequency of massive algal blooms and detrimental low dissolved

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[387] A message from Maritime Administrator Sean T. Connaughton, Deepwater Port Licensing for LNG and Oil, U.S. Maritime Administration, July, 2008.

[388] Statement by Lisa P. Jackson, Commissioner, New Jersey Department of Environmental Protection, Before the United States Senate Committee on Environment And Public Works On S.1499, the Marine Vessel Emissions Reduction Act of 2007, Feb. 14, 2008.

[389] Death from Shipping, *Environmental Science & Technology,* 2007, 41 (24) p. 8206.

[390] Death from Shipping, *Environmental Science & Technology*, 2007, 41 (24) p. 8206.

[391] Paulina Jaramillo, W. Michael Griffin, and H. Scott Matthews, Comparative Life-Cycle Air Emissions of Coal, Domestic Natural Gas, LNG, and SNG for Electricity Generation, *Environmental Science & Technology*, 2007, 41, p. 6290.

[392] Paulina Jaramillo, W. Michael Griffin, and H. Scott Matthews, Comparative Life-Cycle Air Emissions of Coal, Domestic Natural Gas, LNG, and SNG for Electricity Generation, *Environmental Science & Technology*, 2007, 41, p. 6294.

[393] Paulina Jaramillo, W. Michael Griffin, and H. Scott Matthews, Comparative Life-Cycle Air Emissions of Coal, Domestic Natural Gas, LNG, and SNG for Electricity Generation, *Environmental Science & Technology*, 2007, 41, p. 6294.

[394] Statement by Lisa P. Jackson, Commissioner, New Jersey Department of Environmental Protection, Before the United States Senate Committee on Environment And Public Works On S.1499, the Marine Vessel Emissions Reduction Act of 2007, Feb. 14, 2008.

oxygen conditions.[395,396] Indeed, the COZ is already experiencing such harms. Adding more NO_x is contrary to current efforts to reduce nitrogen loading.[397] Existing NO_x emissions from combustion of natural gas and other fossil fuels significantly contributes to eutrophication of coastal waters worldwide, and these emissions are expected to increase in the future.[398] NO_x and SO_x emissions are also of concern as they form acids in the atmosphere, which results in acid rain.

d. Greenhouse Gas Impacts on the Environment

Greenhouse gases, such as carbon dioxide, methane, NO_x, are well known to contribute to global warming and climate change.[399,400,401] There is a wealth of information on how global warming already has altered the planet and what changes are predicted for the future.[402,403] Impacts range from sea level rise, changes in ocean circulation patterns and rates, increased number and intensities of storms, ocean acidification, and water temperature changes resulting in spatial and temporal shifts in population distributions and dynamics affecting entire ecosystems and their productivity.

6. Light Pollution Impacts

For security and navigational reasons, LNG terminals and tankers require adequate lighting. However, light pollution at night and during twilight hours can be ecologically disruptive. For instance, light affects the daily vertical migration of zooplankton and decreases their grazing on phytoplankton and also increases their risk of predation by fish.[404,405] Also, artificial lights can disorientate migrating birds at night and attract birds in general.[406,407] Lights may also attract

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[395] Human Alteration of the Nitrogen Cycle: Threats, Benefits and Opportunities, Scope Policy Briefs, No. 4, UNESCO, Apr. 2007, at http://unesdoc.unesco.org/images/0015/001509/150916E.pdf (last visited August. 7, 2008).
[396] H. Pearl, Coastal eutrophication and harmful algal blooms: Importance of atmospheric deposition and groundwater as "new" nitrogen and other nutrient sources, *Limnology and Oceanography*, 1997, 42 (5, part 2) p. 1154-1165.
[397] Action Plan for the New York-New Jersey Harbor Estuary Program, USEPA Harbor Estuary Program, (Draft June 17, 2008), at http://www.harborestuary.org/reports/HEP_Action_Plan-061708.pdf (last visited Aug. 22, 2008).
[398] Galloway, *et al*., Nitrogen cycles: past, present, and future, *Biogeochemistry*, 2004, 70 p.153-226.
[399] *Climate Change 2007: The Physical Science Basis, Fourth Assessment Report, Intergovernmental Panel on Climate Change,* 2007, (S., Solomon *et al*., Eds.). (Cambridge University Press, Cambridge, UK) 996 pp. at http://www.ipcc.ch/ipccreports/ar4-wg1.htm (last visited Aug. 26, 2008).
[400] Health and Environmental Impacts of NO_x, U.S. Environmental Protection Agency, at http://www.epa.gov/airprogm/oar/urbanair/nox/hlth.html (last visited July 23, 2008).
[401] Human Alteration of the Nitrogen Cycle: Threats, Benefits and Opportunities, Scope Policy Briefs, No. 4, UNESCO, Apr. 2007, at http://unesdoc.unesco.org/images/0015/001509/150916E.pdf (last visited August. 7, 2008).
[402] *Climate Change 2007: The Physical Science Basis, Fourth Assessment Report, Intergovernmental Panel on Climate Change,* 2007, (S., Solomon *et al*., Eds.). (Cambridge University Press, Cambridge, UK) 996 pp. at http://www.ipcc.ch/ipccreports/ar4-wg1.htm (last visited Aug. 26, 2008).
[403] Assessment of observed changes and responses in natural and managed systems, C. Rosenzweig, et al., in *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, (M.L. Parry, et al., Eds.), p. 79-131 (Cambridge University Press, Cambridge, UK). at http://www.ipcc.ch/ipccreports/ar4-wg2.htm (last visited Aug. 26, 2008).
[404] M.V. Moore, *et al*., Urban light pollution alters the diel vertical migration of *Daphnia*, Verhandlungen Internationale Verein Limnology, 2000, 27, p. 1-4.
[405] Calypso Final Environmental Impact Statement, Docket No. USCG-2006-26009, p. 4-60 (July 2008).
[406] Broadwater Final Environmental Impact Statement, Federal Energy Regulatory Commission, Docket Nos. CP06-54-000, *et al*., p. 3-112 (Jan. 11, 2008).

turtles and marine mammals, increasing their risk of impingement during seawater uptake by terminals or tankers and of potential vessel strikes.[408]

7. Noise Pollution Impacts to Marine Life

"Sound is the primary means of communicating, navigating, and foraging for many species of marine mammals and fish."[409] Therefore, introduced noise to marine waters can interfere with these vital functions. Noise can cause physical and behavioral responses, loss of hearing, injuries, and in severe incidents, fatalities.[410] LNG tankers generate high noise levels during berthing, un-berthing, and regasification, in addition to LNG port construction and other operations.[411] A marine mammal study by the National Oceanic and Atmospheric Administration (NOAA) found that constructing the Neptune LNG port off Boston, which consists of two turret buoys similar to the four proposed by Excalibur off New Jersey, would harass 1,303 dolphins and whales due to noise pollution.[412] Another study by NOAA of the Northeast Gateway LNG port off Boston, also consisting of two turret buoys, found that operations of that port would harass 732 dolphins and whales per year.[413] The studies on Neptune and Northeast Gateway found that the construction and operation of two turret buoys would "adversely affect…the continued existence of the northern right, humpback, and fin whales."[414]

8. Vessel Strike Impacts on Marine Mammals and Turtles

Long-distance LNG tanker transits and the many support vessels required for construction and operations increase ship traffic and, thus, the risks of ship strikes to endangered, threatened, and other species. "Federal endangered and threatened species that could occur in the vicinity of the offshore terminal or along the offshore pipeline route include several species of whales (sperm whale, finback whale, sei whale, humpback whale, North Atlantic Right whale), [and] turtles (Atlantic loggerhead turtle, Atlantic leatherback turtle, Kemp's ridley turtle, Atlantic hawksbill turtle)."[415]

"Some studies have indicated that whales, when exposed to the hydrodynamic forces of large ships, may be drawn into the path, thus colliding with the ship."[416] "North Atlantic right whales are of particular concern because their numbers are so depleted biologists and researchers believe a handful more vessel strikes could doom the species."[417] In fact, back in 2005, many of these

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[407] Calypso Final Environmental Impact Statement, Docket No. USCG-2006-26009, p. 4-47 and 4-55 (July 2008).
[408] Calypso Final Environmental Impact Statement, Docket No. USCG-2006-26009, p. 4-33 and 4-52 (July 2008).
[409] Ocean Studies Board. *Ocean Noise and Marine Mammals*, p. 12 (The National Academy Press, Washington D.C.) (2003).
[410] Ocean Studies Board. *Ocean Noise and Marine Mammals*, p. 89-90 (The National Academy Press, Washington D.C.) (2003).
[411] Broadwater Final Environmental Impact Statement, Federal Energy Regulatory Commission, Docket Nos. CP06-54-000, *et al*., p.3-92 - 3-93 (Jan. 11, 2008).
[412] 73 Fed. Reg. 33407 (June 12, 2008).
[413] 73 Fed. Reg. 29489 (May 21, 2008).
[414] 73 Fed. Reg. 29490 (May 21, 2008).
[415] Crown Landing Final Environmental Impact Statement, Federal Energy Regulatory Commission, Docket Nos. CP04-411-000, *et al*., p. 3-31 (Apr. 26, 2006).
[416] Northeast Gateway Final Environmental Impact Statement, Docket No. USCG-2005-22219, p. 4-56 (Oct. 2006).
[417] Douglas Moser, *LNG company funding whale detection system*, Gloucester Daily Times, Aug. 13, 2007, at http://www.gloucestertimes.com/punews/local_story_225093910?page=2 (last visited Aug. 26, 2008).

scientists recommended that emergency management actions be taken immediately to reduce ship mortalities because vessel strikes continue to be the leading cause of death of right whales.[418] The right whales migrate through the COZ in the spring and fall.[419] The enormous size of LNG tankers makes them incapable of quick braking and steering adjustments. Since right whales tend to inhabit surface waters and also have limited maneuverability, the combination with LNG tankers can be deadly.[420]

C. Violent Seas: Storms, Hurricanes, and Nor'easters

Beyond the continuous harms that result from these LNG terminals, tankers, and operations, natural hazards increase the risks to people and the marine environment.

Storms are common in the COZ, resulting in high winds and waves, rain, and snow, and storm surges. Nor'easters are large low-pressure coastal storm systems powered by northeasterly winds. They get their "name from [their] continuously strong northeasterly winds blowing in from the ocean ahead of the storm and over the coastal areas."[421] Nor'easters have caused many blizzards, freezing rains, and damaging hurricane-force winds and high waves and surf. Indeed, the Perfect Storm, also known as the Halloween Storm, in 1991 was a nor'easter.[422] These intense storms can occur anytime of the year, roughly 10 times a year in the COZ.[423] Nor'easters are more common from the fall to spring, while tropical storms and hurricanes typically occur in the summer and fall. Tropical storms originate in the tropics and are classified as hurricanes once wind speeds reach 74 miles per hour.[424] In August of 1893, a hurricane completely wiped out and destroyed Hog Island, a built-up one-mile barrier beach that was just south of the Rockaways on the far western end of Long Island.[425]

Category 3 hurricanes occur about every 25 years in the Long Island area.[426] Between 1950-2007, four hurricanes passed through the COZ and hit Long Island (three of which were Category 3 hurricanes).[427] Further, "[m]ore than 85 tropical storms passed within 115 nautical

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[418] S.B. Kraus, *et al*., North Atlantic Right Whales in Crisis, *Science*, 2005, 309 (5734) p. 561-562.
[419] Michael Moore, *Whither the North Atlantic Right Whale?*, Oceanus, Nov. 3, 2004, at http://www.whoi.edu/oceanus/viewArticle.do?id=2482 (last visited July 21, 2008).
[420] Northeast Gateway Final Environmental Impact Statement, Docket No. USCG-2005-22219, p. 4-85 (Oct. 2006).
[421] Storm Encyclopedia, The Weather Channel, http://www.weather.com/encyclopedia/winter/noreast.html (last visited Aug. 27, 2008).
[422] Satellite Gallery the Perfect Storm Damage Summary October 1991, National Climatic Data Center, National Oceanic and Atmospheric Administration, Department of Commerce http://www.ncdc.noaa.gov/oa/satellite/satelliteseye/cyclones/pfctstorm91/pfctstdam.html (last visited August, 27, 2008).
[423] Nor'easters. Storm-E http://www3.cet.edu/weather2/h17.html (last visited August, 27, 2008).
[424] Frequently asked questions Hurricane Research Division, National Oceanic and Atmospheric Administration, Department of Commerce, at http://www.aoml.noaa.gov/hrd/tcfaq/A1.html (last visited August, 27, 2008).
[425] A.. Naparstek, *Storm Tracker*, New York Magazine, Sept. 4, 2005, at http://nymag.com/nymetro/news/people/columns/intelligencer/12908/ (last visited July 30, 2008).
[426] Safe Harbor Energy Project Deepwater Port License Application Vol. 2, Exhibit V, NJDES Permit Application, Atlantic Sea Island Group, Aug. 2007, p. V-12.
[427] Continental United States Hurricane Strikes 1950-2007, National Oceanic and Atmospheric Administration, Department of Commerce, at http://www.nhc.noaa.gov/gifs/hurr-uslandfalling-1950-2007.jpg (last visited Aug. 2, 2008).

miles of Long Island between 1851 and 2000."[428] These storms also generate strong winds, waves, and swells in the COZ.[429]

Because of the configuration and topography of the New Jersey and New York shorelines, storm surges increase as the surges move northwestward toward the New York Harbor where the COZ becomes more shallow and narrow at its apex. Therefore, even moderate storms can result in higher wave heights and storm surges than would be typical in most coastal areas. When storms and high tides coincide, water surges and waves are pushed even higher.
Since storms are more frequent from the fall to the spring, high wave heights will delay and impede LNG transfers during peak months of natural gas consumption, resulting in economic impacts and energy insecurity.[430] Exxon's facility plans to stop operations when wave heights exceed 3 meters (9.8 feet).[431] However, it is worth noting that Shell Oil and TransCanada stated that Broadwater, which is the same technology Exxon proposes to use, could only operate safely in wave heights of 2 meters (6.7 feet).[432] Significant wave heights from NOAA Buoy # 44025 for five years were averaged, indicating that 3% of the time waves were 3 meters or greater.[433] On average, the worst months were October, November, and December with 7%, 7%, and 6% of the time exceeding 3 meters, respectively.[434] January and March were next with 4% each.[435] In some years, specific months had wave heights equal to or greater than three meters more than 10% of the time.[436] These include April of 2003 (10%), November of 2006 (12%), and December of 2003 (13%).[437]

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[428] Safe Harbor Energy Project Deepwater Port License Application Vol. 2, Exhibit V, NJDES Permit Application, Atlantic Sea Island Group, Aug. 2007, p. V-12.
[429] Historical Hurricane Tracks, Coastal Services Center, National Oceanic and Atmospheric Administration, Department of Commerce, at http://maps.csc.noaa.gov/hurricanes/viewer.html (last visited Aug. 2, 2008).
[430] Crown Landing Final Environmental Impact Statement, Federal Energy Regulatory Commission, Docket Nos. CP04-411-000, *et al*., p. 3-26 (Apr. 26, 2006).
[431] NYDOS Federal Coastal Consistency Objection to Broadwater Liquefied Natural Gas (LNG) Energy/Pipeline, Federal Energy Regulatory Commission, Docket Nos. CP06-54-000, *et al*., Submission 20080422-0126, p. 66 (April 10, 2008)
[432] NYDOS Federal Coastal Consistency Objection to Broadwater Liquefied Natural Gas (LNG) Energy/Pipeline, Federal Energy Regulatory Commission, Docket Nos. CP06-54-000, *et al*., Submission 20080422-0126, p. 65 (April 10, 2008)
[433] Station 44025 – Long Island 33 NM South Islip, NY, National Data Buoy Center, National Oceanic and Atmospheric Administration, Department of Commerce, at http://www.ndbc.noaa.gov/station_history.php?station=44025 (last visited Aug. 4, 2008). 2002-2006 percentage determined based on recorded observations.
[434] Station 44025 – Long Island 33 NM South Islip, NY, National Data Buoy Center, National Oceanic and Atmospheric Administration, Department of Commerce, at http://www.ndbc.noaa.gov/station_history.php?station=44025 (last visited Aug. 4, 2008).
[435] Station 44025 – Long Island 33 NM South Islip, NY, National Data Buoy Center, National Oceanic and Atmospheric Administration, Department of Commerce, at http://www.ndbc.noaa.gov/station_history.php?station=44025 (last visited Aug. 4, 2008).
[436] Station 44025 – Long Island 33 NM South Islip, NY, National Data Buoy Center, National Oceanic and Atmospheric Administration, Department of Commerce, at http://www.ndbc.noaa.gov/station_history.php?station=44025 (last visited Aug. 4, 2008).
[437] Station 44025 – Long Island 33 NM South Islip, NY, National Data Buoy Center, National Oceanic and Atmospheric Administration, Department of Commerce, at http://www.ndbc.noaa.gov/station_history.php?station=44025 (last visited Aug. 4, 2008).

Extreme wave height analysis reported by ASIG demonstrated wave heights may reach and exceed 25 feet (8 meters) in the ASIG artificial island project area.[438] Maximum wave heights exceeded three meters for every month from 1991-2001 at NOAA buoy #44025, with the greatest height recorded at about, 30.5 feet (9.3 meters).[439] At NOAA buoy Ambrose Light #ALSN6, which marks the channel entrance to the New York Harbor, the wave height from 1990-2000 reached even higher to 55.4 feet (16.9 meters).[440] Considering that ASIG proposes building the artificial LNG island at only 25 feet above sea level, extreme waves could swamp this terminal, likely causing severe impacts.

Many of the developers of LNG facilities have minimized storm concerns and delays and boasted about their facilities' ability to survive severe storm events. ASIG claims their artificial island will withstand a 200-year storm.[441] Broadwater asserted that the FSRU could withstand a Category 5 hurricane and 100-year storm in Long Island Sound.[442] Exxon states that "[t]he floating ocean terminal [in the COZ] will be designed and built to withstand extreme storms without breaking free of its mooring."[443]

Despite these dubious claims, the real test is when these storms hit. The oil industry had made similar claims as to the robustness of oil platforms and rigs prior to implementation. However, Hurricanes Katrina and Rita in the Gulf of Mexico "destroyed or seriously damaged approximately 223 platforms and oil rigs"[444] of which at least 113 platforms were destroyed.[445] In fact, six oil rigs were ripped from their moorings and several rammed ashore; one drifted 66 miles and washed-up on Dauphin Island, AL.[446] The two hurricanes also "damaged more than 560 pipeline segments."[447] Many leaks and spills due to weather damage were reported.[448]

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[438] Safe Harbor Energy Project Deepwater Port License Application Vol. 2, Exhibit V NJDES Permit Application, Atlantic Sea Island Group, Aug. 2007. p. V-12.
[439] Station 44025 – Long Island 33 NM South Islip, NY, National Data Buoy Center, National Oceanic and Atmospheric Administration, Department of Commerce, at http://www.ndbc.noaa.gov/station_history.php?station=44025 (last visited Aug. 4, 2008).
[440] Station ALSN6 – Ambrose Light, NY, National Data Buoy Center, National Oceanic and Atmospheric Administration, Department of Commerce, at http://www.ndbc.noaa.gov/station_history.php?station=alsn6 (last visited Aug. 27, 2008).
[441] Safe Harbor Energy Project Deepwater Port License Application Vol. Three, Part One, Topic Report Three, Biological Resources, Atlantic Sea Island Group, Aug. 2007, p.5 3-1.
[442] Broadwater Final Environmental Impact Statement, Federal Energy Regulatory Commission, Docket Nos. CP06-54-000, *et al*., p. 3-267 (Jan. 11, 2008).
[443] Recently Asked Questions, BlueOcean Energy, ExxonMobil, at http://www.blueoceanenergy.com/RecentlyAskedQuestions/tabid/72/Default.aspx (last visited Aug. 1, 2008).
[444] Petroleum Spills of One Barrel or Greater from Federal Outer Continental Shelf Facilities Resulting from Damages Caused by 2005 Hurricanes Katrina and Rita Including Post-Hurricane Seepage Through June 2007, Minerals Management Services, U.S. Department of Interior, Revised July 30, 2007, p. 6, at http://www.mms.gov/incidents/PDFs/HurrKatrinaRitaSpillageRev30Jul2007.pdf (last visited Aug. 26, 2008).
[445] Press Release, *MMS Updates Hurricanes Katrina and Rita Damage*, Minerals Management Services, US Department of Interior, May 1, 2006, at http://www.mms.gov/ooc/press/2006/press0501.htm (last visited Aug. 21, 2008).
[446] Hurricane Katrina 2005, Drilling Rig Hurricane Damage, at http://home.versatel.nl/the_sims/rig/h-katrina.htm (last visited Aug. 26, 2008).
[447] Petroleum Spills of One Barrel or Greater from Federal Outer Continental Shelf Facilities Resulting from Damages Caused by 2005 Hurricanes Katrina and Rita Including Post-Hurricane Seepage Through June 2007, Minerals Management Services, U.S. Department of Interior, Revised July 30, 2007, p. 6, at http://www.mms.gov/incidents/PDFs/HurrKatrinaRitaSpillageRev30Jul2007.pdf (last visited Aug. 26, 2008).

Sunken rigs and platforms then posed navigational hazards, and at least one barge collided into a submerged oil platform following Hurricane Rita releasing "an unknown amount oil...(possibly up to 3 million gallons)."[449]

Both Exxon's FSRU technology and ASIG's artificial island in the open ocean are unprecedented, and a lack of any storm resistance evidence is not reassuring. Hog Island was not far from the proposed artificial island site, and its obliteration should serve as evidence of how destructive storms can be in this region. The prospect of LNG tankers or storage facilities adrift in storms is frightening given the very dense populations of surrounding coasts. Storm events also increase the risk of ships in transit colliding with the terminal and tankers.

D. Human Errors and Risks

LNG facilities and tankers also are at risk from human error. Submerged pipelines have been damaged or disrupted by anchoring and trawling despite safety zones and restrictions.[450] Human errors and equipment failures have resulted in multiple spills, collisions, and fires at existing offshore oil and gas facilities.[451] In February of 2008, an LNG tanker's power system shut down due to a computer glitch, leaving the tanker adrift 35 miles off Cape Cod, Massachusetts in stormy seas until rescue vessels arrived.[452]

Placing terminals in between traffic lanes to the busiest port on the East Coast of the U.S. only increases the potential for collisions, as LNG tankers weave in and out of traffic lanes to access terminals, disrupting existing traffic patterns. ASIG admits in their application that the LNG tankers frequenting their proposed port could "more than double (128 percent) the ship traffic on inbound route 3 and add 28 percent to outbound route 2."[453] Thousands of ships pass through the shipping lanes to and from the NJ/NY port every year, including oil tankers, chemical tankers, container carriers, car carriers, general cargo carriers, and cruiselines.[454]

E. Pollution is Pollution No Matter Where it Occurs

It must be noted that importing LNG does not prevent the inherent environmental harms that natural gas extraction creates. The local and global environmental consequences occur wherever

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[448] Press Release, *MMS Updates Hurricanes Katrina and Rita Damage*, Minerals Management Services, US Department of Interior, May 1, 2006, at http://www.mms.gov/ooc/press/2006/press0501.htm (last visited Aug. 21, 2008).
[449] Report to Congress: Oil Spill Liability Trust Fund Hurricane Impact, Department of Homeland Security, 2006, p.5, at http://www.uscg.mil/npfc/docs/PDFs/osltf_report_hurricanes.pdf (last visited Aug. 21, 2008).
[450] MMS Incident Statistics and Summaries 1996-2010, Minerals Management Services, US Department of Interior http://www.mms.gov/incidents/IncidentStatisticsSummaries.htm (last visited Aug. 2, 2008).
[451] MMS Incident Statistics and Summaries 1996-2010, Minerals Management Services, US Department of Interior http://www.mms.gov/incidents/IncidentStatisticsSummaries.htm (last visited Aug. 2, 2008).
[452] *Power Restored to Disabled LNG Tanker*, Boston Globe, Feb. 13, 2008, at http://www.boston.com/news/local/massachusetts/articles/2008/02/13/power_restored_to_disabled_lng_tanker/ (last visited August 4, 2008).
[453] Safe Harbor Energy Project Deepwater Port License Application Vol. Two, Exhibit N, Atlantic Sea Island Group, Aug. 2007, p. N-7.
[454] Safe Harbor Energy Project Deepwater Port License Application Vol. Two, Exhibit N, Atlantic Sea Island Group, Aug. 2007, p. N-66.

the fossil fuel is produced. For example, New Jersey Governor Corzine and many other governors have consistently opposed offshore drilling off their coasts because of environmental concerns. Yet, Canadian Superior Energy, one of the 50 % partners in Excalibur who proposes Liberty Natural Gas, is actively drilling in offshore gas fields in the waters off Trinidad and Tobago.[455] If New Jersey approved Excalibur's terminal, it would be indirectly subsidizing offshore drilling in Trinidad and Tobago, a country with weak environmental standards and polluted beaches from offshore drilling.[456]

Other probable suppliers of LNG include other countries involved in offshore drilling such as Russia,[457] Nigeria,[458] Venezuela,[459] and Qatar, which has "the largest offshore gas reservoir in the world."[460] "ExxonMobil has been working with Qatar Petroleum to develop the field since the early 1990s."[461] Russia's operations with oil and gas development on and off-shore of Sakhalin Island is another example of a project that should not be subsidized due to its "chronic environmental impacts…including threats to the critically endangered Western Gray Whales, damage to wild salmon spawning grounds, and negative impacts to indigenous and fishing cultures."[462] Thus, importing LNG will not absolve environmental impacts.

F. Coast to Coast Governors Reject LNG

Many governmental leaders have set an important precedent of protecting the environment by rejecting previous LNG projects due to ecological concerns. Indeed, California Governor Arnold Schwarzenegger vetoed the Cabrillo LNG port 14 miles off his state because it "would result in significant and unmitigated impacts to California's air quality and marine life."[463] New York and Connecticut blocked the Broadwater project because of inconsistency with coastal zone management. New York Governor David Paterson stated that "Frankly, Broadwater would scar Long Island Sound and it would have established a very dangerous precedent of industrializing a waterway that generations of people have spent millions of dollars trying to preserve. It would severely curtail commercial and recreational fishing and would damage the sea life that lives right in the Sound."[464] Both the proposed Cabrillo and Broadwater ports would have used the

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[455] Dan Healing, *Canadian Superior surges on Trinidad natural gas find*, Calgary Herald, Aug. 14, 2008, at http://www.canada.com/calgaryherald/news/calgarybusiness/story.html?id=f6c91223-1634-4c3b-87ad-8bc26b6c736f (last visited Aug. 14, 2008).
[456] Rajendra Ramlogan, *Meeting the Challenges of Environmental Imperatives: The Hydrocarbon Sector in Trinidad and Tobago*, 23 Energy L. J. 127, 130-32 (2002).
[457] Press Advisory, *Shell's Sakhalin II Announces It Cannot Get Financing from US and UK Export Credit Agencies*, Pacific Environment, Sakhalin Environment Watch, WWF-UK, Mar. 4, 2008 (on file with author).
[458] Ron Scherer, *Some signs of relief on gasoline prices*, The Christian Science Monitor, June 23, 2008.
[459] *Cameron Awarded Venezuelan Contract*, Natural Gas Week, Energy Intelligence Group, Inc., Jan. 7, 2008, at http://www.energyintel.com/DocumentDetail.asp?document_id=220576 (last visited Aug. 26, 2008).
[460] Press Release, *What it takes to link a 9,000-mile LNG chain*, ExxonMobil, June 1, 2007, at http://www.exxonmobil.com/corporate/news_features_20070601_lngchain.aspx (last visited Jun. 29, 2008).
[461] Press Release, *What it takes to link a 9,000-mile LNG chain*, ExxonMobil, June 1, 2007, at http://www.exxonmobil.com/corporate/news_features_20070601_lngchain.aspx (last visited Jun. 29, 2008).
[462] Press Advisory, *Shell's Sakhalin II Announces It Cannot Get Financing from US and UK Export Credit Agencies*, Pacific Environment, Sakhalin Environment Watch, WWF-UK, Mar. 4, 2008 (on file with author).
[463] Letter from Arnold Schwarzenegger, Governor, California, to Sean Connaughton, Administrator, Maritime Administration, U.S. Department of Transportation, May 18, 2007 (on file with author).
[464] Governor David Paterson, Press Conference, April 10, 2008, http://www.youtube.com/watch?v=iHbtNE8sar8 (last visited Aug. 27, 2008).

same technology that Exxon now proposes off New Jersey. The COZ deserves equal environmental protection.

XI. CONCLUSION

In short, after careful review and consideration, LNG is the wrong energy choice. LNG is not in the public interest and is environmentally destructive. It sets forth an energy platform that will destabilize the U.S.'s energy independence on natural gas, make the U.S. more dependent on another foreign fossil fuel, significantly increase energy costs, pollute the ocean and air, harm marine ecosystems, and increase climate change. In addition, when compared to the local, long-term, high quality jobs that a green energy path provides, building LNG terminals provides few and short-term jobs.

There is no compelling public interest in building new LNG terminals. Indeed the only true beneficiaries will be foreign governments, such as Russia and those in the Middle East that will be major sources of the LNG, and the multi-national corporations that will reap the profits.

The U.S. can and should maintain its independence with its abundant natural gas reserves that are more than adequate to serve as a bridge as we invest in a greener future.