LIQUEFIED NATURAL GAS (LNG) PROJECTS PENDING BEFORE THE CALIFORNIA STATE LANDS COMMISSION

California State Lands Commission
Staff Briefing Paper

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INTRODUCTION

This staff briefing paper summarizes information and the responsibilities and activities of the California State Lands Commission (Commission) related to three proposals to build and operate liquefied natural gas (LNG) import terminals in California. In September 2003 and February 2004, the Commission received applications from **BHP Billiton LNG International, Inc.** and **Crystal Energy, LLC**, respectively, for new pipeline right-of-way leases associated with proposed LNG terminals in federal waters offshore California. Additionally, **Sound Energy Solutions (SES)** proposes to construct an onshore LNG terminal on lands that were legislatively granted to the city of Long Beach. Joint Environmental Impact Statements/Environmental Impact Reports (EIS/EIRs) will be prepared for each project pursuant to the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). Table 1 identifies the roles of the Commission and the other State and federal lead agencies relative to these proposed projects.

Table 1. CEQA and NEPA Lead Agencies for Proposed California LNG Projects[1]

	BHP Billiton	Crystal Energy	SES
California State Lands Commission	CEQA Lead Agency	CEQA Lead Agency	CEQA Trustee Agency
Port of Long Beach			CEQA Lead Agency
U.S. Coast Guard (USCG)/U.S. Maritime Administration (MARAD)	NEPA Lead Agencies	NEPA Lead Agencies	
Federal Energy Regulatory Commission (FERC)			NEPA Lead Agency

This staff paper is divided into three sections: background information on LNG and natural gas; the Commission's role in each LNG proposal discussed in the staff paper; and a summary of staff's activities in ongoing LNG matters.

Background: LNG and the California Energy Commission Assessment of Natural Gas Supply and Demand in California

LNG is natural gas in its liquid form after being cooled to a temperature of -259°F. Since LNG is 600 times smaller in volume than natural gas in its normal vapor state, LNG can be shipped in double-hull carriers designed to handle low temperatures and insulated to limit the amount of LNG that boils off or evaporates (this boil-off gas is often used to fuel

[1] The proposed BHP Billiton and Crystal Energy offshore LNG terminals are "deepwater ports" as defined in the federal Deepwater Port Act of 1974, as amended ("a fixed or floating manmade structure other than a vessel, or a group of structures, located beyond the territorial sea and off the coast of the U.S., used or intended for use as a port or terminal for the transportation, storage, and further handling of oil or natural gas for transportation to any State").

the ships).[2] In many cases, the LNG is then re-gasified and distributed as natural gas to customers through pipelines. LNG can also be used in its liquid form as an alternative fuel for vehicles. (See Attachment 1, *Frequently Asked Questions About LNG*.)

According to a recent California Energy Commission (CEC) Staff Report, California consumes approximately 6 billion cubic feet per day (Bcfd) of natural gas, and during some months this demand peaks to 10 Bcfd.[3] California's total annual consumption of natural gas was 2.2 trillion cubic feet (Tcf) in 2003; by 2013, natural gas demand in the State is projected to reach 2.4 Tcf, in part as a result of the growing use of natural gas for electricity generation.[4] According to the U.S. Department of Energy's Energy Information Administration (EIA), electricity generation and industrial consumers are the largest users of natural gas in California (33% and 32% respectively), followed by residential (23%) and commercial (11%) customers.[5] Residential and commercial customers use natural gas primarily to heat spaces (homes, businesses, etc.) and water. Compressed natural gas (CNG) and LNG are also used as transportation fuels.

California has imported natural gas to meet its needs since the 1940s. Out-of-state sources of natural gas currently represent approximately 85% of supply and are anticipated to rise to 88% by 2013, due in part to declining in-state natural gas production. These imports flow through interstate pipelines from four major supply basins located in the Southwest, Rocky Mountains region, and Western Canada. Today, California competes for this natural gas with fast-growing western states such as Nevada, Arizona, and New Mexico, as well as the Midwest. According to the CEC staff's 2005 *Natural Gas Assessment Update*, the tight natural gas supply situation impacts prices (wholesale natural gas prices in California and the U.S. have doubled since July 2001), and rising natural gas prices affect California's economy and consumers.

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[2] LNG is transported at sea in three basic types of carriers – membrane ships, independent spherical tank ships, and independent prismatic tank ships. The containment system on LNG carriers is required to minimize the heat leaking into the cargo from the surroundings and to protect the ship's hull from brittle fracture, which would result if the LNG came in contact with the steel hull. For example, membrane tanks incorporate a primary and secondary membrane, separated by an insulation system and from a vessel's hull. In the event that the primary membrane fails, the secondary membrane must be able to keep the cargo away from the vessel's hull for at least 15 days to allow for emergency offloading. Independent tanks are specially designed to assure that, should a crack develop, the crack will grow so slowly that any escaped liquid will vaporize or be deflected by a spray shield to drip pans below the tank. The LNG cargo tanks for all three types of LNG tanks are also separated from the external environment by a double hull. This means external damage to an LNG carrier hull would not result in an LNG release unless the damage was extensive enough to puncture the inner hull and then the cargo tank. Each of these types of carriers must meet international and USCG requirements before they receive the various approvals that are required to allow them to operate in U.S. waters.

[3] California Energy Commission Staff Report, *Natural Gas Assessment Update*, February 2005 (http://www.energy.ca.gov/2005publications/CEC-600-2005-003/CEC-600-2005-003.PDF).

[4] California Energy Commission Staff Report*, Natural Gas Market Assessment*, August 2003 (http://www.energy.ca.gov/reports/2003-08-08_100-03-006.PDF).

[5] U.S. Department of Energy, Energy Information Administration, *California Natural Gas Consumption by End Use*, cited in California Energy Commission, *Natural Gas Assessment Update*, February 2005 (http://tonto.eia.doe.gov/dnav/ng/ng_cons_sum_dcu_SCA_m.htm).

The CEC's *2003 Integrated Energy Policy Report*, which serves as the foundation for energy policies and decisions affecting the State, identifies strategies to address the State's natural gas supply, demand, and price challenges, and lists priorities to ensure a reliable supply of natural gas sufficient to meet California's demand (Table 2).[6] State government entities are directed to carry out their duties and responsibilities based upon the information and analyses in this Report, once it is adopted by the Governor.[7]

Table 2. California Energy Commission (CEC)-Adopted Priorities for Balancing the State's Energy Demand with Supply (from *2003 Integrated Energy Policy Report*)

CEC Priority Ranking	Priority
1	Increase energy efficiency in the natural gas marketplace by, among other strategies, enforcing the State's building and appliance standards, funding conservation and energy efficiency programs, deploying cogeneration and distributed generation technologies, and replacing or upgrading older, less-efficient natural gas-fired power plants with modern electricity generators.
2	Reduce natural gas dependence by means such as implementing natural gas energy-efficiency and conservation programs and using renewable energy resources (wind, geothermal, biomass, solar).
3	Develop new natural gas infrastructure, including new sources of supplies, such as LNG. In furtherance of this priority, the *2003 Integrated Energy Policy Report* recommends that the State "encourage the construction of liquefied natural gas facilities and infrastructure and coordinate permit reviews with all entities to facilitate their development on the West Coast."

The 2005 *Natural Gas Assessment Update* adds: "To make more efficient use of existing natural gas supplies, the *2003 Energy Report* recommended increasing energy efficiency programs that reduce both natural gas and electricity use. The State should also pursue strategies to generate 33 percent of its electricity from renewable energy. Even with these aggressive actions, however, the statewide demand for natural gas will continue to grow by at least one percent per year requiring additional natural gas imports into the State."

Previously Proposed LNG Facilities in California

In the 1970s, several companies proposed to build LNG import facilities in California in or near Oxnard, Point Conception, and the Port of Los Angeles. Since the agencies involved in site approval could not agree on a site, the State Legislature enacted the Liquefied Natural Gas Terminal Act of 1977 (formerly Public Utilities Code §§ 5550 et seq.). Under this Act, which has expired, the California Public Utilities Commission (CPUC), with input from the California Coastal Commission (CCC) and State Energy

[6] California Energy Commission, *2003 Integrated Energy Policy Report*, December 2003 (http://www.energy.ca.gov/2003_energypolicy/index.html); see also *Integrated Energy Policy Report 2004 Update*, November 2004 (http://www.energy.ca.gov/2004_policy_update/index.html).

[7] The 2003 Integrated Energy Policy Report has been submitted to the Governor, but the CEC has not yet received a formal reply (personal communication with Kevin Kennedy, CEC, February 16, 2005).

Resources Conservation and Development Commission (now the CEC), could approve an LNG terminal at a site "remote from human population in order to provide the maximum possible protection to the public against the possibility of an accident."

In May 1978, the CCC adopted and transmitted to the CPUC a ranking of four (of 82 nominated) potential **onshore** LNG terminal sites—Horno Canyon in Camp Pendleton (San Diego County); Rattlesnake Canyon (San Luis Obispo County); Little Cojo near Point Conception (Santa Barbara County); and Deer Canyon (Ventura County).[8] The CCC also found that the Ventura Flats, in international waters of the Santa Barbara Channel, appeared to be the most appropriate site for an **offshore** LNG terminal that could be linked to shore via a subsea gas pipeline to the Oxnard area.[9] The CPUC eventually approved an onshore site at Point Conception, due to its remote location and contingent upon demonstration of earthquake safety. In November 1978, the Commission issued a 30-year General Lease-Industrial Use to Western LNG Terminal Associates to build, operate, and maintain an LNG receiving, storage and re-gasification terminal and related marine facilities. However, the project proponents cancelled the project when the importation of LNG became uneconomical. The LNG terminal was never built, and the lease was quitclaimed to the State, effective January 1, 2000.

Current and Recently Proposed LNG Facilities: North America

Currently, four LNG-receiving and regasification terminals are located in the continental United States: Lake Charles, Louisiana; Elba Island, Georgia; Cove Point, Maryland; and Everett, Massachusetts. A fifth facility is located in Peñuelas, Puerto Rico. To date, MARAD has also approved two licenses under the federal Deepwater Port Act of 1974, as amended (see Attachment 2, *Deepwater Port Act Fact Sheet*).[10] Numerous additional projects are pending before the FERC or the USCG/MARAD; in response, the U.S. Congress recently held hearings on the siting, safety, and security of LNG import terminals in the United States.[11]

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[8] California Coastal Commission, *Final Report Evaluating and Ranking LNG Terminal Sites*, May 24, 1978. Rankings were based on analyses of population density, wind and wave conditions, earthquake faults, soil conditions, and other siting criteria.

[9] California Coastal Commission, *Offshore LNG Terminal Study*, September 15, 1978.

[10] In November 2003, MARAD approved a license for Port Pelican, LLC (a ChevronTexaco affiliate) to construct and operate the nation's first LNG deepwater port approximately 36 miles offshore Louisiana (see http://dmses.dot.gov/docimages/pdf88/260279_web.pdf). In December 2003, MARAD approved a license to El Paso Energy Bridge Gulf of Mexico, LLC for a deepwater port approximately 116 miles offshore Louisiana (see http://dmses.dot.gov/docimages/pdf89/270364_web.pdf).

[11] For example, on February 15, 2005, the Senate Energy & Natural Resources Committee's Energy subcommittee held a hearing to receive testimony regarding the prospects for LNG in the United States and to discuss the safety and security issues related to LNG development. Witnesses were the FERC, the USCG, State authorities (including the president of the CPUC), and industry stakeholders. Issues discussed included LNG siting processes; risk assessment; and the State and local governments' role. Transcripts from this hearing are posted at http://energy.senate.gov/hearings/witnesslist.cfm?id=1384.

Six LNG terminals have recently been proposed in California, and projects proposed by **BHP Billiton**, **Crystal Energy**, and **SES** remain under consideration; plans for two LNG import terminals in Baja California, Mexico are also moving ahead (Figure 1).[12] (See also: Attachment 3, *Existing, Proposed and Potential North American LNG Terminals*; Attachment 4, *LNG Projects on the West Coast*; and Attachment 5, *Artists' Drawings of Potential LNG Terminals in California and Baja California*.)

[12] In January 2003, Bechtel Enterprises suspended negotiations with the city of Vallejo to build an LNG terminal and regasification facility on Mare Island. In March 2004, Calpine Corp. withdrew plans for an LNG terminal at Samoa Point, Eureka, based on feedback from the local community and public officials. In March 2004, Marathon Oil Corp. dropped plans to build an LNG terminal on Mexico's Pacific coast after the Mexican Government purchased the proposed site and removed it from consideration.

Figure 1. Proposed and Announced West Coast LNG Terminals and Capacity (in million cubic feet per day [MMCFD])[13]

[13] This information is provided and updated by the California Energy Commission (CEC), and can be found on the CEC website at: http://www.energy.ca.gov/lng/projects.html.

THE COMMISSION'S ROLE WITH RESPECT TO THE PROPOSED CALIFORNIA LNG IMPORT TERMINALS

As shown in Table 1, the Commission is, or will be, the CEQA lead agency for two proposed offshore LNG projects (**BHP Billiton,** and **Crystal Energy**). The Commission also has review responsibilities as a Trustee Agency for the proposed onshore terminal at the Port of Long Beach (**SES**).

Commission as Lead Agency under the CEQA

1. **BHP Billiton**. In September 2003, BHP Billiton LNG International, Inc., a wholly owned subsidiary of BHP Billiton Ltd. (Australia), submitted an application to the Commission for a pipeline right-of-way lease associated with its proposed Cabrillo Port LNG Deepwater Port. Associated applications were submitted to the USCG and MARAD, and the USCG, MARAD, and Commission are preparing a joint EIS/EIR pursuant to a Memorandum of Agreement.[14] As proposed, BHP Billiton would build and operate a floating storage and re-gasification unit (FSRU) that would be moored approximately 14 miles offshore of the Ventura/Los Angeles County border in 2,900 feet of water. LNG carriers would transport LNG from the Pacific basin to the FSRU (at a rate of approximately 2 to 3 shipments per week [104 to 156 carriers per year]), where it would be stored and regasified. Total LNG storage capacity on the FSRU would be approximately 72 million gallons. An anticipated 800 million cubic feet per day of natural gas would be delivered onshore via two new 21.1-mile-long, 24-inch-diameter pipelines laid on the seafloor. The applicant's stated design life is 40 years, although the federal license for the deepwater port would have no expiration date.

   The State lease application calls for the construction and operation of the portion of these two pipelines across State lands. As proposed, horizontal directional boring (HDB) would be used to install the pipelines below the shoreline to a new metering station at Ormond Beach in Oxnard. New onshore pipelines would also be built to distribute natural gas from the metering station throughout Southern California via the intrastate pipeline system operated by Southern California Gas Co. (SoCalGas), a natural gas utility regulated by the CPUC. Pending receipt of all approvals, BHP Billiton estimates the proposed project will be online in 2008, at a cost of approximately $550 million. Project details are available on the Commission website, http://www.slc.ca.gov, and a project website, http://www.cabrilloport.ene.com.

2. **Crystal Energy**. In February 2004, Crystal Energy submitted an application to the Commission for a pipeline right-of-way lease associated with its Clearwater Port project, a proposal to convert and operate federal Platform Grace, which lies approximately 11 miles offshore Ventura County, as an LNG terminal and re-gasification facility. Associated applications were submitted to the USCG and MARAD, as well as to the U.S. Minerals Management Service, which would need to

[14] Memorandum of Agreement for the Review of Deepwater Ports License Applications (December 2003) (http://www.slc.ca.gov/Division_Pages/DEPM/DEPM_Programs_and_Reports/BHP_Deep_Water_Port/MOA_12-05-03.pdf).

revise the federal Development and Production Plan for Platform Grace. The applications were revised and resubmitted in July 2004, in response to agency comments. Crystal Energy has signed a long-term agreement with Venoco, Inc. (the operator of Platform Grace) for use of the existing platform. In October 2004, Woodside (an Australian company) announced it would provide technical and operational expertise, plus funding to jointly develop the proposed Clearwater Port. As proposed, tankers would deliver LNG to a new multiple-dolphin dock moored adjacent to the platform; the LNG would then be offloaded onto Platform Grace, re-gasified, and delivered onshore via a new 36-inch-diameter natural gas pipeline that would be laid on the ocean floor. The pipeline would reach landfall near the Mandalay Bay Power Generation Station in Oxnard, where it would connect into the SoCalGas intrastate pipeline system after construction of new onshore pipelines.

3. **ChevronTexaco**. In August 2004, ChevronTexaco first met with Commission staff to discuss potential plans to submit an application for an LNG storage and re-gasification facility and associated natural gas pipeline in State waters (within 3 nautical miles of shore) in Southern California. Due to its proposed location in State waters, this project would not be a deepwater port, and the NEPA lead agency will be the FERC. However, in June 2005, ChevronTexaco notified public agencies that it did not plan to pursue the project (CEC 2005).

Commission as Trustee Agency under the CEQA

4. **Sound Energy Solutions (SES)**. SES, a wholly owned subsidiary of Mitsubishi Corp., proposes to construct and operate an onshore LNG receiving/re-gasification terminal at the Port of Long Beach, on lands that have been legislatively granted to the city of Long Beach. As proposed, LNG would be shipped to California aboard LNG carriers, offloaded, and either distributed in liquid form for fuel distributors or re-gasified for delivery via a new pipeline to the local SoCalGas transmission system.

   SES has submitted applications to the Port of Long Beach and the FERC, which prepared a joint EIS/EIR, dated October 2005, that was recently released for public review and comment. The CPUC has claimed in a letter to the FERC that California has jurisdiction over LNG facilities within its borders, and that SES must also submit an application to the CPUC. In response, the FERC concluded that LNG import terminals are engaged in foreign commerce and, as such, regulatory authority for the siting and construction of LNG terminals rests exclusively with the federal government.[15] The CPUC subsequently filed suit against the FERC in federal court, arguing that State officials should be involved in the safety and environmental reviews of LNG facilities within the State. Federal legislation to give the FERC clear, strengthened authority over LNG facility siting was contained in the 2005 Comprehensive Energy Bill that was signed into law by the President. The proposed legislation does not currently apply to deepwater port projects, where the USCG/MARAD is the designated federal lead agency.

[15] Federal Energy Regulatory Commission, *Declaratory Order Asserting Exclusive Jurisdiction*, issued March 24, 2004 (http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=10099827).

Addressing Public Concerns

In its environmental reviews for the joint EIS/EIRs being prepared for each LNG project proposal, Commission staff will thoroughly research and independently analyze issues and concerns raised by local, State, and federal agencies and the public. Opponents of the LNG projects have focused particularly on public safety issues. For example, they envision acts of terrorism, such as hijacking and detonating an LNG carrier and igniting a vapor cloud that could demolish populated areas. A January 2004 explosion at an LNG production plant in Algeria has intensified public concern. Local residents have also expressed concerns with the siting and operation of associated new onshore natural gas pipelines.

A site-specific Independent Risk Assessment will be conducted for each LNG terminal project reviewed by the Commission. Staff will also incorporate into its analyses the findings of a report recently released by the U.S. Department of Energy, which provides guidance to address potential public safety and property impacts relative to a potential LNG spill over water.[16] Key conclusions of this report include those below.

- Risks from accidental LNG spills, such as from collisions and groundings, are small and manageable with current safety and security practices; consequences from intentional events, such as terrorist acts, are more severe, but such risks can be significantly reduced with appropriate security, planning, prevention, and mitigation.
- Risk identification/risk management processes should be conducted in cooperation with appropriate stakeholders, including public safety officials and elected public officials, and should take into account site-specific conditions, available intelligence, threat assessments, safety and security operations, and available resources.
- Current modeling tools for analyzing LNG spills over water, if applied as identified in the Report, can be used to improve analysis of site-specific hazards, consequences, and risks, and to identify and mitigate hazards to protect public safety and property.

STAFF ACTIVITY

Application and Environmental Review

As noted above, the Commission has received applications for two pipeline right-of-way leases associated with LNG projects; these applications are or will be reviewed by staff in the Commission's Land Management, Environmental Planning and Management, Marine Facilities, Mineral Resources Management, and Legal Divisions. The status of the application for each of the three projects likely to come before the Commission is summarized below and in Table 3.

[16] Sandia National Laboratories, *Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water* (SAND2004-6258), December 2004 (http://www.fossil.energy.gov/programs/oilgas/storage/lng/sandia_lng_1204.pdf).

Table 3. Staff LNG Project Activity Table (as of October 2005)

	BHP Billiton	**Crystal Energy**
Application received	✓ 9/3/03	✓ 2/10/04 (original) ✓ 7/29/04 (revised)
Application complete	✓ 10/14/04	?
Approval by Commission to select EIS/EIR consultant	✓ 10/20/03	✓ 10/20/03
Consultant selected	✓ 2/3/04	?
Notice of Intent/Notice of Preparation (NOI/NOP)	✓ 2/24/04	?
Public scoping meetings/open houses	✓ 3/15/04 to 3/16/04	?
Draft EIS/EIR released for public comment	✓ 10/29/04 to 12/20/04	?
Draft EIS/EIR meetings/open houses	✓ 11/29/04 to 12/1/04	?
Recirculate revised environmental document for public review and comment	*anticipated first quarter 2006*	N/A
Public hearings on revised document	*approximately 30 days following release to public*	N/A
Final EIS/EIR with responses to comments	*anticipated Summer/Fall 2006*	?
Commission meetings on whether or not to certify EIR and on lease application	*anticipated Summer/Fall 2006*	?

The proposal that is furthest along in the environmental review process is the **BHP Billiton** Cabrillo Port LNG Deepwater Port. To date, a third-party consultant managed by the Commission, USCG, and MARAD was contracted to prepare the EIS/EIR, public scoping meetings/open houses were held in Oxnard and Malibu in March 2004, a Draft EIS/EIR was released in October 2004, and public meetings/open houses on the Draft EIS/EIR were held in Santa Clarita, Oxnard, and Malibu in December 2004.[17] More than 1,500 comments were received on the Draft EIS/EIR through the close of the public comment period in December 2004. The project is currently on hold until the applicant provides additional information requested by the lead agencies, information presented in the Draft EIS/EIR is verified and revised in consideration with consultations with Sandia National Laboratories, and the environmental document recirculated for additional public review and comment. Staff currently anticipates bringing the EIR and State lease application for the Commission's consideration in Summer/Fall 2006. Attachment 6, *Risk Assessment Process*, shows the hazard and risk analysis process that is part of the project EIS/EIR documentation. Attachment 7, *Opportunities for Public Comment*, shows the initial public review and agency decision-making processes for this project.

[17] The informal open houses allowed meeting participants to review displays, maps, and literature and to meet agency staffs, members of the EIS/EIR project team, and staffs from BHP Billiton and SoCalGas; the scoping meetings provided an opportunity for the public to provide oral and/or written comments.

The USCG, MARAD, and Commission will also prepare a joint EIS/EIR in connection with the federal and State applications received for the proposed **Crystal Energy** Clearwater Port LNG terminal at Platform Grace. These applications are currently incomplete, due in part to Crystal Energy's need to address agency concerns over plans by Venoco (the Platform Grace operator) to resume oil and gas production on Platform Grace (the applications do not contain an analysis of risks associated with simultaneous LNG and oil/gas production operations on the platform). On January 27, 2005, Crystal Energy submitted responses to agency comments. Staff anticipates bringing the EIR and State lease application for the Commission's consideration in 2006.

In its Trustee Agency role, Commission staff submitted scoping comments for the proposed **SES** Port of Long Beach LNG Project. Staff continues to monitor this project and will comment on its associated EIS/EIR as appropriate. As previously indicated, the FERC and the Port of Long Beach have released a draft EIS/EIR for public review with comments due December 8, 2005.

The Commission's Marine Facilities Division may have an additional, significant role in the proposed **SES** facility. Specifically, the Commission has statutory mandates, pursuant to the Lempert-Keene-Seastrand Oil Spill Prevention and Response Act of 1990, to inspect or cause to be inspected all State marine facilities and their associated equipment, and to monitor marine facilities operations and the effects on public health, safety, and the environment.

LNG Terminal Engineering and Maintenance Standards (LNGTEMS)

In March 2005, a third-party consultant, retained by the Commission, will begin work on the codification of engineering design and maintenance standards for wharf/pier or offshore LNG marine terminals in California. The final product will be similar to the Commission's Marine Oil Terminal Engineering and Maintenance Standards (MOTEMS) (July 2003). Standards and criteria will include, but not be limited to, structural analysis and design procedures for wharf/pier and offshore terminals, pipelines, pipeline supports, (seismic criteria for) integral LNG tanks, mechanical/electrical equipment, mooring hardware, geotechnical hazards, and fire detection/suppression systems. Two workshops seeking input on design and procedures will be held during the development of proposed LNGTEMS. A thorough peer review of the resulting standards will occur.

State LNG Interagency Permitting Working Group

The Commission staff is also actively participating in and coordinating with State and local agencies as a member of the State's LNG Interagency Permitting Working Group. This group, which meets monthly, has been established by the CEC to promote close communication among and support for agencies potentially involved in the permitting process of any LNG facility in California.

Frequently Asked Questions About LNG*

What is LNG?
Liquefied natural gas, or LNG, is natural gas in its liquid form. When natural gas is cooled to -259° Fahrenheit (-161° Celsius), it becomes a clear, colorless, odorless liquid. LNG is neither corrosive nor toxic. It is mostly methane, with low concentrations of other hydrocarbons, water, carbon dioxide, nitrogen, oxygen, and some sulfur compounds. During the process known as *liquefaction*, natural gas is cooled below its boiling point, removing most of these compounds. The remaining natural gas is mostly methane, with only small amounts of other hydrocarbons. LNG weighs less than half the weight of water, so it will float if spilled on water.

Where does LNG come from?
A majority of the world's LNG supply comes from countries with large natural gas reserves. These countries include Algeria, Australia, Brunei, Indonesia, Libya, Malaysia, Nigeria, Oman, Qatar, and Trinidad and Tobago.

What countries import LNG?
There are 40 LNG-receiving terminals located worldwide. Japan, South Korea, the United States, and a number of European counties import LNG.

Where are LNG import terminals located in the United States?
LNG terminals in the U.S. are located in Everett, Massachusetts; Cove Point, Maryland; Elba Island, Georgia; and Lake Charles, Louisiana. There is also a terminal in Peñuelas, Puerto Rico.

How is LNG transported?
LNG is transported in double-hull ships specifically designed to handle the low temperature of LNG. These carriers are insulated to limit the amount of LNG that boils off or evaporates. This boil-off gas is sometimes used to supplement fuel for the carriers. LNG carriers are up to 1,000 feet long, and require a minimum water depth of 40 feet when fully loaded. There are currently 136 ships that transport more than 120 million metric tons of LNG every year. (Source: University of Houston IELE, *Introduction to LNG*)

How is LNG stored?
At most terminals, when LNG is received, it is transferred to insulated storage tanks that are built specifically to hold LNG. These tanks can be found above or below ground and keep the liquid at a low temperature to minimize the amount of evaporation. If LNG vapors are not released, the pressure and temperature within the tank will continue to rise. LNG is characterized as a cryogen, a liquefied gas kept in its liquid state at very low temperatures. The temperature within the tank will remain constant if the pressure is kept constant by allowing the boil-off gas to escape from the tank. This is known as *auto-refrigeration*. The boil-off gas is collected and used as a fuel source in the facility or on the tanker that transports it. When natural gas is needed, the LNG is warmed to a point where it converts back to its gaseous state. This is accomplished using a regasification process involving heat exchangers.

How is natural gas stored?
Natural gas may be stored in a number of ways. It is most commonly stored under ground, under pressure, in three types of facilities. The most commonly used facilities in California are depleted reservoirs in oil and/or gas fields, because they are more available. Aquifers and salt cavern formations are also used under certain conditions. The characteristics and economics of each type of storage site will dictate its suitability for use. Two of the most important characteristics of an underground storage reservoir are its capability to hold natural gas for future use and its deliverability rate. The deliverability rate is determined by the withdrawal capacity of the associated valves and compressors and the total amount of gas in the reservoir. In other states, natural gas is

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* Adapted from the California Energy Commission website at http://www.energy.ca.gov/lng/faq.html. A *Glossary of LNG-Related Terms and Definitions* is at: http://www.energy.ca.gov/lng/glossary.html.

also stored as LNG after the natural gas has been liquefied and placed in aboveground storage tanks. (Source: U.S. Department of Energy, Energy Information Administration.)

How is LNG used?
LNG is normally warmed to make natural gas to be used in heating and cooking, as well as electricity generation and other industrial uses. LNG can also be kept as a liquid to be used as an alternative transportation fuel.

Why use LNG?
Natural gas is the cleanest burning fossil fuel. It produces fewer emissions and pollutants than either coal or oil. The North American supply basins are maturing, and as demand for natural gas increases in California and throughout the United States, alternative sources of natural gas are being investigated. Natural gas is available outside North America, but it is not accessible by pipelines. Natural gas can be imported to the United States from distant sources in the form of LNG. Because LNG occupies only a fraction (1/600) of the volume of natural gas, and takes up less space, it is more economical to transport across large distances and can be stored in larger quantities. LNG is a price-competitive source of energy that could help meet future economic needs in the United States.

Is LNG flammable?
When cold LNG comes in contact with warmer air, it becomes a visible vapor cloud. As it continues to get warmer, the vapor cloud becomes lighter than air and rises. When LNG vapor mixes with air, it is flammable only if it is within 5% to 15% natural gas in air. If it is less than 5% natural gas in air, there is not enough natural gas in the air to burn. If it is more than 15% natural gas in air, there is too much gas in the air and not enough oxygen for it to burn.

Is LNG explosive?
As a liquid, LNG is not explosive. LNG vapor will explode only if it is in an enclosed space and within the flammable range of 5% to 15% when mixed with air.

What is a rapid-phase transition?
When enough LNG is spilled on water at a very fast rate, a rapid-phase transition, or RPT, occurs. Heat is transferred from the water to the LNG, causing the LNG to instantly convert from its liquid phase to its gaseous phase. A large amount of energy is released during this rapid transition between phases, and a physical explosion can occur. While there is no combustion, this physical explosion can be hazardous to any nearby person or buildings.

What about security?
All LNG ships must comply with all pertinent local and international regulatory requirements, which include regulations and codes set forth by the International Maritime Organization (IMO), the U.S. Maritime Administration (MARAD), the U.S. Coast Guard, and the U.S. Department of Transportation (DOT), as well as the hosting port authority. DOT regulations must be followed at onshore LNG facilities and marine terminals. The DOT Research and Special Programs Administration regulations include 49 *Code of Federal Regulations* 193, “Liquefied Natural Gas Facilities: Federal Safety Standards.” These standards specify siting, design, construction, equipment, and fire protection requirements that apply to new LNG facilities and to existing facilities that have been replaced, relocated, or significantly altered.

Offshore marine terminals must follow regulations set by the Coast Guard. The Coast Guard monitors the safety of coastal waters around the United States and ensures the safety of ships while in U.S. waters and in port by preventing other ships from getting near LNG tankers. The Coast Guard works with local harbor authorities and LNG facility personnel to ensure that proper procedures are followed. The Coast Guard and MARAD are the Federal agencies responsible for siting offshore LNG facilities and are currently developing regulations.

Deepwater Port Act
Fact Sheet

Deepwater Port Act of 1974

The Deepwater Port Act of 1974, as amended (the Act, 33 U.S. Code [U.S.C.] 1501 *et seq.*), regulates the location, ownership, construction, and operation of deepwater ports in waters beyond the territorial limits of the United States, and authorizes the Secretary of Transportation to license the ownership, construction, or operation of a deepwater port. The Secretary of Transportation has since delegated the authority to issue, transfer, amend, or reinstate a license for the construction and operation of a deepwater port to the Maritime Administration (MARAD). The Act also provides for the protection of marine and coastal environments from adverse effects of the development of such ports.

Deepwater Ports

According to the Act, a deepwater port is a fixed or floating manmade structure other than a vessel, or a group of structures, located beyond the territorial sea and off the coast of the U.S., used or intended for use as a port or terminal for the transportation, storage, and further handling of oil or natural gas for transportation to any State. Deepwater ports must not interfere with international navigation or other reasonable uses of the high seas and the construction of the port must represent the best available technology in order to minimize adverse impacts on the marine environment.

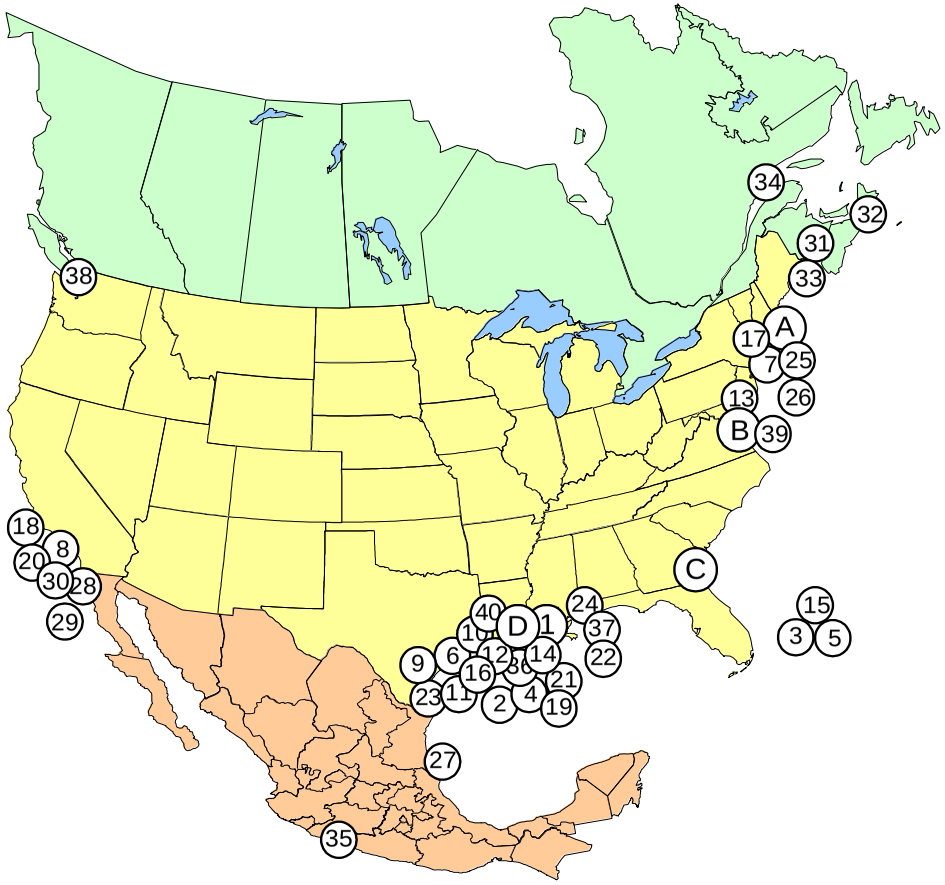
Issuing a License

A notice of each complete license application must be published in the *Federal Register*. The U.S. Coast Guard and MARAD (along with other Federal agencies) must evaluate the potential for each deepwater port to impact the natural and human environment, by complying with the National Environmental Policy Act (NEPA), during the application review process. The analysis must contain information regarding the effect on the marine environment, the effect on oceanographic currents and wave patterns, and the effect on alternate uses of the oceans and navigable waters, the potential danger to deepwater ports from waves and the weather, the effects on land-based developments effect on human health and welfare, and other considerations the Secretary deems necessary. The application review process must be completed in less than one year from the date of initial application.

To issue a license, MARAD must find that the applicant is financially responsible, can and will comply with applicable laws and regulations, and that the construction of the port is in the national interest.

FERC

Existing and Proposed North American LNG Terminals



May 2004

Office of Energy Projects

Existing Terminals with Approved Expansions

A. Everett, MA : 1.035 Bcfd (Tractebel – DOMAC)
B. Cove Point, MD : 1.0 Bcfd (Dominion – Cove Point LNG)
C. Elba Island, GA : 1.2 Bcfd (El Paso – Southern LNG)
D. Lake Charles, LA : 1.2 Bcfd (Southern Union – Trunkline LNG)

Approved Terminals

1. Hackberry, LA : 1.5 Bcfd, (Sempra Energy)
2. Port Pelican: 1.6 Bcfd, (Chevron Texaco)
3. Bahamas : 0.84 Bcfd, (AES Ocean Express)*
4. Gulf of Mexico: 0.5 Bcfd, (El Paso Energy Bridge GOM, LLC)
5. Bahamas : 0.83 Bcfd, (Calypso Tractebel)*

Proposed Terminals and Expansions – FERC

6. Freeport, TX : 1.5 Bcfd, (Cheniere / Freeport LNG Dev.)
7. Fall River, MA : 0.8 Bcfd, (Weaver's Cove Energy)
8. Long Beach, CA : 0.7 Bcfd, (SES/Mitsubishi)
9. Corpus Christi, TX : 2.6 Bcfd, (Cheniere LNG Partners)
10. Sabine, LA : 2.6 Bcfd (Cheniere LNG)
11. Corpus Christi, TX : 1.0 Bcfd (Vista Del Sol/ExxonMobil)
12. Sabine, TX : 1.0 Bcfd (Golden Pass/ExxonMobil)
13. Logan Township, NJ : 1.2 Bcfd (Crown Landing LNG – BP)
14. Lake Charles, LA: 0.6 Bcfd (Southern Union – Trunkline LNG)
15. Bahamas : 0.5 Bcfd, (Seafarer - El Paso/FPL)
16. Corpus Christi, TX: 1.0 Bcfd (Occidental Energy Ventures)
17. Providence, RI : 0.5 Bcfd (Keyspan & BG LNG)

Proposed Terminals – Coast Guard

18. California Offshore: 1.5 Bcfd, (Cabrillo Port – BHP Billiton)
19. Louisiana Offshore : 1.0 Bcfd (Gulf Landing – Shell)
20. So. California Offshore : 0.5 Bcfd, (Crystal Energy)
21. Louisiana Offshore : 1.0 Bcfd (McMoRan Exp.)
22. Gulf of Mexico: n/a (Compass Port - ConocoPhillips)

Planned Terminals and Expansions

23. Brownsville, TX : n/a, (Cheniere LNG Partners)
24. Mobile Bay, AL: 1.0 Bcfd, (ExxonMobil)
25. Somerset, MA : 0.65 Bcfd (Somerset LNG)
26. Belmar, NJ Offshore : n/a (El Paso Global)
27. Altamira, Tamulipas : 1.12 Bcfd, (Shell)
28. Baja California, MX : 1.0 Bcfd, (Sempra & Shell)
29. Baja California - Offshore : 1.4 Bcfd, (Chevron Texaco)
30. California - Offshore : 0.5 Bcfd, (Chevron Texaco)
31. St. John, NB : 0.5 Bcfd, (Canaport – Irving Oil)
32. Point Tupper, NS 1.0 Bcf/d (Bear Head LNG - Access Northeast Energy)
33. Searsport, ME : n/a
34. St. Lawrence, QC : n/a (TCPL and/or Gaz Met)
35. Lázaro Cárdenas, MX : 0.5 Bcfd (Tractebel)
36. Gulf of Mexico : 1.0 Bcfd (ExxonMobil)
37. Mobile Bay, AL: 1.0 Bcfd (Cheniere LNG Partners)
38. Cherry Point, WA: 0.5 Bcfd (Cherry Point Energy LLC)
39. Cove Point, MD : 0.8 Bcfd (Dominion)
40. Port Arthur, TX: 1.5 Bcfd (Sempra)

**US pipeline approved; LNG terminal pending in Bahamas*

This information is provided and updated by the Federal Energy Regulatory Commission (FERC), and can be found on the FERC website at http://www.ferc.gov/industries/gas/gen-info/horizon-lng.pdf.

Attachment 3

Liquefied Natural Gas Projects on the West Coast (07/29/2004)*

Project Owner/Name	Project Location	Project Description	Capacities	Projected Online	Status/Comments
Projects along British Columbia, Canada and Oregon Coastlines					
Galveston LNG, Kitimat LNG Terminal	Kitimat, British Columbia	No project description at this time.	**Average:** Unknown **Peak:** Unknown **Storage:** Unknown	Unknown	**Possible LNG Sources:** Unknown **Approximate Project Cost:** $300 Million Plans to build LNG facility announced May 2004.
WestPac Terminals Inc., Ridley LNG Terminal	On Ridley Island in Prince Rupert, British Columbia	This project will use Ridley Terminals existing dock facilities.	**Average:** Unknown **Peak:** Unknown **Storage:** Unknown	2009	**Possible LNG Sources:** Indonesia, Middle East and Australia **Approximate Project Cost:** Unknown Agreement signed with Ridley Terminals & Port of Prince Rupert, 7/5/04.
Port Westard LNG LLC (Formerly Cherry Point Energy LLC), St. Helens LNG Terminal	Adjacent to Port of St. Helens along Columbia River, Oregon	Project would be near an existing power plant, two permitted power plants and a proposed ethanol processing plant. A pipeline would be built to connect the terminal with the Williams Northwest Pipeline.	**Average:** 700 MMcfd **Peak:** 1,250 MMcfd **Storage:** Unknown	Unknown	**Possible LNG Sources:** Unknown **Approximate Project Cost:** $300-400 million Port Westward LNG currently negotiating land purchase.
Projects along Southern California Coastline					
Sound Energy Solutions, Sound Energy Solutions LNG Import Terminal (http://www.soundenergysolutions.com) **Onshore**	Port of Long Beach ~25 acres at Pier T East, Berth 126	Import facility to include LNG carrier berth, two full containment storage tanks, shell and tube vaporizers, metering and odorizing facilities, equipment for recovering natural gas liquids, LNG vehicle fuel truck-loading facility, and new 2.3 mile natural gas pipeline connecting to an existing SoCal Gas pipeline.	**Average:** 700 MMcfd **Peak:** 1,000 MMcfd **Storage:** 320,000m^3	2008	**Possible LNG Sources:** Australia, Malaysia, Alaska **Approximate Project Cost:** $400 million Application filed on 1/26/04.
BHP Billiton, Cabrillo Deepwater Port LNG Facility (www.lngsolutions.bhpbilliton.com) **Offshore**	Offshore of Ventura County ~21 miles offshore from the City of Port Hueneme	Permanently moored floating storage & regasification unit (FSRU) terminal to include 21.1 mile subsea pipelines that would connect to an existing SoCal Gas pipeline. Water depth at the mooring location is about 2,900 feet.	**Average:** 800 MMcfd **Peak:** 1,500 MMcfd **Storage:** 320,000m^3	2008	**Possible LNG Sources:** Australia **Approximate Project Cost:** $550 million

* Excerpted from file on California Energy Commission website at: http://www.energy.ca.gov/lng/projects.html.

Liquefied Natural Gas Projects on the West Coast (continued)

Project Owner/Name	Project Location	Project Description	Capacities	Projected Online	Status/Comments
Projects along Southern California Coastline (continued)					
Crystal Energy, Small Ventures, Others, Crystal Clearwater Port Project (http:www.crystalenergyllc.com/index.html) **Offshore**	Offshore of Ventura County Approximately 11 miles offshore of the City of Oxnard in the Santa Barbara Channel	Import facility would use an existing, but reconfigured oil platform known as Platform Grace. Reconfiguration would involve installing a cool-down tank, pumps, vaporizers, and reinstalling and upgrading of the platform's power-production capability. The platform is located in 318 feet of water. A new subsea pipeline would transport the gas from the platform to the SoCal Gas onshore pipeline system. No additional on-site storage is expected. If on-site storage is required, Crystal Energy would contract for storage service from existing facilities.	**Average:** 800 MMcfd **Peak:** 1,250 MMcfd **Storage:** 0	2006	**Possible LNG Sources:** Alaska, Southeast Asia, Middle East - international "spot" market. MOU signed with Alaskan Gas line. **Approximate Project Cost:** $160 million
ChevronTexaco, Port Penguin LNG Facility **TBD**	TBD	TBD. The project is a gravity-based system similar to the GNL Mar Adentro de Baja California project (see below).	TBD	TBD	**Possible LNG Sources:** Unknown **Approximate Project Cost:** Unknown
Projects along Baja California and Gulf of California Coastlines					
Sempra Energy LNG Corporation/Shell International Gas Ltd, Energia Costa Azul LNG Receiving Terminal **Onshore**	14 miles north of Ensenada	The project will include a receiving facility and related port infrastructure. The site has more than 400 acres of undeveloped land, remote from residential areas. LNG would be used to meet the growing energy demands in western Mexico with surplus exported to California and the Southwestern U.S	**Average:** 1,000 MMcfd **Peak:** 2,000 MMcfd with expansion **Storage:** 320,000m^3	2007	**Possible LNG Source:** Indonesia **Approximate Project Cost**: $669 million CRE's permit and the City of Ensenada's land-use permit were issued in August, 2003. The SEMARNAT environmental permit was issued in April, 2002.
ChevronTexaco, GNL Mar Adentro de Baja California **Offshore**	13 Km (8 mi) off the coast of Tijuana & approximately 600 meters east of South Coronado Island	Import facility, a gravity-based structure (GBS), including all utility systems required to support operations. Water depth at the proposed site is only 65 feet. A new underwater pipeline will be constructed to connect to Baja California's existing pipeline system.	**Average:** 700 MMcfd **Peak:** 1,400 MMcfd **Storage:** 250,000m^3	2007	**Possible LNG Sources:** Western Australia **Approximate Project Cost**: $650 million CRE accepted the offshore permit application in July, 2003. No land-use permit needed.

Artists' Drawings of Potential LNG Terminals in California and Baja California*

Proposed BHP Billiton Cabrillo Port LNG Deepwater Port

Floating Storage and Regasification Unit [FSRU] only

(source: Draft EIS/EIR for Cabrillo Port LNG Deepwater Port, October 2004; see also http://www.lngsolutions.com)

Proposed Crystal Energy, LLC Clearwater Port LNG Deepwater Port

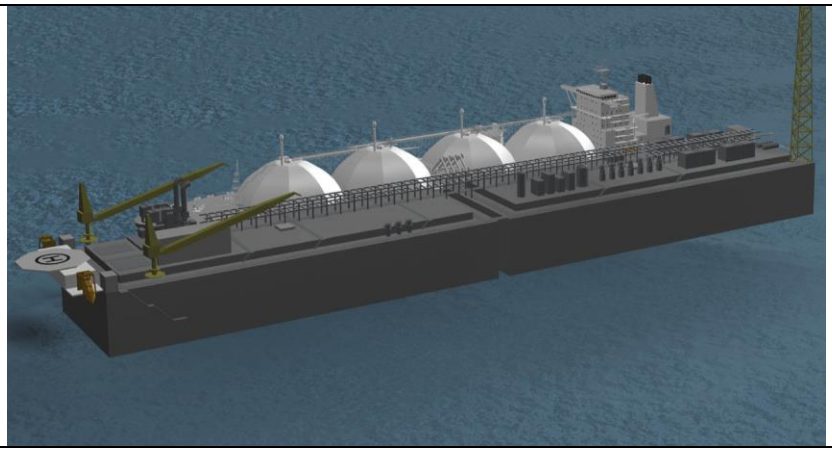
LNG carrier moored adjacent to Platform Grace

(source: Crystal Energy, LLC, 2005; see also http://www.crystalenergyllc.com)

Potential ChevronTexaco Southern California LNG Terminal

Gravity Based Structure with LNG carrier moored in background

(source: ChevronTexaco, 2004)



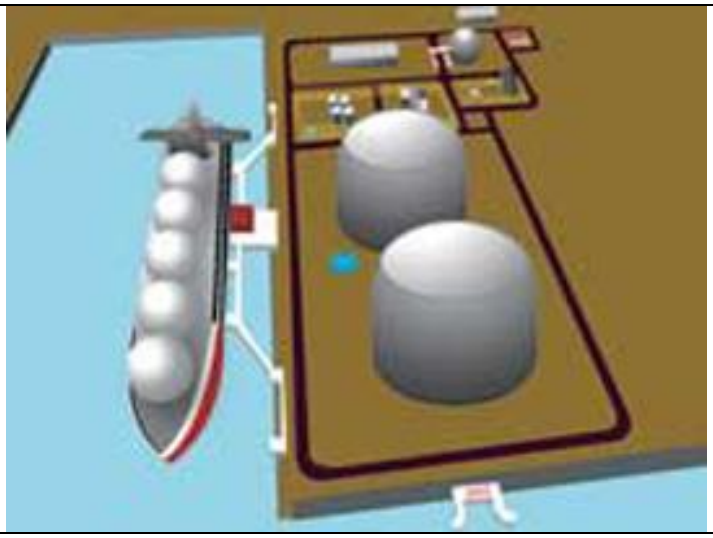
* Drawings were provided to the Commission staff and/or obtained from public documents or websites. Images are not necessarily to scale with each other.

Artists' Drawings of Potential LNG Terminals in California and Baja California (continued)*

Proposed Sound Energy Solutions LNG Import Terminal at Port of Long Beach

Terminal with ship at dock and 2 storage tanks

(source: http://www.polb.com/html/1_about/news2.html [Summer 2004]; see also http://www.soundenergysolutions.com)



Proposed ChevronTexaco Terminal GNL Mar Adentro de Baja California

Gravity Based Structure with LNG carrier moored alongside

(source: http://www.chevrontexaco.com/gnlbaja/about/)

Proposed Sempra Energy & Pacific LNG Consortium / Shell Group Energía Costa Azul LNG Receipt Terminal

Terminal with ship at dock and onshore facilities

(source: http://www.sempra.com/lng_sreplans.htm)

* Drawings were provided to the Commission staff and/or obtained from public documents or websites. Images are not necessarily to scale with each other.

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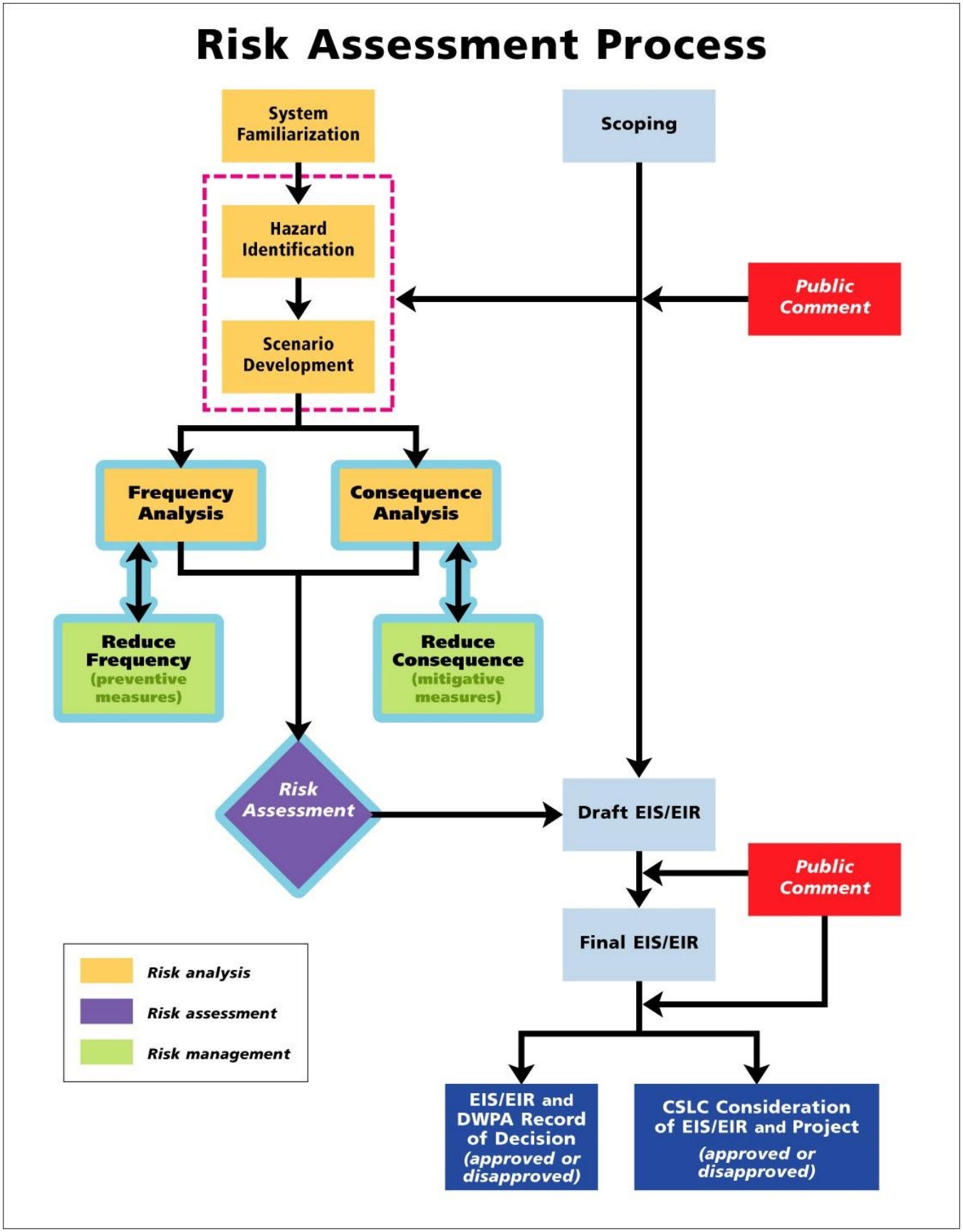
Risk Assessment Process
System Familiarization
Hazard Identification
Scenario Development
Scoping
Public Comment
Frequency Analysis
Consequence Analysis
Reduce Frequency (preventive measures)
Reduce Consequence (mitigative measures)
Risk Assessment
Draft EIS/EIR
Public Comment
Final EIS/EIR
Risk analysis
Risk assessment
Risk management
EIS/EIR and DWPA Record of Decision (approved or disapproved)
CSLC Consideration of EIS/EIR and Project (approved or disapproved)

Opportunities for Public Comment During the Environmental Review Process Under NEPA/CEQA and the Deepwater Port Act