Ratepayers for Affordable Clean Energy
CPUC Rulemaking 04-01-025
March 23, 2004

Addendum D:

LNG Terminals a Sea Bed Methane "Bridge" [1]

Experts believe the energy industry's push for coastal states to accept offshore LNG terminals is not really about LNG, which they describe as merely a transition infrastructure to the energy industry's next Big Thing.

One of the largest categories of at-sea industrial projects covered by the proposed Federal Energy Bill provision is likely to be the increasingly controversial extraction of methane from the layer of ice and methane captured beneath the rock beds of the ocean sea floor. Methane hydrates, also known as methane "clathrates" are a form of frozen natural gas locked in water ice, buried in a rock layer beneath the deep ocean floor. This potential energy source is expected to become commercially viable, driven by federal incentives and subsidies, within approximately fifteen years, according to experts.

Thus, installing an LNG terminal on California's coastline runs the risk of underwriting

[1]This addendum was prepared with the assistance of Richard Charter.

dangerous and controversial mining of the ocean floor by making California gas and electric customers dependent on gas imports..

Significant adverse environmental impacts on marine life can be expected from extraction technologies for harvest of methane from the sea floor hydrates. Extraction technologies will involve removal of the "overburden" sea floor rock, followed by large-scale strip-mining of the seabed, or "in situ" gasification of hydrates using pumped-in antifreeze agents injected through horizontal boreholes. Large scale geologic hazards caused by destabilization of the sea floor, release of toxic substances into the water column, and discharge of silt plumes and other pollutants into the ocean are among the impacts of this process.

In particular, some experts predict that strip mining the ocean floors and arctic for methane could catastrophically accelerate the already alarming global warming trends of recent years. Pointing to evidence that the sea floor hydrate layer is highly unstable and historically subject to catastrophic releases of mega-reactive methane gas, causing a dramatic intensification of global warming that some predict to threaten far greater planetary destabilization than expected under the current climate change scenario.

In the near term, at-sea floating LNG terminals, underwater gas pipelines from offshore LNG terminals to shore, and other infrastructure now being proposed for importation of LNG will be transferable to use for transport and conversion of natural gas derived from sub-sea methane hydrates. In other words, LNG terminals and LNG itself are a bridge fuel to a very dangerous

new development in the energy industry - offshore drilling and seabed methane strip-mining.

Methane hydrates, locked deep beneath the ocean floor and Alaska permafrost, is the greatest single reservoir of carbon on the planet, 10 trillion tons entombed under permafrost and the deepest oceans, locked into mounds of bizarre ice-like compounds that form when flammable methane gas encounters cold, high-pressure conditions.

Methane hydrates can respond quite violently to perturbations in their temperature-pressure environment. Eight thousand years ago, over a thousand cubic miles of quivering methane hydrate beds exploded when the seas above them got too warm. They slid almost 500 miles off the continental slope into the Norwegian Sea, leaving behind massive craters on the sea floor and setting off gigantic tidal waves that drowned miles of coastline.

Fifteen thousand years ago, climate scientists hypothesize, methane hydrate meltdowns may have unleashed enough heat-sucking methane into the atmosphere to shoot the global temperature up by 10 degrees Celsius, an abrupt finale to the last ice age.

Methane hydrates are dangerous, drilling them for gas is expensive, and environmentalists are wary of their exploitation. But U.S. Department of Energy is paying oil companies and others $50 million to drill into the sea floor and permafrost in search of the deposits.

While scientists quibble over the exact size of the world's methane hydrate deposits, few question

that the overall endowment is, as the Department of Energy puts it, "truly staggering." Methane hydrates may hold 100 times more gas than all of the world's conventional natural gas reserves: perhaps even more energy than all of the coal, oil and natural gas found the world over, geologists say.

It isn't easy to study these strange formations. Most of the world's methane hydrates lie buried hundreds of feet under the ocean floor. Once liberated from the temperature-pressure matrix that holds them in icy thrall, hydrates rapidly dissociate into invisible methane gas -- vast quantities of it.

At the end of December 2003, an international consortium including BP, Chevron, and U.S. and Canadian geologists succeeded in capturing hydrates from under northern Canada's permafrost, transforming it back into gas and capturing it.

According to recently deposed Shell chairman Philip Watts, natural gas, which today provides just 16 percent of the world's primary energy needs as opposed to oil's commanding 43 percent, could overtake crude as the world's primary energy source within a mere two decades.

But in the United States, domestic gas supplies have started to decline. In 1998, the Texas gas industry had to drill 4,000 new wells in order to keep natural gas production steady; the following year, they had to drill 6,400 new wells to do the same. In the Gulf of Mexico, the number of drilling rigs looking for gas shot up by 40 percent between 1996 and 2000, but

produced virtually the same amount of gas. Between 1998 and 2007, despite the planned drilling of more than 100,000 wells, Canadian natural gas production is expected to essentially remain flat, energy analysts say.

Getting more natural gas from foreign gas fields will be as politically charged as oil rights. According to natural-gas analyst Julian Darley, "almost all the new country sources are either unstable, potentially unfriendly, or Muslim -- or all three."

Methane hydrates, on the other hand, can be found in the Gulf of Mexico, Canada and Alaska.

The challenges of commercial-level production, though, are stiff. Observers call Japanese methane-hydrate drilling efforts "horrifically dangerous." If a fist-size piece makes its way up the pipe, it emerges at the surface as an explosion of up to 40 gallons of flammable gas. Piercing the hydrates can unleash even greater hazards, as they sometimes act as plugs on gigantic bubbles of volatile gas.

Plus, "when you produce the hydrates, it actually cools itself," Collett says. "If you depressurize it without adding heat, it becomes colder and colder, so you drive yourself back into the hydrates' equilibrium range."

As a result, current techniques to extract gas from hydrates are estimated to cost six times more than for conventional oil and gas reserves. In the 1980s it cost 15 times more to extract oil from

Canada's vast stretch of tarry sands than from a conventional oil field. By 2003, government subsidies and technological advances had transformed "unconventional" tar sands into conventional oil reserves, catapulting Canada's reserves above those of Iraq and second only to Saudi Arabia's. Energy ministers and oil companies are betting the same might happen with methane hydrates. "If the current momentum is sustained," says the Energy Department's Tom Mroz, "it is likely that U.S. consumers will see some energy as a result of producing gas from hydrate reservoirs by 2015." With abundant beds of methane hydrates in its otherwise resource-poor territory, energy-hungry Japan has forked out hundreds of millions to unlock methane hydrate riches, similarly forecasting 2015 as the hydrate-gas start date.

Environmentalists are not keen about the prospect of opening up multiple methane hydrate mines. "We cannot afford to burn more than a small fraction of traditional gas resources, much less mine new frontiers," complains oceanographer and climate change scientist Jeremy Leggett. "Thinking of burning methane hydrates is like opening a Pandora's box knowing a murderous and quite probably genocidal genie lurks within it," he says.

One problem is that "much more methane escapes during the production and processing of natural gas than had previously been realized," Darley says. Methane is 20 times more powerful a greenhouse gas than carbon dioxide, so a mere 3 percent rate of leakage from ever-lengthening gas pipelines can undermine the environmental benefits of burning it instead of oil. According to the latest available EPA figures, pipelines and wells in the U.S. leaked around 1.5 percent of their methane into the atmosphere in 2000. Worldwide, leaky gas pipelines and other gas

infrastructure could be spewing as much as 2.3 percent, according to the International Energy Agency.

Respectfully,

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