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Gas Hydrates as an Energy Source

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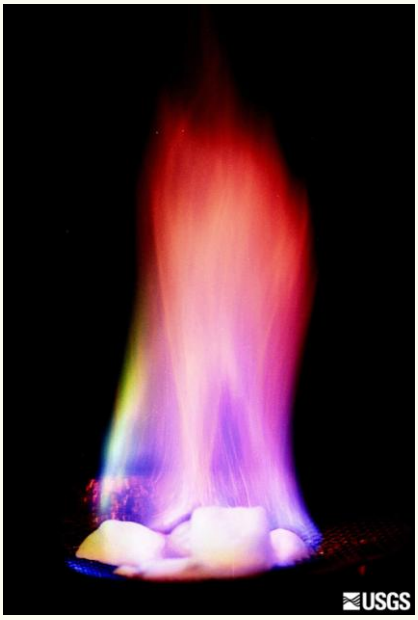
Methane hydrates—the frozen, highly concentrated form of natural gas widely distributed along the earth's continental margins, is of interest to researchers both as a potential energy resource and as a potential climate risk. In her talk in Monday's Energy Policy Seminar, Carolyn Ruppel, Chief of the US Geological Survey's Gas Hydrates Project, explained why neither or these aspects of methane hydrates should be overstated.

There is a lot of methane hydrate out there, Ruppel acknowledged, concentrated along the continental margins, where organic runoff provides microbes with a substrate for generating methane that can then freeze in the cold, high pressure environment of the sea floor. Most of this methane hydrate "is unlikely to be a resource," Ruppel said, explaining that it is not concentrated in mineable seams, like coal, but rather dispersed in fine-grained sediments and not concentrated enough to be economically recoverable.



Ruppel emphasized that there are a few places, such as the Gulf of Mexico or areas with high concentrations of hydrate in sands, where methane hydrates are relatively more concentrated. If natural gas prices were high enough, economic recovery of gas from methane hydrates might be possible. And there are other places, such as Japan, where an interest in energy security is driving serious efforts to explore development of this resource. But, Ruppel noted, compared with resources such as conventional and shale gas, gas hydrates are "not the first-choice gas resource" at this time for countries like the US, a situation that could change in the coming years.

Just as their potential as a resource should not be overstated, Ruppel similarly suggested that the climate risk posed by methane hydrates may also be less than worst-case scenarios might suggest. Methane, she explained, is a powerful greenhouse gas, and tremendous amounts of methane are stored in methane hydrates. If a substantial amount of this methane entered the atmosphere, the consequences for the climate could be disastrous. With global warming causing the ocean to warm, the fear is that some deepwater methane hydrates could break down, releasing methane gas that could in turn escape into the atmosphere. There have indeed been some very alarming projections of the potential scale of such an effect, particularly in the Arctic Ocean.

However, Ruppel noted that research by the USGS and other groups into escaping gas from underwater methane hydrates suggests that the immediate climate threat is less than might be feared, because "most methane will stay sequestered under global warming." One mitigating effect is that most breakdown in gas hydrates will occur where the deposits are at the threshold of temperature stability, and the percentage of gas hydrate that exists under these conditions is not very large. A second factor is that methane emitted at methane seeps on the seafloor typically dissolves into the ocean before reaching the surface. This poses a challenge in terms of ocean acidification, she observed, but does not result in significant release of methane to the atmosphere. Even in permafrost areas, climate-driven permafrost thaw and the associated release of greenhouse gases, not breakdown of gas hydrates buried deep within the permafrost, probably constitutes the more important pathway for methane release to the atmosphere.

Ruppel spoke as part of the Kennedy School's Energy Policy Seminar Series, which is jointly sponsored by the Energy Technology Innovation Policy research group of the Belfer Center and by the Consortium for Energy Policy Research of the Mossavar-Rahmani Center on Business and Government.