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International gas hydrate research program: Key findings and perspectives

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Gas hydrates occur globally through deep-water continental margins and in areas overlain by thick permafrost deposits. Due to the growing consensus that gas hydrate resources hosted in sand-rich sediments are the technologically amenable for production, resource assessment efforts have focused on sand bearing deposits. Estimated gas-in-place in hydrate-bearing sand came up with median estimate of 43,311 tcf utilizing a petroleum system approach, which are consistent with other studies and correspond to substantial resource potential(HEI, 2011).

The Asian countries including Japan, Korea, China, India have been conducting their own national gas hydrate research program since late 1990's. Main exploratory drilling campaigns have been relatively rare and have been conducted around the world, especially in Asia and North America (Collett, 2014). Academic projects have also been conducted in the U.S., notably the ODP and IODP Legs in North American offshore areas. The most important research sites and areas are highlighted in Mallik(Canada), Alaska North Slope (US), Blake Ridge and Cascadia(ODP & IODP), Gulf of Mexico(JIP, US), Nankai Trough(MH21, Japan), Ulleung Basin(UBGH, Korea), Indian Ocean(NGHP, India), Shenhu Basin(GMGS, China), Gumusut-Kakap(Malaysia), New Zealand, Taiwan, and so on(Fig.1). The recently launched MIGRATE project in European countries also deserves attention.

Notably Arctic Mallik production test in Canada was the first dedicated hydrate-research site, and the location of a thermal-stimulation test in 2002 and depressurization test in 2007-2008. And the first and only CO_2-injected field production trial was conducted in 2012 in the Alaska Ignik Sikumi site operated by ConocoPhillips. For marine gas hydrates, the world's first offshore production test was successfully conducted in 2013 using depressurization method in Nankai Trough, Japan. It is expected that 2nd production test will be performed in early 2017 in Nankai Trough for a month operation with much improved production technologies of depressurization method (MH21, 2014).

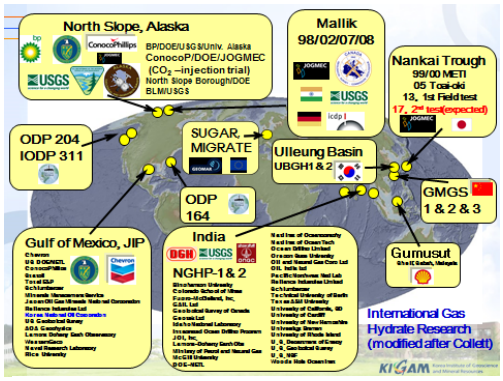

Figure 1: International gas hydrate research program (modified from Collett)

Gas hydrate production raises significant operational challenges in sand-rich sediments which will arise from dissociation. The challenges will be concerned with produced water discharge, stimulation, flow assurance, geomechanical stability, sand control, subsurface monitoring, and etc. And the long-duration field production tests are the next prerequisite for assessing production profiles. But early commercial production is likely to come from Asia when less gas availability and higher gas prices (SBC, 2015).

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