

Unconventional natural gas plays in Pakistan: opportunities and challenges

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The share of natural gas contribution to Pakistan’s energy mix was 41.81% for the year 2021, thus reflecting the huge dependence on natural gas. The rapid exhaustion of these reserves in Pakistan has reduced the reserve-to-production ratio (RP ratio) for not more than 15 years. Over the last few years, the country has faced rapid and regular shortfalls in natural gas supplies, forcing authorities to begin importing liquefied natural gas (LNG), mainly from Qatar. Since natural gas infrastructure in Pakistan is well established, future energy directives must include a substantial research and development efforts towards exploration and exploitation of alternative and unconventional natural gas resources, which have already acquired the status of ‘game changer’ in the international energy market. Although relatively unexplored, the Thar coalfield is the largest lignite resource of Pakistan, representing 94% share of total coal reserves in the country. The prospects of coalbed methane (CBM) have been shown on an empirical basis for some time, however, limited progress has been made thus far. The geology and rank of the Thar coalfield have been found to be analogous to other methane producing coalfields in the region including the Barmer Basin and Cambay Basins (India). The Cambay Basin, a kind of extension of Thar, has been reported to be fairly high in CBM content at greater depths and the Barmer Basin, which lies in the Thar Desert of Indian Rajasthan, has a gas content ranging from 3 to 4 m³/ton. A number of studies have also indicated that the geological stage of Thar lignite may be susceptible to biogenic methane generation. Likewise, few organic rich shales have been prospected in Pakistan, recently. The technically recoverable shale gas resources of Pakistan has been estimated to be as large as 105 Tcf by US Energy Information Administration (EIA). The geologic setting of Southern and Central Indus Basins, which are located along the western borders of Pakistan with India and Afghanistan, are potential source of significant volumes of shale gas. The main source rock in the Lower Indus Basin is the lower Cretaceous Sembar Formation, which contains silty shale, shale and marl. These prospects provide an opportunity to initiate the exploration and exploitation of this alternative energy resource, which could provide a source-resource for the applications of conventional as well as novel technologies such as the stimulation or regeneration of methane through biological applications. Developing subsurface biogenic methane as an alternative source of natural gas has tremendous potential as well as challenges including regulatory, production costs and market demand. However, a major and extensive development program is required to harness this new resource. Ultimately, this development may ensure a more ‘carbon-lean’ energy mix for the country as opposed to the prospective of increased coal use.

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