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The Role of Geoscience in Evolving Regulatory Reguirements for Commingled Abandonment

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Abstract

Commingled hydrocarbon production occurs when oil or gas from more than one geologically distinct zone is produced in an unsegregated manner within a single wellbore. Over 73,000 wells are producing oil or natural gas in a commingled manner across Alberta, all of which will eventually require abandonment. When operators abandon these wells, they are required to follow AER's technical requirements detailed in *Directive 020* – Well Abandonment. The intent of these requirements is to prevent environmental impacts through gas or fluid migration, and to ensure resource equity and conservation is achieved amongst current and future operators. *Directive 020* allows operators to submit non-routine requests to seek variance from the abandonment requirements for commingled zones in a well when there is demonstrated low risk from unsegregated abandonment. Estimated cost savings of such variances could be substantial to Alberta's oil and gas industry, potentially enabling a large opportunity for AER and industry to increase the number of inactive wells that are abandoned and overall reduce liability. Hence, the AER/AGS has been conducting targeted geoscience projects since 2015 to: 1) derive a risk-based methodology applicable across the province; and 2) undertake detailed case studies in large gas fields and CBM pools of southeastern and central Alberta respectively, to evaluate if the regions have no intolerable increase in risk from allowing widespread commingled abandonment. For stratigraphic intervals that are approved for commingled abandonment, groundwater and formation fluids may flow from one aquifer to another establishing hydraulic communication through perforated intervals in unsegregated commingled wellbores.

One of our objectives was to devise an approach by which AER and industry could quickly ascertain the level of subsurface risk and concerns associated with potential commingled abandonment of various pools throughout the province. A risk-ranking screening tool was developed using the Alberta Table of Formations to qualitatively display the relative probability of risk and consequence from commingled abandonments. This derivation uses knowledge of the regional geology and hydrogeology of the Alberta sedimentary basin to provide a stratigraphic zonation of groups and formations. Our second objective has been to conduct detailed geoscience studies to determine the feasibility and consequence of defining routine commingled abandonment regions allowing pool-scale commingled well abandonments. If favourable subsurface conditions are deemed to exist for commingled abandonment, then thick successions of depleted hydrocarbon zones and aquifers will be left in a commingled geobody. This presentation will provide an overview of our province-wide screening tool for assessing subsurface risk from commingled abandonment. Two case studies will be shared where groundwater-gas migration analysis was used to understand potential implications for commingled abandonment in large, geologically complex, gas fields, and requirements for resource preservation and environmental protection.

Dan Palombi joined the Alberta Geological Survey in 2010 as a hydrogeologist and currently works as a senior advisor in groundwater and energy geosciences. His role involves leading a provincial-scale program on the study, mapping, quantification, and reporting of Alberta's groundwater resources. Dan's focus is on designing and implementing applied research projects focused on achieving goals that are of high importance to regulators, policy-makers, and Albertans by providing relevant, impactful geoscience to support regulatory and environmental issues. The majority of his work applies regional groundwater flow principles and methods to oil and gas well abandonment, CCUS, regional hydrogeological characterization, and geothermal resource appraisal studies. Dan's background resides in regional and petroleum hydrogeology having spent over 15 years conducting regional-scale studies and mapping groundwater flow systems across the Western Canada Sedimentary Basin. Dan received his B.Sc. in Geology and M.Sc. in Hydrogeology from the University of Alberta.