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Fault Activation During Multi-Well Completion: Fault Slip to Ground Motion

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Summary

The Montney Shale in NE British Columbia, Canada has a history of seismicity induced by hydraulic fracturing operations, resulting in the BCOGC imposing mandatory ground motion monitoring in specific areas. In this Montney case study, induced seismicity was monitored with a local array during hydraulic fracturing operations. Sequential hydraulic fracture stages progressively activated a number of parallel critically stressed faults, resulting in induced microseismicity detected in the range between Mw 1 and 3. Source mechanisms are predominantly strike-slip consistent with lineations apparent from the seismic locations. The case study provides interesting insights about the spatial and temporal characteristics of the seismogenic faults, geomechanical controls and the relationship to fracturing operations. Ground acceleration data were collected close to the operations providing information about the local ground motion at near offsets. However, no ground motions were recorded that exceed the minimum levels requiring reporting by thee BCOGC. Dynamic modeling was performed to further understand ground motions and local site amplification in the region. The case study highlights observations during multiple fault activation with progressive fault activation and the corresponding ground motion.