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Suggested Best Practice for seismic monitoring and characterization of non-conventional reservoirs

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High rates of induced seismicity and gas leakage in non-conventional production have become a growing issue of public concern. It has resulted in calls for independent monitoring before, during and after reservoir production. To date no uniform practice for it exists and few reservoirs are locally monitored at all.

Nonetheless, local seismic monitoring is a pre-requisite for detecting small earthquakes, increases of which can foreshadow damaging ones and indicate gas leaks. Appropriately designed networks, including seismic reflection studies, can be used to collect these and Seismic Emission Tomography (SET) data, the latter significantly helping reservoir characterization and exploitation.

We suggest a Step-by-Step procedure for implementing such networks. We describe various field kits, installations, and workflows, all aimed at avoiding damaging seismicity, as indicators of well stability, and improving reservoir exploitation.

In Step 1, a single downhole seismograph is recommended for establishing baseline seismicity before development. Subsequent Steps are used to decide cost-effective ways of monitoring treatments, production, and abandonment. We include suggestions for monitoring of disposal and underground storage. We also describe how repeated SET observations improve reservoir management as well as regulatory monitoring. Moreover, SET acquisition can be included at incremental cost in active surveys or temporary passive deployments.