

## Subsurface geological site criteria for the placement of Small Modular Reactors in southern Saskatchewan, Canada

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### Summary

Small Modular Reactors (SMRs) may be a viable solution for rising energy needs as they produce clean energy and are inherently safe and low risk.

SMRs can be designed to be placed at surface, partial or fully underground installations and therefore, geological aspects must be taken into consideration. They are smaller than conventional reactors where output is < 300 Megawatt Electric (MWe). SMRs are designed with modular technology using module factory fabrication, by way of series production and short construction times. These units can be transported, by boat, truck or rail to a site, and fuel cells are inserted during manufacturing (World Nuclear Association).

SMRs are in design and manufacturing stage and therefore little geological site criteria exist for the placement of SMRs in Saskatchewan or globally. An understanding of the optimal desired geological features and potential risk factors are needed in order to minimize potential hazards by ensuring proper placement of the SMRs and alleviate public concern.

This paper presents the subsurface geological criteria to be investigated when siting SMRs in the Phanerozoic bedrock of southern Saskatchewan. An understanding of the optimal desired geological conditions and those that pose a potential risk are needed in order to minimize potential hazards by proper placement of the structure and alleviate public concerns.

In southern Saskatchewan, subsurface geology that affect bedrock integrity are divided into economic activity and natural phenomena that affect seismicity, subsurface collapse, and gas leaks. Economic activity includes: oil and gas, injection and fracking: potash solution and conventional mining: gas storage caverns: sinkholes from abandoned coalmines. Natural phenomena include reactivation of faults and lineaments, salt dissolution, and mass movement from karst and sinks.

This study identified the areas of economic activity and natural phenomena in southern Saskatchewan that may pose a risk when placing a SMR.