

## Gas Potential of the Torok Formation in the Foothills of the Brooks Range - Alaska North Slope (Part A)

Bever, Jeff <sup>\*1</sup>; Slotboom, Robin <sup>1</sup>; Rancier, Wayne <sup>1</sup>  
(1)Suncor Energy, Calgary, AB, Canada.

Natural gas in the Torok Formation in the foothills of the Brooks Range of Alaska's North Slope has enormous potential as an economically exploitable resource and future gas supply for Alaska, North American and international markets.

The Cretaceous age Torok Formation is an interbedded sequence of shale, siltstones and sandstones that is thousands of feet thick. The sequence is regionally extensive and contains vertically connected, laterally continuous, base-of-slope deposited or "bottomset" sandstone reservoirs.

The Torok Formation within the foothills is interpreted to be extensively gas charged with gas-in-place estimates in the tens of TCF's. North and up dip of the foothills trend, oil is being commercially produced from the Torok in the Tarn and Meltwater fields.

The exploration well density in the outer foothills region is low, with fewer than ten wells penetrating the lower part of the Torok Formation. The wells have strong gas shows and calculated net gas pay; however, none have extensively tested the gas flow potential of the "bottomset" reservoirs.

More specifically, the available well control and regional 2D seismic grid provide clear evidence of a combined conventional and unconventional gas resource play, as indicated below:

- Source rock analyses and mud logs support the presence of a large, contiguous, gas-saturated reservoir;
- Thick succession of vertically connected, sandstone reservoirs (hundreds of feet);
- Area-wide seismic reflectors imply laterally continuous and regionally extensive sandstone reservoirs;
- Porous sandstone (commonly >10%) and observed rock permeability > 0.1 mD;
- Wire-line log pay (using standard, conventional log analyses);
- Thick shale seals;
- Thrust-faulted, relatively uncomplicated structural traps (tens of miles long);
- High formation pressure (in some cases greater than 6,000 psi);
- Calculated gas in place estimates greater than 60 BCF per section.

The single geological risk for this Torok play is reservoir quality. Overall, sandstone matrix permeability is low, between sub-millidarcy (mD) and low single digit mD values, with occasional >5 mD streaks. However, fractured rock permeability is interpreted to be prevalent

and is expected to provide substantial uplift to the reservoir's production capability.

Reservoir modelling and production simulations using horizontal drilling and modern completion methods support sustainable gas flow rate estimates of greater than 5 MMcf/d and cumulative production potential greater than 10 BCF per well. These gas deliverability projections can be supported with analogue examples from producing Western Canadian gas fields.

Based on reasonable demand, price and fiscal assumptions, natural gas from the Torok Formation presents a resource opportunity which should attract continued attention from industry, government and Alaskan stakeholders.