VALIDATING A RESOURCE MODEL: A URANIUM CASE STUDY

Background on Geology and Resource Estimation

The spatial distribution of the shear-hosted mineralisation and that of a more disseminated nature developing around major structural intersections was difficult to interpret with drill-holes 15m apart. The deposit was estimated using global change-of-support and service-variables techniques within the gaussian framework. Amok, a Canadian Cogema subsidiary, completed a trial pit as a means to: address the resource risk; review the suitability of the estimation methodology; and evaluate project viability. Some of the work undertaken on the trial pit data is summarised below.

From sample grades to run-of-mine (ROM) grades

Groups of blast-hole data were created (Fig 1) to experimentally determine dispersion variances and grade-tonnage curves (Fig 2). The group that produced grade-tonnage figures close to the production data, see the blue line in Fig 2, was used to derive the effective Selective Mining Unit (SMU) or “Equivalent Block”. Further, the Discrete Gaussian (DG) change-of-support model was successfully tested for various groups of blast-hole data.

This work clearly demonstrated that combining the DG change-of-support model and the “Equivalent Block” was appropriate for predicting ROM grades from sample grades.

Validating the use of the Gaussian framework for block estimation

The studies based on the drill-hole data had indicated that the calculation of service variables was critically dependent upon the Hermite polynomials $H_1$, $H_2$ and $H_3$. The validation used the grade control data to check that these $H_n$’s verified the key gaussian relationship $E\{H_n (Y_{x+h}) / Y_x\} = \rho^n H_n (Y_x)$.

The check returned acceptable results (Fig 3), which assisted in establishing that a gaussian-based modelling technique was appropriate for block estimation.

Benefits

The orebody was mined out, exhibiting excellent estimated vs. actual grade reconciliation.

The validation techniques described above were pivotal in enhancing the understanding of the geological risk and in proving up an estimation methodology suitable for resource-to-reserve conversion. The results were a key factor in the decision to proceed with mining.

Henri Sans gratefully acknowledges the permission of Cogema to make public this paper.