Good Decisions Require Firm Geological Foundations

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This paper argues that a thorough understanding of the geology that underpins a project is a critical pre-requisite for good decision-making. Gaining that understanding, and communicating it, requires an ability, and the techniques, to visualise and to express numerically the range of possible geological outcomes, in terms of risk and volumetric/value uncertainty.

Risk (or chance) can have several somewhat different meanings, in this context, including the chance of finding measurable quantities of hydrocarbon (GCoS or Pg) and the chance of finding economic quantities of hydrocarbon (ECoS or Pe). In SPE/WPC/AAPG Resource Classification framework terms, GCoS/Pg is the chance of converting a Prospective Resource into a Contingent Resource (and one minus this is the risk of drilling a dry hole); ECoS/Pe is GCoS/Pg multiplied by the conditional probability (chance) that the quantity found will be economic, that is greater than the economic threshold volume.

To compute Expected Monetary Values, we should use ECoS/Pe, although it is common practice to approximate that by using GCoS/Pg and letting the low volume end of the range have negative value, if that's what the cash flow analysis indicates. For portfolio optimisation, the risk measure used depends on the parameter that is being optimised; for discovered volumes (that is, contingent resources plus reserves), GCoS/Pg should be used; for reserves or value, it should be ECoS/Pe.

Uncertainty in the range of volumes and/or value can be handled satisfactorily by a variety of methods, including Monte Carlo simulation, multiple scenario analysis and Swanson's Rule. The SPE/WPC/AAPG Resource Classification framework is proposed as the basis for capturing and quantifying concepts of risk and uncertainty, as these relate to projects.