

## Workshop Examines Resources, Reserves, and Development

More than 65 technical specialists, representing 32 Organizations in nine countries, attended the SPE Applied Technology Workshop (ATW) "Resources to Reserves for Asset Development," held 18–21 November in Penang, Malaysia. This was the fourth in a series of workshops being organized under the auspices of SPE's Oil and Gas Reserves and Reserves Education committees.

The goal of the ATW was to highlight the recently published SPE Petroleum Resources Management System (PRMS) as a vehicle for business decision making, both in a regional context and in relation to other reserves protocols. Discussion throughout emphasized the interconnection between the process of estimating recoverable hydrocarbon volumes and the assessment of risk and uncertainty.

Mohd Jukris Abdul Wahab of Petronas, SPE Northern Asia Pacific Region director, gave the keynote address, which was followed by a presentation on PRMS by Geoff Barker, Resource Investment Strategy Consultants, who is an SPE Oil and Gas Reserves Committee member.

The first session was an Overview of Petroleum Resources and Reserves, keynoted by Yasin Senturk, Saudi Aramco. Among the challenges facing the industry, Senturk said, are the need for reliable reserves estimates and the reporting of those estimates within a harmonized system of definitions. But beyond this, he emphasized that the industry needs a systematic reserves-data management reporting and tracking system. PRMS is a key stage in the process, providing an update of the 1997 definitions that have already been promoted as standards in the oil and gas industry. The 2D PRMS scheme includes economic considerations on both the vertical axis (project maturity) and the horizontal axis (uncertainty), Senturk noted. Economics is separated from technical and project-maturity considerations in the overarching 3D United Nations Framework Classification (UNFC), he explained, and PRMS and other schemes can be

mapped onto the UNFC. In this way, different schemes can be compared.

The ultimate goal, Senturk noted, is for PRMS to become a global standard, and an initiative is under way to produce guidelines for the implementation/application of PRMS. There is a worldwide effort to bring together different schemes for classifying reserves and resources. These ideas have been extended to estimating procedures and disclosure guidelines. The reserves-assessment process can draw upon deterministic and probabilistic methods, and these approaches are best used in combination, Senturk said.

Following the keynote address was a presentation by Amit Ashok Namjoshi, Inpex Browse, on Reserves Estimation of a Middle Eastern Waterflood.

The second session, Estimating Hydrocarbon Volumes, was keynoted by Paul F. Worthington of Gaffney, Cline & Associates, and it provided an overview of principles fundamental to technically sound reserves estimation. Discussion topics and their presenters included

- Coalbed Methane (CBM) Within the PRMS—Mike Reeder, RPS Energy
- Reserves Determination in Stacked and Compartmentalized Reservoirs—Rani Koya, Hess
- 3D Reservoir Modeling—Doug Peacock, Gaffney, Cline & Associates

The session then divided into breakout sessions to discuss the challenges related to waterflooding, CBM, stacked and compartmentalized reservoirs, and 3D modeling.

In the third session, Risk and Uncertainty, Graeme Simpson, RPS Energy, gave the keynote address. Presentations included The Role of Contingent Resources, given by Peter Woodroof, Genting Oil and Gas; The Truth Is Out There—Managing Risk and Uncertainty, given by Morten Tonnesen, Roxar Software Solutions; and Probabilistic Methodology and Aggregation of Reserves, given by Alistair Jones, Woodside Energy.

During the session, the use of risk and uncertainty was discussed as the basis for resource-classification schemes, in the

aggregation of volumes, and in the valuation of assets. Probabilistic methods have a role up to the estimation of in-place volumes, it was noted, and thereafter, deterministic methods need to be used for purposes such as profile generation and economic analysis. Future issues in probabilistic estimation, identified in the session program, included

- Interdependencies viewed against scale of measurement, interpretation protocol, and net-to-gross
- Aggregation of stacked reservoir volumes, interpreted using the same methods or discrete methods

A challenging issue regarding the probabilistic aggregation of hydrocarbon volumes across multiple fields is the reluctance of stakeholders to accept anything other than arithmetic addition and, then, the shortcomings in the auditability of correlations to establish interdependence, it was noted. As an example, it was explained that Monte Carlo methodology assumes rank correlation factors, rather than linear ones. A computational approach to quantifying correlatability avoids Monte Carlo methods and essentially makes better use of expert input, it was observed, and this approach has improved the auditability of interdependencies.

The fourth session, Implications for the Region, was keynoted by Wisut Punnahitanon, Malaysia-Thailand Joint Authority, and was followed by a panel discussion on the reserves-classification protocols of the Asia Pacific region. Serving as panelists were Siree Nasakul, Thailand Department of Mineral Fuels, Brenda Wyllie, Hess, Punnahitanon, and Abdoerrias Mohammad Noer, Petronas.

The reserves protocols of the Malaysia-Thailand Joint Authority were outlined. Although these broadly track PRMS, there are some differences in terminology, it was noted. Reserves estimates, for example, are taken to be 100% proved plus 20% probable. The static volumetric method is most commonly used in connection with tools such as material-balance calculation and decline-curve

analysis. Areas classified as reserves must have existing facilities for process and transportation, gas sales contracts (up to 20 years), and a commitment to install facilities to implement the field-development plan.

Through the Thailand Department of Mineral Fuels, a reserves-report format underpinned by regional definitions of resources and reserves has evolved, it was observed. Key questions posed in the session were whether different approaches should be used for different field situations, whether the resources and reserves definitions used in that part of the world will continue to have a regional role, and how PRMS can be used to maximum benefit.

The production-sharing contract (PSC) is the most common vehicle for governments to use in granting access to contracting oil and gas companies, it was noted. Essentially, the contractor takes all the risk and funds the exploration, appraisal, development, and production activities. In return, the contractor is refunded some or all of these costs in the form of produced hydrocarbons. The remaining production is shared in a pro-

portion defined by the PSC. The contractor's net entitlement interest (NEI) defines the contractor's share of reserves and, hence, production. This NEI is affected by changes in capital costs, hydrocarbon prices, and the production profile.

Also discussed was the integrated use of diverse data in unlocking the reserves of problematic (stranded gas) reservoirs. The issue of uncertainty was viewed through a scenario approach based on the geological workflow.

The final topical session, Business Decision Making, addressed the relationship between the basis of hydrocarbon-volume estimation and the key elements of decision making. Session keynoter was Ian Dunderdale, Harrison Lovegrove. Presentations were made on Growing the Business—Net Volume vs. Value, by Peter Adam, Energi Mega Persada; and on Business Analysis Metrics Asset Valuation, by Ian Angell, Wood Mackenzie. Adam and Angell then participated in a panel discussion.

The discussion initially focused on regional statistics and metrics, then branched into global merger, acquisition, and divestment trends; the cur-

rent upstream market; regional asset deals compared with global trends; and implied reserves values. A synopsis was drawn, reflecting the basis for asset-purchase valuation and current trends in upstream transactions.

Following this, business decision making was analyzed from the perspective of an Indonesian midsized independent oil and gas company. The analysis addressed the highs and lows of the business, taking company and asset valuations during the Asian economic crisis in 1997 and comparing them with the present market in Indonesia under a PSC regime. The role of PRMS was brought into this discussion.

The ATW Technical Program Committee was cochaired by Worthington, Mazuin Ismail, Petronas, and Ian Sylvester, Woodside Energy. Committee members included Dunderdale, Senturk, Wyllie, Ian Collins, Serica Energy, Stephen Flew, Schlumberger, Erwin Groeneweg, Salamander Energy, Kristina Hariutomo, PT Medco E&P, Vinit Hansamuit PTT Exploration and Production, Farhana Rokhani, ExxonMobil, and Lingnathan Sivachalam, RPS Energy. **JPT**

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