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July 16, 2012

Observations on the Use of Price Forecasts to Determine the Current Present Worth of Nalcor's Muskrat Falls Generation and Labrador - Island Transmission Link Projects

Prepared by Richard Westney and Jack Evans, Westney Consulting Group Canada, ULC
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Background

Nalcor is preparing Current Present Worth (CPW) analyses for use in Decision Gate 3, the decision to sanction and fund the Muskrat Falls Generation and Labrador - Island Transmission Link projects. PIRA Energy Group (PIRA), an energy consulting firm, has provided Nalcor with fuel oil price forecasts for use in the CPW calculations.

Four price forecasts for the price of each type of fuel oil were provided; these are referred to as Low, Reference, High, and Expected Value. This raises the question: Which is the most reasonable price forecast to use in the CPW analyses at Decision Gate 3?

A well-established global provider of project risk management consulting services, Westney Consulting Group has been requested to provide an expert opinion on which of the PIRA forecasts is most reasonable for use in the CPW calculations.

Discussion

CPW analysis requires that prices be forecast many years into the future to help determine annual cash-flows; a discount rate is then applied to these future cash-flows to determine the project's present value. Therefore it is important that the most appropriate price forecast be used as the basis for CPW analysis.

We understand that PIRA developed specific scenarios on which the Low, Reference, and High price forecasts were based. They assigned probabilities to each of these scenarios, with the highest probability being assigned to the Reference scenario. PIRA describes the Reference scenario as its most likely view of how events will unfold, reflecting certain data and assumptions about various global financial and economic drivers. The Reference price forecast is based on the Reference scenario and has the same probability. Since it has the highest probability it is analogous to the *mode* of a probability distribution, which is the value that represents the most likely outcome.

As might be expected, the difference between the Low price forecast and the Reference price forecast is smaller than the difference between the High and Reference price forecasts. This is not surprising; for example, it is quite possible for a future price to be 100% higher than a most

July 16, 2012

likely value, but not possible for it to be 100% lower. Clearly, in such cases, the distribution of possible outcomes is asymmetrical, as it is here.

PIRA also provided an Expected Value price forecast, which was based on a probability-weighted average of the Low, Reference, and High price forecasts. Unlike the Low, Reference, and High price forecasts, which are based on specific scenarios, the Expected Value price forecast represents the full range of outcomes under all possible scenarios. It incorporates the potential outcomes of the three PIRA price forecasting scenarios into a single view, and is analogous to the *mean* of a probability distribution. The mean is a valuable measure in business decisions because it reflects both the full range of possible outcomes and their associated probabilities. When the distribution of possible outcomes is asymmetrical, as it is in this case, the Expected Value price forecast will typically be greater than the Reference price forecast.

Observations

CPW calculations are performed to support decision-making under a variety of circumstances. Decision-makers may wish to be conservative in some cases and less so in others; it depends on how the results of the CPW calculation will be used. Nalcor is currently performing CPW analyses in preparation for Decision Gate 3. This is a critical point in a project's life-cycle, when the financial stakeholders make the decision to commit to full funding.

Which of the price forecasts is most appropriate for Nalcor to use in its current CPW analyses: Reference or Expected Value? While this is a question only the project's decision-makers can answer, Westney's experience and methodologies in the probabilistic analysis of project economics provide an independent perspective as to what might be considered the most reasonable choice.

In our opinion, the Expected Value price forecast is the one that represents the most reasonable choice at Decision Gate 3. We understand Nalcor's CPW analyses require forecasting the price of oil for the next 50 years. Since the Expected Value price forecast represents the full range of outcomes, we consider it to be a more appropriate basis for predicting prices over this long time horizon than one based on a specific scenario. Moreover, assuming PIRA's Expected Value price forecast is a reasonable analog for the mean value of future oil prices, it is likely that it will more closely track actual prices than the Reference price forecast will. As the years go by, actual outcomes would be more likely to cluster around the Expected Value price forecast than around the Low, Reference, or High price forecasts. Finally, we note that the use of the Expected Value price forecast is consistent with our experience with a variety of clients and conditions.

July 16, 2012

About the authors:

John (Jack) Evans is a Senior Executive Consultant with Westney Consulting Group where his focus is on probabilistic risk analysis and executive decision-making for investments in large capital projects. Prior to joining Westney in 2008, Jack held numerous management positions in the energy industry including serving as Treasurer of Amoco Canada as well as Risk Director of Amoco Energy Group North America. He holds a BS in Basic Engineering from Princeton University, and an MBA from the Amos Tuck School of Business Administration at Dartmouth College where he was an Edward Tuck Scholar.

Richard (Dick) Westney founded Westney Consulting Group in 1978 to provide thought leadership and consulting services to organizations investing in major capital projects in the energy industry. Westney Consulting Group Inc., and its subsidiaries Westney Consulting Group Canada ULC, and Westney Consulting Group International LLC, provide project and risk management consulting on a global basis, focusing on due diligence, risk analysis, strategic planning, and organizational effectiveness.

An internationally recognized authority, Dick is the author of 5 books on project and risk management, and served as visiting faculty for executive programs at Texas A&M and Stanford Universities, the Norwegian University of Science and Technology, the University of Houston, the University of Texas, and Moscow School of Management. A Fellow and Past-President of the Association for the Advancement of Cost Engineering (AACE Int'l.), he received that organization's highest honor, the Award of Merit. He currently serves on the Executive Advisory Board of the Engineering and Construction Contracting Association (ECC) and on the SPE Program Committee for the Offshore Technology Conference (OTC). Dick is a graduate of the City College of New York (BS Mechanical Engineering), Rensselaer Polytechnic Institute (MS Management Science), and Harvard Business School.

July 16, 2012

APPENDICES

- I. Discussion of statistical terminology used in this opinion
- II. Discussion of best practices at decision gates for major capital projects