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## *A Non-Cooperative Game for Maintenance Contracting with Vendor Owned Spares Inventory*

**Abstract:** As the product and after-sales service are increasingly integrated, maintenance programs are transitioning from material-based contract to performance-based contract. This paradigm shift enables the equipment manufacturer (i.e. vendor) to maximize the service profit post the product installation, while the customer can lower the asset ownership cost with assured operational availability. A main challenge in designing and executing a performance-based maintenance contract has to do with the so-called moral hazard in which one player is more likely to take risks because the resulting costs are borne by the other. Under the principal-agent gaming framework, we propose a multi-criteria contracting model to maximize the utilities of all the stakeholders. The goals are achieved by optimizing maintenance interval, the spare stock level, and the repair capacity. For this non-cooperative game, we prove that the actions of both players can be deduced by each other despite asymmetric information. Hence a first-best solution is guaranteed without moral hazard issue. Numerical studies from wind turbine industry show that a consolidated multi-item contract could be advantageous over multiple single-item contracts as it ensures a higher profit margin at a lower customer's cost. If time is available, research advances in smart grids, distributed energy generation planning, and zero-carbon supply chain models will be elaborated as well.

**Biography:** Dr. Tongdan Jin is an Associate Professor in The Ingram School of Engineering at Texas State University. Prior to academia, he had five-year experience in managing reliability and support services of high-end capital goods in Teradyne Inc., Boston. He obtained his Ph.D. in Industrial and Systems Engineering from Rutgers University. His MS and BSEE degrees are, respectively, from Beijing Institute of Technology and Shaanxi University of Science Technology. He has authored and co-authored over 120 papers published in refereed journals and conference proceedings, including IEEE Transactions on Reliability, European Journal of Operational Research, and Production and Operations Management. Dr. Jin has been invited to present his research findings in many universities/institutions in the USA, China and Singapore. He is a recipient of Evans-McElroy best conference paper in Reliability and Maintainability Symposium in 2014. His research has been funded by NSF, USDA, and The US Department of Education, among others. His current research interests focus on reliability modeling and optimization, product-service integration, and renewable energy integration.