Exhibit No.:
Witness: Adonis Yatchew
Type of Exhibit: Direct Testimony
Issue: Rate Design/Noranda Impact
Sponsoring Party: Noranda Aluminum, Inc.
Case No.: ER-2010-0036

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Union Electric Company, d/b/a AmerenUE's Tariffs to Increase Its Annual Revenues for Electric Service	)	**Case No. ER-2010-0036**

Direct Testimony of Adonis Yatchew

On behalf of

Noranda Aluminum, Inc.

January 6, 2010

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OF THE STATE OF MISSOURI

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CITY OF TORONTO)
) **SS**
ONTARIO, CANADA)

Affidavit of Adonis Yatchew

Adonis Yatchew, being first duly sworn, on his oath states:

1. My name is Adonis Yatchew. I am a Professor of Economics at the University of Toronto located at 150 St. George Street, Toronto, Ontario, Canada M5S 3G7.

2. Attached hereto and made a part hereof for all purposes is my direct testimony, which was prepared in written form for introduction into evidence in Missouri Public Service Commission Case No. ER-2010-0036.

3. I hereby swear and affirm that the testimony is true and correct.

Adonis Yatchew

Subscribed and sworn to before me this ___ day of January, 2010

Notary Public

Q **PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

A Adonis Yatchew. My business address is 150 St. George Street, Toronto, Ontario, Canada M5S 3G7.

Q **WHAT IS YOUR OCCUPATION?**

A I am a Professor of Economics at the University of Toronto and the Editor-in-Chief of the Energy Journal, a publication of the International Association for Energy Economics and one of the leading academic publications in energy economics. The headquarters of the Association are located in Cleveland, Ohio.

Q **WHAT IS YOUR EXPERIENCE WITH PRIVATE SECTOR CORPORATIONS AND GOVERNMENT AGENCIES RELATING TO ENERGY POLICY?**

A For many years I have advised public and private sector corporations and government agencies on energy policy, and have prepared numerous analyses and studies of the electricity industry.

Q **WHAT IS YOUR EDUCATIONAL BACKGROUND?**

A I hold a B.A. and M.A. from the University of Toronto and a Ph.D. in economics from Harvard University.

Q **WHAT ACADEMIC AWARDS OR OTHER ACHIEVEMENTS HAVE YOU OBTAINED?**

A I have been consistently ranked among the best teachers in the Economics Department and have received the Social Sciences Teaching Award at the University of Toronto. I have also been invited to teach at the University of

Chicago and have been elected a Visiting Fellow of Trinity College, Cambridge University.

Q HAS YOUR WORK BEEN PUBLISHED IN ANY ACADEMIC JOURNALS?

A My research is published in leading economics and statistics journals, and I have written a graduate level textbook in econometrics. My book, *Semiparametric Regression for the Applied Econometrician*, published by Cambridge University Press, contains a number of applications to energy economics. I have attached as Schedule AY1 a true and accurate curriculum vitae describing my publications in further detail.

Q WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A Electricity rates that are designed to retain or attract business enterprises within a particular geographic region have been implemented in many jurisdictions worldwide. The purpose of my testimony is to assess the appropriateness of reliance on such rates for the aluminum producing industry in the state of Missouri. I also critically examine the rationales for such rates from the perspectives of both public policy in these challenging economic times, and traditional economic analysis.

Q DID YOU ARRIVE AT ANY CONCLUSIONS AS A RESULT OF YOUR ANALYSIS?

A I arrived at two central conclusions: First, the U.S. aluminum industry has experienced substantial job losses over the last decade, which have been exacerbated by the recent economic upheaval. Sound public and regulatory

policy would strongly suggest that the prevention of further job losses, where this can be reasonably achieved, should be an important objective. Second, traditional principles of rate design are consistent with electricity rates targeted to retain jobs and promote economic development.

Q BEFORE DISCUSSING YOUR CONCLUSIONS, CAN YOU PROVIDE SOME BACKGROUND ON THE U.S. ALUMINUM INDUSTRY?

A The production of aluminum is highly intensive in the use of electricity which can comprise the largest share of costs. Thus, aluminum producers are especially sensitive to the price of electricity. Jobs in the U.S. aluminum industry are considered highly remunerative and, from this point of view, desirable. Production requires large long-term capital investments. Plant closures lead to job losses to employees and financial losses to investors.

Q IS THE PREVENTION OF FURTHER JOB LOSSES AN IMPORTANT PUBLIC POLICY OBJECTIVE?

A These are extraordinary economic times, unprecedented since the Great Depression. While economic and financial collapse seems to have been averted, the outlook for the medium term is at best uncertain. In particular, it is unclear whether the U.S. economy has built up sufficient momentum to avert an extended period of high unemployment or, worse still, slipping into another, perhaps deep, recession. Many economists have expressed concern that this is a 'jobless recovery'. The U.S. national unemployment rate hovers around 10%, but there is substantial variation from state to state. Some local economies have been

devastated by the collapse of industrial production. Others may yet suffer similar fates as business failures continue at high levels: the number of large company bankruptcy filings has increased by more than 500% since 2007. Many U.S. trading partners are striving to protect jobs while trying not to allow circumstances to degenerate into a trade conflict.

The instability of the financial system and the enormous deficits which continue to grow and add prodigiously to government debt contribute to the uncertainty surrounding the economy's medium-term recovery. This accumulated debt is presently being serviced at extremely low interest rates. History has repeatedly confirmed that expansion of the money supply has been followed by periods of inflation and higher interest rates. As interest rates increase, the cost of borrowing will put further pressure on government and businesses alike. To date, over 130 U.S. banks have failed in 2009, compared to less than 30 in 2008 and only 3 in 2007.

The U.S. aluminum industry had experienced major job losses even before the recent economic calamity. In light of the current economy, the health of the U.S. aluminum industry is even more tenuous. Given the present state of the economy, it would seem incumbent upon U.S. policy makers at all levels to make every effort to sustain U.S. business and promote employment at this critical juncture.

Q ARE TRADITIONAL ECONOMIC PRINCIPLES OF ELECTRICITY RATE DESIGN CONSISTENT WITH THE OBJECTIVES OF JOB PRESERVATION?

A Electricity rate design has been informed by sound economic analysis for many decades. Economic analysis can often distinguish between rate designs that are more or less economically efficient. Regulators have routinely taken into account a host of factors in designing rates—including job preservation and economic development. Regulators usually have a degree of flexibility in structuring rates. Thus, it is not surprising that relative rates for different customer classes can vary significantly from one jurisdiction to another.

It is beyond the scope of my testimony to make recommendations on the specific structure of these rates and their consequences for the utility and for other customers. However, it should be noted that failure to implement rates that realistically address the needs of Noranda Aluminum may be detrimental to all parties involved. The associated job losses would have adverse impacts on the local and state economy and the public purse through reduced tax revenues and increased welfare expenditures.

Q CAN YOU DESCRIBE SOME OF THE KEY FEATURES OF THE ALUMINUM PRODUCTION INDUSTRY?

A Aluminum is the most common metal found in the earth's crust. However, because it is typically found in forms where it is strongly bonded to oxygen, it requires large quantities of energy to extract. This energy is primarily comprised of electricity. The cost of electricity constitutes one of the single largest components in the production of aluminum. For Noranda Aluminum, for example, electricity costs exceed the cost of alumina, (aluminum oxide) which is a source of the metal, as well as the cost of labor.

Aluminum smelting is a continuous, energy-intensive process with limited substitutability away from electricity. Thus, plants operate at high average utilization, or load factor, which is an attractive characteristic from the standpoint of an electric system. Because of their generally desirable profiles and their heavy reliance on electric availability, smelters are susceptible to competitive solicitation by multiple jurisdictions and geographic regions especially with respect to electricity prices.

The aluminum industry is vulnerable to volatile commodity prices, which argues for targeted measures to preserve economic benefits, especially during periods of low prices.

An aluminum smelter is a particularly salient example of the type of electricity customer typically targeted by 'economic development' rates. From the perspective of local economies, smelters are not only attractive additions to the local tax base but are large-scale employers that offer high wages.

Q **HAS THE U.S. ALUMINUM BUSINESS SUFFERED IN RECENT YEARS?**

A The aluminum industry in the U.S. had been under steady pressure even before the dramatic economic events which began in 2008. At the turn of the present century the United States was the largest producer of aluminum in the world with a market share of 15%. Over the course of the ensuing years, it steadily lost market share. By 2008, U.S. producers accounted for less than 7% of worldwide production. This dramatic

decline in U.S. market share is attributable to two factors – rapid expansion in China's capacity and an avalanche of plant closures in the U.S.

Over the period 2000 to 2009, U.S. production capacity has been cut in half. Major facilities have been shut down or mothballed in Maryland, Montana, Oregon, New York, North Carolina, Tennessee, Texas, Washington and West Virginia. In many cases, the cost of electricity played an important role in the closures.

Q IS THE ALUMINUM INDUSTRY IN THE UNITED STATES FACING PRESSURE FROM FORCES OUTSIDE OF THE U.S.?

A International markets for aluminum are closely linked. Spot prices move closely together in different parts of the world. Thus, U.S. producers compete directly with producers in China, Russia, Canada and other countries.

International cost pressures have been amplified by recent economic events. For example, the United States, the European Union and Mexico have filed complaints with the World Trade Organization which state that China is engaging in export restrictions of bauxite, a raw material from which aluminum is extracted. Such practices have the effect of increasing production costs for U.S. (and other) aluminum producers, reducing their competitiveness and endangering U.S. jobs and capital investments.

Q WHAT LEVELS OF GOVERNMENT HAVE BEEN INVOLVED IN PROMOTING EMPLOYMENT AND ECONOMIC DEVELOPMENT?

A As previously discussed, the U.S. aluminum industry has experienced severe job losses over the last decade. This has only been exacerbated by the recent deep economic recession. As many have come to recognize more acutely in the last year or so, the *responsibility* for policies which retain and create jobs is not merely the domain of federal authorities and the central bank. That responsibility sprawls across all levels of government and across government agencies. Traditionally, state and local tax policies, expenditures on education and public services, and infrastructure investment have comprised important tools of job creation and retention, and economic development. Inter-jurisdictional competition to attract major employers and concomitant investment has been the subject of much economic discussion and analysis. Such competition has the virtue of improving the effectiveness and accountability of local governments.

Q WHAT TYPE OF EFFECTS WOULD A PLANT SHUTDOWN HAVE ON SOUTHEAST MISSOURI?

A Unemployment affects not only those without jobs, but many others whose livelihood is affected by the vitality of the economy. The typical voter who has become unemployed during this "Great Recession" looks not just to the federal government for support, but perhaps even more so to the local or state government to promote opportunities for employment.

The loss of a major employer in a region can have stunning effects on the local economy. For example, recent setbacks for the U.S. auto industry have raised Michigan's unemployment rate to 15%; some districts within Michigan are

experiencing much higher jobless rates. By a number of relevant criteria, Noranda's New Madrid smelter plays an important role in the Missouri economy. With approximately 900 people on staff, it is one of the largest employers in southeast Missouri. It is my understanding that the operation has an annual electricity bill of approximately $140 million.

Q CAN ECONOMIC PRINCIPLES DISTINGUISH BETWEEN THE RELATIVE EFFICIENCY OF DIFFERENT RATE DESIGNS?

A It is widely recognized that ratemaking entails art as well as science; and that the scope of responsibility for evaluating electricity costs and prices for service extends beyond setting terms and conditions for service and applying formulistic principles to develop prices for providing service. A particular set of problems arises from the mismatch between (1) the short-term problem of developing rates to give an electricity provider the opportunity to recover sufficient revenues to meet its obligations (including a reasonable return to shareholders) and (2) the longer-term problem of attracting new, or sustaining the viability of, existing customers. Electricity rate design has been informed by sound economic analysis for many decades. Economic principles can often distinguish between rate designs that are more or less economically efficient.

There is a strong economic rationale for considering the economic costs of lost jobs and idle capital stock when determining rates. For example, if electricity prices are leading an industrial customer to reduce output, shift production to another jurisdiction or shut down an operation entirely, then the lowering of rates to such a customer may be justified on grounds of

economic efficiency. While these arguments apply generally to industrial customers, they are especially relevant in industries where electricity comprises a large proportion of total costs, such as is the case for aluminum smelting.

Q DO ISSUES SUCH AS THE PRESERVATION AND INCREASE OF EMPLOYMENT REGULARLY FACTOR INTO THE RATE MAKING PROCESS?

A Electricity rates targeted to preserve and increase employment have represented a common part of the rate making process both for regulated investor-owned utilities and power suppliers. The aluminum industry has participated in this process historically, but under conditions that typically differ from the process for other types of firms. Due to the electric intensity of aluminum production, smelters have tended to be located in regions with low electricity costs and prices. Aluminum smelters in the U.S. compete in a world market, where other countries also seek to obtain the economic development benefits of aluminum production. Over time, the historical conditions which created a favorable environment for aluminum smelters have changed. In some instances, regulators have found ways to maintain a rate level sufficient to retain smelter operations. In other cases, this has not occurred.

Q DO YOU HAVE ANY CONCLUDING COMMENTS THAT YOU WISH TO MAKE?

A Yes. The arguments favoring electricity rates that realistically address the needs of Noranda Aluminum, its employees and broader public interests in Missouri are

based on established principles. They constitute sound public policy, and they are consistent with traditional economic principles of rate design.

SCHEDULE AY1

AUTHOR QUALIFICATIONS AND CURRICULUM VITAE

ADONIS JOHN YATCHEW, PH.D.

Adonis Yatchew is Professor of Economics at the University of Toronto. He is also Editor-in-Chief of the Energy Journal, a publication of the International Association for Energy Economics and one of the leading academic publications in energy economics.

He has many years of experience advising public and private sector corporations and government agencies on policy matters, particularly those related to energy. He has prepared numerous analyses and studies of the electricity industry. He has prepared short term market assessments and forecasts of the cellular telephone industry; coauthored studies on oil pipeline cost allocation; and been involved in studies or analyses of the natural gas, gasoline and airline industries, among others.

Adonis received his undergraduate and B.A. and M.A. degrees at the University of Toronto, and his Ph.D. at Harvard University. He is consistently ranked among the best teachers in the Economics Department, and has received the Social Sciences Teaching Award at the University of Toronto. His research is published in leading economics and statistics journals, and he has written a graduate level textbook in econometrics. He has also taught at the University of Chicago (jointly teaching a course with a subsequent Nobel Prize winner in Economics) and been elected a Visiting Fellow of Trinity College, Cambridge University.

His book entitled *Semiparametric Regression for the Applied Econometrician*, published by Cambridge University Press, contains a number of applications to energy economics.

SCHEDULE AY1

CURRICULUM VITAE -- ADONIS JOHN YATCHEW

OFFICE ADDRESS: Department of Economics (416) 978-7128 voice
University of Toronto (416) 978-6713 fax
150 St. George Street
Toronto, Ontario
Canada M5S 3G7 yatchew@chass.utoronto.ca

CURRENT EMPLOYMENT STATUS: Professor of Economics

OTHER PROFESSIONAL ACTIVITIES:
Editor-in-Chief, The Energy Journal (2006-present)
Editor, The Energy Journal, (2006)
Joint Editor (with G. Campbell Watkins) The Energy Journal (1997-2005)
Joint Editor (with Len Waverman) The Energy Journal (1995-1996)
Member, Editorial Board, Foundations and Trends in Econometrics
Editor (with Yves Smeers) 1997, Distributed Generation, special issue of the Energy Journal
Advisory Editor, Economics Letters (1985-1997)
Member, Advisory Board, *Eurasia Foundation*, 1995-2007
Member, Board of Directors, *EnerConnect*, 1998-2006

AWARDS AND DISTINCTIONS:
Teaching award: University of Toronto Teaching Award, 1987
Top grade in Ontario, Royal Conservatory of Music, Toronto, Grade X Piano exam, 1969

EDUCATION:
Ph.D. Harvard University, Economics - 1980
M.A., University of Toronto, Economics - 1975
B.A., University of Toronto, Mathematics and Economics - 1974
A.R.C.T. piano, completion of practical exams, Royal Conservatory of Music, Toronto – 1972

ACADEMIC EXPERIENCE:

2006-2009	Associate Chair for Graduate Studies, University of Toronto
2005	Visiting Fellow, ARC Center of Excellence for Mathematics and Statistics of Complex Systems, Mathematical Sciences Institute, Australian National University
2004-present	Professor of Economics, University of Toronto
2001	Visiting Fellow, School of Mathematical Sciences, Australian National University
1986 to 2004	Associate Professor, Economics, University of Toronto
1989, 1990, 1991	Visiting Research Associate, Harvard University
1986	Visiting Fellow Commoner, Trinity College, Cambridge U.K.
1980 to 1986	Assistant Professor, Economics, University of Toronto

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1984	Visiting Research Associate, National Bureau of Economic Research, Cambridge, Massachusetts
1982 to 1984	Visiting Assistant Professor, University of Chicago
1976	Lecturer, University of Toronto, Scarborough College

REFEREED PUBLICATIONS:

Pesando, J., and Yatchew, A., 1977, "Real vs. Nominal Interest Rates and the Demand for Consumer Durables in Canada", Journal of Money, Credit, and Banking, 428-436.

Yatchew, A., 1981, "Further Evidence on 'Estimation of a Disequilibrium Aggregate Labor Market'", Review of Economics and Statistics, 142-144.

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Hall, Peter and A. Yatchew, 2005: "Unified Approach to Testing Functional Hypotheses in Semiparametric Contexts", Journal of Econometrics, 127, 225-252.

Yatchew, A. and W. Haerdle 2006: "Nonparametric State Price Density Estimation Using Constrained Least Squares and the Bootstrap", Journal of Econometrics, 133:2, 579-599.

Ricciuto, L., V. Tarasuk and A. Yatchew 2006: "Socio-demographic Influences on Food Purchasing Among Canadian Households", European Journal of Clinical Nutrition, 60:6, 778-790.

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McCaig, B. and A. Yatchew 2007: "International Welfare Comparisons and Nonparametric Testing of Multivariate Stochastic Dominance", Journal of Applied Econometrics, 22:5, 951-969.

Hall, Peter and A. Yatchew 2007: "Nonparametric Estimation When Data on Derivatives are Available", Annals of Statistics, 35:1, 300-323.

Yatchew, A. 2008: "Perspectives on Nonparametric and Semiparametric Modeling", The Energy Journal, Special Issue to Acknowledge the Contribution of G. Campbell Watkins to Energy Economics, 17-30.

BOOK

Yatchew, A., 2003, Semiparametric Regression for the Applied Econometrician, 213 pages, Themes in Modern Econometrics, Cambridge University Press.

OTHER SELECTED PAPERS / STUDIES

Yatchew, A. 1995, "The Distribution of Electricity on Ontario: Restructuring Issues, Costs and Regulation", Ontario Hydro at the Millenium, University of Toronto Press, 327-342,353-354.

Yatchew, A. 1995, "Comments on The Regulation of Trade in Electricity: A Canadian Perspective", Ontario Hydro at the Millenium, University of Toronto Press, 165-7.

Yatchew, A. 2001: "Incentive Regulation of Distributing Utilities Using Yardstick Competition", Electricity Journal, Jan/Feb, 56-60.

Littlechild, S. and A. Yatchew, 2002: "Hydro One Transmission and Distribution: Should They Remain Combined or be Separated", www.chass.utoronto.ca/~yatchew .

WORKING PAPERS

Yatchew, A., 1999, "Differencing Methods in Nonparametric Regression: Simple Techniques for the Applied Econometrician", 86 manuscript pages.

SCHEDULE AY1

OTHER PROFESSIONAL EXPERIENCE:

Electrical Utilities:

(2008) Prepared analysis of incentive regulation and productivity growth for electricity distributors. Filed before the Ontario Energy Board.

(2007) Prepared analysis of distributor benchmarking on behalf of the Electricity Distributors Association. Filed before the Ontario Energy Board.

(2007) Filed evidence before the Market Surveillance Panel in Ontario on appropriate monitoring of spot markets.

(2006) Prepared review of incentive regulation filed before the Ontario Energy Board.

(2006) Filed evidence before the New Brunswick Board of Commissioners of Public Utilities on cost-sharing of joint-use power poles.

(2005) Prepared analysis on cost-sharing of power poles by cable companies. The analysis was part of the basis for a settlement proceeding in Ontario.

(2004) Prepared analysis on cost-sharing of power poles by cable companies. The document was filed before the Ontario Energy Board.

(2003) Testified before the Ontario Energy Board on distributor service area amendments.

(2003) Testified before the New Brunswick Board of Commissioners of Public Utilities on performance based regulation, benchmarking and rate of return issues.

(1993-1998) Prepared major studies for the Municipal Electric Association on restructuring of the electric utility industry in Ontario.

(1991-1992) Research Director for the Municipal Electric Association in their intervention before the Environmental Assessment Board in connection with Ontario Hydro's 25 year Demand/Supply Plan.

(1992) Prepared testimony on forecasts of electricity demand for Ontario -- Environmental Assessment Board Hearing.

(1982-1995) Consultant to the Municipal Electric Association at the Ontario Hydro Rate Hearings before the Ontario Energy Board.

Class Action: (2004-2007) Prepared various analyses in a class action and settlement proceeding involving billing of natural gas.

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Probability Analysis: (2004, 2005, 2006) Prepared odds of winning prizes in promotions by international fast-food chain.

Banking Industry: (1997) Prepared analysis of securities lending for Canada Trust.

Information Technology: (1994) Prepared cost allocation analyses.

Bell Mobility: (1991, 1992, 1993, 1994) Prepared short term market assessment and forecasts for cellular telephone sales.

Competition / Antitrust: (1990) Prepared statistical analysis in connection with a legal proceeding on anti-competitive behavior relating to the supply of paper forms; (1989) prepared analysis in connection with the Imperial Oil/Texaco merger deliberations before the Federal Competition Tribunal.

Airlines: (1989) Prepared technical analysis of the effects of booking system biases in a major U.S. litigation.

Toronto Transit Commission: (1988, 1989, 1991) Various studies on subjects such as subway reliability measures, evaluation criteria for resource allocation, statistical procedures in relation to count data.

Oil Pipelines: (1987, 1992) Coauthored studies on pipeline cost allocation.

Minerals: (1985) Performed econometric analysis of zinc, copper, potash markets as part of a larger study for Cominco.

Natural Gas: (1985) Coauthored a major background study for the Federal Government/Province of Alberta energy price negotiations.

Parking Authority of Toronto: (1985) Designed data sampling scheme for Parking Authority of Toronto - to be used for monitoring flows into parking lots and as a broad audit check.

Film Industry: (1981) One of three co-investigators in study for Federal Government of tax incentives to the Canadian film industry.