

Coupling Energy Assistance and Energy Hedging to Reduce Expense Volatility for LIHEAP Recipient Households

By Tom Matthews

Introduction

Since 1981, the federal government has provided energy assistance to low-income households through the Low Income Household Energy Assistance Program (LIHEAP). This program, coupled with state funding and with mandatory and voluntary utility programs, has been successful in reducing energy costs, particularly home heating costs, for low-income families. The majority of U.S. households experience home heating expense volatility due to the year-to-year fluctuation in wholesale energy prices, unpredictable winter weather and from the hegemony of utility hedging programs. Low-income households are likely to have increased year-to-year cost volatility compared to those households that don't receive assistance. Recent literature in development economics suggests that volatility of commodity costs as compared absolute commodity cost level has a greater influence on the ability to escape poverty on both microeconomic and macroeconomic levels.

The majority of U.S. households use natural gas as the primary means for space heating. Natural gas is also one of the most actively traded commodities in exchange-based and over-the-counter financial markets. Utilities have limited incentive to engage in long-term hedging (24 months or longer) strategies in these markets on behalf of their customers, mainly because of the risk of under-recovery of hedging expenses through the utility rate case process. A federal government-backed hedging program coupled with existing utility trading infrastructure could dramatically reduce the year-to-year home heating cost volatility experienced by LIHEAP recipient households. Such a program would benefit low-income households, the federal government as well as utilities.

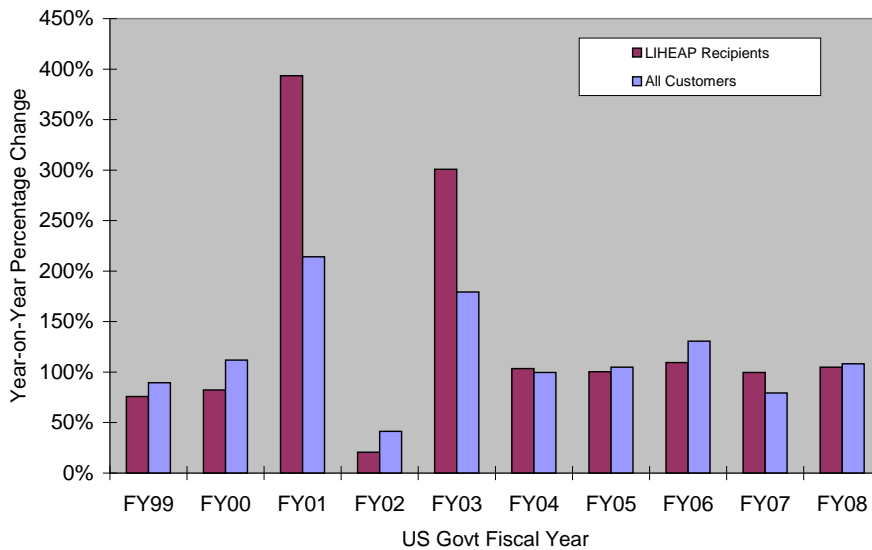
Income and Expense Volatility

Subsistence commodity producers in most developing countries suffer from feast or famine market conditions caused by volatile commodity markets. Uncertainty of what the next season may bring deters long-term economic planning and investment. Joshua Aizenman and Brian Pinto, in their 2004 paper "Managing Volatility and Crisis, A Practitioner's Guide Overview," suggest that without sufficient economic planning, the benefits of high priced periods do not offset the periods of low prices in both microeconomic and macroeconomic circumstances, leading to a long-term negative effect. This condition, the authors suggest, is caused by incomplete capital markets and weak institutions. Oli Brown, Alec Crawford and Jason Gibson of the International Institute for Sustainable Development suggest in their 2008 paper, "Boom or Bust: How Commodity Price Volatility Impedes Poverty Reduction, and What To Do About It," that better commodity hedging programs, similar to what is available in more developed countries, could lead commodity producers out of this poverty trap.

The logic for low-income commodity producers is equally applicable to low-income commodity consumers, such as home heating consumers receiving energy assistance in the United States. Energy assistance programs help lower overall heating costs incurred by low-income households; however, these programs may also contribute to a feast-or-famine condition that inhibits long-term economic planning. Low-income households must rely on the price stabilization programs implemented by their local utility, supplemented by cash contributions from federal, state and utility assistance programs. Unlike many developing countries, the U.S. has robust markets to help institutions and individuals manage energy and other commodity price risks. The scope of this paper is not to predict the behavior of low-income households should heating expenses and corresponding assistance programs become more predictable, but rather to suggest how low-income energy assistance programs might better take advantage of the financial markets.

The data in the chart below shows the percentage change in natural gas home-heating costs for Illinois consumers and for Illinois consumers receiving LIHEAP assistance. While heating costs for those households receiving LIHEAP are significantly lower than the households not receiving assistance, the year-to-year volatility of costs (as measured by the standard deviation of observations) is significantly higher for homes receiving assistance. Note that the table does not include state or utility assistance funds. It is unclear whether energy assistance funds beyond the federal LIHEAP program exacerbate the year-on-year cost volatility for low-income households.

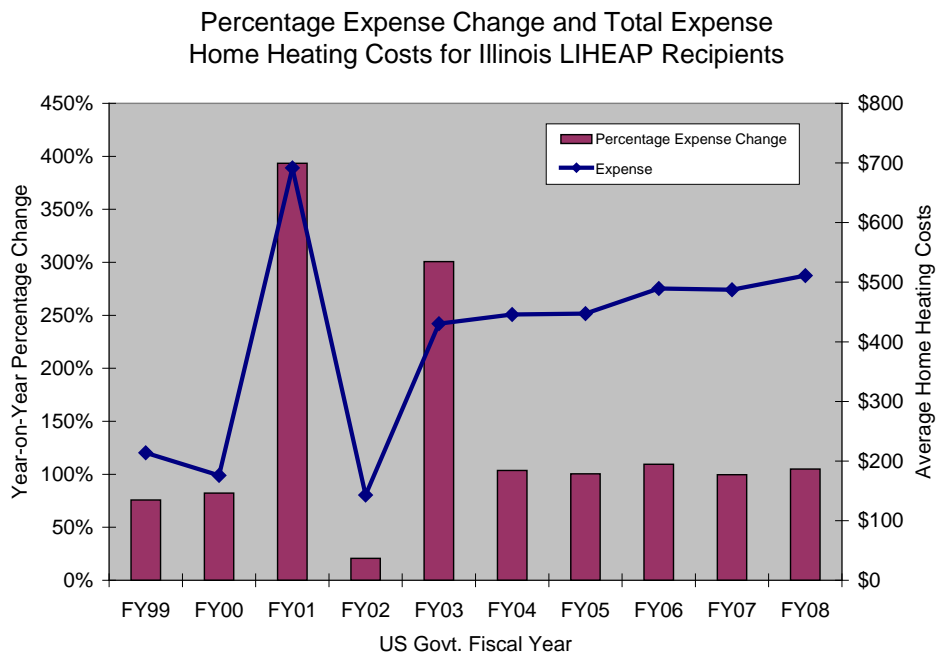
Percentage Expense Change
Home Heating Costs for Illinois Consumers



Consumption and price data comes directly from the EIA website (www.eia.doe.gov). LIHEAP recipients were computed using the average of Illinois LIHEAP heating recipients for FY02 and FY03 as a percentage of total Illinois natural gas consumers for the same period. This percentage was applied equally to all Illinois natural gas consumers for the period 1998 through 2007. Applicable LIHEAP dollars comes directly from the HHS website (www.acf.hhs.gov).

When there is a significant increase in year-on-year energy prices, households receiving LIHEAP assistance face greater heating costs uncertainty than average consumers not receiving assistance. The graphs above and below are consistent with the findings of Francois

Bourguignon, Sylvie Lambert and Akika Suwa-Eisenmann. Their paper, “Trade Exposure and Income Volatility in Cash-Crop Exporting Countries” presented in the September 2004 issue of the *European Review of Agricultural Economics*, showed that the poorest income groups bear the largest economic risk from highly fluctuating commodity prices in developing countries.



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Roughly 25 percent of Illinois households eligible to receive LIHEAP assistance actually receive assistance based on the most recent data available from The Campaign for Home Energy Assistance. As the number of recipients increase, the year-on-year expense volatility declines but the overall expense per LIHEAP household increases. In general, unless available LIHEAP dollars move one-for-one with underlying commodity prices, LIHEAP dollars will lower recipient household costs for a given year but it may increase year-to-year expense volatility compared to non-recipient households. This is illustrated in the generalized example below using data from the years 1999, 2000 and 2001.

From the winter of 1999-2000 to the winter of 2000-2001, home heating costs increased significantly in much of the United States because of colder-than-normal temperatures and higher commodity prices. In Illinois, winter weather as measured in population-weighted heating degree days (HDD) increased from 4,766 HDD for the six-month period ending in March 2000, to 5,826 HDD for the six-month period ending in March 2001. The additional HDD resulted in a 19.2 percent average increase in Illinois residential natural gas consumption based on consumption data available from the U.S. Department of Energy’s Energy Information Administration (EIA). Data available from the EIA also showed that average delivered natural

gas prices for the state, increased from an average of \$5.77 per MMBTU for the six months ending in March 2000 to \$10.06 for the six months ending in March 2001.

2000 & 2001 RESIDENTIAL HOME HEATING COSTS WITH LIHEAP ASSISTANCE Illinois (IL) Households with Natural Gas (NG) Heat

	OCT-99 THRU MAR-00	OCT-00 THRU MAR-01
IL Residential MCF Usage	332,649,000	396,552,000
IL Households with NG Heat	2,892,529	2,910,652
Average Winter MCF	115.00	136.24
Deilvered Cost Per MCF	\$5.77	\$10.06
Total Household Heating Costs	\$663.57	\$1,370.59
IL Federal LIHEAP Funding	\$93,000,000	\$108,000,000
Allocation to Households with NG	\$75,330,000	\$87,480,000
Estimated Recipient NG Households	146,773	146,773
Average Payment	-\$513.24	-\$596.02
Remaining Household Obligation	\$150.32	\$774.57

Usage, household count and price data come from the U.S. Department of Energy, Energy Information Administration. LIHEAP funding and recipient household data comes from the U.S. Department of Health and Human Services.

The table shows that average Illinois residential heating costs more than doubled from the winter of 1999-2000 to 2000-2001; per-household costs increased from \$664 to \$1,371. For those households accustomed receiving federal LIHEAP assistance, average adjusted heating costs increased over 500 percent, from \$150 per household to \$775 per household. If recipient households could insure against variable commodity prices, year-to-year LIHEAP adjusted heating costs would be far more stable. The optimal solution to this problem may be for LIHEAP recipients to have a hedging program separate from conventional pass-through utility rates.

Supportive Market Structure

North America has robust markets for the forward hedging of natural gas price risk. The benchmark New York Mercantile Exchange (Nymex) Henry Hub Natural Gas Futures contract trades forward nearly 12 years. The annual volume traded on the exchange more than exceeds U.S. consumption for the equivalent year. This means that if an entity can predict its natural gas purchase requirement for any month in the next 12 years, and the entity's price exposure is closely tied to Henry Hub Futures, the entity can easily hedge away their price exposure using the Nymex futures market. Regional price differentials to the benchmark futures market are commonly called "basis." Many of these basis differentials trade in the over-the-counter (OTC) market and usually out two to four years. If a Chicago utility wanted to hedge its natural gas purchase exposure on behalf of its customers, the utility would likely hedge a particular month using a purchase combination of Nymex futures contract and an OTC contract for Chicago basis (commonly referred to as Chicago City Gate). For practical purposes, Nymex futures alone serves as sufficient hedge for a Chicago utility because of the strong correlation between the Henry Hub prices, physical delivery point for Nymex futures and price of gas delivered to the Chicago City Gate. The correlation coefficient was 99.5 percent for the period January 2003 through December 2007 between prompt month natural gas futures (www.nymex.com) and prompt month Chicago City Gate prices (www.theice.com).

Intuitively, it would seem that utilities, particularly investor-owned utilities, would benefit from long-term hedging programs implemented on behalf of their customers. Using the logic from the development economics literature, more predictable utility bills reduce the number of customers that fall behind in bill payments and which benefits the utility's revenue stream. In a May 2002 article for *Public Utilities Fortnightly*, John Herbert suggested that long-term hedging programs can cause short-term liquidity constraints and also carry the risk of not being fully recovered through a utility rate case. Exchange-based trading requires daily margining requirements and can tie-up utility cash flow in volatile markets. Similarly, over-the-counter transactions are traded under International Swap Dealer Association (ISDA) contracts which may have cash flow restrictive covenants based on credit ratings and/or the size and duration of transactions. If available cash or lines of credit are pledged to ISDA transactions, this could tie up needed capital for critical infrastructure projects. For this reason, utilities may limit their hedging activities.

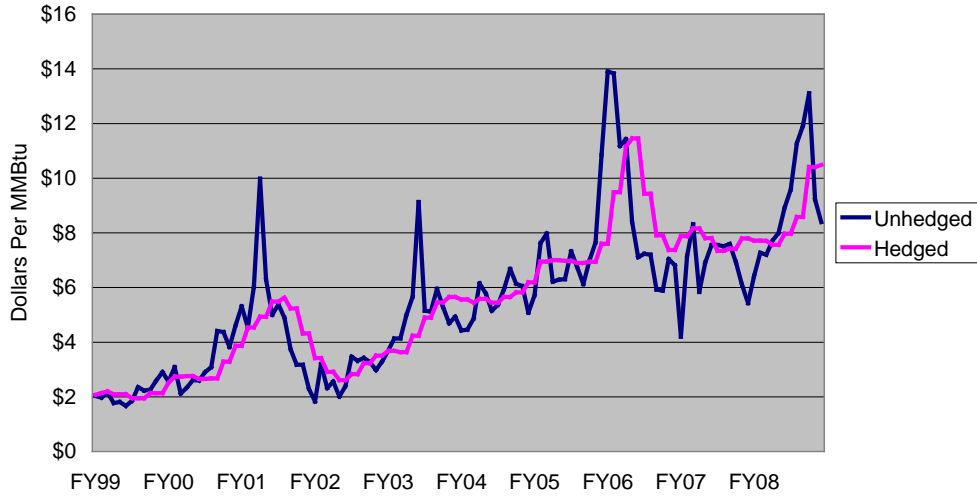
Under LIHEAP, the federal government is trying to anticipate funding requirements for the upcoming fiscal year. If the LIHEAP funds fall short of requirements due to higher than expected energy prices and/or colder than expected weather, the government will likely make emergency funding to LIHEAP recipients. If energy prices drop from initial funding, the funding is not scaled back which leads to the inherent expense volatility that LIHEAP recipients experience compared to other households. Both the government and LIHEAP recipients, along with the recipient's utility, would benefit from a federal government-backed hedging program.

Linear Decline Hedging Program

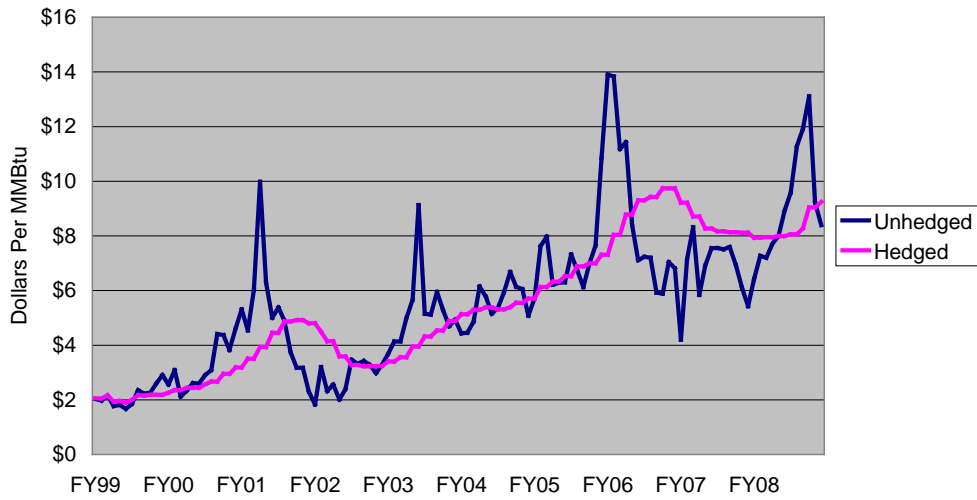
A successful hedging program doesn't need to be complicated. In fact, it can be very simple and mechanical, requiring no market opinion by those administering it. The most common long-term hedging strategy is a linear decline hedging strategy. Under a linear decline hedging strategy, an equal percentage of monthly exposures are purchased on a set day of the month for a specified number of months into the future.

The graphs below are based on actual daily price and settlement data from the Nymex as if a linear decline hedging strategy had been executed on or near the 15th of the month, every other month for the period October 1998 through March 2008. The key point from the graphs is that as the hedge horizon increases from 6 months, to 12 months, to 18 months, and finally to 24 months, the month-to-month and year-to-year natural gas expense volatility decreases significantly if hedged in this manner. This is illustrated by the red line on each of the graphs below which shows the hedged price of gas compared to the market price of natural gas on the blue line.

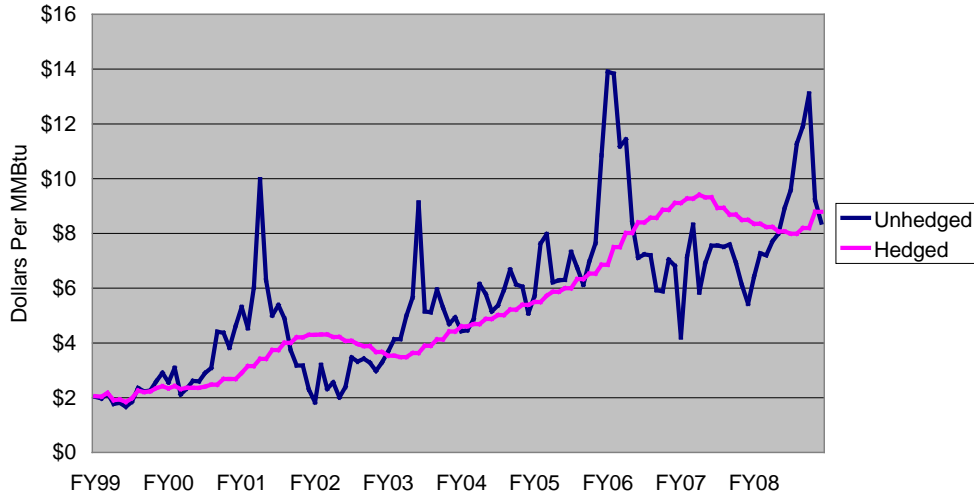
6 Month Rolling Hedges Compared to an Unhedged Position Nymex Natural Gas Futures



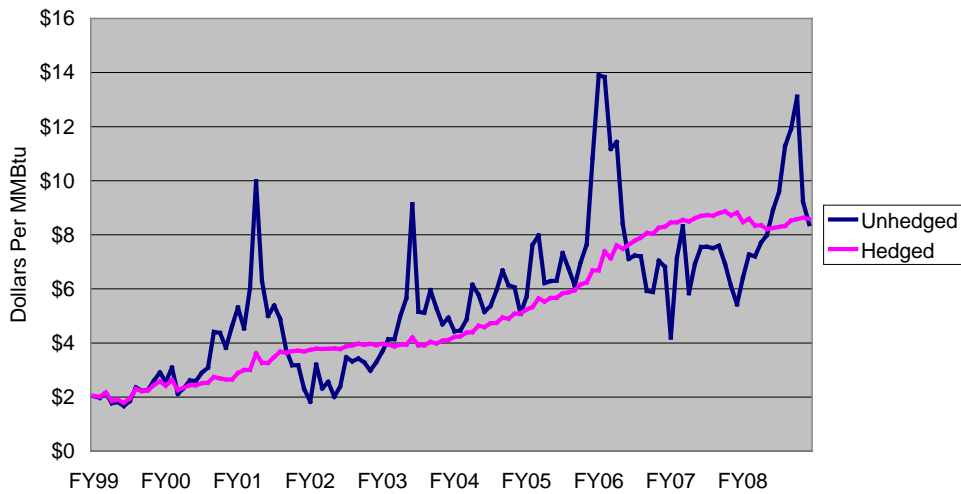
12 Month Rolling Hedges Compared to an Unhedged Position Nymex Natural Gas Futures



18 Month Rolling Hedges
 Compared to an Unhedged Position
 Nymex Natural Gas Futures



24 Month Rolling Hedges
 Compared to an Unhedged Position
 Nymex Natural Gas Futures



If the series of graphs were expanded to include hedging programs with horizons out to 48 months, the red line on the graphs would become progressively flatter as the hedge horizon increases. Another benefit that arises from increasing the hedge horizon is the ability to better predict home heating costs (indicative from the flatter cost line), for both households as well as for the federal government. Households can better allocate financial resources on a forward

looking basis, and the federal government can better predict budget expense for programs like LIHEAP.

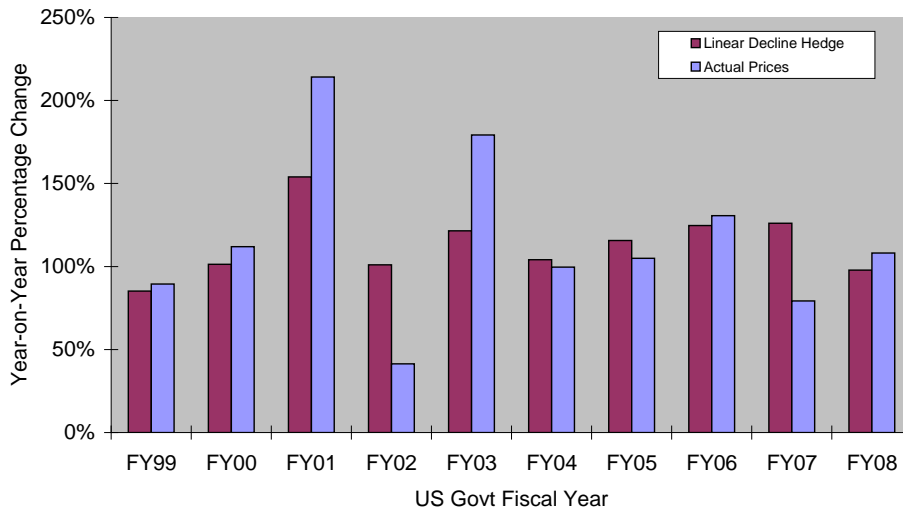
Coupling Assistance and Hedging

As mentioned earlier, a utility, particularly an investor-owned utility, has liquidity risks and cost recovery risks to consider when engaging in long-term hedging programs like the linear decline hedging program represented above. Most utilities, however, have the necessary infrastructure for trading in exchange-based and OTC markets, particularly for their local market area.

According to a 2007 survey by the American Gas Association (www.aga.org), 88 percent of U.S. natural gas utilities incorporated financial derivatives to hedge against market price volatility on behalf of their customers. For this reason, utilities are in the best position to execute and manage a linear decline hedging program on behalf of their LIHEAP recipient customers. The federal government should be more than willing, given the resulting stabilization of LIHEAP expenses, to provide the necessary financial guarantees with exchanges and/or counterparties for commodity hedges directly related to LIHEAP recipient customers. Under guarantee, it is quite possible that the government will have no cash flow requirements related to the hedges that are being backed. For this hedging program to be successful, state utility commissions would need to recognize two rate structures within a given jurisdiction: one for standard utility customers; and one for LIHEAP recipient customers. The distribution component for these rate structures would be the same but the commodity component would be based on separate hedging programs. Utilities would manage a separate hedge portfolio for LIHEAP customers and physical gas procurement would continue to be the same for all customers.

Unfortunately, we can't look back into time and estimate how federal funding would have changed if a linear decline hedging program has been implemented on behalf on Illinois LIHEAP recipient households. We can compare the annual cost for volatility all gas consumers for actual costs and for estimated costs under a linear decline hedging strategy. As represented on the graph below, employing the linear decline strategy would have significantly reduced year-to-year heating expense volatility.

Percentage Expense Change Home Heating Costs for Illinois Consumers



Consumption and actual price data comes directly from the EIA website (www.eia.doe.gov). Natural gas futures data comes from the New York Mercantile Exchange (www.nymex.com)

Utilities have limited incentive to engage in long-term hedging strategies on behalf of their customers, mainly because of the risk of under-recovery of hedging expenses through the utility rate case process. A federal government-backed linear decline hedging program coupled with existing utility trading infrastructure could dramatically reduce the year-to-year home heating cost volatility experience by LIHEAP recipient households. Under such a program, LIHEAP households would benefit from more stable home heating expenses. The federal government would be better able predict and fund the LIHEAP program in concert with actual heating costs. Finally, utilities would welcome a government-backed long-term hedging program for low-income customers because of the inherent revenue stabilization.

Tom Matthews is the Energy Commodity Risk Administrator for Tri-State Generation and Transmission Association in Westminster, Colorado. Prior to joining Tri-State, he held commodity risk management positions with Kinder Morgan, Inc. and with Molson Coors Brewing. Tom has a bachelor of science degree in economics from the University of Wisconsin at Madison and a master of science degree in financial markets from the Illinois Institute of Technology. The views in this paper are strictly his own and should not be attributed to his current employer or previous employers.