Public Version

**BEFORE THE STATE CORPORATION COMMISSION
OF THE STATE OF KANSAS**

DIRECT TESTIMONY

OF

JESSICA L. TUCKER

**ON BEHALF OF
KANSAS CITY POWER & LIGHT COMPANY**

**IN THE MATTER OF THE APPLICATION OF
KANSAS CITY POWER & LIGHT COMPANY
TO MAKE CERTAIN CHANGES IN
ITS CHARGES FOR ELECTRIC SERVICE**

DOCKET NO. 18-KCPE-____-RTS

I. INTRODUCTION AND OVERVIEW

Q: Please state your name and business address.

A: My name is Jessica L. Tucker. My business address is 1200 Main Street, Kansas City, Missouri 64105.

Q: By whom and in what capacity are you employed?

A: I am employed by Kansas City Power & Light Company ("KCP&L" or the Company) as Senior Manager, Fuels & Emissions.

Q: On whose behalf are you testifying?

A: I am testifying on behalf of KCP&L.

Q: What are your primary responsibilities?

A: My primary responsibilities include management and oversight of fuel procurement and logistics (apart from natural gas and to some extent, oil) as well as coal combustion residual product management and marketing for Company operated generating stations.

Q: What is the purpose of your testimony?

A: My testimony addresses KCP&L's fuel inventory management. The goal of fuel inventory management is to balance the cost of purchasing fuel and holding it in inventory against the risk of not having enough fuel available to satisfy demand in real time. The purpose of my testimony is to explain the process by which KCP&L determines the amount of fuel inventory to keep on hand, how the level of fuel inventory impacts KCP&L's costs, and inventory values.

Q: Please summarize your conclusions.

A: The coal inventory targets I present for inclusion in rate base are shown in the attached Exhibit JLT-1 **(Confidential)** and are the values used to determine Adjustment RB-74, Fuel Inventory, included in Exhibit RAK-2 of the Direct Testimony of KCP&L witness Ronald A. Klote. The inventory values for ammonia, lime, limestone, RESPond® and powder activated carbon ("PAC"), and the inventory values for oil are also shown in Exhibit JLT-1 **(Confidential)** and were included in the derivation of Adjustment RB-74.

II. EDUCATION AND EXPERIENCE

Q: Please describe your education, experience and employment history?

A: I graduated Summa Cum Laude from Kansas State University in December 1999 with a Bachelor's of Science degree in Agriculture. I began my career in the energy industry in January 2001 with Aquila as an Associate Hourly Trader. In this role, my efforts were focused on executing short term physical power transactions in the real-time market across various North American Electric Reliability Corporation ("NERC") regions. My employment with KCP&L began in August of 2002 as an Hourly Trader on the real-time desk. From August 2002 to May 2006, my role focused on buying and selling power in the real-time market. In June 2006, I was promoted to Interchange Marketer, which focused my trading activity on day ahead and monthly power transactions. I was also a part of KCP&L's Regional Transmission Organization ("RTO") integration team that prepared the generation dispatching and trading area for participation in the Southwest Power Pool ("SPP") Energy Imbalance Service ("EIS") market, which launched on February 1, 2007. In November 2010, I was promoted to Manager, System Operations (Power). My primary responsibility was to oversee 24x7 Power Control Center functions, which consisted of real time and day ahead power trading, power scheduling, and generation dispatching operations. This not only included overseeing our participation in the SPP market, but compliance with applicable NERC Reliability Standards as well. I was also responsible for preparing the dispatching and trading group for participation in the SPP Integrated Marketplace ("IM"), which launched on March 1, 2014. In April 2015, I was promoted to Senior Manager, Power System Operations. In July 2017, I transitioned to the position of Senior Manager, Fuels & Emissions within the Fuels group.

Q: Have you previously testified in a proceeding before the Kansas Corporation Commission ("KCC" or "Commission") or before any other utility regulatory agency?

A: Yes, I testified before the Missouri Public Service Commission in early 2017 on certain topics associated with the SPP Integrated Marketplace.

III. KCP&L'S FUEL INVENTORY MANAGEMENT

Q: Please provide an overview of KCP&L's fuel inventory management policy.

KCP&L is a vertically integrated regulated electric utility company with an obligation to serve customers within its franchised service territory. Fuel inventory is one of the tools KCP&L uses to ensure reliable service to its' customers. KCP&L's fuel inventory management policy deals only with coal and oil. Because of the Company's limited use of natural gas and the relative low likelihood of a material disruption in the supply of natural gas, KCP&L does not maintain an inventory of natural gas. The table below lists the various electric generating resources KCP&L owns and each unit's primary fuel. The Iatan, La Cygne, and Montrose units also use oil for start-up and flame stability. The Wolf Creek nuclear generation station uses oil for start-up and emergency generation.

Unit	Location	Year Completed	2017 MW Capacity	Notes	Primary Fuel
Hawthorn 5	Missouri	1969	564	(a)	Coal
Hawthorn 6 & 9	Missouri	2000	235		Natural Gas
Hawthorn 7	Missouri	2000	78		Natural Gas
Hawthorn 8	Missouri	2000	79		Natural Gas
Iatan 1	Missouri	1980	490	(b)	Coal
Iatan 2	Missouri	2010	482	(b)	Coal
La Cygne 1	Kansas	1973	368	(b)	Coal
La Cygne 2	Kansas	1977	331	(b)	Coal
Montrose 2	Missouri	1960	164		Coal
Montrose 3	Missouri	1964	170		Coal
Northeast 11	Missouri	1972	47		Oil
Northeast 12	Missouri	1972	41		Oil
Northeast 13	Missouri	1976	46		Oil
Northeast 14	Missouri	1976	49		Oil
Northeast 15	Missouri	1975	53		Oil
Northeast 16	Missouri	1975	53		Oil
Northeast 17	Missouri	1977	53		Oil
Northeast 18	Missouri	1977	52		Oil
Northeast Black Start Generator	Missouri	1985	2		Oil
Osawatomie Comb Turb 1	Kansas	2003	76		Natural Gas
Spearville 1 (100.5 MW)	Kansas	2006	29	(c)	Wind
Spearville 2 (48 MW)	Kansas	2010	14	(d)	Wind
West Gardner Comb Turb 1	Kansas	2003	80		Natural Gas
West Gardner Comb Turb 2	Kansas	2003	79		Natural Gas
West Gardner Comb Turb 3	Kansas	2003	77		Natural Gas
West Gardner Comb Turb 4	Kansas	2003	78		Natural Gas
Wolf Creek	Kansas	1985	552	(b)	Nuclear
Total KCP&L			4,342		
				59.2%	Coal
				18.0%	Natural Gas
				12.7%	Nuclear
				9.1%	Oil
				1.0%	Wind

Notes:

(a) Hawthorn Unit 5 returned to commercial operation in 2001 with a new boiler, air quality control equipment and uprated turbine following a 1999 explosion.

(b) KCP&L share of jointly owned unit.

(c) The 100.5 MW Spearville Wind Energy Facility's accredited capacity is 29 MW per SPP Planning Criteria published on 4/26/2016

(d) The 48 MW Spearville 2 Wind Energy Facility's accredited capacity is 14 MW per SPP Planning Criteria published on 4/26/2016

As stated above, the goal of fuel inventory management is to balance the cost of purchasing fuel and holding it in inventory against the risk of not having enough fuel available to satisfy demand in real time. KCP&L holds a certain level of fuel inventory to mitigate the uncertainty inherent in both the amount of fuel the Company expects to burn and fuel deliveries. Both fuel burn and deliveries can be impacted by weather. Fuel burn can also be impacted by SPP market conditions, the availability of the unit holding the inventory, and the availability of other units in KCP&L's or SPP's system. Fuel deliveries can also be impacted by breakdowns at a mine or in the transportation system. Events like the Missouri River floods of 1993 and 2011, the 2005 joint line derailments in the Southern Powder River Basin (PRB), and more recently, the 2013-2014 reductions in train velocity that caused severe interruptions in the delivery of coal to KCP&L's plants. Fuel inventories are insurance against events that interrupt the delivery of fuel or unexpectedly increase the demand for fuel. All of these factors vary randomly. Fuel inventories act like a "shock absorber" when fuel deliveries do not exactly match fuel requirements, and enable KCP&L to continue generating electricity reliably between fuel shipments.

Q: How does KCP&L manage its fuel inventory?

A: Managing fuel inventory involves ordering fuel, receiving fuel into inventory, and burning fuel out of inventory. KCP&L controls inventory levels primarily through its fuel ordering policy. That is, KCP&L sets fuel inventory targets and then orders fuel to achieve those targets. We define inventory targets as the inventory level that we aim to maintain on average during "normal" times.

In addition to fuel ordering policy, plant dispatch policy can be used to control inventory, however KCP&L does not solely control the dispatch of its units. Effective March 1, 2014, NERC certified SPP as the Balancing Authority ("BA") for the SPP region. As the BA and RTO operating an integrated marketplace for electric power, SPP optimizes the generation resources for its members. To do that, it uses a regional security constrained, offer-based economic algorithm to dispatch the members' units. If a plant is low on fuel, SPP might coordinate with the plant owner to reduce the operation of that plant to conserve inventory. This could require other plants under SPP's dispatch to operate more and to use more fuel than they normally would. One can view this as a transfer of fuel "by wire" to the plant with low inventory. To determine the best inventory level, KCP&L balances the cost of holding fuel against the expected cost of running out of fuel.

Q: What are the costs associated with holding fuel inventory?

A: Holding costs reflect cost of capital and operating costs. Holding inventories requires an investment in working capital, which requires providing investors and lenders returns that meet their expectations. It also includes the income taxes associated with providing the cost of capital. The operating costs of holding inventory include costs other than the cost of the capital tied up in the inventories. For example, we treat property tax as an operating cost.

Q: Please explain what is meant by the expected cost of running out of fuel.

A: In this context, expected cost means the probability of running out of fuel times the cost of running out of fuel. The cost of running out of fuel at a power plant is the additional cost incurred when a more expensive resource must be dispatched to serve the load that would have otherwise been served by the plant if it had the fuel to do so. If there are not enough resources available to serve load, there could be a failure to meet customer demand for electricity.

Q: How does KCP&L determine the best inventory level, *i.e.*, the level that balances the cost of holding fuel against the expected cost of running out?

A: KCP&L uses the Electric Power Research Institute's Utility Fuel Inventory Model ("UFIM") to identify those inventory levels with the lowest expected total cost. In other words, we minimize the sum of inventory holding costs and the expected cost of running out of fuel.

Q: How does UFIM work?

A: UFIM uses a Markov decision model to iterate through various order policies to determine the optimal ordering policy. It identifies an inventory target as a concise way to express the following fuel ordering policy:

Current Month Order =(Inventory Target – Current Inventory)
+ Expected Burn this Month
+ Expected Supply Shortfall

UFIM's target assumes all fuel on hand is available to meet expected burn. "Basemat" is added to the available target developed with UFIM to determine KCP&L's inventory target. Generally, and in the rest of my testimony, references to inventory targets mean the sum of fuel readily available to meet burn plus basemat.

Q: What is basemat?

A: Basemat is the quantity of coal occupying the bottom 18 inches of our coal stockpile footprint. It may or may not be useable due to contamination from water, soil, clay, or fill material on which the coal is placed. Because of this uncertainty about the quality of the coal, basemat is not considered readily available. However, because it is dynamic and it can be burned (although with difficulty), it is not written off or considered a sunk cost. To determine basemat under our compacted stockpiles, we only consider the area of a pile that is thicker than nine (9) inches. The basemat values presented here for coal inventory locations are premised on work performed by MIKON Corporation, a consulting engineering firm that specializes in coal stockpile inventories and related services for utilities nationwide.

Q: How does the UFIM model work?

A: The fundamental purpose of UFIM is to develop least-cost ordering policies, *i.e.*, targets, for fuel inventory. UFIM does this by dividing time into “normal” periods and “disruption” periods where a disruption is an event of limited duration with an uncertain occurrence. It develops inventory targets for normal times and disruption management policies. The inventory target that UFIM develops is that level of inventory that balances the cost of holding inventory with the cost of running out of fuel.

Q: What are the primary inputs to UFIM?

A: The key inputs are: holding costs, fuel supply cost curves, costs of running out of fuel, fuel requirement distributions, “normal” supply uncertainty distributions, and disruption characteristics.

Q: What are the holding costs you used to develop coal inventory levels for this case?

A: KCP&L based the holding costs it used to develop fuel inventory levels for this case on the cost of capital as of May 31, 2017.

Q: What do you mean by “fuel supply cost curves”?

A: A fuel supply cost curve recognizes that the delivered cost of fuel may vary depending on the quantity of fuel purchased in a given month. For example, our fuel supply cost curves for PRB coal recognize that when monthly purchases exceed normal levels, we may need to lease additional train sets. Those lease costs cause the marginal cost of fuel above normal levels to be slightly higher than the normal cost of fuel.

Q: What did you use for the normal cost of fuel?

A: The normal fuel prices underlying all the fuel supply cost curves were the average quarterly projected price forecasts for 2018.

Q: What did you use for the costs of running out of fuel?

A: There are several components to the cost of running out of fuel. The first cost is the opportunity cost of forgone power sales. We developed that cost by constructing a price duration curve derived from the distribution of off-system transactions that exceeded coincident load and other commitments for January 2015 through December 2017. We supplemented those points with estimates for purchasing additional energy and using oil-fired generation. The last point on the price duration curve is the socio-economic cost of failing to meet load for which we used KCP&L's assumed cost for unserved load. These price duration curves are referred to in UFIM as burn reduction cost curves. Burn reduction cost curves can vary by inventory, location, and disruption.

Q: What fuel requirement distributions did you use?

A: For all units, we used distributions based on projected fuel requirements.

Q: What do you mean by "normal" supply uncertainty?

A: We normally experience random variations between fuel burned and fuel received in any given month. These supply shortfalls or overages are assumed to be independent from period to period and are not expected to significantly affect inventory policy. To determine these normal variations, we developed probability distributions of receipt uncertainty based on the difference between historical burn and receipts.

Q: What are disruptions?

A: A disruption is any change in circumstances that persists for a finite duration and significantly affects inventory policy. A supply disruption might entail a complete cut-off of fuel deliveries, a reduction in deliveries, or an increase in the variability of receipts. A demand disruption might consist of an increase in expected burn or an increase in the variability of burn. Other disruptions might involve temporary increases in the cost of fuel or the cost of replacement power. Different disruptions have different probabilities of occurring and different expected durations.

Q: What disruptions did KCP&L use in developing its inventory targets?

A: KCP&L recognized three types of disruptions in development of its inventory targets:

- Railroad or mine capacity constraints;
- Fuel yard failures; and
- Major floods.

Q: Please explain what you mean by disruptions related to railroad or mine capacity constraints.

A: Supply capacity is the ultimate quantity of coal that can be produced, loaded, and shipped out of the PRB in a given time period. Constraints to supply capacity can come from either the railroads or the mines, but regardless of which of these is the constraint source, the quantity of coal that can be delivered is restricted. A constrained supply caused by railroad capacity constraints can come from an inability of the railroad to ship a greater volume of coal from the PRB. A scenario such as this can arise from not having enough slack capacity to place more trains in-service. It can also come from an infrastructure failure such as the May 2005 derailments on the joint line in the PRB. Beginning in the winter of 2013-2014 there was a serious decline in rail service across the U.S. rail network, in particular the upper Midwest region. That degradation in service which persisted into fall 2014 is another example of a disruption that we refer to as a railroad or mine capacity constraint.

A variety of mine issues can constrain supply, such as there not being enough available load-outs, not enough space to stage empty trains, reaching the productive limits of equipment such as shovels, draglines, conveyors, and trucks, or the mine reaching the production limits specified in its environmental quality permits. We lump the mine and railroad capacity constraints together because they can occur simultaneously and one may mask the other.

Q: Please explain what you mean by disruptions related to fuel yard failures.

A: KCP&L and other utilities have experienced major failures in the equipment used to receive fuel. As used here, "disruption" is designed to cover the variety of circumstances that could result in a significant constraint on a plant's ability to receive fuel. For example, in 1986 KCP&L's Hawthorn station lost an unloading conveyor in a fire caused by the combustion of coal dust. That outage materially limited fuel deliveries for four months.

Q: Please explain what you mean by "major flood" disruptions.

A: Since 1993, the Missouri River has had two major floods. This disruption was modeled after those floods. Floods can lengthen railroad cycle times as the railroads reroute trains and curtail the deliveries of coal to generating stations.

Q: What are the coal inventory targets used in this case?

A: The coal inventory targets resulting from application of UFIM and their associated value for incorporation into rate base are shown in the attached Exhibit JLT-1 **(Confidential)** and are the values used to determine adjustment RB-74, "Adjust Fossil Fuel Inventories to required levels" included in Exhibit RAK-2 of the Direct Testimony of KCP&L witness Ronald A. Klote. Since these coal inventory targets are a function of fuel prices, cost of capital and other factors that may be adjusted in the course of this proceeding, we would expect to adjust the coal inventory targets as necessary.

Q: How are the Company's costs affected by coal inventory levels?

A: There are two major costs affected by coal inventory levels. Those are the cost of holding fuel and the cost of running out of fuel. Generally, the cost of holding fuel is much lower than the cost of running out of fuel.

Q: How would the cost of running out of fuel affect the Company's costs?

A: There are several components to the cost of running out of fuel. Typically, the first cost encountered when inventory levels are low is the opportunity cost of forgone margins when a unit cannot be dispatched in the market. Then there is the increased cost of purchased power due to higher cost units being dispatched in the market as generation is shifted from the unit with low inventory levels; thus effectively moving fuel by wire to offset our low inventory levels. Finally, although not expected under any reasonably foreseeable scenario, would be the cost of running out of fuel and the socio-economic cost of failing to meet load.

Q: How does the cost of holding inventory compare to the cost of running out of fuel?

A: Holding costs, which are essentially the cost of capital required to finance the investment, are linear. On the other hand, the expected costs of running out of fuel are best represented by an asymptotic curve. In other words, the relatively minor cost of having too much inventory can be insignificant compared to the cost of running out of fuel. Exhibit JLT-2 graphically illustrates the costs associated with maintaining inventory. It shows the cost of holding inventory and the expected cost of running out of inventory for various levels of inventory. The target levels recommended by the Company in this case are those levels (plus basemat) that represent the lowest points on the curve for the sum of holding cost and expected shortage cost. That is, the target level is the point at which the total cost is lowest. The key takeaway from Exhibit JLT-2 is how the inventory related costs are not symmetric around the low-cost point. The cost of having too little inventory is much greater than having too much inventory.

Q: Given the impact of fuel prices on inventory, would it be appropriate to update coal inventory levels included in rate base?

A: Yes. It would be appropriate to update the coal inventory levels for changes in fuel prices and cost of capital. A change in either the delivered cost of coal or cost of capital may result in different coal inventory levels. For example, higher fuel prices would result in lower inventory levels with all other assumptions remaining constant. A lower cost of capital would result in higher inventory levels with all other assumptions remaining constant.

IV. INVENTORY VALUES

Q: How did you forecast the coal prices?

A: The June 2018 delivered prices of PRB coal were forecast as the sum of the mine price and the transportation rate, inclusive of diesel fuel surcharge. Most of the coal contracts under which KCP&L expects to purchase PRB coal in 2018 specify a fixed mine price that is only subject to adjustment for quality or government imposition such as changes in laws, regulations, or taxes. Those contracts that are not fixed either specify a base price and allow for some form of inflation adjustment or are tied to a market index.

Q: How did you develop projections of the freight rates for moving PRB coal?

A: We developed the freight rate projections based on the contractually defined escalation mechanisms. Where those contracts called for an index, we constructed the forecasted index from data forecast by Moody's Analytics. We expect to update coal prices and freight rates during the course of this proceeding.

Q: How were the inventory values for ammonia, lime, limestone, PAC, and RESPond® determined?

A: Inventory values for ammonia, lime, limestone, and PAC were calculated as the average month-end quantity on hand for the 12-month period from December 1, 2016 through November 30, 2017 multiplied by the projected June 2018 per unit value. The RESPond® product is handled differently than ammonia, lime, limestone, and PAC. RESPond® tends to be delivered to the plant on more of an "as needed" basis and thus sizeable inventories are not kept onsite. The onsite Montrose tank can only hold approximately 2 truckloads (roughly 8,700 gallons) of RESPond®. One truckload of RESPond® is ordered at a time (approximately 4,300 gallons). Once the tank levels get down to less than half its capacity, the station will order in another truckload. The inventory quantity for RESPond® was calculated by taking the average volume per delivery for the 12-month period from December 1, 2016 through November 30, 2017 and dividing by 2. This volume was then multiplied by the projected June 2018 per unit value. The inventory values for ammonia, lime, limestone, PAC, and RESPond® are shown in Exhibit JLT-1 **(Confidential)**.

Q: How were the inventory values for oil determined?

A: Inventory values for oil were calculated as the average month-end quantity on hand for the 12-month period from December 1, 2016 through November 30, 2017 multiplied by the

June 2018 per unit value, except for Wolf Creek and Northeast generating station in which the September 2017 month end inventory prices per unit were used. The inventory values for oil are shown in Exhibit JLT-1 **(Confidential)**.

Q: Does that conclude your testimony?

A: Yes, it does.

BEFORE THE CORPORATION COMMISSION
OF THE STATE OF KANSAS

In the Matter of the Application of Kansas City Power & Light Company to Make Certain Changes in Its Charge for Electric Service	))))	**Docket No. 18-KCPE-____-RTS**

AFFIDAVIT OF JESSICA L. TUCKER

STATE OF MISSOURI)
) ss
COUNTY OF JACKSON)

Jessica L. Tucker, being first duly sworn on his oath, states:

1. My name is Jessica L. Tucker. I work in Kansas City, Missouri, and I am employed by Kansas City Power & Light Company as Senior Manager, Fuels and Emissions.

2. Attached hereto and made a part hereof for all purposes is my Direct Testimony on behalf of Kansas City Power & Light Company consisting of sixteen (16) pages, having been prepared in written form for introduction into evidence in the above-captioned docket.

3. I have knowledge of the matters set forth therein. I hereby swear and affirm that my answers contained in the attached testimony to the questions therein propounded, including any attachments thereto, are true and accurate to the best of my knowledge, information and belief.

Jessica L. Tucker

Subscribed and sworn before me this 1st day of May 2018.

Notary Public

My commission expires: 4/26/2021

ANTHONY R WESTENKIRCHNER
Notary Public, Notary Seal
State of Missouri
Platte County
Commission # 17279952
My Commission Expires April 26, 2021

EXHIBIT JLT-1

THIS DOCUMENT CONTAINS CONFIDENTIAL INFORMATION NOT AVAILABLE TO THE PUBLIC ORIGINAL FILED UNDER SEAL

Illustration of Inventory Costs

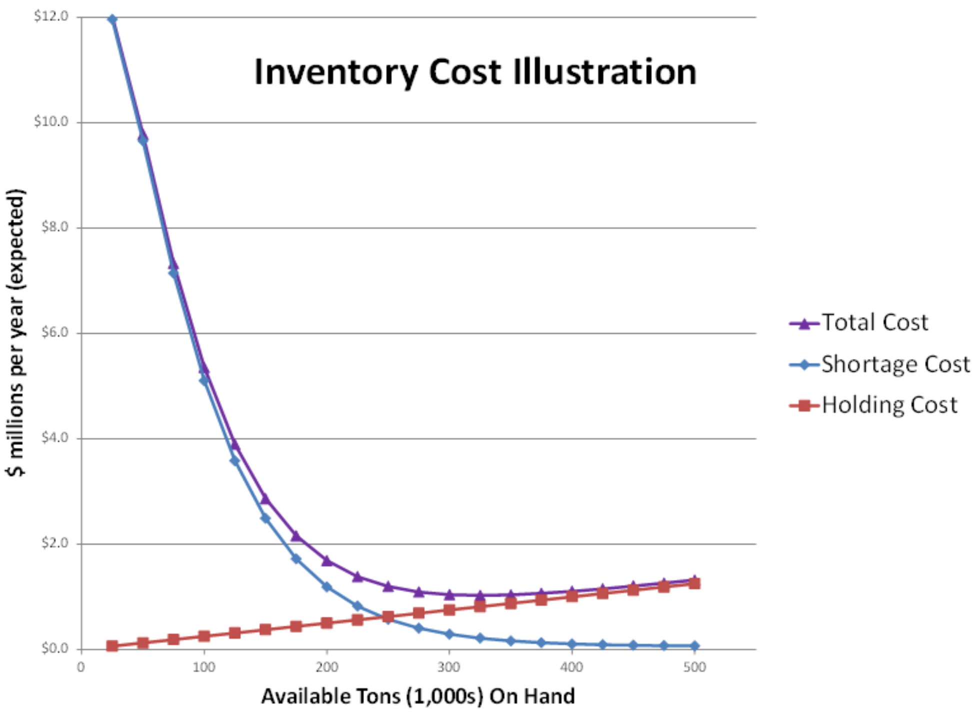

Exhibit JLT-2
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