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2017

Analysis of Market Impact for Proposed EmberClear Generation Facility in Pawnee Illinois

AN ANALYSIS FOR THE GREATER SPRINGFIELD CHAMBER OF COMMERCE CONCERNING THE POTENTIAL IMPACT ON WHOLESALE ELECTRICITY PRICES IN CENTRAL ILLINOIS RESULTING FROM THE OPERATION OF A NEW ELECTRTIC GENERATION ASSET IN PAWNEE ILLINOIS

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Table of Contents

List of Figures

Disclaimer: The analyses contained in this document are based upon publicly available data and information. As such, the conclusions conveyed in this document are subject to change if different, new, or revised data concerning the operation of the Midcontinent ISO market, City Water Light and Power, or EmberClear become available.

EXECUTIVE SUMMARY

The EmberClear Corporation proposes to construct and operate the Lincoln Land Energy Center in Pawnee Illinois which is located approximately 15 miles from Springfield. The project proposal contemplates the development and operation of a 1,100 MW power plant with a capital budget exceeding $1 billion in Pawnee Illinois. The Greater Springfield Chamber of Commerce supports investment and job creation within the Springfield region, and the Lincoln Land project has the potential to attract long-term development to the region. However, the introduction of the Lincoln Land project may reduce the price for electricity in the region – a potential concern for the Springfield municipal utility City Water Light and Power ('CWLP'). To determine whether the Lincoln Land project would be harmful to the financial stability of CWLP's generating portfolio, The Power Bureau was retained to answer the following questions:

- What impact will the Lincoln Land project have on wholesale electricity supply prices in the region?
- What net impact will those changes when factored for CWLP's wholesale electricity operations?

To answer these questions, The Power Bureau conducted a series of detailed simulations of the wholesale electricity market in the Springfield region for the benchmark year of 2022 (the anticipated first full year of operation for the Lincoln Land project). The simulations factored market operations both with and without the operation of the Lincoln Land project. Analyses of the simulation results yielded estimates of changes in wholesale electricity prices resulting from the introduction of the Lincoln Land generating resource. The findings of the analyses are:

- **Minor Impact on Regional Wholesale Power Prices.** On an annualized basis, the introduction of the Lincoln Land generation resource is projected to suppress regional wholesale electricity prices by an average of only 0.15%. Wholesale price impacts attributed to the Lincoln Land generating resource for the 2022 baseline year ranged from a reduction of as much as 0.56% to an increase of up to 0.15%.

- **Minor Financial Impact on City Water Light & Power Generating Portfolio.** Based on the market simulations for the year 2022, we project the following financial impacts on CWLP:

  - **Limited Impact on CWLP Wholesale Electricity Sales Revenue.** The prices at which CWLP could sell electricity into the wholesale market are projected to be marginally lower resulting from the introduction of the Lincoln Land Energy Center. We estimate this potential annual revenue loss to CWLP to be approximately $182,000 in the 2022 period.

  - **Limited Impact on CWLP Wholesale Electricity Purchase Prices.** The prices at which CWLP can purchase electricity generation are projected to fall in response to the price suppression effect caused by the introduction of the Lincoln Land Energy Center. We estimate that CWLP will realize between $12,000 and $17,000 in lower electricity purchasing costs during the 2022 period.

  - **Total Impact.** We project that the operation of the Lincoln Land Energy Center to have a total net negative annual impact of between $165,000 and $170,000 (referencing 2022 as a baseline).

- **CWLP appears to be operating its generation resources in an uneconomical manner.** According to CWLP's own financial reporting, the Full Cost of Generation for CWLP's generation resource portfolio (the sum of Fuel, Operation O&M, and Debt) was $76.98/MWh in 2016. Based on estimates informed by data received from the U.S. Department of Energy, it appears that CWLP elected to operate its generation in 2016 when market prices for electricity were as low as $24.00/MWh and an average of

$33.71/MWh. This resulted in CWLP generating electricity at a cost that was $50.22/MWh above the available wholesale market price for electricity. It appears that CWLP passed these Above-Market generation costs on to its Native Load Customers (retail electricity customers of CWLP). Estimates of the annual cost impact for Native Load Customers due to CWLP's Above-Market generation costs are conveyed in Figure 1 below.

Figure 1: Levelized Allocation of Above-Market Generation Costs to CWLP Native Load Customers (2016)

Cost Elements		Residential	Commercial	Industrial	State of Illinois	Security Lights	Total / Average
Number of Customers	A	60,488	8,569	0	3	3,044	72,104
Average Annual Consumption (MWh)	B	612,518	952,186	0	79,459	4,877	1,649,039
Average Consumption per Customer (MWh)	C = B / A	10.1	111.1	0.0	26,486.4	1.6	22.9
Above-Market Cost for CWLP ($)	D	$82,817,116					
Above-Market Cost for CWLP ($/MWh)	E = D / B	$50.22					
Above-Market Cost per Rate Class	F = B * E	**$30,761,508**	**$47,820,127**	**$0**	**$3,990,555**	**$244,926**	**$82,817,116**
Above-Market Cost per Average Customer	G = C * E	**$509**	**$5,581**	**$0**	**$1,330,185**	**$80**	**$1,149**

- **In the context of CWLP's existing Above-Market cost of generation, the price suppression effects of the Lincoln Land Energy Center are negligible.** We note that the approximately $170,000 in net total annual price suppression effect on CWLP's financial operations due to the Lincoln Land Energy Center is approximately 0.20% of the $82.8 million in Above-Market cost of generation CWLP incurred in 2016.

BACKGROUND

The Greater Springfield Chamber of Commerce (‘Chamber’) commissioned The Power Bureau to evaluate the impact on regional wholesale power prices resulting from the introduction of a proposed natural gas fired combined cycle power plant in Pawnee Illinois. The focus of the study was to establish whether the addition of new power supply from the proposed power plant would depress regional wholesale prices, and thereby negatively impact the financial position of existing power generation resources that are owned and operated by the local municipal utility City Water Light and Power (‘CWLP’).

EXISTING LOCAL POWER GENERATION PORTFOLIO. CWLP is part of the municipal government of the City of Springfield, Illinois, and reports to the Mayor’s Office and the Springfield City Council. CWLP’s primary operations orient around delivering electricity and water services. The Electricity Division of CWLP is comprised of the Electric Generating Department and the Electric Transmission, Distribution and operations Department. The Electric Generating Department oversees the operation of the primary generating resources shown in Figure 2 below:

Figure 2: CWLP Primary Generating Resources Portfolio

Unit Name	Plant Type	Nameplate Generating Capacity (MW)	Summer Generating Capacity (MW)	Winter Generating Capacity (MW)
Dallman Unit 1	Baseload	90.2	73.0	73.0
Dallman Unit 2	Baseload	90.2	65.0	65.0
Dallman Unit 3	Baseload	207.3	188.0	188.0
Dallman Unit 4	Baseload	230.1	208.0	208.0
Reynolds	Peaking	17.5	14.0	19.0
Factory	Peaking	25.5	Unknown	Unknown
Interstate	Peaking	134	Unknown	Unknown

[A] Source: 2015 Form EIA-860, Illinois Environmental Protection Agency, Air Pollution Control - Permit Record

CWLP meets the electricity supply needs of its native load (customers taking retail electricity service from CWLP) by generating electricity with its own generating resources, and purchasing electricity from the regional wholesale market (Midcontinent Independent System Operator, or ‘MISO’) and possibly bilateral parties. CWLP may also sell electricity from its generation resources to the MISO market and bilateral parties. This combination of options (generation, buying and selling) allows CWLP the option to secure least-cost electricity supply for its native load customers.

CWLP has utilized the services of The Energy Authority (‘TEA’) to manage sales of electricity from CWLP generation resources (for use in supporting native load requirements or for sales to counterparties) and electricity purchases from MISO. TEA is a utility services and consulting firm that provides municipal power marketing and risk management services to over 50 public power authorities in the U.S. Figure 3 conveys the volumes of electricity generation (Column A) and wholesale electricity purchases (Column B) CWLP has utilized to meet the electricity supply needs of its native load customers (Column D) for the years 2012 to 2016. As can be noted, CWLP annual electricity generation (Column A) is typically greater than annual electricity supply requirements of its native load customers (Column D).

Figure 3: Historical Annual Supply Sources & Uses for CWLP

Year	Supply Sources (MWh)			Supply Sales (MWh)		
	Net Generated Electricity	Wholesale Electricity Purchases	Total Electricity Supply	Electricity Sales to Native Load	Wholesale Electricity Sales	Total Electricity Sales
	A	B	C = A + B	D	E	F = D + E
2012	2,108,077	630,072	2,738,149	1,738,880	999,269	2,738,149
2013	2,023,103	548,664	2,571,767	1,725,328	846,439	2,571,767
2014	2,548,675	456,102	3,004,777	1,735,828	1,268,949	3,004,777
2015	2,205,312	614,871	2,820,183	1,693,051	1,127,132	2,820,183
2016	1,765,383	878,106	2,643,489	1,649,039	994,450	2,643,489

Source: Continuing Disclosure Statement, City of Springfield, Illinois – Electric Light and Power Fund for Fiscal Year Ended February 29, 2016.

Figure 4 below conveys the average prices at which CWLP purchased and sold electricity between 2012 and 2016. In 2016, CWLP purchased 87,106 MW of wholesale electricity supply at an average rate of \$29.85/MWh. During that same period, CWLP sold 994,450 MWh of wholesale electricity at an average rate of \$20.54/MWh.

Figure 4: Historical Wholesale Electricity Transaction Results for CWLP

Year	Wholesale Electricity Purchases			Wholesale Electricity Sales		
	Annual Electricity Purchases (MWh)	Annual Expenditures	Average Price for Electricity Purchases (\$/MWh)	Annual Electricity Sales (MWh)	Annual Revenues	Average Unit Price for Electricity Sales (\$/MWh)
	A	B	C = B / A	D	E	F = E / D
2012	630,072	\$19,895,000	\$31.58	999,269	\$17,330,000	\$17.34
2013	548,664	\$20,545,000	\$37.45	846,439	\$15,148,000	\$17.90
2014	456,102	\$21,361,000	\$46.83	1,268,949	\$34,248,000	\$26.99
2015	614,871	\$23,474,000	\$38.18	1,127,132	\$22,974,000	\$20.38
2016	878,106	\$26,211,000	\$29.85	994,450	\$20,405,000	\$20.52

Source: Continuing Disclosure Statement, City of Springfield, Illinois – Electric Light and Power Fund for Fiscal Year Ended February 29, 2016.

The average wholesale electricity purchases and sales noted in Figure 3 include the electricity volumes and costs associated with existing wind supply contracts between CWLP and NextEra Energy Resources, LLC. Under these contracts, CWLP purchases electricity produced at the Hancock County Wind Farm (20 MW purchased) and Crystal Lake Wind Farm (100 MW purchased) both of which are located in Iowa.[1] The electricity secured through these contracts is not directly consumed by CWLP's native load customers. Instead, the electricity purchased through the wind contracts is immediately sold back to the MISO wholesale electricity market. Under this arrangement, CWLP purchases electricity from the wind farms at according to a fixed price schedule, and then sells the electricity at the prevailing wholesale market rate. Through this buying and selling process, CWLP incurs either a gain (i.e. selling price exceeds buying

[1] https://www.cwlp.com/Departments/ElectricDeptHome/ElectricInformation/Generation.aspx

price) or a loss (i.e. buying price exceed selling price), and these gains or losses are passed through to CWLP's native load customers.

To illustrate the impact of the wind contracts on CWLP's supply arrangements, we have applied estimated costs, revenues and volumes for the wind supply contracts in Figure 5 for the 2013 period based on press accounts. As noted, during 2013 CWLP purchased electricity from its contracted wind resources at a price of $52.42/MWh, and sold that electricity at $12.25/MWh for an estimated loss of approximately $14 million. Based on the calculated residual values, we note that CWLP sold non-wind electricity supply for a price for $29.54/MWh and purchase non-wind supply at a price of $11.64/MWh. In this case, the net of CWLP's non-wind sales and purchases served to offset approximately $9 million of the losses incurred through the wind contracts.

Figure 5: CWLP Wholesale Electricity Sales and Purchases (2013)

Wholesale Electricity Transactions	Calculation	Electricity (MWh)	Annual Cost	Unit Price ($/MWh)
Total Electricity Purchases	**A**	**548,664**	**$20,545,000**	**$37.45**
Wind Contract Purchases [A]	B	347,196	$18,200,000	$52.42
Wholesale Market Purchases	C = A - B	201,468	$2,345,000	$11.64
Total Electricity Sales	**D**	**846,439**	**$15,148,000**	**$17.90**
Wind Contract Sales [A]	E	347,196	$4,253,148	$12.25
Wholesale Market Sales	F = D - E	499,243	$10,894,852	$29.54
Net Electricity Sales	**G = D - A**	**297,775**	**-$5,397,000**	**-$18.12**

[A] Source: "Gloomy days for CWLP, Utility faces financial storm," Illinois Times, Patrick Yeagle, Nov. 6, 2014

As a buyer and seller of wholesale electricity CWLP is exposed to market price risk. When market prices fall CWLP, realizes lower costs for electricity purchases but also receives lower revenues for electricity sales. Conversely, when market prices rise, CWLP faces higher costs for electricity purchases but also realizes higher revenues for electricity sales. Therefore, our analysis seeks to estimate the net of these impacts that CWLP may experience with the introduction of the Lincoln Land project.

PROPOSED POWER PLANT. EmberClear Corporation ('EmberClear') proposes to construct and operate the Lincoln Land Energy Center ('Lincoln Land') in Pawnee Illinois which is located approximately 15 miles from Springfield. The Lincoln Land project proposal contemplates the development and operation of a 1,100 MW power plant that would project would occupy an 80-acre site in Pawnee Illinois, and be operational as early as the summer of 2021 pending zoning, financing, and various state and federal regulatory approvals.[2]

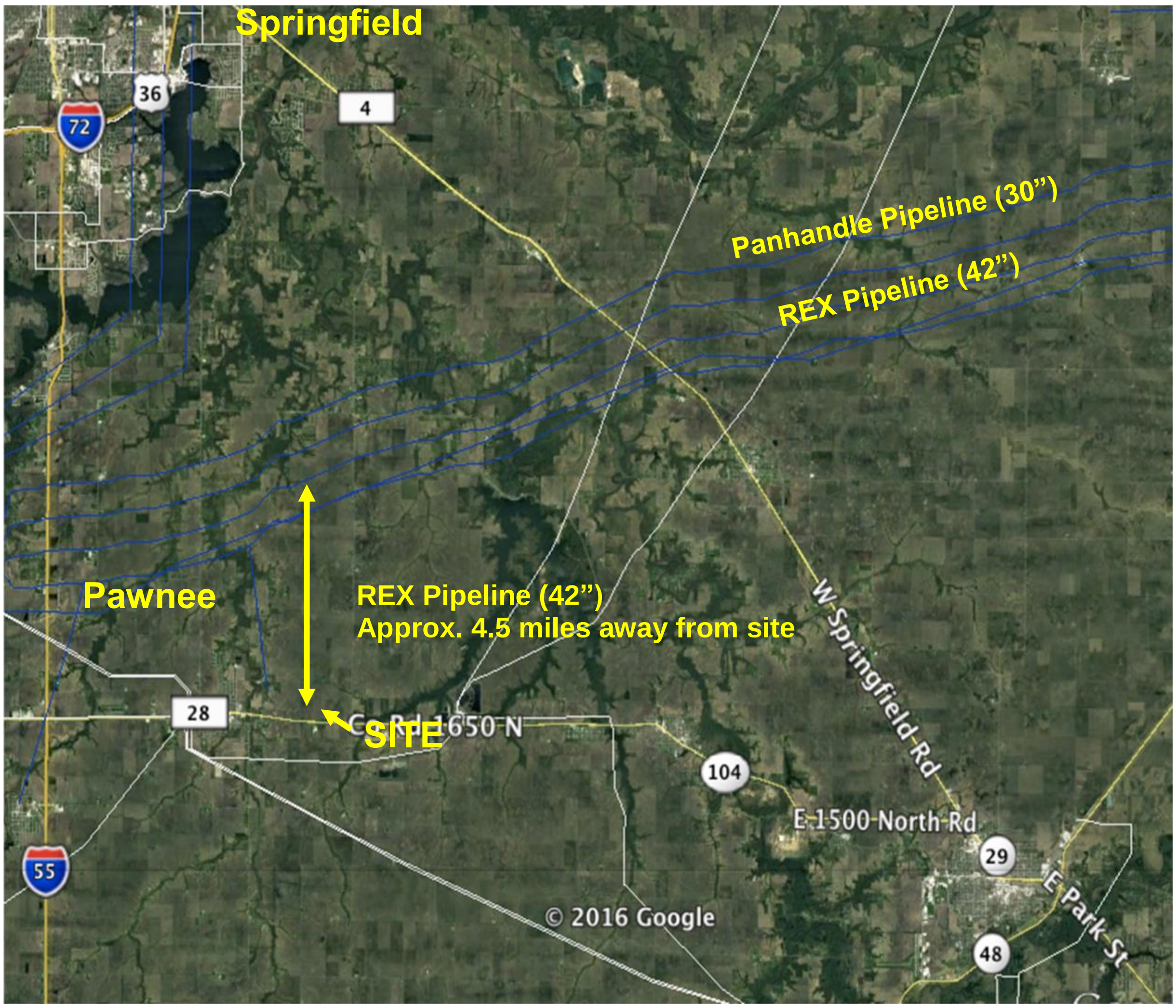
EmberClear is a privately held company, and is owned by Ember Partners L.P. EmberClear is an energy development company that engages in the development of power, chemical, and liquid fuels projects in the United States and Europe. It is currently developing two 337-megawatt natural gas combined cycle power plants at Good Spring, Pennsylvania. The company is also developing natural gas to liquids facility

[2] Source: EmberClear Corporation

on approximately 800 acres in Adams County, Mississippi, as well as developing natural gas to liquids facility in the Mid Atlantic. The company is based in Calgary, Canada.[3]

Lincoln Land would utilize natural gas for fuel by accessing either the Panhandle or REX interstate natural gas pipelines that are located to the north of the proposed site for the power plant. Electricity generated from the power plant would be delivered to the regional power grid through an adjacent substation. Figures 6 conveys the general location of the Lincoln Land development and the primary natural gas assets that would support its operation.

Figure 6: Proposed Lincoln Land Energy Center Location



Currently, plans for the Lincoln Land powerhouse include two advanced class gas turbine generators with associated heat recovery steam generator and steam turbine generator. The nameplate generation capacity for the plant will be 1,100 MW with a net maximum output of between 1,046 MW and 1,100 MW (with duct firing), and have a heat rate of approximately 6,300 btu/kWh of generation. An engineering

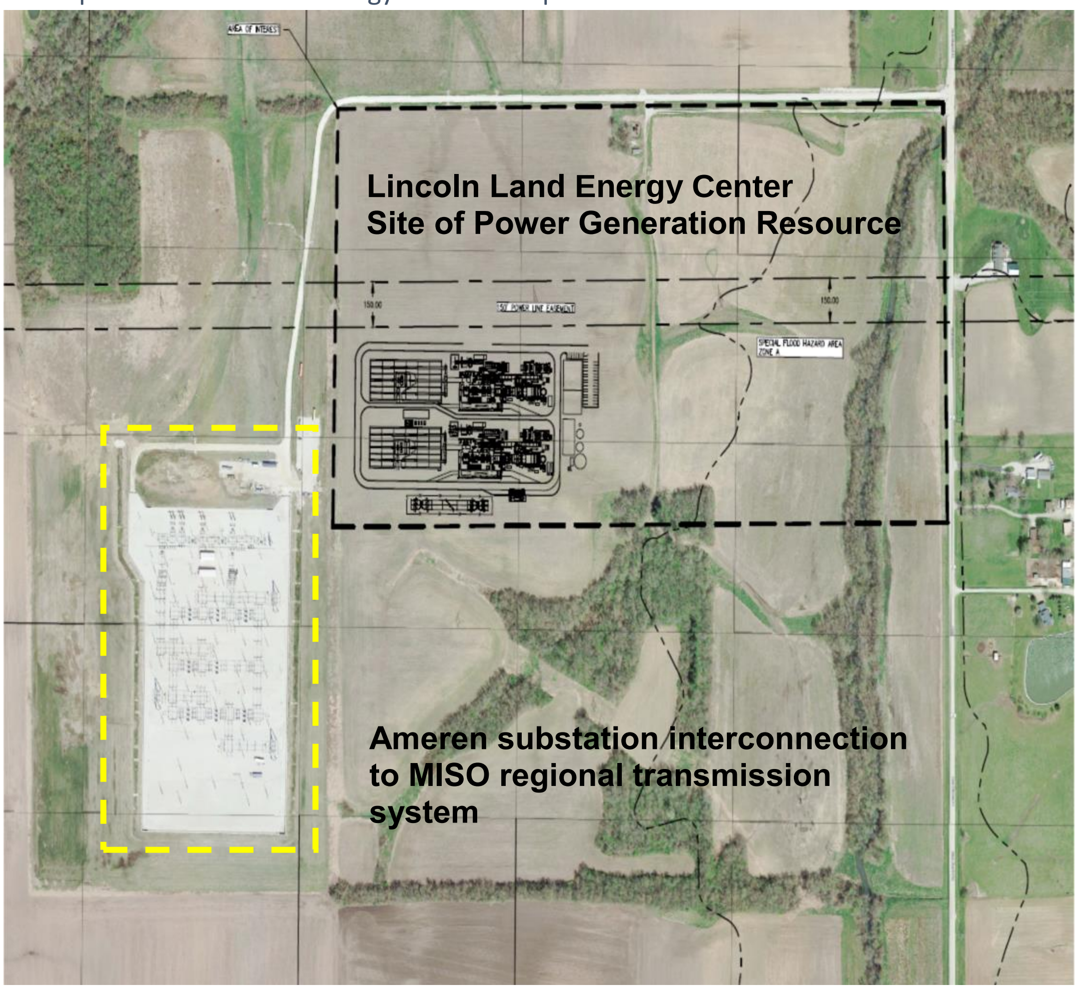
[3] Ibid

study assessing the technical issues related to the interconnecting the plant to the MISO regional transmission system (a necessary step in the development of new power generation assets within the region) has been completed by an outside engineering firm.

The estimated cost of constructing Lincoln Land is approximately $1 billion. Construction of the power plant would take an estimated 2.5 years. Between 500 and 800 construction jobs would be supported during the construction phase of the project, while full operations at the plant will support approximately 40 permanent jobs with average annual wages of between $80,0 00 and $90,000.[4]

Figures 7 conveys the general layout of the Lincoln Land development and the adjacent Ameren substation through which Lincoln Land would connect to the MISO regional transmission system.

Figure 7: Proposed Lincoln Land Energy Center Footprint in Pawnee



RESEARCH QUESTIONS. The Chamber supports investment and job creation within the Springfield region. To that end, the Chamber believes that the Lincoln Land project has the potential to attract long-term development to the region. Because CWLP is exposed to wholesale electricity market price risk, the Chamber seeks to answer the following questions:

[4] Source: various media reports including State Journal Register

- What impact will the Lincoln Land project have on wholesale electricity supply prices in the region?
- What net impact will those changes when factored for CWLP's wholesale electricity operations?

To answer these questions, The Power Bureau conducted a simulation of the MISO wholesale electricity market to project wholesale prices for electricity under a range of defined assumptions that included the operation of the Lincoln Land power plant. The remainder of this paper document the approach used to conduct these simulations, and the analysis of those simulation results.

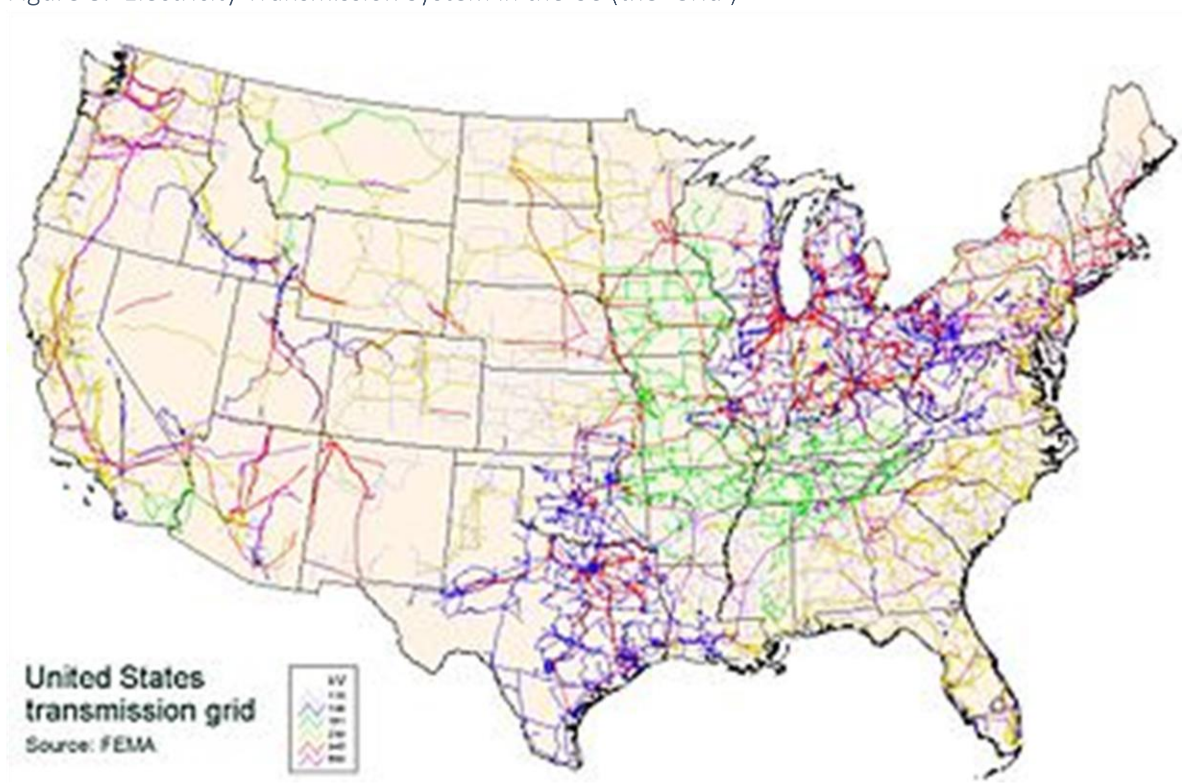
Electricity Markets.

The structure and operation of the regional wholesale electricity market determines the answers to the primary research questions addressed in this paper:

- What impact will the Lincoln Land project have on wholesale electricity supply prices in the region?
- What net impact will those changes when factored for CWLP's wholesale electricity operations?

REGIONAL SUPPLY, DEMAND, AND TRANSMISSION. In the US, electricity is largely generated by central power plants of varying capacity (maximum output), fuel sources, and operational characteristics (i.e., amount of time to cycle up and down). These central power plants are sometimes (but not always) located proximate to load centers where electricity demand is highest. A network of high voltage (230, 345, and 765 kv) electricity transmission lines are used to move electricity from remote central power plants to load centers. These transmission lines form what is referred to as the 'grid'. Figure 8 conveys how the US grid spans multiple states and jurisdictions.

Figure 8: Electricity Transmission System in the US (the 'Grid')

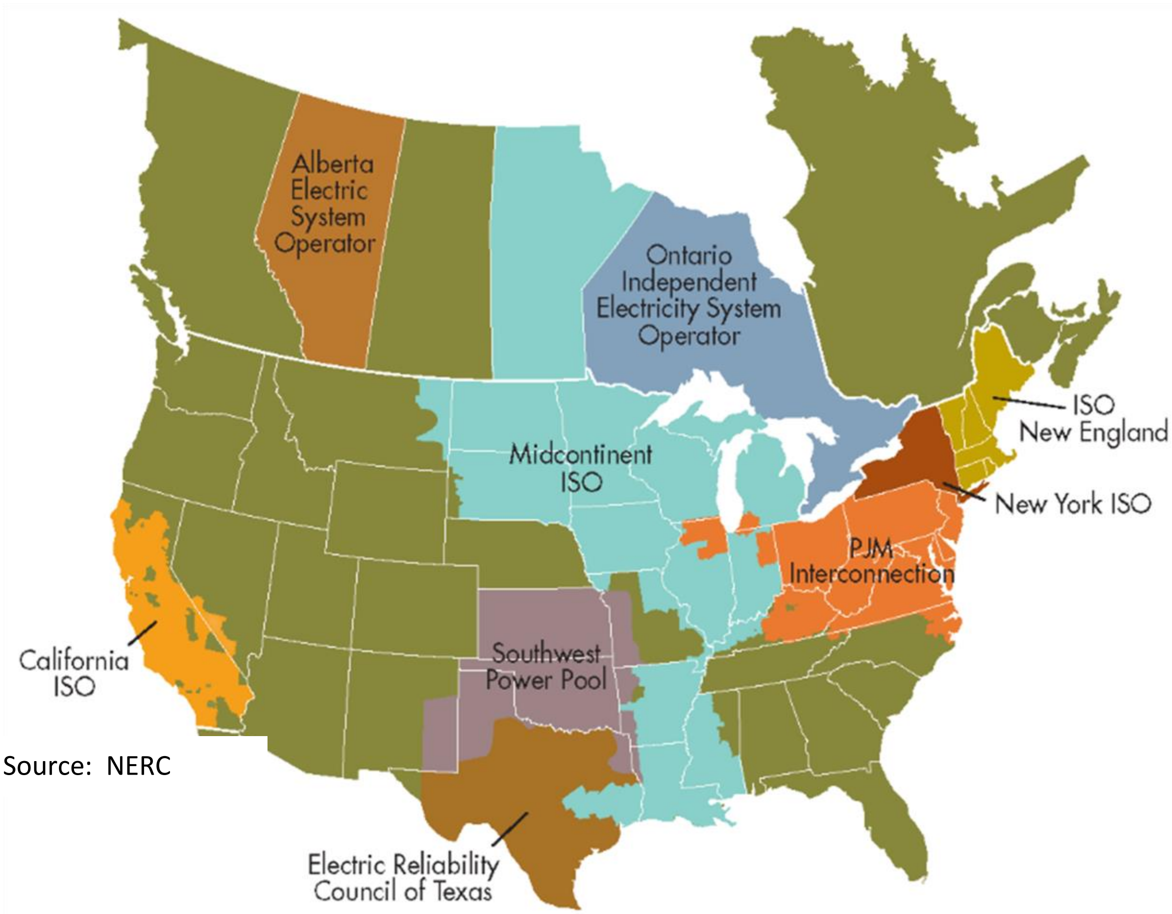


So long as these transmission lines have sufficient thermal capacity, new power generating resources can connect to transmission lines (usually at a substation) and inject electricity into the grid. Conversely, if there is sufficient capacity on a transmission line, a load serving entity (such as a utility) can connect to the transmission line and draw electricity from the grid.

ORGANIZED WHOLESALE MARKETS. In the 1990s, states and regions in the United States established competitive wholesale electricity markets by establishing independent transmission operators that were authorized to manage the use of electricity operations of power plants located within defined regions. These independent system operators (ISOs) and Regional Transmission Organizations (RTOs) operate under the authority of the Federal Energy Regulatory Commission (FERC).

The ISOs and RTOs perform eight key functions: design and administer the Energy Market Tariff, manage grid congestion, establish parallel path flows, provide ancillary services, support Open Access Same-Time Information System (OASIS) and Capability Calculations, monitor market operations, facilitate planning and expansion for the transmission network, and coordinate interregional power flows. Figure 9 below conveys the current market regions managed by ISOs and RTOs in the US and Canada.

Figure 9: ISO/RTO Market Regions in the US and Canada



Source: NERC

Illinois is split between the Midcontinent ISO (MISO) and the PJM Interconnection (PJM). Despite this split between PJM and MISO, there remains substantial electricity transmission flow between both the MISO and PJM controlled portions of the state as well as with all neighboring states. The Springfield metropolitan area is located within the MISO wholesale region.

MISO serves as the regional Balancing Authority and is responsible for balancing Supply and Demand on the electric transmission system throughout its territory in real time. This energy balance must consider the interchange of power between MISO and other neighboring RTOs. Within the MISO footprint there are sub-regions referred to as control areas which are also responsible for managing the balance between load, generation and interchange within their sub area.

ELECTRICITY PRICE DISCOVERY IN MISO. MISO operates a market for the buying and selling of wholesale electricity. The final price of energy for a given hour is referred to as the Locational Marginal Price (LMP). The MISO LMP is made up of three components: the Marginal Energy Component (MEC), the Marginal Congestion Component (MCC), and the Marginal Loss Component (MLC). MISO uses these three components when calculating the LMP to capture not only the marginal cost of energy but also the limitations of the transmission system.

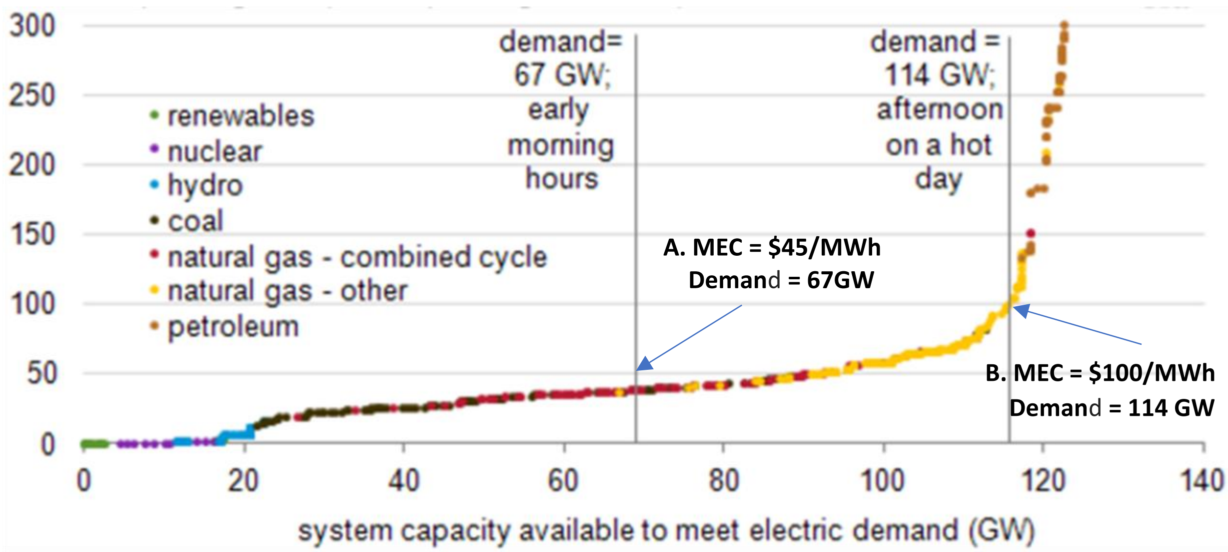
The Marginal Energy Component (MEC) is typically the largest portion of the LMP. As a condition of connecting to the MISO regional transmission system, generators must agree to dispatch the power plant according to the rules established by MISO. This arrangement allows the ISO/RTO to effectively balance electricity supply and demand throughout the entire region and zones within the region.

MISO rules aim to select a least cost combination to meet each hourly level of demand. To establish cost (and thereby the dispatch order), MISO receives two types of price offers from generators for each hour of the day for the Day-Ahead and Real-Time Energy markets as well as the Day-Ahead and Real-Time Operating Reserve Markets:

- **Market Offers.** An offer curve is an offer to sell a specific level of electricity generation from a resource at a defined price. A generator may offer a single price for all MW of their generation (a "Block "offer), or they may offer a schedule of paired sets of increasing volumes of electricity generation at increasing price levels (an "Energy Offer Curve"). MISO receives generators' offers and selects the combination of offers that yield the lowest cost for each hour's level of electricity demand. The price for each hour's electricity supply (the Locational Marginal Price – 'LMP') is set by the price offered by the marginal generation resource for each hour. If a generator's offer is accepted by MISO, then that generator must deliver the specified amount of electricity and will be paid the LMP price.
- **Self-Schedules.** Market Participants may submit Self-Schedules, which consist of a fixed quantity of Energy Regulating Reserve and Spinning Reserve or On-Line Supplemental Reserve per hour that may be dispatched from the Resource if it is on-line. The difference between a Self-Schedule and the Market Offer is that a Self-Scheduled generation asset cannot specify a price. Instead, a Self-Schedule generator must accept whatever LMP is set through the regular bidding process by Market Offers. Self-Schedules allow generators to keep resources that are not economical or practical to shut down or reduce output.

Through these schedules and processes, MISO can dispatch power plants to meet demand on a lowest cost basis. Figure 10 conveys a hypothetical dispatch order based on price bids from generators. As noted, generation resources with the lowest marginal costs (renewables, nuclear, hydro) are the first resources selected. The least-cost combination of coal, combined cycle natural gas, simple cycle natural gas, and petroleum generation resources are selected to meet the hourly demand. For instances, when demand is low (Point A) MEC prices are relatively low, but when demand increases then more expensive generation resources are brought online (Point B) resulting in a much higher hourly MEC price.

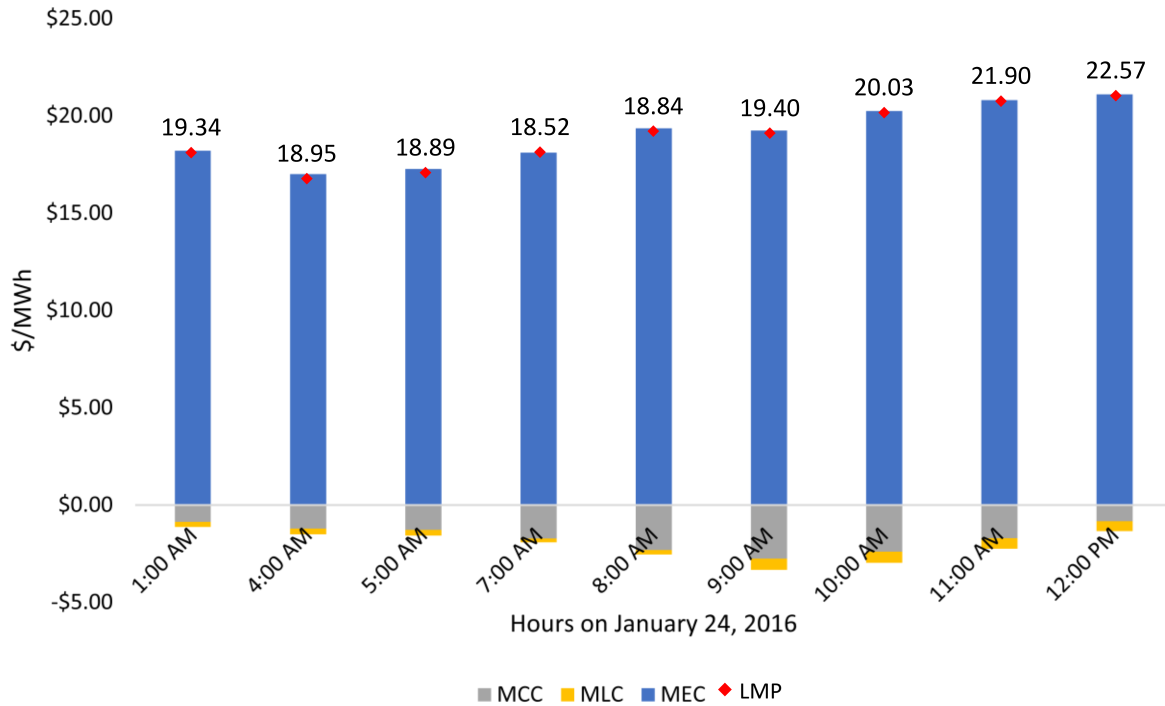
Figure 10: Electricity Dispatch Order Based on MEC Price Bids



Even though the MISO transmission system is robust, electricity generated at each power plant connected to the MISO transmission system cannot deliver electricity directly to every point in the transmission system where the electricity is needed. This is due to thermal and other physical limitations of transmission assets (i.e. transmission lines have a maximum carrying capacity). Without restrictions, the LMP across the MISO footprint would be the same. The existence of transmission losses and transmission line thermal limits result in adjustments to the cost of supplying the last incremental amount of energy. For any given hour, the MEC of the LMP is the same across the MISO footprint. However, the Marginal Loss Cost (MLC) and Marginal Congestion Cost (MCC) differ to create the variance in the hourly LMPs.

Figure 11 shows how MEC, MLC and MCC combined to set the final LMP at the point where CWLP connects to the MISO transmission system on the morning of January 24, 2016. It is important to note that MCC (Congestion) and MLC (Losses) can be either positive or negative values. In the time series presented in Figure 11, the values for MCC and MLC were negative, and therefore effectively lowered the LMP compensation for generation provided during those hours at the Dallman 4 interconnection.

Figure 11: Average day-ahead LMP for CWLP Dallman Interconnection on January 24, 2016



Congestion occurs when available, least-cost energy cannot be delivered to all load because transmission facilities are not adequate to deliver that energy to one or more areas, and higher cost units in the constrained area(s) must be dispatched to meet the load. The result of Congestion is that the price of energy in the constrained area(s) is higher than in the unconstrained area. Congestion is neither good nor bad, but is a direct measure of the extent to which there are multiple marginal generating units dispatched to serve load due to transmission constraints. Congestion costs can be alleviated by:

- Enhancing existing or constructing more transmission (to get around existing constraints);
- Operating new generation within the transmission-constricted zone; or,
- Reducing electricity demand within the transmission-constricted zone.

Marginal Congestion Charges (MCC) are volatile and change over time. Figure 12 conveys the annual average MCC for the interconnection points between CWLP's Dallman generation assets and the MISO transmission system. As noted above MCC can be either a positive or negative value.

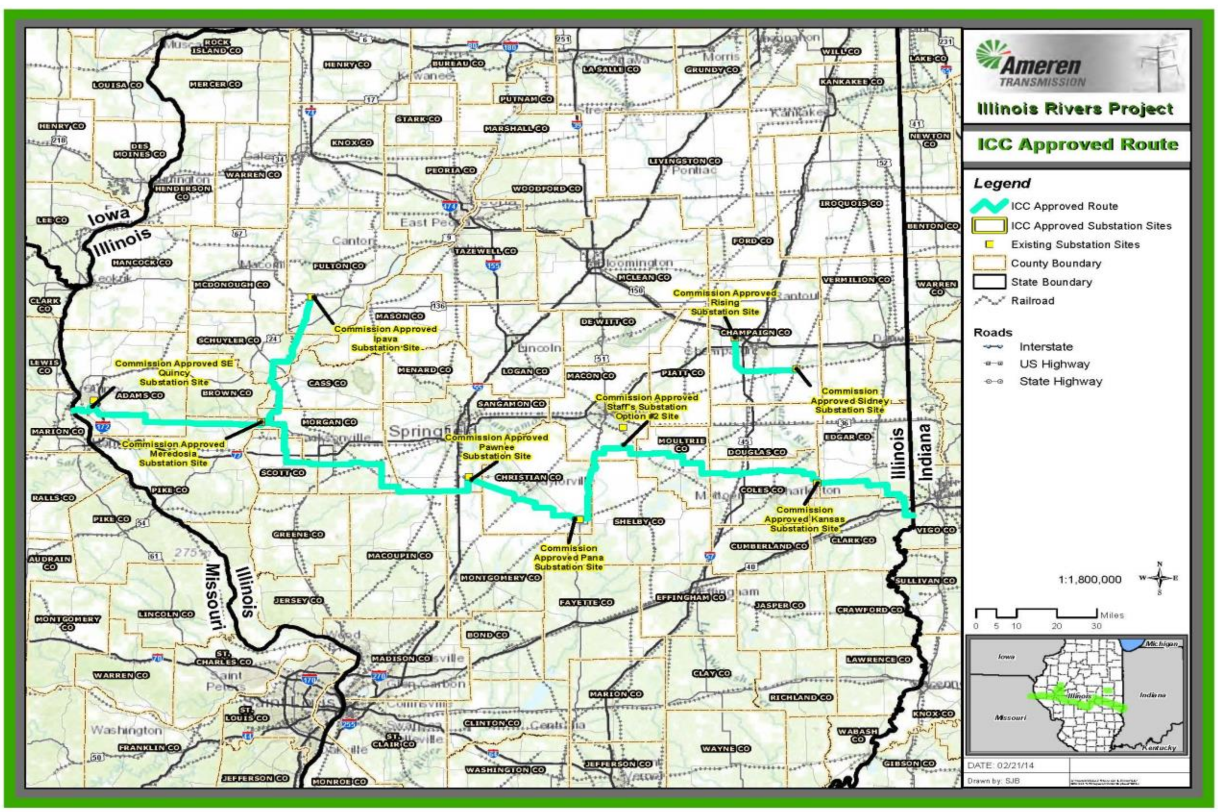
Figure 12: Annual Average Marginal Congestion Charges for CWLP Dallman Interconnections

Pricing Node	Type	Cost	Average Annual Marginal Congestion Charge ($/MWh)				
			2013	2014	2015	2016	4-Year Average
Dallman 1	Gennode	MCC	$0.30	-$0.24	$1.72	$1.87	$0.91
Dallman 2	Gennode	MCC	$0.30	-$0.24	$1.72	$1.87	$0.91
Dallman 3	Gennode	MCC	$0.32	-$0.23	$1.71	$1.83	$0.91
Dallman 4	Gennode	MCC	$0.32	-$0.30	$1.71	$1.83	$0.89

Source: MISO Day-Ahead LMP reports

MCC costs in central Illinois are expected to be reduced by between $0.98/MWh and $1.40/MWh in the with the completion of the Illinois Rivers Transmission Project.[5] The Illinois Rivers Transmission Project will expand the MISO grid through Central Illinois and provide more options for routing power supply through the region. The project will support the construction of multiple new substations, including a new substation in Pawnee, Illinois. Figure 13 conveys the route for the Illinois Rivers Project.

Figure 13: Congestion Relief from Illinois Rivers Project Transmission System Upgrades



With Congestion in central Illinois being effectively nullified by the Illinois Rivers project, the cost impact resulting from the introduction of the Lincoln Land project is weighted towards Marginal Energy Cost.

[5] “Ameren lays out route 'Illinois Rivers' power transmission line”, Herald & Review, Tony Reid, 10/3/2012

ANALYSIS MODEL

Our analysis of the potential impacts on wholesale electricity market prices in the Springfield region seeks to replicate this wholesale market price discovery function through simulations. To establish the potential price impact resulting from the operation of the Lincoln Land project, we structure two market simulations. The first simulation stipulates that Lincoln Land generation resource asset is not available. The second simulation stipulates that Lincoln Land generation resource is available for bidding. By comparing the outputs of these two scenarios, we can infer the level of impact the Lincoln Land asset will have on wholesale electricity prices.

In a competitive wholesale electricity market, prices should be based on the marginal cost of production. Prices will rise to the point of the variable cost of the last generating unit needed to meet demand. One of the principal functions of market simulations is to estimate this hourly market-clearing price at various locations. For this study, we focus on pricing in the MISO_CWLP Hub which is proximate to the CWLP generating portfolio.

The market simulations used for this analysis reflect a fundamental approach in estimating prices which factors the economics and physical characteristics of demand and supply. We estimated hourly prices by using hourly demand and individual resource-operating characteristics in a transmission-constrained, chronological dispatch algorithm. The operation of resources within the electric market is modeled to determine which resources are on the margin for each zone in any given hour.

Existing generating resources were defined and modeled individually with specification of several cost components and physical characteristics and operating constraints. Hydro generation for each area, with instantaneous maximums, off-peak minimums, and sustained peaking constraints are also input. Demand-side resources and price-induced curtailment functions are defined, allowing the model to balance use of generation against alternatives to reducing customer demand.

Based on these, the simulation dispatches generation first according to variable cost, subject to non-cycling and minimum run constraints until hourly demand is met in each area. Transmission constraints, losses, wheeling costs and unit start-up costs are reflected in the dispatch. The market-clearing price is then determined by observing the cost of meeting an incremental increase in demand in each area. All operating units in an area receive the hourly market-clearing price for the power they generate.

KEY DATA SOURCES. The simulations utilized data from multiple sources including:

- **NERC Electric Supply & Demand Database.** The primary source of data for the Generating Resources is produced by the North American Electric Reliability Council (NERC).
- **EIA-860.** An alternate source for other Generating Resources information like ES&D. EIA generally provides detailed locational data which is used most frequently when segregating generating units into dispatch Areas.
- **EIA Form 411 and USDOE Reliability Region Seasonal Assessments.** EIA Form-411 reports (from some Reliability Regions) contain heat rates or locational data (city, county, zip code, etc.) and expected new resource additions.
- **NERC Reliability Region Reports.** ECAR - ECAR411 Report, ERCOT411 Report, FRCC, MAAC/PJM411 Report, MAIN (not publicly available), MAPP411 Report (public) represented, NPCC Report, NYiso Gold Book, isoNE CELT report, SERC411 Report, SPP411 Report, 2003 WECC411 Report

- **USDOE-EIA Electric Power Monthly, Table 1.** From the document "Electric Power Monthly, Table 1", we obtain a list of new power plants that recently entered commercial operation.
- **EnergyArgus.** EnergyArgus publishes a monthly report which EPIS uses to augment database research which is available for a subscription fee. Because this typically provides minimal plant data, it is not used as a primary data source.
- **Heat Rates.** Heat rates were calculated for thermal generating resource using the Continual Emission Monitoring System (CEMS) data provided by the Environmental Protection Agency (EPA). These are full-load heat rates based on HHV (higher heating value). Average heat rate is drawn from FERC Form 1 and at the NERC Reliability Region Form 411 report. Average heat rate is less efficient (higher heat rate) than full output heat rate and is calculated based on aggregated historical actual generation, aggregated historical actual fuel consumption, and heat content of the fuel.

PRICING POINTS. The simulations modeled hourly energy dispatch and price for the entire MISO region for calendar year 2022. This approach provided for the robust level of electricity importing and exporting that occurs between the regions in Illinois. For reporting purposes, we localize the analysis to reflect pricing within the MISO-CWLP market hub.

SCENARIO ANALYSIS. At its base, the Scenario analysis approach seeks to measure the effect that introducing the Lincoln Land generating asset into the MISO_CWLP Hub may have on hourly prices at future points in time when we control for certain variables. Scenarios are sets of assumptions upon which we simulate the operation of the MISO market. For this study, the Scenarios relied on the general assumptions conveyed in Figure 14.

Figure 14: Wholesale Market Simulation Scenario Variables

Scenario Number	Scenario Year	Load	Fuel Prices	Transmission	Generation	
					Retirements	New Build
1	2022	Normal (NERC Regional Projections)	Normal (EIA Annual Energy Outlook, 2017)	Assumes completion of Illinois River Project	All Retirements Currently Known in MISO and PJM	All New Build Currently Under Construction in MISO and PJM
2	2022	Normal (NERC Regional Projections)	Normal (EIA Annual Energy Outlook, 2017)	Assumes completion of Illinois River Project	All Retirements Currently Known in MISO and PJM	All New Build Currently Under Construction in MISO and PJM ***PLUS*** Lincoln Land

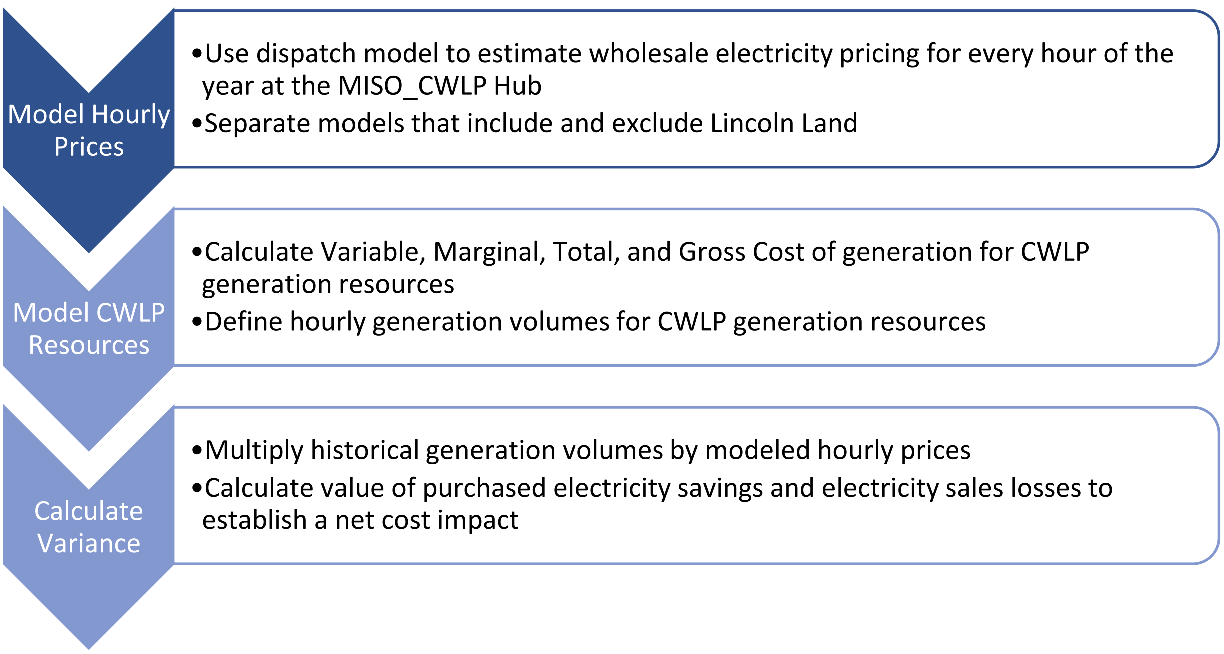
By simulating MISO market operations in the year 2022, we projected the hourly prices for electricity at each of the market hubs within MISO, including the MISO_CWLP Hub. In our analysis, the Scenarios hold all variables constant except for the introduction of Lincoln Land as an available generation resource within the MISO region.

Findings

The simulations yield different wholesale market price projections that reflect the expected market conditions resulting from the assumed levels of electricity demand, fuel prices, and generation asset availability. Based on these pricing patterns, we can calculate potential cost impacts for the CWLP generation portfolio that could occur if the Lincoln Land generation asset is developed.

Assessing the cost impact of the Lincoln Land generating resource is a multi-step process conveyed in Figure 15.

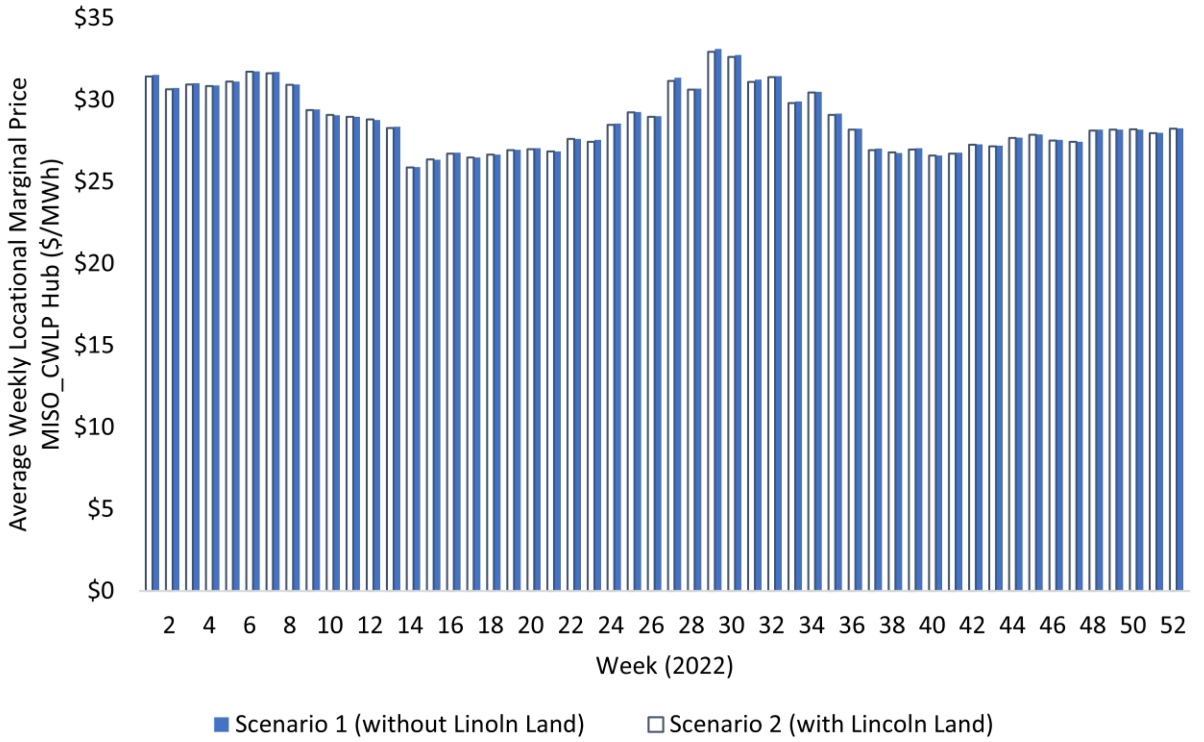
Figure 15: Process for Estimating Impact of Changes in Wholesale Electricity Pricing



Modeling Hourly Prices. Even though the Lincoln Land generating resource is significantly larger than the generation capacity of CWLP's entire resource portfolio, this does not mean that CWLP generating capacity will be replaced or overwhelmed. Because the Springfield region is connected to the larger MISO footprint, electricity is constantly being imported into and exported from the MISO_CWLP Hub on an ongoing basis. Therefore, it is best to view both the CWLP and Lincoln Land generating resources as MISO regional resources instead of simply local resources.

Our simulation of the hourly electricity prices at the MISO_CWLP Hub in 2022 shows little variation between Scenario 1 (no Lincoln Land generation resource) and Scenario 2 (fully-operational Lincoln Land generation resource). Figure 16 conveys the projected average weekly LMP prices in the MISO_CWLP Hub in the year 2022 for Scenarios 1 and 2 (NOTE: we chose to present the average weekly LMP values for the 52 weeks in 2022 instead of the hourly results to simplify the graph – the scenario analysis is based on hourly simulation results).

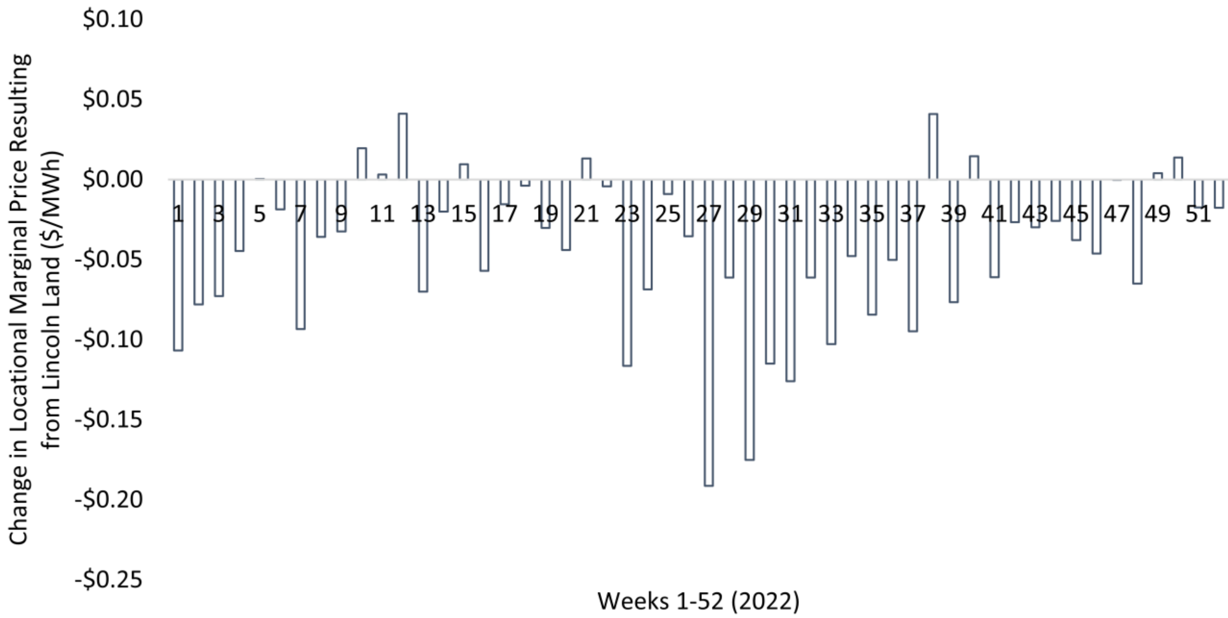
Figure 16: Wholesale Electricity Pricing Comparison: Weekly Average LMP (MISO_CWLP Hub)



As observed, the differences in projected LMP prices at the MISO_CWLP Hub in Scenarios 1 and 2 are minor (an annual average of only -0.15%). The minor impact on wholesale prices at the MISO_CWLP Hub is due to MISO_CWLP Hub's being a small part of the much larger MISO geography, where the addition of 1,100 MW of new generation capacity is a relatively minor event. Based on the simulations, we project that most of the electricity generated at the Lincoln Land station will be exported from the MISO_CWLP Hub to the broader MISO region.

Figure 17 conveys the projected differences in average weekly LMP prices at the MISO_CWLP Hub in the year 2022 between Scenarios 1 and 2. For reference, negative values indicate that LMP prices were lower after the introduction of the Lincoln Land generation resource, while positive values indicate that LMP process were higher after the introduction of the Lincoln Land generation resource. Negative values indicate that the inclusion of the Lincoln Land generation resource has reordered the dispatch curve for the MISO region resulting in a lower cost generation resource setting a lower clearing price. Conversely, positive values indicate that the inclusion of the Lincoln Land generation resource has reordered the dispatch curve for the MISO region resulting in a higher cost generation resource setting a higher clearing price.

Figure 17: Impact of Lincoln Land on Average Weekly LMP Prices at MISO_CWLP Hub (2022)



On a weekly basis, the introduction of the Lincoln Land generation resource is projected to reduce wholesale electricity at the CLWP_MISO Hub by a maximum of 0.56% ($0.20/MWh), or increase LMP at the MISO_CLWP Hub by as much as 0.15% ($0.05/MWh). In all, the introduction of the Lincoln Land generation resource is projected to have only a minor impact on wholesale electricity at the CLWP_MISO Hub. On an annualized basis, the introduction of the Lincoln Land generation asset is projected to reduce wholesale electricity at the CLWP_MISO Hub by 0.15% ($0.05/MWh).

MODEL CWLP GENERATION RESOURCE COSTS AND UTILIZATION. The impact of the relatively minor yet variable price suppression effect attributable to the Lincoln Land generating resource must be adjusted by the volume and cost of electricity generated by CWLP's generation resource. Therefore, we examined how the CWLP generation resources were managed.

Range of Allowable CWLP Plant Operations. We note that the 2015 CWLP financial audit report for CWLP states the following regarding the operation of CWLP wholesale electricity assets:

> *"City Council approved a Resource Management Agreement with The Energy Authority (TEA), giving TEA the exclusive right to market the City's excess generation capacity, effective March 1, 2003. Under this agreement, the City pays a monthly resource management fee to TEA. The City paid resource management fees of $764,260 and $753,710 to TEA during the years ended February 28, 2015 and February 28, 2014, respectively.*
>
> *The City is a transmission-owning member of Midcontinent Independent System Operator (MISO) and participates in the energy market operated by MISO (the "MISO Energy Market") under a Resource Management Agreement with The Energy Authority Inc. ("TEA"). The City has designated TEA to be the Market Participant for the transaction of power sales and purchases in the MISO Energy Market on behalf of the City. The MISO Energy Market consists of both Day Ahead and Real-Time energy markets. Participation in the MISO Energy Market gives the System the ability to offer excess generating capacity for sale into the MISO Energy Market and also provides the*

opportunity for economic power purchases to accommodate the System's native load needs at certain times of the year. Net sales to MISO totaled $10,478,169 and $27,308,967 for the years ended February 28, 2015 and February 28, 2014, respectively. Net sales to MISO are included with operating revenues.[6]

Additionally, according to a solicitation released by CWLP in December 20, 2016, CWLP states that it "currently participates in the MISO market, through a third-party market participant (CWLP is not a direct participant),"[7] and that "CWLP actively participates in forward energy markets, outside of MISO, to hedge the natural volatility in the short-term energy market(s)".[8] The solicitation did not elaborate on the nature of how CWLP operates "outside of MISO".

In combination, the auditor's findings in 2015 and the December 2016 solicitation indicate the following concerning the operation of CWLP's generation resources:

1. CWLP may sell into the MISO day-ahead and real-time energy markets;
2. CWLP may sell into forward markets outside of the MISO energy markets;
3. CWLP retained an outside consultant in 2003 to market 'excess generating capacity" on behalf of CWLP into the MISO energy market; and,
4. CWLP may purchase electricity from the MISO energy market on behalf of its ratepayers.

Because the 2015 audit does not contain any of the required GAAP reporting one would expect to see when derivatives are part of an organization's financial activities (such as forward energy contracts), we infer that CWLP and TEA do not engage in forward sales contracts, but limits the operations of CWLP's generation resources to:

1. Generating volumes of electricity to satisfy the demand of CWLP ratepayers;
2. Selling excess generation to the MISO market through its outside consultant;
3. Purchasing and then immediately selling electricity from two wind farms under a multi-year power purchase agreement; and,
4. Purchasing electricity from the MISO market to balance local electricity demand.

Baselining CWLP Generation Resource Utilization. Unless required to run for reliability purposes, generation resources in the MISO region bid into the MISO day-ahead auction at their marginal cost of generation. A generation resource's marginal cost is generally considered to be the sum of fuel plus operations and management (O&M) costs. Figure 18 conveys the estimated marginal cost of generation for each of CWLP's primary generation resources in 2016. To reflect the most accurate cost estimates we relied on information specific to the operation of the CWLP generation resources in 2016 as reported by CWLP to the US Department of Energy. As noted by the green shaded cells, the marginal cost of generation for CWLP's primary generation resources in 2016 ranged between $51.99/MWh and $53.43/MWh.

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[6] CITY OF SPRINGFIELD, ILLINOIS ELECTRIC LIGHT AND POWER FUND (An Enterprise Fund of the City of Springfield, Illinois) For the Years Ended February 28, 2015 and February 28, 2014

[7] Request for Proposal #UE17-21, "Electric Market Participation and Related Services", Section 3.1.1, page 16

[8] Ibid, Section 4.1.1, page 18

Figure 18: Cost of Generation for CWLP Primary Generation Resources (2016)

Cost Variables		Dallman Unit 1	Dallman Unit 2	Dallman Unit 3	Dallman Unit 4
Plant Thermal Efficiencies					
Plant Heat Rate (MMBtu/MWh) [A]	A	12.72	12.58	11.94	12.15
Heat Content of Coal (MMBtu/Ton) [A]	B	21.15			
MWh Generation/Ton Coal	C = B / A	1.66	1.68	1.77	1.74
Fuel Cost (Coal)					
Average Cost per Ton of Coal [B]	D	$39.00			
Fuel Cost per MWh of Net Generation	E = D / C	$23.46	$23.20	$22.02	$22.40
Production O&M Cost					
Annual Production O & M Cost [C]	F	$52,913,000			
MWh Generated (Net) [C]	G	1,765,383			
Production O&M Cost per MWh	H = F / G	$29.97			
Marginal Cost per MWh of Net Generation					
Fuel Cost per MWh	I = E	$23.46	$23.20	$22.02	$22.40
Production O&M Cost per MWh	J = H	$29.97	$29.97	$29.97	$29.97
Marginal Cost of Generation	**K = E + H**	**$53.43**	**$53.17**	**$51.99**	**$52.37**

[A] Annual Average for 2016 per EIA-923 Report

[B] "CWLP seeking to slash coal expense by more than $6 million," State Journal Register, January 30, 2016

[C] 2016 Continuing Disclosure Reports for the Water Fund and the Electric Fund (CWLP)

Applying these marginal costs of generation for the CWLP generation resources proved problematic for the 2022 simulation in that the simulation yielded no hours during which the resources cleared in the day-ahead auctions. Stated in another way, our market model showed that the CWLP generation resources – if priced at the marginal cost of generation - were more expensive than other resources in the MISO market, and were therefore assumed to not required to meet electricity demand in 2022.

To verify the market simulation findings, we compared the MISO Marginal Energy Cost (i.e. the clearing price for electricity bids in each hour of the year) in 2016 against the reported Marginal Cost of Generation for CWLP's primary generation resources. Figure 19 conveys the number of hours that the CWLP primary generation resources would have cleared the MISO day ahead auctions if they bid into those auctions at their full Marginal Cost of Generation (i.e. Fuel Costs plus O&M Costs). As noted in the green shaded cells, the full Marginal Cost of Generation for CWLP's generation resources was higher than the clearing market price for electricity in all but 1.9% of the hours in 2016. This means that CWLP operated generation resources in a non-economical manner, which is consistent with our simulation findings.

Figure 19: Hours when CWLP Cost of Generation was less than MISO Marginal Energy Cost (2016)

Cost Basis	Dallman Unit 1	Dallman Unit 2	Dallman Unit 3	Dallman Unit 4
Marginal Cost of Generation ($/MWh)	**$53.43**	**$53.17**	**$51.99**	**$52.37**
# Hours in 2016 when MISO hourly Marginal Energy Cost was above the CWLP Marginal Cost of Generation	155	160	169	166
# Total Hours in 2016	8784	8784	8784	8784
% of Total Hours when CWLP Marginal Costs were less than MISO hourly Marginal Energy Cost	**1.8%**	**1.8%**	**1.9%**	**1.9%**

To understand how the CWLP generation resources are operated, we reviewed plant operations data reported by CWLP to the US Department of Energy, Energy Information Administration (EIA), and published in Form EIA-923. Figure 20 conveys the monthly generation from CWLP generation resources (which is approximately 1% less than the net output reported by CWLP for 2016 on the CWLP website). Figure 21 conveys the estimated number of operating hours for each CWLP generation resource based on dividing monthly generation (MWh) by the operational capacity (MW) of the generation resource.

Figure 20: CWLP Generation Outputs (2016)

Month	CWLP Generation Outputs (2016)					
	Dallman Units					Total Monthly MWh
	1	2	3	4	Other	
	MWh	MWh	MWh	MWh	MWh	
January	0	13,416	32,327	67,965	2	113,710
February	0	0	42,254	42,637	448	85,339
March	5,004	0	51,319	75,978	1,162	133,463
April	9,267	0	26,077	112,131	1,027	148,502
May	15,555	0	80,709	91,761	1,715	189,740
June	34,760	17,893	87,281	104,709	1,013	245,656
July	32,390	25,591	76,701	81,219	2,493	218,394
August	35,170	34,675	81,651	77,997	2,348	231,841
September	40,474	32,242	28,544	13,601	1,676	116,537
October	34,274	36,781	0	0	1,347	72,402
November	16,483	33,851	0	25,099	2,021	77,454
December	41,838	25,009	0	100,763	899	168,509
Annual	**265,215**	**219,458**	**506,863**	**793,860**	**16,151**	**1,801,547**

Source: Form EIA-923

Figure 21: CWLP Generation Monthly Operating Hours (2016)

Month	CWLP Generation Resource Operating Hours (2016)					
	Dallman Units					Total Unit Hours of Operation
	1	2	3	4	Other	
	Hours	Hours	Hours	Hours	Hours	
January	0	205	172	327	0	704
February	0	0	225	205	3	433
March	69	0	273	365	9	716
April	127	0	139	539	8	813
May	213	0	429	441	13	1,096
June	476	275	464	503	8	1,726
July	444	394	408	390	19	1,655
August	482	533	434	375	18	1,842
September	554	496	152	65	13	1,280
October	470	566	0	0	10	1,046
November	226	521	0	121	16	884
December	573	385	0	484	7	1,449
Annual	**3,633**	**3,375**	**2,696**	**3,817**	**125**	**13,646**

because the CWLP generation resource were not operated in a baseload capacity (i.e. continuous operation) we assumed that the generation resources were operated during the hours in each month that had the highest Marginal Energy Charge. Figure 22 conveys the average bid prices for each month that triggered the dispatch of electricity from CWLP generation resources.

Figure 22: CWLP Average Monthly Electricity Dispatch Prices (2016)

Month	Dallman Units					Average Bid Price
	1	2	3	4	Other	
	$/MWh	$/MWh	$/MWh	$/MWh	$/MWh	
January	-	$25.00	$25.62	$23.07	-	**$24.56**
February	-	-	$22.56	$22.77	$37.50	**$27.61**
March	$24.90	-	$21.42	$20.17	$28.80	**$23.82**
April	$27.16	-	$23.09	$18.22	$33.20	**$25.42**
May	$25.82	-	$21.40	$21.16	$36.50	**$26.22**
June	$21.33	$27.15	$21.66	$20.63	$54.00	**$28.95**
July	$24.99	$26.46	$26.10	$26.50	$60.20	**$32.85**
August	$24.19	$22.84	$25.85	$28.20	$59.00	**$32.02**
September	$20.69	$22.72	$21.90	$31.00	$61.00	**$31.46**
October	$25.53	$22.91	-	-	$50.20	**$32.88**
November	$27.65	$21.20	-	$30.95	$37.50	**$29.33**
December	$24.60	$29.65	-	$27.09	$58.00	**$34.84**
Annual	**$24.05**	**$24.26**	**$23.36**	**$23.30**	**$48.80**	**$28.75**

The bid prices at which CWLP generation resources appear to have been dispatched in 2016 are far below the Marginal Cost of Generation shown in Figure 18. Figure 23 conveys the Fuel and Production O&M costs for the Dallman units as well as the annual Maximum, Average and Minimum Average Generation Resource Dispatch Price for each unit from Figure 22. We note that the Fuel Cost (gold shaded cells). for the various Dallman units is roughly equal to the Average Generation Resource Dispatch Price (green shaded cells). Based on this, we conclude that the Dallman units are being dispatched at bid prices that are below the level necessary to fully cover Fuel Costs as well as Operational O& M Costs (i.e. the units are being dispatched based on Fuel Cost only).

Figure 23: Cost of Generation for CWLP Primary Generation Resources (2016)

Cost Variables	Dallman Unit 1	Dallman Unit 2	Dallman Unit 3	Dallman Unit 4
Marginal Cost of Generation				
Fuel Cost per MWh	**$23.46**	**$23.20**	**$22.02**	**$22.40**
Production O&M Cost per MWh	$29.97	$29.97	$29.97	$29.97
Total Cost per MWh	**$53.43**	**$53.17**	**$51.99**	**$52.37**
Range of Generation Resource Energy Dispatch Price				
Annual Maximum	$27.65	$29.65	$26.10	$31.00
Annual Average	**$24.05**	**$24.26**	**$23.36**	**$23.30**
Annual Low	$21.33	$21.20	$21.90	$18.22

While the CWLP generation resources appear to have been dispatched at prices roughly equivalent to their Fuel Costs, they were compensated at the Locational Marginal Price (LMP) that includes the Marginal Energy Charge Plus Marginal Congestion Charges Plus Marginal Loss Charges. Figure 24 conveys the average LMP prices paid for electricity generation at the MISO_CWLP Hub during 2016.

Figure 24: CWLP Average Monthly Electricity Compensation Prices (2016)

Month	Dallman Units					Equivalent Average Weighted LMP Price
	1	2	3	4	Other	
	$/MWh	$/MWh	$/MWh	$/MWh	$/MWh	
January	-	$27.86	$28.67	$26.54	-	**$27.30**
February	-	-	$27.86	$28.40	$38.17	**$28.19**
March	$29.67	-	$26.72	$25.80	$31.86	**$26.35**
April	$30.04	-	$29.16	$26.72	$32.12	**$27.39**
May	$35.10	-	$32.62	$32.42	$59.03	**$32.96**
June	$31.28	$35.80	$31.37	$30.68	$53.14	**$31.47**
July	$38.78	$40.36	$39.71	$40.30	$64.77	**$40.16**
August	$39.22	$37.81	$40.63	$42.63	$66.89	**$40.93**
September	$34.03	$35.38	$43.04	$67.46	$75.62	**$41.11**
October	$33.20	$31.55	-	-	$50.08	**$32.68**
November	$31.10	$26.98	-	$33.38	$40.11	**$30.27**
December	$33.34	$36.78	-	$34.89	$64.44	**$34.94**
Annual	**$34.38**	**$34.14**	**$33.93**	**$32.79**	**$55.35**	**$33.71**

While the Equivalent Average Weighted LMP Price (i.e. the average LMP price paid during the hours when CWLP generation resource were operating during 2016) paid to CWLP for generation output was higher than the Fuel Cost that was used to bid the generation, the revenues were not sufficient to cover the full Marginal Cost of Generation for the CWLP electricity generation operation in the aggregate. CWLP's costs for Fuel, Operations & Management, and Debt (as reported by CWLP) are conveyed in Figure 25. We note in the green shaded cells that the Full Generation Cost for CWLP (the sum of Fuel, Operations & Management and Debt) ranges between a low of $63.81/MWh (2014) and a high of $79.68/MWh (2016).

Figure 25: CWLP Reported Cost of Generation (2012-2016)

City Water Light & Power Financials						
Cost Variables	Calculation	Reporting Year				
		2012	2013	2014	2015	2016
Generation (MWh)						
Gross Generation	A	2,429,498	2,355,241	2,933,493	2,556,504	2,071,547
Less: Station Use	B	-321,421	-332,138	-384,817	-351,193	-306,164
Annual Total	C = A + B	**2,108,077**	**2,023,103**	**2,548,676**	**2,205,311**	**1,765,383**
Operating Expenses						
Production O & M	D	$60,175,000	$48,827,000	$56,128,000	$64,570,000	$52,913,000
Fuel	E	$50,017,000	$50,707,000	$64,035,000	$58,867,000	$46,266,000
Annual Total	F = D + E	**$110,192,000**	**$99,534,000**	**$120,163,000**	**$123,437,000**	**$99,179,000**
Debt Service						
2006 Senior Lien Bonds	G	$25,901,000	$25,897,000	$25,901,000	$25,897,000	$10,042,000
2007 Senior Lien Bonds	H	$9,714,000	$11,824,000	$11,819,000	$11,827,000	$12,730,000
2008 Senior Lien Bonds	I	$7,321,000	$4,736,000	$4,736,000	$4,736,000	$12,784,000
2015 Senior Lien Bonds	J	$0	$0	$0	$0	$5,925,000
Annual Total	K= G+H+I+J	**$42,936,000**	**$42,457,000**	**$42,456,000**	**$42,460,000**	**$41,481,000**
Combined Generation Costs						
Production O & M	L = C	$60,175,000	$48,827,000	$56,128,000	$64,570,000	$52,913,000
Fuel	M = F	$50,017,000	$50,707,000	$64,035,000	$58,867,000	$46,266,000
Debt Service	N = K	$42,936,000	$42,457,000	$42,456,000	$42,460,000	$41,481,000
Annual Total	O=L+M+N	**$153,128,000**	**$141,991,000**	**$162,619,000**	**$165,897,000**	**$140,660,000**
Unit Costs for Generation						
Production O & M	P = L / C	$28.54	$24.13	$22.02	$29.28	$29.97
Fuel	Q = M / C	$23.73	$25.06	$25.12	$26.69	$26.21
Debt Service	R = N / C	$20.37	$20.99	$16.66	$19.25	$23.50
Full Generation Cost	S = O / C	**$72.64**	**$70.18**	**$63.81**	**$75.23**	**$79.68**

Source: 2016 Continuing Disclosure Reports for the Water Fund and the Electric Fund (CWLP)

We observe that the difference between the Equivalent Average Weighted LMP and the Average Generation Costs may be interpreted as a loss for the CWLP operation. However, a more accurate description would be to consider the differential as an 'Above Market Cost'. An Above Market Cost indicates that CWLP opted to ignore lower cost resources (i.e. wholesale energy purchases from MISO) in favor of generating electricity at a higher cost. In so doing, CWLP does not technically 'lose' money – rather, CWLP's native load customers are forced to absorb higher costs that were necessary.

Table 26 conveys the value of the estimated Above Market Costs incurred by CWLP in 2016. Pending the point of reference, CWLP's costs were either $82.8 million above market (i.e. Full Generation Cost vs. Equivalent Average Weighted LMP), or $40.5 million above market (Marginal Generation Cost vs. Equivalent Average Weighted LMP). We anticipate similar results for prior years 2012 through 2015.

Figure 26: Weighted Cost Comparisons of CWLP Generation vs. MISO_CWLP Hub (2016)

Pricing Metric for CWLP	CWLP Generation Price ($/MWh)	Equivalent Average Weighted MISO_CWLP Hub LMP Price ($/MWh)	Price Differential between CWLP Generation and MISO_CWLP Hub LMP ($/MWh)	Annual Generation (MWh)	Above / (Below) Market Costs for CWLP ($/MWh)
	A	B	C = A - B	D	E = C * D
Full Generation Cost (Fuel, O & M, Debt Service)	$79.68	$33.71	$45.97	1,801,547	$82,817,116
Marginal Generation Cost (Fuel, O & M)	$56.18	$33.71	$22.47	1,801,547	$40,480,761

To validate the accuracy of the Equivalent Average Weighted MISO_CWLP Hub Price estimate ($33.71/MWh – the estimated market price for electricity during the hours when we projected that CWLP was generating electricity), we reviewed the wholesale electricity supply prices set by the Illinois Power Agency for the Ameren Illinois region for 2016 which were set on April 1, 2015.[9] The IPA secures wholesale electricity supply for Ameren Illinois through a competitive bidding process to set prices for On-Peak hours (daytime hours Monday through Friday) and Off-Peak hours (weekday evenings, weekends, and holidays).

Figure 27 conveys the monthly prices negotiated by the IPA for the Ameren region for each month in 2016. We note that the average value for on peak electricity for the 2016 period was $37.54. When we account for risk premiums, the IPA rates generally validate our estimates of the market value of CWLP generation during 2016.

Figure 27: IPA Auction Results for Wholesale Electricity Purchase Prices for Ameren (2016)

Contract Month	On-Peak Supply		Off-Peak Supply	
	Price ($/MWh)	Volume (MWh)	Price ($/MWh)	Volume (MWh)
January	$40.95	425	$31.55	350
February	$40.17	400	$31.14	325
March	$36.35	350	$28.80	250
April	$36.45	275	$27.96	175
May	$36.48	300	$27.80	200
June	$36.74	175	$26.20	125
July	$41.94	200	$26.93	150
August	$40.14	200	$26.93	150
September	$35.34	125	$25.56	125
October	$35.27	125	$26.38	100
November	$35.27	125	$26.79	100
December	$35.32	150	$28.00	125
Average	**$37.54**		**$27.84**	

Source: Illinois Power Agency, April 1, 2015

9 Illinois Commerce Commission, Public Notice of Successful Bidders and Average Prices, Ameren Illinois Company and Commonwealth Edison Company, Spring 2015 Procurement of Standard Energy Products, April 1, 2015

Based on CWLP financial reporting, it appears that CWLP and TEA operated CWLP generation resources to generate approximately 1.8 million MWh of electricity with a Full Generation Cost of $79.68/MWh (fuel plus, O&M, debt). The estimated wholesale price for electricity from the MISO market for the same period and estimated hours of operation was $33.71/MWh. This indicates that CWLP generated electricity at a cost that was $45.97/MWh above the wholesale market price. If this is the case, then it appears that CWLP customers incurred $82.8 million in above-market costs. If we treat debt as a sunk cost and consider only Fuel and Operational O&M costs, then the CWLP generated electricity was generated at a cost of $56.18/MWh – or $22.47/MWh above the wholesale market price. If this is the case, then CWLP customers incurred $40.5 million in above-market costs.

CALCULATING COST IMPACT PER PRICE VARIANCE. As noted, there were very few hours during 2016 where the MISO_CWLP Hub prices were greater than the cost of generation for the CWLP generation resource portfolio. The price suppression effect on regional wholesale electricity prices attributable to the Lincoln Land project would worsen the apparent losses incurred by CWLP.

- **Impact on CWLP Wholesale Electricity Sales Revenue.** We conclude that the level of revenues CWLP captures through the sale of electricity to the wholesale market may be reduced by approximately $183,000 per annum due to price suppression effects attributable to the Lincoln Land project.

  We derived our estimate by multiplying the hourly price differentials generated by the market simulations for Scenarios 1 and 2 for the year 2022 against the projected hourly generation schedule for the CWLP generation resources for 2016. Figure 28 conveys how CWLP sales revenues for wholesale electricity sales would be impacted if the Lincoln Land project was in full operation in 2022. Based on these assumptions, we note that CWLP may realize a modest reduction in revenue of $182,900 on an annual basis.

Figure 28: Projected Monthly Revenue Impacts for CWLP with Lincoln Land Energy Center (2022)

Month	Revenue Loss / (Gain) for CWLP
January	$20,012
February	$6,489
March	$4,347
April	$9,403
May	(-$724)
June	$26,128
July	$46,091
August	$39,204
September	$14,872
October	$2,827
November	$6,955
December	$7,355
Total	**$182,960**

- **Impact on CWLP Wholesale Electricity Purchase Costs.** We conclude that the level of revenues CWLP captures through the sale of electricity to the wholesale market may be reduced by between $12,000 and $17,600 per annum.

  Figure 3 above conveyed the volumes of electricity generation sold by CWLP during the 2012 through 2016 periods. The average annual purchases for the five-year period was approximately 625,000. However, these volumes include annual wind energy purchases of approximately 350,000 MWh under a contract that is expected to expire prior to 2022. If we assume a similar net level of electricity purchases (i.e. purchases net of the wind contract), then we can estimate the level of wholesale market purchases to be approximately 278,000 MWh. Figure 29 conveys how CWLP electricity purchase costs for wholesale electricity purchases would be impacted if the purchases are levelized in a monthly basis (Column C) or are weighted to the May through October period (Column E) in 2022. Based on these assumptions, we note that CWLP may realize a minor decrease in electricity purchase costs (between $12,000 and $17,000) in 2022 if the Lincoln Land generating asset is in operation.

Figure 29: Range of Impacts on CWLP Wholesale Electricity Purchase Costs

Month	Monthly Average Price Impact ($/MWh)	Level Allocation		Seasonal Allocation	
		Volume (MWh)	Revenue Impact	Volume (MWh)	Revenue Impact
January	-$0.0576	23,197	-$1,336	0	$0
February	-$0.0531	23,197	-$1,231	0	$0
March	-$0.0045	23,197	-$104	0	$0
April	-$0.0196	23,197	-$454	0	$0
May	-$0.0152	23,197	-$352	23,255	-$353
June	-$0.0547	23,197	-$1,269	40,332	-$2,207
July	-$0.1243	23,197	-$2,883	51,426	-$6,391
August	-$0.0907	23,197	-$2,104	53,140	-$4,819
September	-$0.0444	23,197	-$1,030	59,933	-$2,661
October	-$0.0250	23,197	-$579	50,282	-$1,255
November	-$0.0359	23,197	-$833	0	$0
December	-$0.0093	23,197	-$215	0	$0
Total		**278,367**	**-$12,389**	**278,367**	**-$17,686**

Figure 30 conveys the projected annual net impact of the Lincoln Land Energy Center on CWLP operations in the target year of 2022 (i.e. between $165,274 and $170,570 per annum)

Figure 30: Range of Net Impacts for CWLP Operations Resulting from Lincoln Land Energy Center

Month	Levelized Purchase Scenario			Seasonal Purchase Scenario		
	Revenue Loss / (Gain) for CWLP Electricity Sales	Revenue Loss / (Gain) for CWLP Electricity Purchases	Net Revenue Loss / (Gain) for CWLP	Revenue Loss / (Gain) for CWLP Electricity Sales	Revenue Loss / (Gain) for CWLP Electricity Purchases	Net Revenue Loss / (Gain) for CWLP
	A	B	C = A + B	D	E	F = D + E
January	$20,012	($1,336)	$18,676	$20,012	$0	$20,012
February	$6,489	($1,231)	$5,258	$6,489	$0	$6,489
March	$4,347	($104)	$4,243	$4,347	$0	$4,347
April	$9,403	($454)	$8,949	$9,403	$0	$9,403
May	(-$724)	($352)	($352)	(-$724)	($353)	($353)
June	$26,128	($1,269)	$24,859	$26,128	($2,207)	$23,921
July	$46,091	($2,883)	$43,208	$46,091	($6,391)	$39,700
August	$39,204	($2,104)	$37,100	$39,204	($4,819)	$34,385
September	$14,872	($1,030)	$13,842	$14,872	($2,661)	$12,211
October	$2,827	($579)	$2,248	$2,827	($1,255)	$1,572
November	$6,955	($833)	$6,122	$6,955	$0	$6,955
December	$7,355	($215)	$7,140	$7,355	$0	$7,355
Total	**$182,960**	**($12,390)**	**$170,570**	**$182,960**	**($17,686)**	**$165,274**

CONCLUSIONS

Based on the above analysis, we conclude the following concerning CWLP and the potential financial impact that the introduction of the Lincoln Land Energy Center may have on CWLP electricity generation operations and finances:

The Lincoln Land Energy Center presents a significant infrastructure investment opportunity for the region. With over $1 billion in capital investment as well as ongoing construction and operations employment, the Lincoln Land Energy Center presents a positive economic opportunity for Pawnee and the surrounding region.

Wholesale electricity prices will fall with or without the Lincoln Land Energy Center. The primary concern about the Lincoln Land Energy Center was that its introduction would effectively suppress wholesale electricity sales revenues for CWLP. The completion of the Illinois River Transmission Project in 2019 will contribute more to wholesale electricity price suppression than the Lincoln Land Energy Center by reducing congestion costs in central Illinois region by between $0.98/MWh and $1.40/MWh. These lower congestion costs will reduce the Locational Margin Pricing (the wholesale price) for electricity by between $1.7 and $2.5 million per year based on CWLP's 2016 generation levels. CWLP will realize lower wholesale electricity prices and resulting revenues regardless of whether the Lincoln Land Energy Center is built.

Lincoln Land Energy Center will cause minimal wholesale price suppression for the region. Simulations of the central Illinois electricity market simulations indicate that the introduction of the Lincoln Land Energy Center decrease average annual wholesale electricity prices in the region by approximately $0.06/MWh – or only 0.15%.

- Minimal Impact on CWLP wholesale electricity sales revenue. Annual revenue loss to CWLP due to the price suppression effect resulting from the operation of the Lincoln Land Energy Center is projected to be approximately $182,960.
- Minimal Impact on CWLP wholesale electricity purchase prices. Annual lower expenditures for wholesale electricity purchases for CWLP due to the price suppression effect resulting from the operation of the Lincoln Land Energy Center is projected to be approximately $12,000 to $17,000.
- Minimal Net Impact on CWLP wholesale electricity financial operations. We project that the operation of the Lincoln Land Energy Center to have a total net negative impact of between $165,000 and $170,000 on an annual basis (referencing 2022 as a baseline).

CWLP appears to be operating its generation resources in an uneconomical manner. To establish the potential impacts of the Lincoln Land Energy Center on CWLP finances we examined how CWLP has operated its generation resources. In the course of that examination, we noted the following regarding CWLP's operation of its generation resource in 2016:

- CWLP's Full Cost of Generation in 2016 was $76.98/MWh. The annual Full Cost of operating CWLP's generation resources includes Fuel, Operational O & M, and Debt. The Full Cost of Generation for CWLP totaled $140.7 million. Considering that CWLP generated 1.77 million MWh of electricity in 2016, the average Full Cost of Generation was $79.68/MWh.

- CWLP appear to have operated it Generation Resources when market prices were as low as $24.00/MWh. Based on plant generation data from the Energy Information Administration and CWLP's own financial reports, it appears that CWLP generates electricity when the wholesale price for power approaches the equivalent Fuel Cost for its generation resource – approximately $24.00/MWh. While the electricity generated under this approach was compensated at a price slightly higher than the equivalent Fuel Cost, but not at a level sufficient to cover Operation O & M or Debt.
- CWLP costs are Above-Market by an average of $50.22/MWh. We estimated that the wholesale price of electricity during those hours when CWLP utilized its generation resource was $31.77/MWh. Compared to CWLP's own reported Full Cost of Generation of $79.68/MWh, we conclude that CWLP generation costs are approximately $50.22/MWh above the wholesale market price.
- CWLP's Above-Market costs are passed on to CWLP's native load customers. The aggregate Above Market cost for CWLP generation in 2016 was approximately $82.8 million. These Above-Market costs appear to have been passed on to CWLP's native load customers. Figure 31 conveys how these costs impact the various rate classes and average customers within those rate classes if these Above Market costs were allocated on a per-unit of energy basis. As noted by the cells highlighted in green, these Above-Market costs for a single year are material, yet they are more concerning when we consider that the Above-Market costs for CWLP generation may have occurred over the past several years.

Cost Elements		Residential	Commercial	Industrial	State of Illinois	Security Lights	Total / Average
Number of Customers	A	60,488	8,569	0	3	3,044	72,104
Average Annual Consumption (MWh)	B	612,518	952,186	0	79,459	4,877	1,649,039
Average Consumption per Customer (MWh)	C = B / A	10.1	111.1	0.0	26,486.4	1.6	22.9
Annual Above-Market Cost for CWLP ($)	D	$82,817,116					
Annual Above-Market Cost for CWLP ($/MWh)	E = D / B	$50.22					
Annual Above-Market Cost (Rate Class)	F = B * E	**$30,761,508**	**$47,820,127**	**$0**	**$3,990,555**	**$244,926**	**$82,817,116**
Annual Above-Market Cost (Average Customer)	G = C * E	**$509**	**$5,581**	**$0**	**$1,330,185**	**$80**	**$1,149**

In the context of CWLP's existing Above-Market cost of generation, the price suppression effects of the Lincoln Land Energy Center are negligible. We note that the approximately $170,000 in net total annual price suppression effect on CWLP's financial operations due to the Lincoln Land Energy Center is approximately 0.20% of the $82.8 million in Above-Market cost of generation CWLP incurred in 2016.