ASSESSMENT OF SPIRE MISSOURI'S GAS SUPPLY ALTERNATIVES IN THE ABSENCE OF STL PIPELINE

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Appendix B

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I. INTRODUCTION

Spire Missouri Inc. (the "Company") holds a long-term firm capacity contract on Spire STL Pipeline ("STL Pipeline") for delivery of 350,000 dth/day ("dth/d") of natural gas to its eastern Missouri/St. Louis area service territory ("Spire Missouri East"). On June 22, 2021, the D.C. Circuit Court of Appeals vacated and remanded the certificate authorization of STL Pipeline that was previously granted by the Federal Energy Regulatory Commission ("FERC" or "Commission").[1] Subsequently, on September 14, 2021, the FERC issued a temporary certificate allowing STL Pipeline to operate for 90 days while the Commission considers appropriate next steps.[2] As a result, there is significant uncertainty regarding the future of STL Pipeline.

Concentric Energy Advisors, Inc. ("Concentric") has been retained by the Company to independently identify and evaluate potential alternatives that could replace 350,000 dth/d of capacity in Spire Missouri East's gas supply portfolio prior to the start of next winter (*i.e.*, November 1, 2022) if the firm transportation service provided by STL Pipeline is no longer available. Section II identifies available options to replace some or all of the 350,000 dth/d deficit. Section III compares the benefits of the available options to the benefits of STL Pipeline related to traditional gas supply goals.

A. Executive Summary

Based on an assessment of alternatives available to add 350,000 dth/d of capacity to Spire Missouri's portfolio in the next year, Concentric concludes that:

- There are three potential alternatives that could mitigate a loss of a portion of the potential 350,000 dth/d shortfall prior to next winter (*i.*e., November 1, 2022) – existing unsubscribed pipeline capacity; distributed CNG/LNG; and restoring on-system liquid propane capability.
- However, only available pipeline capacity is viewed by the Company as a potential long-term solution for replacing 350,000 dth/d. Regardless, even if all three of these options were pursued, the magnitude of these available alternatives would be insufficient to fully replace the 350,000 dth/d, thus leaving a significant shortfall.
- Moreover, while these available alternatives would provide certain benefits to Spire Missouri East's customers, they would not provide the same breadth of benefits currently provided to the Company's customers through its contract for transportation with STL Pipeline.

B. Spire Missouri East

Spire Missouri East is a local natural gas distribution company ("LDC") serving approximately 650,000 residential, commercial, and industrial customers in the greater metropolitan St. Louis area

[1] *Env'tl Def. Fund v. FERC*, 2 F.4th 953 (D.C. Cir 2021).

[2] *Spire STL Pipeline LLC*, 176 FERC ¶ 61,160 (2021).

and areas to the south in eastern Missouri. As a regulated public utility, the Company has an obligation to provide safe and reliable service, even on extremely cold winter days, and to do so at a reasonable cost. The consequences of not having the capability to deliver natural gas supplies to customers on extremely cold days can be enormous, affecting customer safety, reliability and cost.

The Company maintains a gas supply portfolio capable of delivering gas to its distribution system to meet the projected design day needs for its firm requirements customers. These customers are mostly residential and smaller commercial and industrial customers.[3] While the Company expects that it will continue to experience load shifts within its service territory over time, Spire Missouri East does not expect any significant growth or decline in demand.

The Company has developed a portfolio of on-system and off-system capacity sufficient to serve firm requirements customers' demands throughout the year. This includes capacity on interstate pipelines delivering to the Company's distribution system, as well the Lange storage facility, which is an on-system underground natural gas storage facility owned and operated by the Company.

Spire Missouri East currently contracts for firm pipeline transportation service on four pipelines that directly interconnect with its distribution system (*i.e.*, STL Pipeline; Mississippi River Transmission ("MRT"); MoGas Pipeline ("MoGas"); and Southern Star Central ("SSC")), as well as contracts for firm pipeline transportation service on four upstream pipelines (*i.e.*, Enable Gas Transmission ("EGT"), Panhandle Eastern Pipeline ("PEPL"), Natural Gas Pipeline Company of America ("NGPL") and Rockies Express Pipeline ("REX")) that feed the downstream pipelines that directly interconnect with the Company's distribution system. The Trunkline Gas Company ("Trunkline") system also indirectly interconnects to the Company's distribution system through the downstream pipelines; however, the Company does not currently contract for firm transportation service on Trunkline.

Figure 1 provides a map of the pipeline infrastructure directly connected to and upstream of the Company's distribution system. Figure 2 provides a map of the pipelines directly interconnected to the Company's distribution system.

[3] In addition, the Company also provides distribution service but does not procure upstream gas supply or transportation for several Basic End Use customers. These customers are mostly large industrial customers who buy their gas supply from a separate entity who is responsible to provide gas supplies at the Company's city-gate for delivery to these customers.

Figure 1: **Overview of the Pipelines Directly and Indirectly Interconnected to the Distribution System**

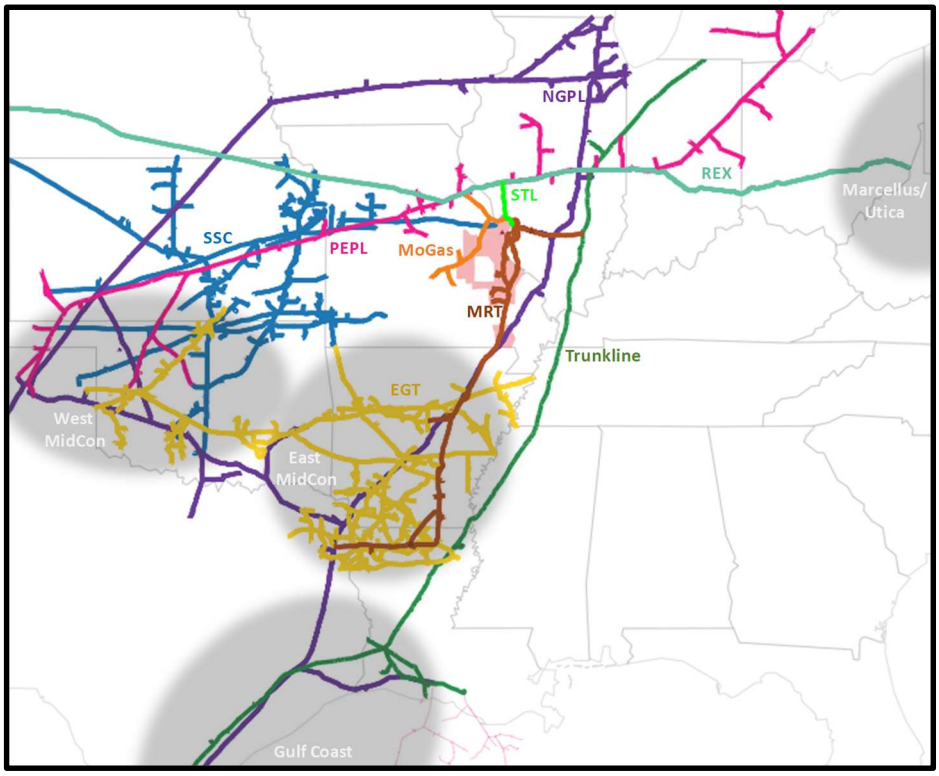
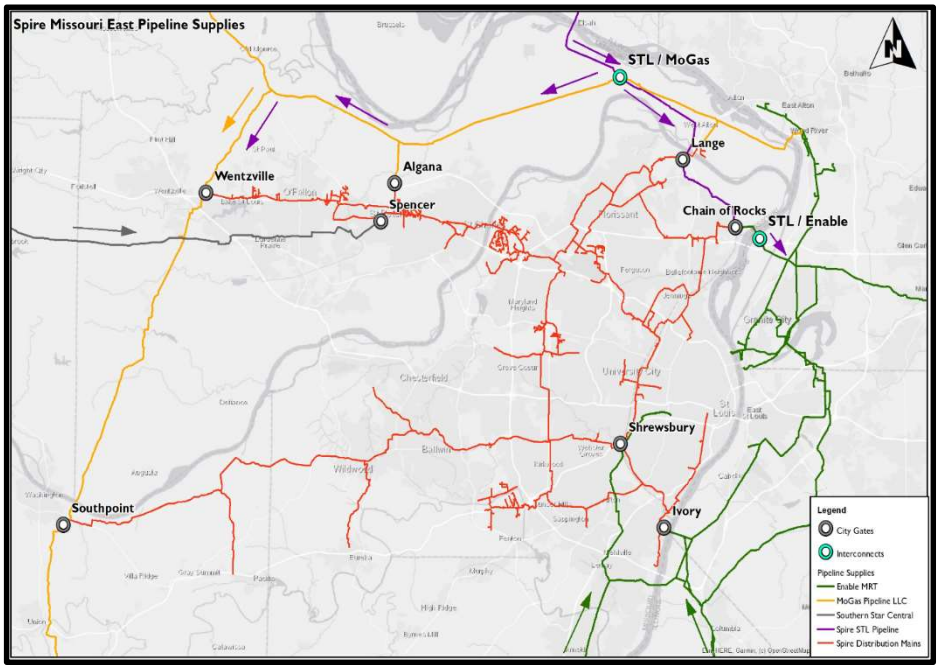


Figure 2: **Detail of the Pipelines Directly Interconnected to the Distribution System**



STL Pipeline is a 65-mile, high-pressure pipeline that is capable of delivering up to 400,000 dth/d of natural gas from a connection with REX in Scott County, Illinois to St. Louis County, Missouri. STL Pipeline currently has three additional interconnections: with MoGas north of St. Louis; at the Company's distribution system near the Lange storage facility; and with the MRT system and the Company's distribution system at a point known as Chain of Rocks. Spire Missouri East currently has a 20-year agreement for firm transportation service on the STL Pipeline with a maximum delivery quantity of 350,000 dth/d. The Company takes natural gas directly off of STL Pipeline at its delivery points, and also utilizes gas delivered from STL Pipeline via MoGas and MRT.[4] Due to STL Pipeline's high-pressure deliveries into MoGas, 82,800 dth/d of additional capacity is created on MoGas that the Company uses to deliver to its citygates on the west side of Spire Missouri East's system. Spire Missouri East is experiencing growth on the western portion of its system and has limited ability to move gas from east to west within its distribution system,[5] so STL Pipeline's ability to support additional deliveries on the west end of the Spire Missouri East's system provides significant benefits to its portfolio. In addition, high pressure deliveries allow STL Pipeline to support refill of Lange storage during the winter, which also provides operational benefits to Spire Missouri East's system.

In addition to STL Pipeline, the Company also contracts for capacity on the following other pipelines that directly interconnect with its distribution system:

- *MRT*: MRT consists of approximately 1,650 miles of pipe, that includes three primary segments: (i) the mainline spanning from Louisiana to Missouri, which has delivery points with the Company's distribution system ("MRT-ML"); (ii) a west line that runs from eastern Texas and connects to the MRT-ML in northern Louisiana ("MRT-WL"), and (iii) an east line that runs from central Illinois to citygates of the Company's distribution system in St. Louis ("MRT-EL"). To serve its customers, the Company currently has firm transportation contracts on the MRT-ML for forward haul of 480,779 dth/d and backhaul of 80,000 dth/d. Spire Missouri East's contracted capacity on MRT is the largest proportion of its portfolio, and it is also the largest customer on MRT. The forward haul contract is used to transport gas purchased on the MRT-WL or the MRT-ML segments in northern Louisiana or Arkansas for delivery to the Company's citygates. The backhaul contract is used to transport gas from the outlet of STL Pipeline south on the MRT-ML to the Company's citygates located off of the MRT-ML in the southeastern portion of the service territory.

- *MoGas Pipeline ("MoGas")*: MoGas is a regional pipeline that consists of approximately 263 miles of pipe, almost all located in Missouri, with a very small amount of pipe located in Illinois. MoGas is directly connected to the Company's distribution system, but is not directly

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4 The MoGas and MRT interconnections with STL Pipeline became operational in the winter 2020.

5 *See, e.g.*, STL Pipeline, Application of Spire STL Pipeline LLC for a Temporary Emergency Certificate, or in the Alternative, Limited Term Certificate, Exhibit Z-1, Affidavit of Scott Carter, Docket CP17-40, July 26, 2021, p. 7; STL Pipeline, Response to August 6, 2021 Data Request, Docket No. CP17-40, Response 9, 10, September 7, 2021.

connected to upstream production. Rather, the Company uses capacity contracted on STL Pipeline, PEPL, and REX to deliver gas into MoGas for ultimate delivery to its citygates. Due to high pressure deliveries from STL Pipeline into MoGas, the Company recently increased its capacity on MoGas to 145,600 dth/d.

- *Southern Star Central ("SSC")*: SSC is a reticulated system that consists of approximately 5,850 miles of pipe, primarily in Kansas, Oklahoma and Missouri, with lesser amounts in Wyoming and Colorado, and very small amounts in Texas and Nebraska. Spire Missouri East's existing contracted capacity on SSC of 30,300 dth/d provides the capability to purchase gas in western Oklahoma and the Texas panhandle and transport that gas on SSC via an 8-inch, approximately 200-mile lateral (known as "Little Mo") that extends across Missouri to the Company's citygate.

As noted, the Company also owns and operates the Lange underground aquifer natural gas storage facility that is located on the Company's distribution system. The Lange facility has a total working gas capacity of approximately 3.6 Bcf and Spire Missouri East can inject into and withdraw gas from the Lange facility throughout the year. For planning purposes, the Company assumes a maximum design day deliverability from Lange of 357,000 dth/d. In the past, the Company also owned and operated an on-system liquid propane infrastructure at two locations on its distribution system (*i.e.*, Catalan and Lange), whereby liquid propane was stored at Lange and then could be withdrawn from storage and vaporized at Lange or transported via a natural gas liquids pipeline to Catalan to be vaporized. Upon the commencement of service of STL Pipeline, Spire Missouri East retired its aging propane facilities; however, based on the uncertainty surrounding the future operation of STL Pipeline, it is Concentric's understanding that the Company is currently working to reestablish operations at Catalan.

II. POTENTIAL ALTERNATIVES TO STL PIPELINE

As discussed, the purpose of this analysis is to evaluate the potential alternatives available to the Company prior to the winter of 2022/2023 to reliably replace 350,000 dth/d of deliverability to the Spire Missouri East distribution system should STL Pipeline no longer be available as a gas supply option. The available options identified in this section are then compared to the benefits of Spire Missouri East continuing to utilize its firm capacity on STL Pipeline in Section III.

A. Existing Unsubscribed Pipeline Capacity

Concentric assumes that firm capacity held by other shippers is being used to serve customers and is therefore not available to Spire Missouri East; however, one option for the Company to replace a portion of the 350,000 dth/d is contracting for existing unsubscribed pipeline capacity to its citygates. To ensure primary rights to the capacity to meet peak winter demands, Spire Missouri would need to contract for firm transportation capacity. As discussed, three pipelines other than STL

Pipeline directly interconnect with Spire Missouri East. Unsubscribed capacity on each of the three pipelines is discussed below:

- **SSC:** As noted, the 8-inch, 200-mile "Little Mo" lateral that extends across Missouri currently delivers supplies off of SSC to Spire Missouri East. The other primary shipper served off of the Little Mo lateral is another utility (Ameren), whose capacity is not expiring in the near-term. Based on a review of the capacity available on SSC's electronic bulletin board, there is currently no additional firm capacity available to the Spire Missouri East citygate on the SSC pipeline system.

- **MoGas:** Since the issuance of the decision by the D.C. Circuit Court of Appeals regarding STL Pipeline's certificate approval, the Company has subscribed for an additional 10,000 dth/d on MoGas, which was the only unsubscribed capacity on the MoGas system capable of delivering to the Spire Missouri East distribution system. Absent STL Pipeline remaining in service, MoGas has indicated that there is no further unsubscribed capacity that can be delivered to the Company's citygates, and it does not anticipate any existing subscribed capacity becoming available in the near-term. In fact, if STL Pipeline is taken out of service, MoGas will be required to decrease its capacity to Spire Missouri East by 82,800 dth/d because it will lose the incremental high pressure deliveries that STL Pipeline provides through its interconnection on the east end of MoGas's system.

- **MRT:** Spire Missouri East has already contracted 568 dth/d on the MRT-ML, which is the only capacity currently unsubscribed on of the MRT-ML. MRT's electronic bulletin board indicates that the MRT-ML is fully subscribed northbound (*i.e.*, there is no available capacity), but that 135,548 dth/d of capacity is unsubscribed on the MRT-EL.[6] However, in recent comments, MRT has indicated that it has 165,849 dth/d of capacity available starting December 1, 2021 available on the MRT-EL.[7] Since the MRT-EL does not directly interconnect to natural gas production nor does it directly connect to a liquid trading point, capacity on upstream pipelines feeding into the MRT-EL (*i.e.*, on Trunkline and/or NGPL) would also be required to serve Spire Missouri East.[8] Based on information provided on Trunkline and

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6 Mississippi River Transmission, Informational Postings, Unsubscribed Capacity Report, November 7, 2021.

7 Reply Comments of Enable Mississippi River Transmission, LLC, Docket No. CP17-40-007, October 5, 2021, at 2. Note, the capacity available via the MRT-EL is not expected to be available for the winter of 2021/2022 because the former Chain of Rocks delivery point would need to be rebuilt. (STL Pipeline, Response to August 6, 2021 Data Request, Docket No. CP17-40, Response 2(b), September 7, 2021).

8 According to S&P Global Platts, "Methodology and Specifications Guide, US and Canada Natural Gas, Latest Update May 2020" the REX, Zone 3 delivered price point applies to: Deliveries from Rockies Express Pipeline to Natural Gas Pipeline Co. of America pipeline at the Moultrie County, IL interconnect; to Midwestern Gas Transmission at the Edgar County, IL interconnect; to ANR Pipeline at the Shelby County, IN interconnect; to the Trunkline system at the Douglas County, IL interconnect; and to the Panhandle Eastern Pipe Line at the Putnam County, IN interconnect.

NGPL's electronic bulletin boards, as well as discussions with these pipelines, it appears that there is sufficient capacity on these upstream pipelines to fill the 165,849 dth/d of currently available capacity on the MRT-EL.

Therefore, in addition to the 10,568 dth/d that the Company has already contracted on MoGas and the MRT-ML, the additional pipeline capacity currently available is limited to approximately 165,850 dth/d via Trunkline and/or NGPL into the MRT-EL. Consequently, based on an evaluation of current market conditions, there is insufficient capacity available for Spire Missouri East to contract on any individual or combination of pipelines to meet the 350,000 dth/d deficit that would result if STL Pipeline were removed from service.

B. On-System Liquid Propane Facilities

Historically, Spire Missouri East utilized on-system liquid propane peaking facilities that consisted of an underground storage cavern at Lange north of St. Louis into which liquid propane was injected, stored, and vaporized as necessary. The Company also had a second vaporization site at Catalan, south of St. Louis, that was interconnected with the storage cavern at Lange via a FERC-jurisdictional natural gas liquids pipeline owned and operated by Spire NGL. However, with the commencement of service on STL Pipeline, the Company retired and decommissioned portions of its aging on-system liquid propane equipment. Additionally, the Company has indicated that Spire NGL was in the process of retiring and decommissioning and portion of its line that serves the Catalan facility. It is Concentric's understanding that the Company is attempting to restore propane service at Catalan, the capability is projected to be between approximately 54,000 dth/d to 59,000 dth/d.[9] While the Company is working to restore liquid propane capability at Catalan, an independent analysis by Charles River Associates has indicated that propane is not a reasonable alternative to STL Pipeline for reliably serving Spire Missouri East's winter peaking requirements.[10] Accordingly, the Company has stated that liquid propane is a temporary, emergency measure only and is not a long-term resource option for replacing a portion of the 350,000 dth/d deficit that would result if STL Pipeline were removed from service.[11]

C. On-System Distributed CNG/LNG

Compressed natural gas ("CNG") or liquified natural gas ("LNG") injections delivered via truck have been used by pipelines and other LDCs to supplement natural gas supplies in various circumstances. These distributed CNG and LNG sites are often operated as peaking facilities, supplementing supplies in situations of extreme cold or short-term replacements due to operational issues. In distributed

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9 Charles River Associates, "Risk Assessment of Alternative Gas Supply Options," November 2021.

10 Charles River Associates, "Risk Assessment of Alternative Gas Supply Options," November 2021.

11 *Spire STL Pipeline, LLC*, Docket No. CP17-40-000, *et. al*., Affidavit of George Godat, November 30, 2021.

CNG applications, natural gas is compressed, loaded into a trailer, delivered by truck to an injection site, decompressed, and discharged into the natural gas system. The process is similar for distributed LNG applications, except the natural gas is transported by truck in a liquified state, and the trucks either vaporize directly into the natural gas system or deliver the LNG for storage in a local tank until it is necessary. These projects are often called "virtual pipelines" and can be implemented in a relatively short period of time as compared to permanent installations.

National Grid has the largest distributed CNG operation in the U.S. on its distribution system, and is continuing to expand such capabilities due to the regulatory rejection of proposed pipeline expansions. Currently, National Grid has two distributed CNG sites in its New York City/Long Island service territory and is in the process of adding two CNG sites, which would provide a total capability to deliver up to 80,000 dth/d in its service territory.[12]

Both distributed CNG and LNG require minimal incremental construction, have relatively small land requirements, can be located in areas of the distribution system to maximize operational benefit, tend to be easier to permit compared to permanent installations, and can be used flexibly (*i.e.*, only when needed). In a scenario where sites are available, permitting is efficient, and the utility has prior relevant experience, a utility distributed CNG or LNG can become operational in a period of approximately 4 to 18 months. However, there are a number of variables that influence the ability to quickly ramp up utility-scale distributed CNG or LNG operations. For example, it is necessary to have existing CNG compression or liquefaction sites (often owned and operated by third-party suppliers) within reasonable proximity of the utility's injection sites, a sufficient number of available trailers to support operations (also often owned and operated by third-parties), and experienced personnel to operate each stage of the process (both third-party contractors and utility personnel). If this supporting infrastructure is not already in place, it would need to be developed, increasing the time required to bring distributed CNG or distributed LNG operations online. In addition, community outreach and potential opposition can also increase development time.

While National Grid is the leading utility in the implementation of distributed CNG, even National Grid's extensive use of CNG is significantly below what would be required to fully replace the 350,000 dth/d that would be lost if STL Pipeline is no longer in service. While Concentric has not conducted an analysis of the potential for distributed CNG or distributed LNG on the Spire Missouri East system, given that the Company has no existing experience with distributed CNG or distributed LNG operations, and that supply chain disruptions could potentially impact the ability to manufacture and obtain the necessary equipment, it is unlikely that distributed CNG or LNG operations at the scale used by National Grid could be implemented by Spire Missouri East prior to next winter, and even if possible, would be capability much lower than what National Grid has accomplished over multiple years. Furthermore, similar to restoring liquid propane, the Company has stated distributed CNG/LNG would only represent only a temporary, emergency measure only and is not a long-term

[12] National Grid, Natural Gas Long-Term Capacity – Second Supplemental Report, June 2021, pp. 14, 17.

resource option for replacing a portion of the 350,000 dth/d deficit that would result if STL Pipeline were removed from service.[13]

D. Other Alternatives Considered

In addition to the potential alternatives discussed in this section, there are also several other alternatives that have been considered. However, due to long lead times, size of impact, or other practical reasons, none of these options are considered viable solutions to replace a portion of the 350,000 dth/d of capacity in Spire Missouri East's gas supply portfolio prior to the start of next winter (*i.e.*, November 1, 2022) if the firm transportation service provided by STL Pipeline is no longer available. Specifically:

- *Pipeline Expansion Capacity*: In addition to contracting for existing unsubscribed capacity, the Company could theoretically contract for capacity on a pipeline expansion. However, Concentric is not aware of any existing open seasons for expansion capacity currently being undertaken by any of the pipelines capable of delivering to the Company's citygates. Regardless, expansions of existing pipelines, whether it be through added compression and/or looping of existing facilities, or through greenfield facilities, generally require significant lead-time. The amount of lead-time required depends on a number of factors (*e.g.*, extent of facilities required; cost of facilities required; extent of permitting; level of opposition), but any meaningful expansion of existing pipeline facilities is not considered to be feasible prior to the winter of 2022/2023.
- *Permanent LNG Facility*: The construction of a permanent LNG facility on the western side of Company's distribution system could be used to replace a portion of the 350,000 dth/d currently contracted on STL Pipeline, as well specifically address the need to meet peaking needs on the western portion of the distribution system. However, whether the Company could obtain the necessary approvals to build a permanent LNG facility is uncertain, and even if it were permitted to do so, the development and construction process requires significant lead time. As evidenced by the LNG facilities most recently constructed by utilities across North America, the time frame required for development from initial concept to in-service can be five or more years. Thus, construction of a permanent LNG facility is not considered a feasible solution prior to the winter of 2022/2023.
- *Conversion of Distribution Customers from Firm to Interruptible*: The Company could potentially partially mitigate the loss of 350,000 dth/d in its gas supply portfolio by offering a new distribution service that would allow existing firm requirements (*i.e.*, sales) customers to choose to be non-firm or "interruptible" under certain specified conditions. Theoretically, such a service could allow Spire Missouri East to reduce its firm customer load on the coldest days of the year, therefore reducing the peak demand for which the Company needs to plan

[13] *Spire STL Pipeline, LLC*, Docket No. CP17-40-000, *et. al.*, Affidavit of George Godat, November 30, 2021.

to serve. However, there are number of uncertainties associated with such a service offering, including the customers that would elect to be interrupted and the total peak load of these customers. Even assuming such a service were to be approved, the customers most likely to participate would be large or dual-fuel firm requirements customers. Based on non-residential usage data provided by Spire Missouri East, the 100 largest firm requirements customers have a combined estimated peak day usage of approximately 10,000 dth/d,[14] and it is highly uncertain whether these customers could or would participate if a new service offering were developed. In addition, such a service would require approval of the Missouri Public Service Commission and, if approved, time for the Company to engage with its largest customers regarding the new service and install any necessary infrastructure at the customer premises to ensure interruption when required. As a result, it is unlikely that the Company would be able to meaningfully mitigate the 350,000 dth/d prior to November 1, 2022 by converting existing firm sales customers to interruptible service.

- *Incremental Demand Response* – Various LDCs have implemented demand response programs in which residential and other smaller customers can voluntarily reduce natural gas consumption when requested in return for an incentive. Many of these programs are in the pilot phase, and as a result, the magnitude of the demand reduction that can be relied upon from these programs is unclear. Any programs to achieve incremental demand response on the Spire Missouri East distribution system would need to be developed by the Company, approved by the Missouri Public Service Commission, and then implemented with customers. Based on these factors, it is not considered to be viable for Spire Missouri East to implement incremental demand response on its distribution system prior to the winter of 2022/2023 that would meaningfully mitigate the 350,000 dth/d prior to November 1, 2022.
- *Behind the Meter Small Scale CNG* – National Grid has indicated that it is currently investigating the potential for behind the meter small scale CNG to reduce the need for the utility to meet peak customer demands.[15] National Grid notes that there are a number of factors that would need to be considered and addressed to determine whether this is a viable option, including safety, market conditions, and rate structures that would be sufficient to incentive customers to pursue this option. Considering the early stages of investigation of such an option, and the uncertainty as to the scale at which it may be implemented, this option is not considered to be a feasible solution for meeting a portion of the 350,000 dth/d by next winter.

[14] Based on monthly customer usage in January 2021.

[15] National Grid, Natural Gas Long-Term Capacity – Second Supplemental Report, June 2021, p. 89.

E. Conclusions

Based on the foregoing, while there are a number of uncertainties regarding the full extent to which the 350,000 dth/d may be able to be mitigated by available alternatives prior to the winter of 2022/2023, it is reasonable to conclude that there is insufficient capability associated with the totality of these potential alternatives, and thus even with these options, Spire Missouri East would still have a significant shortfall compared to the 350,000 dth/d deficit created if firm transportation service provided by STL Pipeline is no longer available.

III. BENEFITS OF STL PIPELINE COMPARED TO ALTERNATIVES

While the options available to the Company prior to next winter would not be able to fully replace the 350,000 dth/d currently provided by STL Pipeline, the benefits of these potential options relative to STL Pipeline have also been evaluated. For purposes of this analysis, the benefits of STL Pipeline and alternatives are evaluated on the following bases, which are consistent with the benefits that have been recognized by numerous state regulatory commissions in approving contracting decisions by natural gas distribution utilities:

Reliability: Because utilities have an obligation to serve firm customers, and the potential for natural gas outages to cause extremely dangerous conditions, it is critical that the supply portfolio provide utilities with reliable delivered gas supplies. Generally, utilities back-up their obligations to firm customers with firm supply contracts and corresponding firm pipeline transportation capacity. While supply and delivery disruptions, and restrictions due to weather, operational issues, or other factors are generally rare, they do occasionally occur, and these upstream reliability concerns are often considered when making portfolio decisions.

For example, Storm Uri in February 2021 significantly affected natural gas production in the Texas/Mid-Continent region, which ultimately led to natural gas supply disruptions across several states. Spire Missouri East was able to reliably serve its customers throughout the storm, in part due to its reliance on deliveries from STL Pipeline. Based on a review of usage of pipelines directly and indirectly capable of delivering to Spire Missouri East prior to and during Storm Uri, it is very unlikely that natural gas delivered via STL Pipeline would have been able to be rerouted on other pipelines to meet the demands experienced by Spire Missouri East during Storm Uri, and therefore, would have resulted in significant customer outages due to the inability to source additional gas in the Mid-Continent region.

Supply Diversity: Having access to a diverse range of gas supplies, transportation paths, and types of assets in the portfolio provides value in the sense that it provides the opportunity to mitigate the effects of supply disruptions and price spikes to take advantage of lower prices in different locations. If a utility purchases all its gas from one supply location, there is the potential that disruptions in that single supply source could cause difficulties in meeting LDC

demands, or at a minimum, can cause customers to be subject to price swings experienced in that supply location. Adding diversity to an LDC's portfolio through access to multiple supply locations or storage can provide value by mitigating the effects of supply disruptions and price swings.

Storm Uri also provides an illustrative example of the order of magnitude of the potential benefits of supply diversity. As discussed above, it is not likely that additional gas supplies in the Mid-Continent region would have been available to Spire Missouri East for purchase during Storm Uri due to supply disruptions and thus would have resulted in customer outages on its distribution system. However, even if sufficient gas supplies were hypothetically available to Spire Missouri East absent its service on STL Pipeline, the incremental costs that could have been incurred would be significant due to the unprecedented natural gas prices in the Mid-Continent region. During the four-day holiday weekend from February 13-16, 2021, daily spot prices at some locations in the Mid-Continent region reached between $200-$375/dth, while gas accessible by STL Pipeline at REX Zone 3 was approximately $65/dth. Thus, for example, multiplying Spire Missouri's capacity on STL Pipeline of 350,000 dth/day times an illustrative price difference between REX Zone 3 and the Mid-Continent of $200/dth times four days results in a potential cost differential of $280 million.

Operational Considerations: Operational considerations must be factored into the decision-making process due to the specific configurations of a distribution system, the size, location, and needs of customers, and the ability of gas to be transported across the distribution system. Due to the unique characteristics of distribution systems, utilities may have requirements to receive certain amounts of natural gas at specific locations on their system to maintain delivery pressures, serve growing loads and/or allow for greater flexibility or security of supply. These operational considerations also play a role in determining an appropriate gas supply portfolio. As discussed previously, STL Pipeline provides operational benefits to Spire Missouri East as it allows for additional supplies to be delivered to the west-end of its system, and allows for the refill of Lange storage during the winter.

Cost: The total cost to acquire and deliver gas supply to customers is clearly an important factor for utilities to consider when developing a gas supply portfolio to ensure that customers are being served in a cost effective and reliable manner. Cost encompasses both cost level as well as cost stability. Especially for assets that have long lives or long-term contracts, it is important to not only consider cost today, but the potential for significant changes in costs over time. Cost stability is one reason that many LDCs utilize hedging as part of their overall gas supply portfolio strategy. Because STL Pipeline's receipt point accesses liquid natural gas supplies on REX, Spire Missouri East only needs to pay costs on one pipeline for delivery to its distribution system, making STL Pipeline a cost effective path for Spire Missouri East's customers.

Flexibility: Customer demand needs can change over time and flexibility in a gas supply portfolio provides the ability to serve those potentially changing needs. For example, demand

growth may not be uniform across the service territory. To the extent that assets provide the flexibility to change delivery points to suit the needs of shifting load centers, those assets would provide greater value to the portfolio than assets that have one fixed delivery point. The flexibility to access multiple supply sources or to allow for intra-day load swings are other examples of flexibility that add value to a gas supply portfolio. Because of the high pressure at which STL Pipeline can operate, it provides the flexibility to not only serve delivery points directly off of the pipeline, including providing the Company the opportunity to refill storage during the winter without compression, but also to deliver gas into MRT to serve points in the southeastern portion of the distribution system, as well as into MoGas to serve points in the western portion of the distribution system.

Environmental Impact: The impact to the environment is also an important consideration in meeting customer demands. Consideration must be given to the environmental impacts of both constructing infrastructure to meet LDC demands, as well as the ongoing impacts of operating the portfolio over time. Any incremental infrastructure required to replace the capacity associated with STL Pipeline will likely have a greater environmental impact than continuing to run the existing pipeline, which has already been constructed.

As a result of balancing these and potentially other factors, and the inherent uncertainty associated with future gas supply and prices, there is no one optimal portfolio. In addition, due to changing circumstances over time, different portfolio decisions may be appropriate at different times.

A. Existing Unsubscribed Pipeline Capacity

Contracting for unsubscribed upstream capacity on NGPL and Trunkline, and then downstream on the MRT-EL to the Spire Missouri East distribution system would not provide the same degree of benefits to Spire Missouri East compared to STL Pipeline in a number of other respects. In addition, any available capacity that would be contracted to be delivered off of the MRT-EL would also require rebuilding the former interconnect between Spire Missouri East and the MRT-EL at Chain of Rocks since that interconnect was replaced with a new interconnect upon commencement of service of the STL Pipeline. The Company estimates that reestablishing this interconnect would take approximately 9 to 12 months. The Company has also indicated that integrity and pressure issues associated with the portion of the Spire Missouri East distribution system receiving gas from that interconnect (*i.e.*, Line 880) would also need to be resolved.[16]

Reliability: Due to pressure differentials, concerns have been raised regarding the ability to physically deliver gas from NGPL and Trunkline into the MRT-EL on a firm basis throughout

[16] Responses of Spire STL Pipeline LLC, Docket No. CP17-40-000 and 001, September 7, 2021, Question No. 2(b).

the year when the gas is needed.[17] In November 2021, Trunkline announced that it had installed a new control valve that enables it to compress gas and provide firm deliveries into the MRT-EL for gas flowing from either the north or south of the interconnect.[18] Thus, it appears that there were prior reliability issues associated with Trunkline being able to deliver into the MRT-EL on a firm basis throughout the year, but at least insofar as deliveries from Trunkline into the MRT-EL are concerned, these former issues have been resolved. However, Concentric is not aware of any similar modifications undertaken to address similar concerns for gas deliveries from NGPL into the MRT-EL.

Operational Considerations: Contracting for existing unsubscribed capacity on the MRT-EL and upstream on Trunkline and NGPL would also not provide the same operational benefit as Spire Missouri East's existing capacity on STL Pipeline. Specifically, contracting for existing unsubscribed capacity upstream of and on the MRT-EL would provide delivery capability to Spire Missouri East near the St. Louis metropolitan area on the eastern portion of its distribution system. However, as previously discussed, the Company requires significant deliveries on the western portion of its system to meet peak day demands and deliveries from the MRT-EL would not be capable of providing those deliveries in the west.

Cost: While there is existing unsubscribed capacity on the MRT-EL and upstream on Trunkline and NGPL, these paths are more costly on a delivered cost basis relative to continuing to utilize STL Pipeline. Specifically, as shown in Figure 3, the delivered cost of gas to the Spire Missouri East citygates using its existing STL Pipeline capacity is approximately $4.35/dth/d.[19] Comparatively, the delivered cost of the Trunkline/MRT-EL path on which there is unsubscribed capacity is $4.48/dth/d (assuming gas is purchased at REX Z3 into Trunkline at its interconnection with REX in Zone 1B and is delivered to the MRT-EL in Zone 1B) or $4.54/dth/d (assuming gas is purchased at Trunkline Zone 1A and is delivered to the MRT-EL in Zone 1B). Likewise, the delivered cost of the NGPL/MRT-EL path is $4.52/dth/d (assuming gas is purchased at REX Z3 into NGPL at its interconnection with REX in the Iowa-Illinois zone and is delivered to the MRT-EL in that same zone).

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17 *See, e.g.*, Motion to Intervene and Comments in Support of Symmetry Energy Solutions, LLC, Docket No. CP17-40-007, August 23, 2012, p. 4); Responses of Spire STL Pipeline LLC, Docket No. CP17-40-000 and 001, September 7, 2021, Question No. 2(a).

18 Trunkline Gas Company LLC, Informational Postings, Non-Critical Notice, "Trunkline Reliability Modifications Complete," November 3, 2021.

19 Based on 100% load factor and reflects the 2022 forward annual average commodity price, Spire Missouri East's negotiated firm transportation daily demand charge of $0.25/dth/d for being an anchor shipper on the project, and the currently applicable fuel/lost gas percentage of 0.59%.

Figure 3: Delivered Cost Comparison for Spire Missouri East – STL Pipeline v. NGPL/Trunkline into MRT-EL

			Commodity	Transportation						Fue/Lost & Unaccounted For			
Pipeline	Rate Sched	Gas Supply	2022 Fwd Gas Cost ($/dth)	Monthly Demand Charge (peak) ($/dth)	Monthly Demand Charge (off peak) ($/dth)	Daily Demand Charge ($/dth)	Usage Charge (peak) ($/dth)	Usage Charge (off peak) ($/dth)	Usage Charge (ann avg) ($/dth)	Fuel Use (%)	Lost Gas (%)	Cost of Fuel & Lost Gas ($/dth)	Total Delivered Cost ($/dth)
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)
Existing Option													
STL Pipeline	FTS	REX Z3	$ 4.08	$ 7.6042	$ 7.6042	$ 0.2500	$ 0.0000	$ 0.0000	$ 0.0000	0.47%	0.12%	$0.0240	**$ 4.35**
Alternative Option #1 (Trunkline/MRT-EL)													
Trunkline Z1B to Z1B													
Trunkline	FT	REX Z3	$ 4.08	$ 3.3350	$ 3.3350	$ 0.1096	$ 0.0051	$ 0.0051	$ 0.0051	0.15%		$0.0061	$ 4.20
MRT-EL	FTS			$ 6.4462	$ 6.4462	$ 0.2119	$ 0.0098	$ 0.0098	$ 0.0098	0.46%	0.92%	$0.0579	$ 0.28
Total													**$ 4.48**
Trunkline Z1A to Z1B													
Trunkline	FT	Trunkline Z1A	$ 4.07	$ 4.7889	$ 4.7889	$ 0.1574	$ 0.0106	$ 0.0106	$ 0.0106	0.65%		$0.0264	$ 4.26
MRT-EL	FTS			$ 6.4462	$ 6.4462	$ 0.2119	$ 0.0098	$ 0.0098	$ 0.0098	0.46%	0.92%	$0.0588	$ 0.28
Total													**$ 4.54**
Alternative Option #2 (NGPL/MRT-EL)													
NGPL IA/IL to IA/IL													
NGPL	FTS	REX Z3	$ 4.08	$ 3.6900	$ 3.4600	$ 0.1169	$ 0.0021	$ 0.0005	$ 0.0012	0.58%	0.51%	$0.0444	$ 4.24
MRT-EL	FTS			$ 6.4462	$ 6.4462	$ 0.2119	$ 0.0098	$ 0.0098	$ 0.0098	0.46%	0.92%	$0.0585	$ 0.28
Total													**$ 4.52**

Flexibility: Similar to STL Pipeline, the MRT-EL path would represent a different pipeline path relative to Spire Missouri East's existing portfolio, and gas delivered off of the MRT-EL would provide Spire Missouri East the ability to serve demand in the St. Louis area, fill storage at Lange, and backhaul gas southward on the MRT-ML to both serve the utility's citygates in the southeastern portion of it distribution system and to refill the utility's Unionville storage capacity on the MRT-ML in Louisiana. However, unlike STL Pipeline, it is Concentric's understanding that the NGPL/Trunkline to MRT-EL paths would not provide the same level of flexibility in that Spire Missouri East would not be able to utilize the NGPL/Trunkline to MRT-EL paths to deliver enough gas into MoGas to meet demands on the western portions of the utility's distribution system. In addition, as previously discussed, the former Chain of Rocks delivery point would be required to be rebuilt and integrity concerns on Line 880 that connects the MRT-EL to the Lange storage facility would also need to be resolved in order for these alternative paths to be able to refill the Lange storage facility during the winter.[20]

Environmental Impact: Greenhouse gas ("GHG") emissions associated with the operation of a pipeline are a function of its compressor stations and any lost and unaccounted for gas. As shown in Figure 3, the fuel use and lost and unaccounted for gas required for transportation on the Trunkline/NGPL and MRT-EL paths is greater than on STL Pipeline. As a result, using these alternative paths instead of STL Pipeline would create comparatively greater emissions and environmental impact. In addition, while these alternative paths would allow for injections into the Lange storage facility (assuming the Chain of Rocks interconnection were to be rebuilt and the Line 880 integrity issues resolved), they would require compression unlike STL Pipeline that allows for direct injections into storage due to the high pressure gas.

B. On-System Liquid Propane Facilities

It is Concentric's understanding that Spire Missouri East is in the process of coordinating with Spire NGL in an attempt to restore liquid propane capability at its Catalan facility, but that it is not possible to do so at the Lange facility. Considering that Spire Missouri East relied upon liquid propane as a peaking resource for decades, it can provide benefits to the utility's customers, including providing diversity to its gas supply portfolio. However, the Company retired its liquid propane capability because the benefits of firm transportation capacity on STL Pipeline outweighed the benefits of the propane facilities, and as noted, the Company considers restoration of liquid propane capability solely as an interim, emergency measure and not a long-term solution. Regardless of being an interim measure only, restoring liquid propane would not provide the same benefits for Spire Missouri East as STL Pipeline.

[20] STL Pipeline, Response to August 6, 2021 Data Request, Docket No. CP17-40, Response 2(b) and 9, September 7, 2021.

Reliability: Having an on-system peaking facility is typically considered a means for natural gas utilities to increase the reliability of their supply against disruptions that may occur upstream. However, the lack of storage at Catalan could impact the reliability of the Catalan facility. Specifically, liquid propane would be stored at Lange, then when needed, the liquid propane would be withdrawn from storage and transported via a natural gas liquids pipeline to Catalan for vaporization. As a result, Catalan does not have the same degree of reliability as an on-system peaking facility that does not have to rely on upstream infrastructure.

Flexibility: The vaporization of liquid propane into the distribution system produces a natural gas stream with a higher btu content that can negatively affect end-use equipment. As a result, it is Concentric's understanding that customers have asked the utility to provide a 48-hour notice if the liquid propane facilities are going to be relied upon so end-use equipment issues with liquid propane in the natural gas stream can be addressed. This notification limits the flexibility associated with using the propane facilities.

Environmental Impact: In a recent report, Trinity Consultants concluded that the use of the liquid propane results in approximately 17% greater GHG emissions relative to the use of pipeline gas from STL Pipeline.[21]

C. On-System Distributed CNG/LNG

Similar to STL Pipeline, distributed CNG/LNG could provide a number of benefits to Spire Missouri East. Distributed CNG/LNG would enhance supply diversity by providing a source of supply that is not currently relied upon to meet the Company's load requirements. In addition, distributed CNG/LNG could provide flexibility in that it could be developed to serve multiple locations on the distribution system, which therefore could also satisfy the operational need of the Company to meet the peak day demands on the western portion of its system. However, while there are certain similar benefits, distributed CNG/LNG would not have the same level of benefits to Spire Missouri East that are provided by STL Pipeline.

Reliability: There are potential reliability concerns related to distributed CNG/LNG relative to STL Pipeline. Distributed CNG/LNG rely on truck deliveries to support operations, and scheduling and managing the delivery process requires careful coordination and constant monitoring.[22] Often, these truck deliveries are needed during harsh winter weather conditions, which can cause transportation challenges on local roadways. In addition, any

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[21] Trinity Consultants, "Evaluation of Environmental Impacts of Spire STL Pipeline," October 2021, pp. 4-1 and 4-2.

[22] Generally, CNG trailers can hold the equivalent of approximately 400 dth of natural gas, meaning it would require approximately 44 trucks per day to supply one distributed CNG sites capable of delivering 17,600 dth/d. LNG trailers can hold the equivalent of 800-850 dth, meaning approximately 22 trucks per day could provide the same 17,600 dth/d of capability.

major traffic congestion (*e.g.*, accidents; construction; weather) can delay deliveries. One mitigation strategy involves having sufficient space to park multiple full trailers at or near the injection site in advance of cold weather; however, additional trucks would still be required to reach the injection site to maintain ongoing CNG/LNG deliveries into the distribution system. National Grid, the largest developer of utility scale distributed CNG in the United States, indicates that it has historically viewed this option as "a contingency operation to augment baseload supply in the event of an unplanned shortage;" however, "as an option for natural gas baseload supply, this option is medium to low in reliability."[23] Both the natural gas utilities and the regulatory staff of the Public Service Commission in New York have identified reliability concerns associated with the use of CNG.[24]

Cost: Spire Missouri states that it would require distributed CNG/LNG for the three coldest winter months (*i.e.*, December through February) or 90 days of service. National Grid has indicated that for comparison purposes, it assumes (i) a gas supply cost of $12.75/dth, which covers the cost of the CNG commodity, road transportation and reservation of trucking volumes; and (ii) a fixed cost per site of $800,000/year related to the capital investment in the site and the ongoing operating and maintenance expenses. Therefore, assuming the standard capability at National Grid's most recent sites of 17,600 dth/d and the need for the service over 90 days of the peak winter season (*i.e.*, December through February), the unit cost of distributed CNG is estimated to be approximately $13.25/dth.[25]

Based on confidential indicative bid information provided to Spire Missouri, Concentric estimates that the cost of a firm distributed LNG service for 90 days over the three peak winter months of December through February would be approximately $20.00/dth.

In comparison to the unit cost of distributed CNG or LNG, the equivalent per unit cost of Spire Missouri East's firm contract on STL Pipeline assuming 90 days of service would be much lower at approximately $5.12/dth.[26]

Environmental Impact: As noted, development of one or more distributed CNG and/or LNG sites would require deliveries from approximately 22 trucks per day (distributed LNG) or 44 trucks per day (distributed CNG) to provide 17,600 dth/d of supply capability. As a result, there would be incremental greenhouse gas emissions associated with this option, and the

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23 National Grid, Natural Gas Long-Term Capacity Report, February 2020, p. 105.

24 Charles River Associates, "Risk Assessment of Alternative Gas Supply Options," November 2021, Appendix B.

25 Reflects the commodity cost of $12.75/dth plus the fixed cost of $800,000 spread over 90 days of service and 17,600 dth/d of capability (*i.e.*, $800,000/10/17,600) or $0.51/dth.

26 Reflects the annual average commodity cost of gas in Figure 3 of $4.08/dth plus the annual demand charges spread over a 90-day service (*i.e.*, $0.25/day x 365 days / 90 days = $1.01/dth) plus the per unit cost of fuel use (*i.e.*, approximately $0.02/dth).

magnitude of the impact would depend on the extent to which this option would be relied upon by the utility.

In addition to the differences noted above, relative to STL Pipeline, which is already constructed and fully operational, the development of distributed CNG/LNG on the Spire Missouri East distribution system is more uncertain. As discussed, while it is possible that the Company may be able to develop one or more distributed CNG or LNG sites on its distribution system prior to the winter of 2022/2023, there are a number of factors that would need to be addressed in the next year (*e.g.*, ensuring availability of local CNG/LNG supply and trucking capability; identifying and acquiring available sites; ability to obtain necessary trained workforce; conducting community outreach and managing any opposition; obtaining all necessary permits; obtaining regulatory approval) that are uncertain.

D. Conclusions

As discussed, three potential alternatives could mitigate a loss of a portion of the potential 350,000 dth/d shortfall in Spire Missouri East's gas supply portfolio prior to next winter (*i.*e., November 1, 2022) – existing unsubscribed pipeline capacity; restoring on-system liquid propane capability; and distributed CNG/LNG – however, only available pipeline capacity is viewed by the Company as a potential long-term solution for replacing 350,000 dth/d. Regardless, even if all three of these options were pursued, the magnitude of these available alternatives would be insufficient to fully replace the 350,000 dth/d, thus leaving a significant shortfall. Moreover, while these available alternatives would provide certain benefits to Spire Missouri East's customers, they would not provide the same breadth of benefits currently provided to the Company's customers through its contract for transportation with STL Pipeline.

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Appendix B