UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Spire STL Pipeline LLC	**)**	**Docket No. CP17-40-000, et al.**

SPIRE MISSOURI INC.'S COMMENTS IN SUPPORT OF THE REQUEST OF SPIRE STL PIPELINE LLC FOR EXPEDITED REISSUANCE OF CERTIFICATES

Spire Missouri Inc.[1] ("Spire Missouri") respectfully submits these comments in support of the "*Request of Spire STL Pipeline LLC For Expedited Reissuance of Certificates*" filed on November 10, 2021 ("Spire STL Request"). For the reasons set forth below, and in the Spire STL Request,[2] Spire Missouri submits that the Federal Energy Regulatory Commission ("Commission") should expeditiously issue an order on remand that reissues the certificates for the Spire STL Pipeline, prior to the expiration of the Commission's temporary certificate,[3] which is currently set to expire on December 13, 2021. As explained herein, reissuances of the certificates sought by Spire STL is in the public convenience and necessity based on a review of the record prior to the 2018 order issuing the certificates, based on facts that have become known since 2018, and based on the current alternatives available to Spire Missouri to meet its peak demand. Moreover, a failure to expeditiously reissue the certificates requested by Spire STL has required and will require Spire Missouri to take costly, unnecessary and duplicative steps to ensure

[1] On August 30, 2017, Laclede Gas Company changed its name to Spire Missouri Inc.; however, the utility and its interests in this proceeding are unchanged from the original intervention in this proceeding, which was filed on February 27, 2017. As noted in the Godat Affidavit, except where there are specific references to other Spire Missouri service areas, operational references to Spire Missouri are to Spire Missouri's St. Louis and eastern Missouri service territory.

[2] In the Spire STL Request, Spire STL Pipeline LLC ("Spire STL") described the need and benefits of the Spire STL Pipeline in St. Louis and eastern Missouri, including Spire Missouri's reliance upon this pipeline to serve customers throughout its service territory. Spire Missouri provides additional details regarding the import of the Spire STL Pipeline upon its ability to serve its customers in these comments.

[3] *Spire STL Pipeline LLC*, 176 FERC ¶ 61,160, at P 11 and order para. (c) (2021) ("Temporary Certificate").

a continued supply of natural gas to support the customers in its market, based upon the limited supply options that are currently available.

In support of these Comments, and to provide the Commission with the necessary factual basis for reaching its decision on the Spire STL Request, Spire Missouri appends to these Comments the following supporting materials, which are referenced and described in the discussion below: (1) Affidavit of George Godat, the Vice President, Gas Supply and General Manager of Spire Missouri ("Godat Affidavit"); (2) "Assessment of Spire Missouri's Gas Supply Alternatives in the Absence of STL Pipeline," by Concentric Energy Advisors ("2021 Concentric Report"); (3) "Risk Assessment of Alternative Gas Supply Options" by Charles River Associates ("CRA Report"); and (4) "Evaluation of Environmental Impacts of Spire STL Pipeline — Spire Missouri Inc." by Trinity Consultants ("Trinity Report").

I. BACKGROUND

On August 3, 2018, the Commission issued Spire STL a certificate of public convenience and necessity to construct and operate the Spire STL Pipeline. The Spire STL Pipeline was constructed and commenced operations in November 2019, in accordance with Commission regulations and policies.[4] The Environmental Defense Fund ("EDF") did not seek a stay of the Certificate Orders and, subsequent to the commencement of operations, EDF's request for rehearing was denied.[5] EDF filed a petition for judicial review with the United States Court of Appeals for the District of Columbia Circuit ("D.C. Circuit").

On June 22, 2021, the D.C. Circuit issued a decision vacating the Certificate Orders. [6]

[4] Spire Missouri further notes that, as the construction and operation of the Spire STL Pipeline was not stayed, it had an obligation to pay under the Precedent Agreement regardless of whether it was using the Spire STL Pipeline.

[5] *See Spire STL Pipeline LLC*, 164 FERC ¶ 61,085 (2018) ("Certificate Order"), *order amending certificate*, 169 FERC ¶61,074, *order on reh'g*, 169 FERC ¶ 61,134 (2019) (collectively, "Certificate Orders"), *pet. for review granted in part, vacating decision sub nom.*, *Envtl. Def. Fund*, No. 20-1016, 2021 WL 2546672 (June 22, 2021).

[6] *Env'tl Def. Fund v. FERC*, 2 F.4th 953 (D.C. Cir. 2021), *reh'g. and recon. denied,* D.C. Cir. Nos. 20-1016, 20-1017 (D.C. Cir. Sept. 7, 2021).

Spire STL Pipeline and Spire Missouri sought rehearing of the vacatur of the certificate, and sought to stay issuance of the mandate.

On July 26, 2021, Spire STL filed the "Application of Spire STL Pipeline LLC For A Temporary Emergency Certificate, Or, In the Alternative, Limited-Term Certificate" ("Spire STL Emergency Application"), wherein it requested that the Commission issue a Temporary Emergency Certificate for the Spire STL Pipeline to ensure that it could continue to operate while the Commission considers an order on remand following *EDF v. FERC*. On August 6, 2021, the Commission issued a "Notice of Application and Establishing Intervention Deadline" in Docket No. CP17-40-007, which established deadlines for the filing of comments and reply comments to the Spire STL Emergency Application to establish a record; the Commission also issued a number of data requests, which were answered by Spire STL Pipeline, with input and assistance from Spire Missouri, on September 7, 2021.

On September 7, 2021, in *Environmental Defense Fund v. FERC*, D.C. Cir. No. 20-1016, *et al*., the D.C. Circuit issued two separate *per curiam* orders, one denying the joint petition of Spire STL and Spire Missouri for panel rehearing as to *EDF v. FERC*, and one denying the joint petition of Spire STL and Spire Missouri for rehearing en banc as to *EDF v. FERC* ("D.C. Circuit Rehearing Denials").

Also on September 7, 2021, Spire Missouri filed its Comments in Support of the Spire STL Emergency Application.[7] Numerous other stakeholders in the St. Louis and eastern Missouri region filed comments in support of the Spire STL Emergency Application.[8]

On September 14, the Commission *sua sponte* issued Spire STL a temporary certificate of

[7] Comments of Spire Missouri Inc., Docket No. CP17-40-007 (dated Sept. 7, 2021) ("Spire Missouri Comments").

[8] *See* Spire STL Request, Attachment A.

public convenience and necessity, pursuant to section 7(c)(1)(B) of the Natural Gas Act ("NGA"), for a period of 90 days, which will terminate on December 13, 2021 unless extended.[9]

On October 5, 2021, Spire Missouri filed its Reply Comments.[10]

On November 10, 2021, Spire STL filed the Spire STL Request, which requests that the Commission expeditiously issue an order on remand reissuing the certificates for the Spire STL Pipeline prior to the expiration of any temporary authorization.

II. INTEREST AND IDENTITY OF SPIRE MISSOURI

Spire Missouri is a local natural gas distribution company ("LDC") that serves approximately 650,000 residential, commercial, and industrial customers in the greater metropolitan St. Louis area and areas to the south in eastern Missouri. It currently holds a long-term firm capacity contract on the Spire STL Pipeline for delivery of 350,000 dekatherms per day ("dth/d") of natural gas to its St. Louis and eastern Missouri service territory.

Spire Missouri is a public utility subject to the regulation of the Public Service Commission of the State of Missouri ("MoPSC"). As a regulated public utility, Spire Missouri 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 the health, property, and prosperity of St. Louis and eastern Missouri.

Spire Missouri was historically highly dependent on the Enable Mississippi River Transmission ("MRT") system to supply St. Louis and eastern Missouri and also relied heavily on the ability to use direct injected propane on peak days (despite the operational drawbacks

[9] 15 U.S.C. § 717f(c)(1)(B).

[10] Reply Comments of Spire Missouri Inc., Docket No. CP17-40-007 (dated Oct. 5, 2021) ("Spire Missouri Reply Comments").

stemming from its higher BTU content). In the normal course of the utility's system planning efforts, Spire Missouri identified its reliance on the MRT system as presenting a heightened supply diversity and reliability risk for Spire Missouri customers.

In the years prior to 2016, Spire Missouri held discussions with developers, including MRT, to improve critical infrastructure for gas supply into the St. Louis region that could optimize opportunities to access new prolific supplies from the Appalachian Basin and allow Spire Missouri to remove its liquid propane peaking facilities from its supply stack, as explained below. However, those discussions did not lead to any definitive agreements to construct new capacity. Consequently, Spire STL was formed and proposed a project, Spire STL Pipeline, that satisfied all of Spire Missouri's critical infrastructure needs, *i.e.*, the Spire STL Pipeline.

Once the Spire STL Pipeline was placed into service, it provided Spire Missouri with 350,000 dth/day of new firm pipeline capacity. Because of this new firm capacity, Spire Missouri undertook several steps to optimize its natural gas supply portfolio, which resulted in replacing preexisting sources, and maximizing the benefits of the new high pressure supply source that was made available by the Spire STL Pipeline.

More specifically, the operation of the Spire STL Pipeline provided higher pressure deliveries from the Spire STL Pipeline into MoGas Pipeline ("MoGas") (via a new interconnect in service December 2020). This allowed Spire Missouri to secure a contract for additional capacity on MoGas, and the high pressures from the Spire STL Pipeline provided incremental delivered capacity on MoGas. This capacity more than doubled the capacity Spire Missouri was able to secure on MoGas before the Spire STL Pipeline was placed into operation, and benefited the west and southwest portions of its distribution system that is primarily served by MoGas. Hydraulically, this allowed Spire Missouri to receive higher pressures and more volume into the

St. Peters, Wentzville, and Southpoint take points, which are all located in the western suburban portions of Spire Missouri's St. Louis service territory. Spire Missouri was able to forego making immediate costly reinforcements to its own distribution system, which would have been absorbed by customers. Furthermore, operation of the Spire STL Pipeline has permitted Spire Missouri to implement the planned retirements of older facilities such as propane peaking.

As a result of these changes to the distribution system, Spire Missouri today 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 (*e.g.*, primarily residential and smaller commercial and industrial customers) throughout its St. Louis and eastern Missouri service territory. In total, Spire Missouri plans for design day sendout of approximately 1,208,000 dth to meet the requirements of its firm requirements (sales) customers.[11]

Spire Missouri has developed a portfolio of on-system and off-system capacity sufficient to serve firm requirements customers' demands throughout the year. Its portfolio includes capacity on interstate pipelines delivering to Spire Missouri's distribution system, as well the Lange storage facility.[12] With respect to Spire Missouri, it currently contracts for firm pipeline transportation service on four pipelines that directly interconnect with its distribution system (*i.e.*, the Spire STL Pipeline; MRT; 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

[11] In addition, Spire Missouri also provides distribution service but does not procure upstream gas supply or transportation for several Basic End Use customers. Spire Missouri's Basic End Use Customers have an estimated design day sendout of approximately 112,500 dth that is not included in the above estimate. These customers are mostly large industrial customers who buy their gas supply from a separate entity who is responsible to provide gas supplies at Spire Missouri's city-gate for delivery to these customers.

[12] The Lange storage facility is an on-system underground natural gas storage facility owned and operated by Spire Missouri.

Rockies Express Pipeline ("REX")).[13] However, as is discussed in detail below, the increment of capacity represented by Spire STL Pipeline is an essential element of Spire Missouri's firm supply portfolio and cannot be replaced without depriving its system of critical peak day deliverability.

III. SUMMARY OF COMMENTS IN SUPPORT

Spire Missouri fully supports Spire STL's request that the Commission expeditiously reissue certificates authorizing Spire STL to continue the current operations of the Spire STL Pipeline. The firm natural gas supplies provided via Spire STL are essential in meeting Spire Missouri's winter season and design peak needs. Consequently, it is vitally important to the residential, commercial and industrial customers served by Spire Missouri that the Spire STL Pipeline remain in service going forward.

The record in this proceeding already contains ample evidence that demonstrates the Spire STL Pipeline is in the public convenience and necessity. Spire STL and Spire Missouri have presented numerous pleadings,[14] reports,[15] and responses to data requests[16] that contain substantial evidence regarding the need for the Spire STL Pipeline. Importantly, several of the forward-looking justifications previously presented by Spire Missouri either continue to exist today, or have actually come to fruition since the initial application was filed. Spire Missouri submits that the evidence previously submitted continue to be considered by the Commission, especially in

[13] The Trunkline Gas Company ("Trunkline") and Natural Gas Pipeline Company of America ("NGPL") pipelines also indirectly interconnect to Spire Missouri's distribution system through the downstream pipelines; however, Spire Missouri does not currently contract for firm transportation service on these pipelines.

[14] *See, e.g.*, Motion For Leave To File An Answer And Answer Of Laclede Gas Company To Certain Protests, Docket No. CP17-40-000 (dated March 22, 2017) ("Spire Missouri March 2017 Answer"); Motion For Leave To File An Answer And Answer Of Laclede Gas Company To Certain Protests, Docket No. CP17-40-000 (dated June 14, 2017) ("Spire Missouri June 2017 Answer"); Spire Missouri Comments; Spire Missouri Reply Comments.

[15] *See, e.g.*, Attachments B, F, G to Spire Missouri March 2017 Answer; Attachment B to Spire Missouri June 2017 Answer.

[16] *See, e.g.*, Responses Data Requests Issued By The Federal Energy Regulatory Commission, Docket No. CP17-40-000 (dated March 13, 2018) ("March 2018 Responses to FERC Data Requests"); Responses Data Requests Issued By The Federal Energy Regulatory Commission, Docket No. CP17-40-007 (dated Sept. 7, 2021) ("September 2021 Responses to FERC Data Requests").

light of the supplemental evidence contained in this pleading that demonstrates the fact that what was previously said in support of the Spire STL Pipeline has actually come to fruition.

In particular, as Mr. Godat explains in his Affidavit,[17] the factual record demonstrates a number of conclusions supporting a finding that the Spire STL Pipeline is needed, no matter how the record is viewed:

- The record previously provided, prior to the issuance of the original certificates to Spire STL Pipeline in 2018, fairly and comprehensively reviewed, fully supports the re-issuance requested by Spire STL Pipeline now.[18]

- Notwithstanding the earlier record before the Commission in 2018, events and changed circumstances since the original close of the record in this proceeding strongly support the issuance of the requested certificates, including changes in Spire Missouri's market demand, the demonstration of the benefits of supply diversity during Winter Storm Uri in February 2021, and changes to the supply arrangements and facilities available to Spire Missouri. Consequently, based on the facts viewed as of the present time, there is a need for the Spire STL Pipeline independent of the facts as they were presented in 2018.[19]

- Looking forward, following this 2021-2022 winter season, Spire Missouri does not have adequate alternatives to meet its peak day load obligations if the firm pipeline supply provided by the Spire STL Pipeline were no longer available. Even if, for the sake of argument, one were to assume potential alternatives could be used by Spire Missouri over the long term – (1) the acquisition of available capacity on the MRT East Line, and associated pipeline asset construction and facilities acquisition to access that MRT East Line supply, (2) re-activation in part of the propane system, and (3) the use of trucked-in LNG or CNG supplies – the supplies offered by the alternatives would simply fall short of meeting Spire Missouri's peak requirements, both in the aggregate and with respect to Spire Missouri's western service areas in the St. Louis region.[20]

- On a forward-looking basis, Spire Missouri's re-establishment of the propane system and reliance on LNG or CNG supplies are not reasonable alternatives to firm pipeline

[17] Spire Missouri has attached to its Comments the Godat Affidavit. The Godat Affidavit explains the historic growth of demand experienced by Spire Missouri (particularly with respect to the western portion of its system), which prompted it to pursue supply enhancement projects and ultimately support the Spire STL Pipeline, explains Spire Missouri's decision to retire its propane system, and discusses why various alternatives to the Spire STL Pipeline are not reasonable or feasible to ensure the provision of safe and reliable natural gas service to Spire Missouri beyond the current winter heating season.

[18] Attachment A ¶ 7; *see also* Section IV *infra*. (referencing items of record previously provided); *see also* Spire STL Request at 13-18 (detailing the extensive evidence of record that resulted in the issuance of the Certificate Orders).

[19] Attachment A ¶¶ 12-30.

[20] *See* Attachment A ¶¶ 9, 43.

> flowing supplies for gas utility supply planning purposes. Therefore, even if the Spire STL Pipeline were not available due to a decision by this Commission, Spire Missouri would only use the propane and LNG/CNG options as interim, and incomplete, emergency "band-aids." Spire Missouri would go on to seek new or expanded pipeline capacity that would require new construction and its attendant capital and other costs, as well as new environmental impacts, to provide firm pipeline supply for its peak demand. This option, relative to the use of the existing, fully-constructed the Spire STL Pipeline, would require years of costly and likely inadequate reliance on propane and LNG/CNG, only to ultimately require wasteful and duplicative new construction and capacity. Put differently, shutting down the Spire STL Pipeline will not remove the need for new pipeline capacity, it will only push such new pipeline capacity costs and impacts into the future.[21]

To support its conclusions and recommendations, Spire Missouri has prepared, or had prepared on its behalf, several materials regarding the continued operation of the Spire STL Pipeline in support of its comments. Specifically:

- Spire Missouri has provided the Godat Affidavit, as noted above. A true and correct copy of the Godat Affidavit is attached hereto as "Attachment A."

- Spire Missouri retained Concentric Energy Advisors, Inc. ("Concentric") to independently identify and evaluate potential alternatives that could replace 350,000 dth/d of capacity in Spire Missouri's gas supply portfolio prior to the start of next winter (*i.e.*, November 1, 2022) if the firm transportation service provided by the Spire STL Pipeline is no longer available. Concentric concludes that of the feasible and other alternatives identified, none of the alternatives together or alone can act as a reasonable substitute for the anticipated shortfall that would result if the Spire STL Pipeline is no longer available, and that the Spire STL Pipeline provides significant cost benefits. A true and correct copy of the report prepared by Concentric is attached hereto as "Attachment B."

- Spire Missouri retained Charles River Associates ("CRA") to perform an independent assessment of risks associated with gas supply options to replace the Spire STL Pipeline. The report specifically analyzes the operational risks, public safety impact, property damage, environmental impact, system integrity impact, supply security risk and permitting challenges associated with three alternative supply options. The CRA report concludes that each of the alternatives analyzed poses elevated levels of risk in comparison to the Spire STL Pipeline, with one of the alternatives posing unacceptable levels of risks to public safety and property damages. A true and correct copy of the report prepared by CRA is attached hereto as "Attachment C."

- Spire Missouri retained Trinity Consultants to evaluate the various environmental impacts associated with the Spire STL Pipeline. Trinity concludes that, overall, the

[21] Attachment A ¶¶ 10, 36-41.

> operation of the Spire STL Pipeline will allow Spire to maintain its current gas supply operations while decreasing both environmental impacts and the emissions of greenhouse gasses, criteria pollutants, and hazardous air pollutants. A true and correct copy of the report prepared by Trinity is attached hereto as "Attachment D."

Moreover, the additional analyses prepared on behalf of Spire Missouri further demonstrate that nothing in the record supports any conclusion of self-dealing or affiliate abuse given the abundant evidence of benefits to Spire Missouri's customers and the absence of benefits to Spire Missouri's affiliate.[22] Spire Missouri has acted throughout the development of the Spire STL Pipeline to ensure a reasonable, reliable and secure supply of natural gas for its customers, and the data provided in these Comments only underscore this conclusion.

IV. CONTINUED OPERATION OF THE SPIRE STL PIPELINE IS IN THE PUBLIC COVENIENCE AND NECESSITY

Spire Missouri's earliest pleadings in the underlying certificate case—*e.g.*, its Motion for Leave to File an Answer And Answer to Certain Protests filed at Docket No. CP17-40-000 on March 22, 2017—identified that the basis of Spire Missouri's execution of a Precedent Agreement was to obtain direct access between the St. Louis market and the newly-expanded REX system, with its access to multiple natural gas producing basins to the east and west of St. Louis.[23] Therein, Spire Missouri detailed key changes to the St. Louis market and the infrastructure serving this region, which resulted in Spire Missouri having a substantial need for capacity on the Spire STL Pipeline, in addition to other benefits.

Since the Spire STL Pipeline was permitted to be placed into service, the St. Louis market has continued to change. However, and importantly, none of the grounds relied upon by Spire Missouri in initially entering into the Precedent Agreement have diminished. Rather, as explained

[22] It is important to recognize that Spire Missouri negotiated a below-market transportation rate on the Spire STL Pipeline.

[23] *See* Spire Missouri March 2017 Answer.

below, the more recent analyses provided by Spire Missouri continue to demonstrate that the Spire STL Pipeline is needed, that other alternatives to the Spire STL Pipeline will not fully address this need, and that there are substantial risks associated with those alternatives in comparison to the continued operation of the Spire STL Pipeline.

A. Spire Missouri's Prior Analysis Demonstrates That The Spire STL Pipeline Would Enhance, And Has Enhanced, Spire Missouri's Reliability As To Its Supply Of Natural Gas.

The same supply diversity considerations that justified Spire Missouri entering into a Precedent Agreement for the Spire STL Pipeline exist today. Spire Missouri has internally evaluated the concept of a pipeline lateral connecting the new Rockies Express Pipeline LLC ("REX") to the St. Louis Market since approximately 2010.[24] Although multiple interstate pipeline companies developed proposals for Spire Missouri's consideration, none of the projects moved forward for various reasons.[25]

Production from the Marcellus and Utica shale supply basins grew at a remarkable rate between 2010-2015,[26] and the beneficial pricing of these supplies became more certain as new pipeline access was developed.[27] Production continues to remain high, and the impacts of such production upon upper Midwest pricing previously identified by Spire Missouri continue today. This shift in supply and pricing dynamics, which originally prompted Spire Missouri to consider whether it could obtain large-scale access to these eastern supplies via REX,[28] continue today.[29]

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[24] Attachment A ¶ 13; *see also* Spire Missouri March 2017 Answer at 4-6.
[25] Spire Missouri March 2017 Answer at 4-8.
[26] Spire Missouri March 2017 Answer at 5.
[27] *See* Spire Missouri March 2017 Answer at 5.
[28] *See* Spire Missouri March 2017 Answer at 5.
[29] Attachment A ¶ 14; *see also* Spire Missouri Reply Comments at 14-15 (noting that "since the filing of the Spire STL Emergency Application, numerous entities that represent a diverse array of stakeholders and interested parties in the greater St. Louis region have indicated their support for Spire's requests for issuance of an emergency or limited-term certificate to ensure the continued supply of lower priced, reliable natural gas from a variety of sources over the STL Pipeline.").

Spire Missouri's access to a diverse range of gas supplies and transportation paths were significantly enhanced by the Spire STL Pipeline.[30] These supply diversity benefits have afforded Spire Missouri the opportunity to mitigate the effects of supply disruptions and price spikes to take advantage of lower prices and gas availability in different locations.[31] Without the diverse nature of the supplies provided by the Spire STL Pipeline, disruptions in single supply sources could cause difficulties for Spire Missouri in meeting demands, or at a minimum, could cause Spire Missouri's customers to be subject to price swings experienced in that supply location.[32]

Spire Missouri's customers have already benefitted from the added diversity of supplies provided via REX that has been made available by its interconnection with the STL Pipeline.[33] This was further confirmed by the 2021 Concentric Report, which concludes the STL Pipeline provides significant reliability benefits, explaining:

> 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 continue 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.[34]

With respect to supply diversity benefits, Concentric also explained:

> 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

[30] Attachment A ¶ 21; *see also* Attachment A, Exhibit 2 (depicting the dramatic benefits that the Spire STL Pipeline has had upon pressure differentials in Spire Missouri's system).

[31] *See* Attachment A ¶¶ 26-27.

[32] *See* Attachment A ¶¶ 26-27.

[33] *See* Spire STL Emergency Application, Exhibit Z-1 ("Carter Aff.").

[34] Attachment B at 11.

> 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 curtailments 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 February 13-16, 2021 period, 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 prices of $200/dth **would result in a potential cost differential of $280 million over those four days**.[35]

Clearly, the supply diversity and reliability benefits previously identified by Spire Missouri[36] came to fruition during Winter Storm Uri in 2021, and Spire Missouri's customers were able to continue to be provided safe and reliable natural gas service, and avoided approximately $280 million in cost increases that could have otherwise occurred absent the Spire STL Pipeline.

The path-specific reliability benefits that the Spire STL Pipeline would provide to Spire Missouri, which were previously highlighted by the Commission, also continue to exist today. The Commission previously explained that the Spire STL Pipeline was necessary:

> not just because it allows it to access supplies flowing on REX, but because it allows Spire Missouri to do so over a specific path, which Spire Missouri believes will provide certain benefits such as direct access to a liquid supply point in very close proximity to its distribution system, and the avoidance of transportation through a seismic zone.[37]

The Spire STL Pipeline permits Spire Missouri to rely upon supplies that are not transported via pipeline that crosses the most active portions of the New Madrid seismic zone (the "New Madrid

[35] Attachment B at 12 (emphasis added).

[36] *See, e.g.*, March 2018 Responses to FERC Data Requests, Response Nos. 1, 5 (explaining that freeze-offs during extreme cold weather temperatures have been a historical concern for Spire Missouri).

[37] Certificate Order at P 84.

Fault").[38] The same concerns continue to exist today and, indeed, were experienced during a magnitude 4.0 earthquake that occurred on November 18, 2021, within 5 miles of MRT's mainline.[39] Therefore, Spire Missouri's efforts to obtain capacity on the Spire STL Pipeline represents a critical aspect of Spire Missouri's long-term planning requirements and is necessary to enhance the robustness of Spire Missouri's gas supply in the event of another major earthquake along the New Madrid Fault.[40]

Moreover, Spire Missouri cannot replicate these benefits by way of obtaining capacity on the MRT East Line. Spire Missouri demonstrates the upstream pipelines feeding MRT's East Line lacked adequate pressures to reliably supply Spire Missouri's distribution system.[41] As explained by Mr. Godat, this evidence has recently been corroborated by a posting made to Trunkline's electronic bulletin board ("EBB"), wherein Trunkline acknowledged it had addressed these issues by completing a project on its system.[42] The posting stated:

> In order to facilitate firm deliveries at Trunkline's existing interconnect with MRT in Clay County, Illinois, Trunkline will be installing a new control valve near the Tuscola station that <u>will enable Trunkline to compress gas to MRT</u> utilizing gas flowing from points North or South of the interconnect. <u>Upon completion of this modification, Trunkline expects increased pressures to allow firm delivery commitments into MRT</u>.[43]

These reliability issues were further highlighted in the Motion to Intervene and Comments of Symmetry Energy Solutions, LLC regarding the Spire STL Emergency Application.[44]

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[38] *See* Spire Missouri March 2017 Answer at 14-16; *see also* Spire Missouri June 2017 Answer, Attachment G (Seismic-Hazard Map); *see* Attachment A ¶ 27.

[39] *See* Attachment A ¶¶ 11, 27.

[40] *See* Attachment A ¶ 27.

[41] Attachment A ¶ 28.

[42] Attachment A ¶ 29.

[43] Attachment A ¶ 29 (emphasis added).

[44] Motion to Intervene and Comments of Symmetry Energy Solutions, LLC, Docket No. CP17-40-007 (dated Aug. 23, 2021) (explaining that "…Symmetry faced curtailment of gas supplies due to loss of supplies on MRT resulting from force majeures issued by Symmetry's suppliers as well as the loss of supplies due to insufficient pressure on pipelines upstream of MRT's East Line… Furthermore, as agent for an industrial customer on MRT, Symmetry knows that this industrial customer also faced curtailment issues on the MRT System…Symmetry

Furthermore, Spire Missouri was able to retire certain propane peaking facilities, consistent with its original representations in support of the Spire STL Pipeline.[45] Although these facilities provided peaking capacity for many years, the benefits of firm transportation capacity on the Spire STL Pipeline significantly outweighed the benefits of continuing to incur increased operational problems, and maintenance and replacement costs associated with these facilities as well as other operational benefits provided by flowing supplies versus using another peak shaving facility[46]

In each of the above referenced instances, the existing record contains ample evidence of the need for the Spire STL Pipeline, which has been corroborated by events occurring subsequent to the issuance of the Certificate Orders. Therefore, Spire Missouri supports the prompt reissuance of certificates, as requested by the Spire STL Request, and submits that such reissuance is necessary and in the public interest.

B. Further Developments Since The Issuance Of The Certificate Orders Demonstrate and Confirm That The Spire STL Pipeline Is A Necessary And Essential Supply Option For Spire Missouri's Operations.

1. The Spire STL Pipeline is needed to address demand shifts on Spire Missouri's distribution system, particularly the western portion thereof.

Prior to the Spire STL Pipeline being placed into service in November 2019, Spire Missouri experienced challenges in meeting the shift in demand to the western portion of its distribution system. Without the Spire STL Pipeline, Spire Missouri would continue to experience these

understands that this gas supply provided to both Symmetry and the industrial customer during the weather event was available only because of the availability of STL Pipeline.").

[45] *See* Motion for Leave to File and Answer and Answer of Laclede Gas Company to Certain Protests, Docket No. CP17-40-000, at 9-11 (dated March 22, 2017).

[46] Attachment A ¶¶ 31-32; *see also* Attachment C at 27-30.

challenges on the western portion of its system due to its limited ability to move gas from east to west within its distribution system.[47]

Population growth in St. Charles County, immediately west of St. Louis, has long spurred increased demand in the western service area of Spire Missouri – the population supplied in that service area increased from 4,000 in 1963 to approximately 110,000 at present. The accompanying demand growth led Spire Missouri to take steps to modify its distribution system to permit natural gas to flow from eastern supply sources (i.e., underground storage and MRT) into the western portion of the system in St. Charles County.[48] Subsequently in 1990 and 1991, additional gas supply capacity was added via two connections to the 12-inch interstate pipeline operated by MoGas on the northwest and western borders of the distribution system.[49] Later, in the late 1990s, capacity was added when Spire Missouri contracted with Williams to convert an oil pipeline to gas service and connect it to the western service areas of Spire Missouri – via the then newly-created Southern Star Central Gas Pipeline, Inc. ("Southern Star Central").[50]

During this time, the primary gas supply sources for St. Charles County remained the same redundant supply sources, i.e., the interconnection with MoGas and the 16-inch distribution feeder line beneath the Missouri River, supplemented by Southern Star Central (which has not indicated that it can or will increase service).[51] Providing service to St. Charles County's current population of approximately 110,000 natural gas customers, while maintaining gas supply and distribution

[47] *See, e.g.*, 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; September 2021 Responses to FERC Data Requests, Response Nos. 9, 10.

[48] Attachment A ¶ 16.

[49] Attachment A ¶ 14; *see also* Spire STL Request at 25, Figure 1 (depicting the substantial population growth has occurred in this area). Spire Missouri notes that the Spire STL Request further details evidence of the significant and rapid population growth that is being experienced in the western portion of Spire Missouri's distribution system in St. Charles County. *See* Spire STL Request at 24-29.

[50] Attachment A ¶ 16.

[51] Attachment A ¶ 19.

piping capacity for future growth that continues to materialize, is critical.[52] With the goal of retiring the propane facilities, Spire Missouri sought a solution to increase supplier capacity to the constrained western areas of its system and supplement supply on the east side of the system, without building costly reinforcements to the Spire Missouri distribution system.[53]

Specifically, as noted above, the operation of the Spire STL Pipeline provided higher pressure deliveries from the Spire STL Pipeline into MoGas (via a new interconnect in service December 2020).[54] This provided hydraulic benefits that allowed Spire Missouri to receive higher pressures and more volume into the St. Peters, Wentzville, and Southpoint take points, located in the western suburban portions of Spire Missouri's St. Louis service territory.[55] Spire Missouri was able to forego making immediate costly reinforcements to its own distribution system, which would have taken years to construct and would have generated costs to be absorbed by customers.[56] Furthermore, operation of the Spire STL Pipeline has permitted Spire Missouri to implement planned retirements of older facilities such as propane peaking.[57]

The above mentioned western issues can only be reasonably met by deliveries over MoGas, which depend in part on the Spire STL Pipeline.[58] If the Spire STL Pipeline is not permitted to operate, a costly, time-consuming and environmentally impactful expansion of the MoGas pipeline[59] and/or reinforcement to Spire Missouri's distribution system would have to be

[52] Attachment A ¶ 20.
[53] *See* Attachment A ¶¶ 20-21, 31-32.
[54] Attachment A ¶¶ 21-24.
[55] Attachment A ¶ 21.
[56] Attachment A ¶ 22.
[57] Attachment A ¶¶ 31-32.
[58] Attachment A ¶ 41.
[59] *See* Motion to Intervene Out-Of-Time Of MoGas Pipeline LLC And Comments In Support, Docket No. CP17-40-007, at 10 (dated July 28, 2021) ("MoGas Comments"); *see also* Attachment A ¶ 41. Spire Missouri notes that a new greenfield pipeline could be built in order provide additional capacity; however, it does not consider this to be a feasible option.

undertaken to meet increased demand.[60] These expansions and/or reinforcements would also require building additional high-pressure pipelines in very populated areas.[61] Based on engineering estimates, it would take years to install such expansions and/or reinforcements, putting Spire Missouri at risk of not being able to serve its customers during the construction period.[62]

2. Other alternatives to the Spire STL Pipeline are not reasonable, reliable or cost efficient.

Spire Missouri's peak day needs can only be reliably satisfied at this time by the continued operation of the Spire STL Pipeline.[63] Spire Missouri retained Concentric to perform an analysis of potential alternatives to the Spire STL Pipeline.[64] This analysis evaluated several potential alternatives available to Spire Missouri to attempt to reliably replace 350,000 dth/d of deliverability to the Spire Missouri distribution system, if the Spire STL Pipeline is no longer available.

Three primary categories of alternatives were considered and analyzed by Spire Missouri: (1) the potential use of existing unsubscribed pipeline capacity; (2) the partial restoration of on-system liquid propane peaking facilities at the Lange underground storage facility; and (3) the utilization of truck deliveries of liquified natural gas ("LNG") and/or compressed natural gas ("CNG"). Importantly, and as summarized below, the alternatives to the continued operation of

[60] *See* Attachment A ¶ 40. Although these distribution system reinforcement projects would be necessary to meet increased demand, they would not address the upstream pipeline capacity issues that Spire Missouri has previously noted to exist.

[61] *See* Attachment A ¶ 40; *see also* Attachment C at 14.

[62] *See* Attachment A ¶ 40.

[63] In addition to the independent analysis of alternatives provided by Spire Missouri detailed in this section, the 2021 Market Study prepared by Black & Veatch Management Consulting, LLC, and the Spire STL Pipeline Analysis of Current and Future Market prepared by RBN Energy LLC for Spire STL further demonstrates that the St. Louis region's natural gas supplies are currently short when industrial demand relying on recallable capacity is considered, and that the region's supplies are even more short without the Spire STL Pipeline. *See* Spire STL Request, Attachments A and B.

[64] Attachment B at 5-6.

the Spire STL Pipeline would fall far short of reliably meeting Spire Missouri's peak demand needs.

a. There is insufficient unsubscribed capacity on existing pipelines to replace the deliverability of the Spire STL Pipeline.

Concentric identified three pipelines other than the Spire STL Pipeline that directly interconnect with Spire Missouri: (1) SSC, (2) MoGas, and (3) MRT.[65] Concentric described each of these pipelines, their points of interconnection with Spire Missouri, any existing capacity Spire Missouri has already contracted for on each of the pipelines, and any indications of current unsubscribed capacity on each of the pipelines.[66]

Based upon its evaluation of current market conditions, Concentric concluded that there is insufficient capacity available for Spire Missouri to contract on any individual or combination of pipelines to meet the 350,000 dth/d deficit that would result if the Spire STL Pipeline was removed from service.[67] The separately produced market study submitted by Spire STL concluded the same.[68] Concentric further explained that Spire Missouri has already contracted for additional capacity on MoGas (10,000 dth/d) and the MRT Main Line (568 dth/d), which limits additional existing capacity to approximately 165,000 dth/d on MRT East Line.[69] This falls significantly short of meeting the shortfall of supplies anticipated if the Spire STL Pipeline is not available and would require additional capital expenditures at Chain of Rocks to make accessible to Spire Missouri.

Furthermore, any claims that other pipelines serving the region can provide Spire Missouri with an efficient and/or reliable alternative to the Spire STL Pipeline should be rejected.

[65] Attachment B at 5-6.
[66] Attachment B at 5-7.
[67] Attachment B at 7.
[68] Spire STL Request, Appendix A.
[69] Attachment B at 7.

Concentric explained that "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…"[70] Specifically, Concentric concluded that the Spire STL Pipeline provides substantial reliability benefits,[71] operational benefits,[72] cost benefits,[73] flexibility benefits,[74] and environmental impact benefits,[75] to Spire Missouri (and therefore to Spire Missouri's customers), relative to existing unsubscribed capacity on other pipelines.

Indeed, and importantly for Spire Missouri's ratepayers, Concentric also assesses the relative cost of MRT's East Line versus Spire STL Pipeline. Concentric concludes that the Spire STL Pipeline would achieve significant savings on a delivered price basis, going forward, relative to an MRT/Trunkline or MRT/NGPL option (savings ranging from $0.13/dth to $0.19/dth).[76] This analysis further corroborates the analysis provided by Spire Missouri both prior to the 2018 certificate order, and more recently in the Spire STL Emergency Application Proceeding.[77]

Furthermore, contracting for existing unsubscribed capacity on the MRT East Line, would require Spire Missouri to re-establish the connection of Line 880 with the MRT East Line at Chain

[70] Attachment B at 13-14.

[71] Attachment B at 14 ("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.").

[72] Attachment B at 14 (explaining that although "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…the Company requires significant deliveries on the western portion of its system to meet peak day demands and these options would not be capable of providing that capability.").

[73] Attachment B at 14-15.

[74] Attachment B at 16.

[75] Attachment B at 16.

[76] Attachment B at 14-15; *see especially* Attachment B, Figure 4.

[77] Attachment A ¶ 44. Spire STL's Request and accompanying studies further corroborates the analysis conducted prior to the 2018 certificate order and more recently, and demonstrates that the Spire STL Pipeline is needed.

of Rocks.[78] CRA performed a risk assessment of the continued operation of Line 880 associated with this alternative, and determined that it presented, *inter alia*, (a) elevated operational risks, environmental impacts, system integrity impacts and supply security risks,[79] and (b) unacceptable public safety impact risks and property impact risks.[80] As such, it concluded that "[w]hile individual risk elements by themselves are a concern, the cumulative impact of the broad risk elements renders the operation of Line 880 as a transmission feeder as an unacceptable outcome of the current events."[81]

b. Re-establishing Spire Missouri's propane peaking facilities is not a reasonable alternative.

Historically, Spire Missouri utilized on-system liquid propane peaking facilities, consisting of an underground storage cavern at Lange north of St. Louis and a second site at Catalan, as necessary. As noted above, operations over the Spire STL Pipeline permitted Spire Missouri to retire and decommission these facilities. Although Spire Missouri is attempting to restore part of its propane service at Catalan solely as a contingent, emergency facility in the event that the Spire STL Pipeline were unavailable, it is estimated that propane at Catalan could currently only provide between 53,718 dth/day and 59,267 dth/day of peaking capacity, as compared to the supply gap that would result if the Spire STL Pipeline was not permitted to continue operations.[82]

Concentric analyzed the on-system liquid propane facilities as another potential, feasible alternative to the Spire STL Pipeline.[83] Similar to its analysis of utilizing unsubscribed existing capacity, Concentric concluded that the Spire STL Pipeline presented reliability benefits,[84]

[78] Attachment C at 9.
[79] Attachment C at 5, 13, 15-17.
[80] Attachment C at 5, 13-15.
[81] Attachment C at 5.
[82] Attachment B at 7; Attachment C at 18-19.
[83] Attachment B at 7, 16-17.
[84] Attachment B at 17.

flexibility benefits[85] and environmental impact benefits[86] as compared to the liquid propane assets. Concentric further explained that while an "on-system peaking facility is considered an additional means for natural gas utilities to increase the reliability of their supply against disruptions that may occur upstream," the unique situation of Spire Missouri's liquid propane facilities presents unique factors that can limit their reliability.[87]

Furthermore, the re-establishment of these facilities presents additional risks relative to the continued operation of the Spire STL Pipeline. In particular, the analysis performed by CRA identifies, *inter alia*, (1) moderate system integrity risks,[88] and (2) elevated operational risks, public safety risks, property impact risks, environmental impact risks, and supply security risks[89] associated with this alternative. Moreover, CRA explained that before Spire Missouri could actually utilize this alternative, several prerequisite actions would need to be taken, including the refurbishment and testing of propane vaporization facilities,[90] the refurbishment and testing of the propane supply line,[91] the acquisition of fuel,[92] and the retraining of staff.[93] These additional risks and prerequisites actions render this alternative unreasonable.

Finally, Spire Missouri notes that the problems identified by CRA as to the propane option only validate the decision by Spire Missouri management to retire that system and replace it with pipeline supplies. The CRA Report, as well as the Trinity Report (which identified environmental

[85] Attachment B at 17.
[86] Attachment B at 17.
[87] Attachment B at 16-17 (noting, in particular, the reliability impacts on the Catalan facility).
[88] Attachment C at 5, 29.
[89] Attachment C at 5, 27-30.
[90] Attachment C at 21.
[91] Attachment C at 21.
[92] Attachment C at 21-22.
[93] Attachment C at 22.

benefits from ending reliance on propane, as discussed below), validates the managerial choice already made and confirmed by Spire Missouri.[94]

c. Spire Missouri cannot reasonably rely upon limited deliveries of LNG and/or CNG by truck.

Spire Missouri also analyzed the potential to use CNG or LNG injections delivery via truck as an alternative means of obtaining supply.[95] While CNG and LNG injections have been used to supplement supplies in peaking circumstances by other gas utilities due to operational issues, it is unlikely that Spire Missouri could implement this alternative at the scale required prior to the next Winter Heating Season due to existing circumstances and current market conditions.[96] Moreover, the expected incremental peak volume from this alternative would only be approximately 10,000 dth/day.[97] The CNG alternative was found unlikely due to the low energy density of CNG, and given the scope of the needs of the Spire Missouri system.[98]

This alternative, while technically feasible, also does not provide the same scale of supply or the level of benefits as the continued operation of the Spire STL Pipeline.[99] Implementing this alternative would also require substantial incremental factors to be addressed within the next year (*e.g.*, ensuring availability of local 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 approval) that are uncertain.[100]

[94] *See* Attachment A ¶ 47.
[95] Attachment B at 7-9, 17-19; Attachment C at 5, 30-33.
[96] Attachment B at 7-9.
[97] Attachment C at 30; *see also* Attachment A ¶ 57.
[98] Attachment C at 30; *see also* Attachment A ¶ 57.
[99] Attachment B at 17-19.
[100] Attachment B at 18-19.

The operation of a micro-LNG alternative also presented incremental risks relative to the Spire STL Pipeline. As explained by CRA, this alternative would result in (1) moderate operational risks, system integrity risks and permitting challenges,[101] (2) elevated environmental impact risks,[102] and (3) unacceptable public safety risks and supply security risks compared to the continued operation of the Spire STL Pipeline.[103] Therefore, it is also not reasonable for Spire Missouri to attempt to rely upon alternative deliveries of LNG and CNG into its system.

Based upon the limited volumes available, as well as the risks of supply interruption by relying on access to these sources, Spire Missouri concluded that this option is not a viable baseload alternative.[104] Furthermore, use of such an alternative as baseload service would be unusual.[105] As such, and as explained in the Godat Affidavit, this alternative is not a long-term option, and would ultimately be displaced by new pipeline facilities.[106]

d. Other potential alternatives are not feasible and cannot be implemented in a timely manner.

In addition, to each of these alternatives, there are several additional alternatives that were considered by Spire Missouri as a part of its alternatives analysis.[107] Spire Missouri could attempt to contract for capacity on another pipeline expansion project; however, Spire Missouri is not aware of any existing open season(s) for expansion capacity currently being undertaken by any of the pipelines capable of delivering to the Spire Missouri's city gates.[108] Furthermore, this alternative is not feasible because expansion projects require varying, but significant, amounts of

[101] Attachment C at 5, 31, 32-33.
[102] Attachment C at 5, 32.
[103] Attachment C at 5, 31-32, 33.
[104] Attachment A ¶ 54-55.
[105] Attachment A ¶ 54-55.
[106] Attachment A ¶ 56.
[107] Attachment B at 9-10.
[108] Attachment B at 9.

lead time that would prevent any meaningful expansion project from being implemented prior to Winter 2022-2023.[109]

Spire Missouri could also attempt to replace a portion of the 350,000 dth/d currently contracted on the Spire STL Pipeline, as well specifically address the need to meet peaking needs on the western portion of the distribution system, by constructing a permanent LNG facility.[110] However, whether Spire Missouri 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.[111] Indeed, recent construction of similar projects (i.e., a permanent peaker/liquefier/vaporizer facility) across North America suggests the time frame required for development from initial concept to in-service can be five or more years.[112]

Spire Missouri could also offer 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.[113] Such a service could allow Spire Missouri to reduce its firm customer load on the coldest days of the year, therefore reducing the peak demand for which Spire Missouri needs to plan to serve. However, uncertainties such as whether customers will participate,[114] whether the MoPSC will approve this service,[115] and the timing required to engage customers and install any necessary infrastructure to provide the service,[116] render it unlikely that Spire Missouri would be able to meaningfully mitigate the loss of deliveries over the Spire STL Pipeline prior to November 1, 2022.

[109] Attachment B at 9.
[110] Attachment B at 9.
[111] Attachment B at 9.
[112] Attachment B at 9.
[113] Attachment B at 9-10
[114] Attachment B at 9-10.
[115] Attachment B at 9-10.
[116] Attachment B at 9-10.

Similarly, Spire Missouri could attempt to implement demand response programs.[117] These programs would, however, have to be developed by Spire Missouri, approved by the MoPSC and then implemented with customers.[118] The uncertainty of timing associated with each of these steps renders this alternative not viable to be implemented prior to the Winter of 2022-2023.[119]

e. The Spire STL Pipeline avoids environmental impacts associated with the implementation of other potential alternatives.

Spire Missouri further investigated whether each of these alternatives would result in incremental adverse impacts upon the environment that would be avoided by the continued operation of the Spire STL Pipeline. In particular, Spire Missouri analyzed whether the continued operation of the Spire STL Pipeline would result in reduced emissions relative to other alternatives and, whether it would result in other environmental benefits relative to other alternatives (e.g., reduction in engine fuel usage, reduction in noise pollution due to reduced engine operation, improved visibility, and reduction in acute and chronic impacts of emissions on nearby soil and vegetation).[120] The report prepared by Trinity concluded that:

> The [STL] pipeline will result in reduced emissions and environmental impacts from Spire's Underground Gas Storage Facility.
>
> The [STL] pipeline will result in reduced emissions and environmental impacts from Spire's Propane Storage Facility.
>
> The [STL] pipeline will decrease the use of less efficient fuel sources such as propane and those used during gas curtailment.
>
> The [STL] pipeline will allow Spire to source gas that is extracted and transported with less emissions than its other existing gas sources.[121]

[117] Attachment B at 10.
[118] Attachment B at 10.
[119] Attachment B at 10.
[120] Attachment D at 3-1 through 3-2.
[121] Attachment D at 1-1.

This analysis further demonstrates that the operation of the Spire STL Pipeline will allow Spire Missouri to maintain current supply operations while decreasing environmental impacts relative to other alternatives.

f. Conclusion regarding alternatives to the continued operation of the Spire STL Pipeline.

The above-described analyses clearly demonstrate that Spire Missouri lacks any reasonable alternatives to the Spire STL Pipeline. The Spire STL Pipeline provides important benefits that cannot be replicated by other feasible alternatives (either individually or cumulatively), avoids increased levels of risk associated with other alternatives, and decreases environmental impacts while permitting Spire Missouri to maintain existing gas supply operations into the St. Louis market.

V. CONCLUSION

WHEREFORE, for the foregoing reasons, Spire Missouri requests that the Commission consider its comments in support of the expedited reissuance of certificates prior to the December 13, 2021 expiration of the temporary certificates, as requested in the Spire STL Request.

/s/ Christopher J. Barr

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Dated: December 1, 2021

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document upon each person designated on the official service list compiled by the Secretary in this proceeding.

Dated at Washington, DC this 1st day of December, 2021.

/s/
Garrett P. Lent

Attachment A

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Spire STL Pipeline LLC	**)**	**Docket No. CP17-40-000, et al.**

AFFIDAVIT OF GEORGE GODAT
ON BEHALF OF SPIRE MISSOURI INC.

I. Identity, Purpose and Summary of Conclusions.

1. My name is George Godat, and I am Vice President, Gas Supply and General Manager Spire Missouri East, a division of Spire Missouri Inc. ("Spire Missouri"). My business address is 700 Market Street St Louis, Missouri 63101.

2. I have held this position since October 2020, and previously held the positions of Vice President – Gas Supply (2018-2020) of Spire Missouri, and prior to that, the position of Vice President, Spire Marketing (fka Laclede Energy Resources) (2009-2018). Prior to joining Laclede Energy Resources, I held various positions in Laclede Gas Company's Gas Supply department for over 14 years with the final position of Director of Gas Supply.

3. In my current position I am responsible, among other duties, for overseeing the gas purchasing and gas control for Spire Missouri, as well as field operations for Spire Missouri East. Except where there are specific references to other Spire Missouri service areas, operational references to Spire Missouri in this Affidavit are to Spire Missouri East.

4. The purpose of this Affidavit is to provide both (1) the perspective and plans of Spire Missouri and (2) specific facts underlying Spire Missouri's support for the "Request of Spire STL Pipeline LLC for Expedited Reissuance of Certificates" filed by Spire STL Pipeline, LLC

("Spire STL") on November 10, 2021 ("November 10 Request"). Many supporting, additional facts are being provided in other submissions attached to Spire Missouri's Comments being filed today, as I discuss in more detail below.

5. Attached to this Affidavit as Exhibit 1 is a current map of Spire Missouri's system and as Exhibit 2 some pressure profile charts provided by our gas control department, for reference purposes.

II. Summary of Conclusions

6. Specifically, this Affidavit will support several critical conclusions, which Spire Missouri strongly recommends the Commission consider with regard to the November 10 Request.

7. First, the record previously provided to the Commission in this certificate proceeding, prior to the issuance of the original certificates for the Spire STL Pipeline in 2018 fully supports the re-issuance requested by Spire STL because it addresses and resolves very real concerns that existed for Spire Missouri prior to the in-service of Spire STL Pipeline.

8. Second, completely irrespective of the earlier record before the Commission in 2018, events have occurred and circumstances have changed since the original close of the record in this proceeding that further support the issuance of the requested certificates, including shifts in Spire Missouri's market demand, the demonstration of the benefits of supply diversity during Winter Storm Uri in February 2021, changes to supply arrangements and the continued leveraging of the benefits of Spire STL Pipeline's high pressure supply across Spire Missouri's distribution system. Consequently, based on the facts viewed as of the present time, Spire Missouri has a need for the Spire STL Pipeline, independent of the facts as they were presented in 2018.

9. Third, looking forward, following this 2021-2022 winter season Spire Missouri does not have adequate alternatives to meet its peak day load obligations if the firm pipeline supply provided by the Spire STL Pipeline facilities were no longer available. Even if, for the sake of

argument, one were to assume potential alternatives could be used by Spire Missouri over the long term – (1) the acquisition of available capacity on the MRT East Line, and associated pipeline asset construction and facilities acquisition to access that MRT East Line supply, (2) re-activation in part of the propane system, and (3) the use of trucked-in Liquified Natural Gas ("LNG") or Compressed Natural Gas ("CNG") supplies – the supplies offered by the alternatives that could be reasonably implemented by the winter of 2022/2023 would simply fall significantly short of meeting Spire Missouri's peak requirements, both in the aggregate and with respect to Spire Missouri East's western service areas.

10. Fourth, on a forward-looking basis, Spire Missouri does not consider re-establishment of the propane system and reliance on LNG or CNG supplies to be reasonable alternatives to firm pipeline flowing supplies for gas utility supply planning purposes. Such alternatives also carry heightened safety concerns. Therefore, even if the Spire STL Pipeline were not available due to a decision by this Commission, Spire Missouri would only use the propane and LNG/CNG options as interim, and incomplete, emergency "band-aids." Spire Missouri would solicit new or expanded pipeline capacity that would require new construction and its attendant capital and other costs, as well as new environmental impacts, to provide firm pipeline supply for its peak demand. This option, relative to the use of the existing, fully-constructed Spire STL Pipeline Project system, would require years of costly and likely inadequate reliance on the band-aids of propane and LNG/CNG, only ultimately to require wasteful and duplicative new construction and capacity. Put differently, shutting down the Spire STL Pipeline will not remove the need for new pipeline capacity, it will only push such new pipeline capacity costs and impacts into the future while continuing to pose risk and uncertainty to customers similar to what Spire Missouri is currently experiencing

III. The Spire STL Pipeline's Benefits Support Continuation of the Certificate as Requested in the November 10 Request.

11. Spire Missouri strongly stands by the evidence provided via affidavits, pleadings and data requests in the period before the 2018 certificate was issued, that the Spire STL Pipeline is needed because of the significant benefits that it would provide, and since has proved, including:

- Supply diversity, improving Spire Missouri's ability to access the prolific supplies in the Rocky Mountain and Marcellus/Utica production basins, for both pricing and supply security reasons.
- Allowing retirement of the propane peaking system:
- Reducing the potential loss of service due to the seismic risks affecting the MRT Mainline facilities providing service from the southwest through the New Madrid seismic zone of which we just experienced a magnitude 4.0 earthquake on 11/17/21 within 5 miles of MRT's mainline.
- Providing a high pressure supply source in the St Louis region that can be leveraged for multiple operational benefits across the distribution system

The citations for these facts are being provided in the Comments being filed with this Affidavit, but I will add that from the original discussions of alternative projects that were rejected, to the development of the Spire STL Pipeline, Spire Missouri has been motivated by the conclusion that these benefits supported the need for a new pipeline and that the Spire STL Pipeline would provide those benefits.

Events and Developments Following Issuance of Spire STL Certificate in 2018 Demonstrate the Need for Continued Certification

12. I will discuss below some of the recent, post-FERC Certificate Order developments that have further lent weight and support to these original bases for Spire Missouri's decision to support the Spire STL Pipeline. However, an additional benefit from Spire Missouri that was not appreciated in 2018 has been the Spire STL Pipeline's role in alleviating potentially severe gas

shortages in the service areas west of St. Louis County where Spire Missouri has and continues to experience substantially all of its new growth.

13. To better provide context for this development, I will provide some relevant historical background on the development of both the broader St. Louis distribution system and the expansion of service to the western, or St. Charles, region of that system in recent decades.[1]

14. By 1990, St. Charles had been the fastest growing county in Missouri for more than a decade with its population increasing almost 48-percent since 1979. St. Charles Gas, a predecessor utility, had 4,000 customers when Laclede Gas took operational control in the summer of 1963. By the 1980s, there were more than 49,000 customers in St. Charles County and an increase to both distribution piping and gas supply capacity was needed. To solve the problem of inadequate distribution capacity, Laclede installed a new 16-inch feeder line that ran beneath the Missouri River. This new pipeline corridor allowed gas to flow from the eastern supply sources – *i.e.*, underground storage and Enable MRT take points – into St Charles County. Gas supply capacity was increased in January 1990 and subsequently increased again in the summer of 1991 by making two connections to a 12-inch interstate pipeline operated by the Missouri Pipeline Company (MoGas) on the far west and southwestern borders of the distribution system – *i.e.*, Wentzville and South Point take points. At that point, St. Charles County had redundant supply sources with western-sourced gas from the MoGas take point at Wentzville and eastern-sourced gas from the 16-inch feeder line beneath the river.

15. However, growth continued to materialize in St. Charles County in the 1990s with roughly 2,000 customers being added each year. Land primarily located between the bounds of I-

[1] Spire STL Request at 25, Figure 1 (depicting the substantial population growth has occurred in this area). Spire Missouri notes that the Spire STL Request further details evidence of the significant and rapid population growth that is being experienced in the western portion of Spire Missouri's distribution system in St. Charles County. *See* Spire STL Request at 24-29.

70, Hwy 94, and I-64 was slated for roughly 1,800 homes by 2000. The proximity of the 300-pound MAOP high-pressure pipeline feeding already inadequately sized main traversing along I-70 from downtown St. Charles to Wentzville in relation to the expected future development southward to the Missouri River presented a challenge. The rapid growth in the region began to constrain the capacity of the 60-pound MAOP system in St. Charles County. Although there were 60-pound MAOP reinforcements that could provide assistance in supplying future load, a high-pressure source located closer to the growth area was required, particularly in light of projected continued load growth in that area.

16. To meet this western supply need, Laclede entered into an agreement with Williams Natural Gas (now Southern Star Central Gas Pipeline, Inc., "Southern Star Central") to provide firm transportation service to Laclede at a delivery point or points near St. Charles in 1997. Under the agreement, Williams would acquire and convert to natural gas service an approximately 185-mile segment of 8-inch petroleum products pipeline running from the vicinity of Lone Jack, MO to the vicinity of St. Charles, MO. Williams Natural Gas granted Laclede the rights to add four delivery points downstream of their primary measurement point. Today, that additional pipeline supplier continues to provide critical feeds into the St. Charles 60-pound MAOP system, but the 8-inch line is very limited in capacity and only provided 30,300 dth/day of capacity running at its peak with no ability to expand.

17. Subsequently, demand continued to grow in this western area. While St. Louis County operations lost a small number of customers during the first five years of the 2000s, the suburban counties north and west of the old city of St. Louis were growing at a rate of 5-10 percent. By 2004, Laclede experienced close to a 7-percent increase overall in new residential customers, and the major focus of that growth was in St. Charles County, thanks to several massive residential

developments and an abundance of available land for new construction. In 2004 alone, Laclede added 2,533 new residential customers representing nearly half of the metropolitan area's total residential customer connections.

18. More recently, the St. Louis Region has continued to see population displacement from St. Louis City and North St. Louis County to the western suburbs. Over the years, this continuing displacement caused Laclede (and now Spire Missouri) to build several new regulator stations and high-pressure lines to sufficiently serve these growing areas.[2] These efforts were all centered around solving the challenges to meet the growing needs of the area with the flowing supply limitations to these portions of the system.

19. Despite its long-term and persistent demand growth, the primary gas supply sources for St. Charles County remained the same redundant supply sources from MoGas and the 16-inch feeder line across the Missouri River as in 1990.

20. Providing service to St. Charles County's current, approximately 110,000 customers, while maintaining gas supply and distribution piping capacity for future growth that continues to materialize, is critical. To address this growth, Spire Missouri had begun to take preliminary steps to maintain pressure in these western service areas in the years preceding the commencement of operations over the Spire STL Pipeline, and had begun to plan on long-term reinforcements to its system flowing gas from the east – a process that would take years, and would require significant costs to Missouri customers, as well as environmental impacts. The development of the Spire STL Pipeline, and its direct interconnections with Spire Missouri, as well as the increase in MoGas deliverability created by the Spire STL Pipeline's high-pressure

[2] Examples of these lines are the 2014 extension to Kehr's Mill and Strecker, the 2015 addition of a new Take Point off of Southern Star at Lake St. Louis and Hawk's Ridge, and the 2018 addition of a new high-pressure line and regulator station at Old Highway 94 and Pralle.

interconnection with MoGas, have addressed the need for additional supply in Spire Missouri's western service areas without the need to engage in system reinforcements.

21. The need for additional supply in the western service areas does not simply stem from projections of future growth, but also from operational pressure challenges actually experienced in the west. Prior to the commencement of service of the Spire STL Pipeline, which increased operating pressures and delivery capability on MoGas, Spire Missouri consistently experienced significantly lower pressures in its Western service areas juggling the small amounts of supply that was available on the MoGas system during cold weather events by flipping it back and forth between the St Charles/Wentzville area and down to the southern portion of its system at the Southpoint take point as pressures continued to drop in both of those areas. MoGas constructed a new interconnected with the Spire STL Pipeline, which in turn increased operating pressures and deliverability capability from MoGas to Spire Missouri. The additional capacity on MoGas was a true game-changer for the pressures across the distribution system and resolved this problem and removed the need, at a minimum, for the lengthy and costly construction of reinforcements to Spire Missouri's system supplying these areas from the east with supply along the Mississippi River corridor if available.

22. As explained above I am responsible for gas supply as well as gas control and I saw first-hand the major operational benefits the new high pressure interconnect that was installed with MoGas pipeline brought to the western part of our distribution system last winter. As shown below, one can see the actual details of the pressure monitoring charts that my controllers were watching as the cold temperatures set in on the St Louis area both January of 2019 when we relied on the traditional MoGas supplies and in February of 2021 after we had the ability to move high pressure supply off the Spire STL Pipeline into MoGas. Maintaining adequate, and higher,

pressures on a utility distribution system is essential. Also, as I mentioned, I have been watching the shift in our demand occur for almost 30 years and have experienced the struggles Spire Missouri has had serving that new demand due to the distance from our traditional MRT supplies on the Eastern side of our system from these growth areas combined with the highly populated areas that lie between the two. The dramatic effect of the new supplies provided directly and indirectly from the Spire STL Pipeline are summarized in a document attached as "Exhibit 2," which is entitled "Illustrative Pressure Differentials – Before and After Spire STL Pipeline Commences Service." This exhibit has detailed pressure data from a number of points on Spire Missouri's system – on the charts, the blue lines show St. Louis County points, and the purple lines show St. Charles County points. The data are from 8 a.m. on the two days I mentioned, approximately two years apart – the first, January 30, 2019. Of particular significance for this discussion are the pressures shown for three points on the line serving St. Charles County, at South Point, Wentzville and Terra & Drug, on Spire Missouri's 300-pound distribution system. The gas day average temperature on that day was 4 degrees Fahrenheit, preceded by three days whose gas day average temperatures were 33, 22 and 12 degrees Fahrenheit, respectively. The second chart shows the pressures for the same points, on February 15, 2021, when the gas day average temperature was 2 degrees Fahrenheit, preceded by three days whose gas day average temperatures were 8, 5 and 3 degrees Fahrenheit, respectively – *i.e.*, both the gas day average temperature on the 2021 date and the three-day run-up to that date were significantly colder than we experienced on January 30, 2019. Yet, the pressures experienced at those three points were far higher in 2021, as shown in the chart below:

Points	South Point	Wentzville	Terra & Drug
Pressure January 30, 2019	81.67 psig	86.71 psig	67.85 psig
Pressure February 15, 2021	222.24 psig	136.45 psig	130.16 psig

The 2019 pressures shown on the chart were especially troubling for Spire Missouri's gas control team given that the temperatures on January 30th were 15 degrees Fahrenheit warmer than our peak day of -10.6 degrees Fahrenheit and our sendout was over 200,000 dth shy of our peak day scenario. When pressures on our 300-pound supply feeder system drop to the 67 pound range they are critically low given they supply gas into our 60 pound intermediate pressure systems that ultimately deliver that gas to the homes and businesses.

23. The dramatic increases in pressure between January 2019 and February 2021 stem solely from the new high pressure deliveries that were made available by the new interconnect with MoGas that went into effect in late 2020, bringing much needed supplies at high pressure to the high growth area of Spire Missouri's system. Since 1990 Spire Missouri had only been successful at adding 93,100 dth/day of pipeline capacity on the western side of its system with MoGas providing 62,800dth/day and Southern Star Central adding 30,300 dth/day. The single interconnect between the Spire STL Pipeline and MoGas provided Spire Missouri with an additional 82,200 dth/day of capacity on MoGas, constituting a true game-changer for our system operations.

24. Without the Spire STL Pipeline's deliveries, not only would Spire Missouri have still been in the process of constructing reinforcements to these western areas, it would have been

in severe danger of losing pressure and experiencing outages during the February 15, 2021 cold weather event. Undeniably, the Spire STL Pipeline has proven itself necessary to ensure adequate natural gas supplies to Spire Missouri in the period after commencement of operations.

25. The experience of Spire Missouri with Winter Storm Uri, in February 2021 (reflected in part in the discussion and chart above), powerfully demonstrates the benefits of the Spire STL Pipeline. During Winter Storm Uri, as the Commission knows from many sources, other areas affected by reduced production in Texas, Oklahoma, and Kansas experienced both outages and tremendous price spikes for the remaining gas flows. Spire Missouri itself experienced significant difficulties in supplying Spire Missouri's Kansas City related markets – including competing for very limited supplies and paying much higher prices. As the VP of gas supply all of my focus was on our Kansas City utility division during that 10 day period of Winter storm Uri, where we sat on calls during all of the night wondering if we were going to have the supply needed to be able to provide service to our customers. Due to the Spire STL Pipeline providing access to supply in the Northeast, at no point was Spire Missouri's St. Louis area service territory at risk of losing service. In fact, Spire STL Pipeline has resulted in the improvement of resiliency to the broader St. Louis region, including western Illinois. For example, Spire Missouri was in a position to help other customers on MRT whose supply sourced out of Oklahoma and on MRT's East Line was being curtailed as illustrated in Symmetry's Comments in Support of the Spire STL Emergency Application.[3]

[3] Motion to Intervene and Comments of Symmetry Energy Solutions, LLC, Docket No. CP17-40-007 (dated Aug. 23, 2021) (explaining that "…Symmetry faced curtailment of gas supplies due to loss of supplies on MRT resulting from force majeures issued by Symmetry's suppliers as well as the loss of supplies due to insufficient pressure on pipelines upstream of MRT's East Line… Furthermore, as agent for an industrial customer on MRT, Symmetry knows that this industrial customer also faced curtailment issues on the MRT System…Symmetry understands that this gas supply provided to both Symmetry and the industrial customer during the weather event was available only because of the availability of STL Pipeline.").

26. The Spire STL Pipeline was critical in other respects as a result of Winter Storm Uri. As Mr. Scott Carter stated in his Affidavit (Exh. Z-1 to the July 26 "Application of Spire STL Pipeline LLC for a Temporary Emergency Certificate, or, in the Alternative, Limited-Term Certificate"), following Winter Storm Uri, Spire Missouri reinjected natural gas into its Lange storage facility during February 20-28, 2021, to replenish inventory in the event of another late cold spell during that winter season. Without the high pressure supply from the Spire STL Pipeline for this purpose, Spire Missouri would not have been able to replenish that level of inventory and would have been at risk for customer outages throughout the rest of the winter season if there had been another cold snap. Again, the historical experience of Spire Missouri subsequent to the commencement of service of the Spire STL Pipeline demonstrates the need for the continued, uninterrupted operation of the pipeline.[4]

27. The seismic risks that are documented extensively in the earlier record prior to the original certificate being granted, have also been further supported by more recent events. On November 18, 2021, an earthquake occurred near Poplar Bluff, Missouri, registering 4.0 on the Richter scale. [5] It was not enough to damage pipeline facilities, but a vivid illustration of the potential for more damaging seismic events in the same active fault zone. Spire Missouri estimates that the epicenter of this earthquake was just over 4 miles from the MRT Mainline. The Spire STL Pipeline not only avoids this seismic area sourcing supply from the north, but the Spire STL Pipeline's interconnection with MRT would also allow Spire Missouri to continue to provide gas to its customers as far south as Poplar Bluff in the event MRT's system were to be compromised by an earthquake.

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[4] Spire Missouri's ability to reinject to storage during the winter in the future would depend on Spire STL Pipeline's availability, and also the availability of receipts from Chain of Rocks station.

[5] *See*, *e.g.*, https://www.google.com/amp/s/fox2now.com/news/missouri/4-0-magnitude-earthquake-hits-se-missouri-wednesday-night/amp/ ; https://earthquake.usgs.gov/earthquakes/eventpage/nm60363582/executive .

28. In addition, it is important to note that in the proceedings leading to the 2018 certificate order, one of the grounds for needing the Spire STL Pipeline capacity in preference to MRT East Line capacity was the historical experience of inadequate operating pressures at interconnections with upstream suppliers into the East Line (Trunkline Gas Company, LLC, or "Trunkline" and Natural Gas Pipeline Company of America LLC, or "NGPL"), which rendered these supplies unreliable.[6] That concern has persisted to the present day, but has been dramatically validated recently by the cuts that occurred between MRT and Trunkline during Winter Storm Uri and Trunkline's posted announcement that it was engaging in construction efforts intended to remedy pressure issues at its interconnection with MRT's East Line.[7]

29. Specifically, Trunkline's published notice stated as follows (emphasis added):[8]

> In order to facilitate firm deliveries at Trunkline's existing interconnect with MRT in Clay County, Illinois, Trunkline will be installing a new control valve near the Tuscola station that will enable Trunkline to compress gas to MRT utilizing gas flowing from points North or South of the interconnect. Upon completion of this modification, *Trunkline expects increased pressures to allow firm delivery commitments into MRT*.

Put differently, Trunkline's announcement admits that until this work would be done, even Trunkline agrees that its prior facilities did <u>*not*</u> "allow firm delivery commitments into MRT."

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[6] *See, e.g.*, Motion For Leave To File An Answer And Answer Of Laclede Gas Company To Certain Protests, Docket No. CP17-40-000, at 11-13, 16-17 (dated March 22, 2017) ("Spire Missouri March 2017 Answer"); Comments of Spire Missouri Inc., Docket No. CP17-40-007, at 4 (dated Sept. 7, 2021) ("Spire Missouri Comments") (citing Carter Aff. ¶¶ 7-9); Motion to Intervene and Comments in Support of Symmetry Energy Solutions, LLC, Docket No. CP17-40-007 (dated Aug. 23, 2021) (commenting that Symmetry is familiar with a customer's curtailment problems in using MRT for service to St. Louis).

[7] *See, e.g.*, Motion to Intervene Comments of Spire Marketing Inc., Docket No. CP17-40-007 (dated Sept. 7, 2021); Motion to Intervene and Comments in Support of Symmetry Energy Solutions, LLC, Docket No. CP17-40-007 (dated Aug. 23, 2021); *see also* https://tgcmessenger.energytransfer.com/ipost/TGC/notice/non-critical, Notice ID 9145, "Trunkline Reliability Modifications" (posted Sept. 3, 2021).

[8] https://tgcmessenger.energytransfer.com/ipost/TGC/notice/non-critical, Notice ID 9145, "Trunkline Reliability Modifications" (posted Sept. 3, 2021). Trunkline subsequently announced that it had completed these modifications https://tgcmessenger.energytransfer.com/ipost/TGC/notice/non-critical, Notice ID 25874, "Trunkline Reliability Modifications Complete" (posted Nov. 3, 2021).

30. Trunkline has announced that these improvements were completed on November 1, 2021;[9] Spire Missouri does not know whether these improvements would resolve the long-standing pressure deficiencies as to Trunkline deliveries into MRT's East Line, which have not yet been tested in actual practice, but the work and announcement prove that the insufficiency of the MRT East Line was a valid problem at the time of the 2018 certificate order, and supported Spire Missouri's allegations of need for the Spire STL Pipeline.

The Decision to Retire the Propane System Was Final Except as Necessary to serve as a Band-Aid to Address Temporary Emergency Peak Needs

31. It is important to clarify Spire Missouri's position regarding the propane plant. For the reasons detailed in the pre-certificate record, Spire Missouri made the decision to retire and de-activate the propane peaking facilities upon the commencement of the Spire STL Pipeline. This was not a decision made specifically in response to the Spire STL Pipeline, but reflected a broader conclusion by Spire Missouri that the aging propane facilities and the negative impacts of directly injecting high Btu propane into its natural gas system were not an appropriate element of the supply stack for meeting peak day needs on an ongoing basis.

32. Because of the court decision and mandate vacating the order, and because of uncertainties over the position of this Commission since the court order, Spire Missouri has taken steps to be prepared to temporarily re-activate the propane system in part. As discussed below, the propane system, with other alternatives, would be insufficient to meet Spire Missouri's needs even if they were considered adequate ongoing supply options. However, Spire Missouri does not intend to reinstitute a long-term reliance upon the propane facilities. As shown in the Charles River Associates' study, "Risk Assessment of Alternative Gas Supply Options," ("CRA Report"),

[9] *Id*.

being concurrently submitted to the Commission, the propane system has significant ongoing risks and deficiencies that make it inferior to the Spire STL Pipeline. If the Spire STL Pipeline were not an option, though, Spire Missouri will seek an option that provides firm pipeline supply to replace it, over whatever term is necessary to create the additional capacity. The decision to end reliance on propane has been made, and Spire Missouri is prepared to defend that conclusion to the Missouri Public Service Commission.[10] This Commission should not consider the propane system to be a long-term option, and any assessment of the costs and environmental impacts of going forward without the Spire STL Pipeline's operations would have to take into account the additional cost and environmental impacts of other, as yet undetermined, firm pipeline options.

Environmental Benefits to Continued Reliance on The Spire STL Pipeline

33. Other environmental benefits relating to Spire Missouri's operations with the Spire STL Pipeline's service are demonstrated in a report by Trinity Consultants, "Evaluation of Environmental Impacts of Spire STL Pipeline" ("Trinity Report") which is being submitted concurrently with this Affidavit.

34. The Trinity Consultants' report concludes that use of the Spire STL Pipeline will have numerous improved environmental effects, including the following: (1) reduced emissions and environmental impacts from Spire's Lange underground storage facility (largely due to the ability to rely on higher pressure from the Spire STL Pipeline to allow direct injections without additional compression by Spire Missouri); (2) reduced emissions and environmental impacts

[10] Proceedings involving prudence reviews of Spire Missouri's actions by the Missouri Public Service Commission include: *In the Matter of Spire Missouri, Inc.'s d/b/a Spire Request for Authority to Implement a General Rate Increase for Natural Gas Service Provided in the Company's Missouri Service Areas,* Case No. GR-2021-0108; I*n the Matter of Spire Missouri, Inc. d/b/a Spire (East)* Purchased Gas Adjustment (PGA) Tariff Filing, File No. GR-2021-0127.

from Spire's propane storage facility ; (3) an overall decrease in the use of less efficient alternative fuel sources used during gas curtailment; and (4) it would allow Spire to source gas that is extracted and transported with less emissions than its other existing gas sources (Appalachian sources and fewer fugitive natural gas leaks).

35. In sum, the Trinity Report concludes that continued use of the Spire STL Pipeline will allow Spire Missouri to maintain its current gas supply operations while decreasing both environmental impacts and the emissions of greenhouse gasses, criteria pollutants, and hazardous air pollutants.

IV. Spire Missouri Cannot Rely Upon the Available Alternatives to the Spire STL Pipeline to Meet Its Obligations.

36. The Spire STL Pipeline facilities provide deep and broad benefits, viewed either in light of the original 2018 record or the record, and even more starkly as illuminated by subsequent events. In addition, however, the need for the Spire STL Pipeline is also demonstrated by the fact that Spire Missouri lacks viable alternatives to its service. The absence of alternatives for this 2021-2022 winter are addressed in Spire STL's emergency application in Dkt. No. CP17-40-007, and the various pleadings submitted with additional information in that sub-docket.

37. In addition, however, the alternatives are insufficient going forward as well. Specifically, if the Commission were to issue an order declining to issue the permanent certificate sought in the November 10 Request, Spire Missouri would not have sufficient supply if it attempted to utilize the alternatives available by next winter season, 2022-2023.

38. Spire Missouri requested that Concentric Energy Advisors prepare a study of the alternatives available to Spire Missouri, and that report, "Assessment of Spire Missouri's Gas Supply Alternatives in the Absence of STL Pipeline," ("Concentric Report") is being concurrently

submitted to the Commission in this proceeding. The Concentric Report reaches significant conclusions, which must also be considered in light of the conclusions of the CRA Report addressing risks. Those conclusions match Spire Missouri's internal assessments, which are as follows:

- Even if Spire Missouri were to attempt to rely on the available alternatives – MRT's East Line, propane and a LNG/CNG supply – these alternatives would be insufficient to replace the loss of the Spire STL Pipeline's capacity and Spire Missouri would fall short of meeting its peak day needs. Consequently, there is a need for the Spire STL Pipeline's continued operation.

- Putting aside the gap in overall adequacy and, the fact that Spire Missouri does not plan to rely upon the propane and LNG/CNG options even if the Spire STL Pipeline were not to remain in service, each of these alternatives have significantly greater costs and/or risks relative to the service provided by the Spire STL Pipeline that render these alternatives inappropriate for reliance over the long term. Consequently, there is an even greater need for the Spire STL Pipeline's continued operation.

39. Concentric concludes, and Spire Missouri agrees, that the only three alternatives for the next winter are similar to the options available for this winter, which are: the currently available capacity on the MRT East Line, restoring propane capability, and developing distributed LNG/CNG, and that together, these three options do not add up to the volume necessary to meet Spire Missouri's peak needs.[11]

40. Other potential future supply alternatives – such as developing a permanent LNG peaking facility on Spire's distribution system, contracting for, new pipeline capacity from other sources – would take multiple years to develop, and are out of the question for next winter on timeline grounds. For example, Concentric considers the potential for a pipeline expansion, but there is no currently pending proposal for such an expansion, it would take years to develop, certificate and build, and its costs and environmental impacts are not known. All pipeline construction alternatives would impose cost and environmental impacts that would be substantial,

[11] Attachment B at 1, 7-9.

but cannot be fairly compared to a fully-installed Spire STL Pipeline's costs and impacts, for purposes of this analysis.

41. Even viewed as partial replacements – and there is no point to building, as it were, three-fourths of a bridge that falls short of its destination – each of the options have grave flaws.

Limitations and Significant Problems with the MRT East Line Option

42. The MRT East Line alternative, involving available capacity back to Trunkline or NGPL, has numerous disadvantages. The total amount of East Line capacity, at approximately 165,000 Dth/day (asserted by MRT) would fall short of the 350,000 Dth/day of capacity available from the Spire STL Pipeline (even with the other options noted below, which are not long-term solutions).[12]

43. As noted above, there remain unanswered questions regarding the adequacy of the upstream deliverability pressures, which have historically been inadequate and unreliable for utility planning purposes. The assertion by Trunkline that it has solved its pressure issues is yet unproven.

44. Heavier reliance on MRT's East Line would require continued, and substantial use of Line 880 in Spire Missouri's system. As is explained in detail in the CRA Report, Line 880 has integrity concerns and poses risks if it were to be relied upon, in the same manner as it was historically, going forward – including the potential for significant compliance costs and even the potential for line replacement, with its attendant service unavailability.[13]

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[12] In its recent open season for firm capacity to be delivered into MRT's East Line, Trunkline offered only 100,000 dth/day, suggesting potential upstream limits to the East Line option as well.

[13] Attachment C at 12-16.

45. Further, pressures from MRT's East Line would be inadequate to allow direct injection of gas into Spire Missouri's Lange storage field, thus requiring the operation and heavy reliance of Spire-owned compressors at Lange, with emissions and other negative impacts.

46. Use of the MRT East Line also requires additional construction work at the Chain of Rocks interconnection facilities, and other costs.

47. As Concentric highlights, by relying on the MRT East Line capacity, Spire Missouri would also be unable to meet the significant growth being experienced on the western portion of its system. Consequently, Spire Missouri would still require further alternatives, including potential significant, costly and time consuming infrastructure additions to its system for which regulatory approval is uncertain.

48. Concentric also assesses the relative cost of MRT's East Line versus the Spire STL Pipeline, and concludes that the Spire STL Pipeline would achieve significant savings on a delivered price basis, going forward, relative to an MRT/Trunkline or MRT/NGPL option (savings ranging from $0.13/dth to $0.19/dth), resulting in potentially $3.11 to $4.55 million annually in savings to customers.[14]

49. Concentric's assessment of delivered price concurs directionally with the analysis provided by Spire Missouri both prior to the 2018 certificate order,[15] and more recently in this proceeding.[16]

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[14] Attachment B at 15-18; *see esp.* Attachment B, Figure 3.

[15] *See, e.g.*, Spire Missouri March 2017 Answer at 12-13; Spire Missouri March 2017 Answer, Attachment F (LGC Delivered Cost Analysis); Motion For Leave To File An Answer And Answer Of Laclede Gas Company To Certain Protests, Docket No. CP17-40-000, at 5-9 (dated June 14, 2017) ("Spire Missouri June 2017 Answer"); Spire Missouri June 2017 Answer, Attachment B at 13-16; Responses Data Requests Issued By The Federal Energy Regulatory Commission, Response No. 1, Docket No. CP17-40-000 (dated March 13, 2018) ("March 2018 Responses to FERC Data Requests").

[16] Motion For Leave To Answer And Answer Of Spire Missouri Inc. To The Motion For Leave To Answer And Answer Of Environmental Defense Fund Dated October 20, 2021, Docket No. CP17-40-007, at 3-5 (dated Oct. 29, 2021).

50. Concentric also agrees with Spire Missouri's assessment of the operational issues with reliance on the MRT East Line, notably that during Winter Storm Uri, without the Spire STL Pipeline, Spire Missouri would not have been able to serve all of its customers and would have experienced significant service outages.[17]

51. While Spire Missouri would not have been able to maintain natural gas service to all of its customers during Winter Storm Uri without the Spire STL Pipeline, hypothetically assuming additional supplies could have been obtained from the south. In addition to preventing curtailments or even outages during Winter Storm Uri, the availability of the Spire STL Pipeline's capacity and its access to alternative gas basins, could have resulted in hundreds of millions of dollars in savings for Spire Missouri customers. The Concentric Report estimates potential illustrative savings of $280 million over the four day holiday weekend.[18]

52. As the Trinity Report found, reliance on the MRT/Trunkline option would result in greater emissions due to both compression by other operators, and the need for compression by Spire Missouri for injections into storage.[19]

The Propane Peaking System Will Not be a Long-Term Solution and Poses Significant Problems Relative to Firm Pipeline Capacity.

53. As noted above, the decision by Spire Missouri to obtain long-term, firm capacity from the Spire STL Pipeline stemmed in part from a managerial decision that the aging, outdated propane system should be retired. Following the commencement of Spire STL's operations, the propane peaking facilities were in fact retired – some were removed, some de-activated, and the

[17] Attachment B at 12-14.
[18] Attachment B at 13.
[19] Attachment D at 3-1, 5-1.

propane supplies kept in the Lange propane cavern were not maintained at historical levels. Reliance on the propane system is not in the best interests of Spire Missouri's customers.

54. To the extent that the Commission were to require the Spire STL Pipeline to cease operations, Spire Missouri would consider any use of partially re-activated propane peaking facilities as a temporary, stopgap measure pending the acquisition of the necessary firm pipeline delivery rights, even though that might take years to fully realize.

55. The grounds supporting retiring, and not relying upon, the propane facilities were discussed at length in the underlying proceeding, but in addition, the CRA Report reviews this alternative in detail, and concludes that the propane option would be limited in volume due to quality problems with direct propane injection, that the supply chain to the Catalan injection site pose operational and integrity risks, and that other costs and risks would attend refurbishment of the facilities and supplies for this partial option.[20] The Trinity Report also identifies a number of respects in which the Spire STL Pipeline Project option would create less GHG and other emissions than continued use of the propane system.[21]

56. As described above, however, the problems identified by CRA as to the propane option only validate the decision by Spire Missouri management to retire that system and replace it with pipeline supplies. – the CRA Report and the Trinity Report both validate a choice already made and confirmed by Spire Missouri. It is my understanding that challenges to that decision should be made to or by the Missouri Public Service Commission, not this Commission.

[20] *See* Attachment C at 18-30.
[21] Attachment D at 4-1, 4-2.

LNG and CNG Are Not Viable Alternatives Except for Emergency Measures

57. As part of its contingency planning for the current winter season, Spire Missouri has investigated the option of distributed LNG, thereby trucking, storing and vaporizing it using portable storage and vaporization facilities available for rental, and injecting such vaporized LNG into its distribution system at a point that would assist in meeting shortfalls due to the potential cessation of service by the Spire STL Pipeline.

58. Because loss of the Spire STL Pipeline would also cause the loss of reliable deliveries from the Lange storage field, the LNG supplies have been projected as nearly baseload supplies.

59. CRA assessed the risks of this LNG option, as well as discussing CNG, which has been used by at least one large gas distributor to supplement pipeline supplies. CRA found that LNG was not feasible for meeting the loss of such a large supply as currently provided by the Spire STL Pipeline, due to its low density of energy, and that LNG posed very significant risks, particularly as to security of supply;[22] the option contemplated deliveries daily using 12 LNG trucks, for the entire winter season, raising the potential for interrupted deliveries due to truck and/or driver unavailability, or weather related problems, among others.[23] CRA also identified numerous other potential issues with the option, and further found only a 10,000 Dth/day contribution by LNG.[24]

60. It is apparent from the very limited volume available from LNG, as well as the extraordinary risks of supply interruption from relying on uninterrupted access to highly specialized trucks, during the most difficult driving period of the year to access LNG supplies over

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22 Attachment C at 33.
23 Attachment C at 33.
24 Attachment C at 30-33.

200 miles from St Louis, that this option is not a viable baseload alternative from a utility management perspective. Moreover, use of such a system as a baseload service would seem highly unusual, probably due to its risk.

61. Beyond the specific problems with LNG (or CNG), Spire Missouri would not plan on using such supplies on an ongoing basis, much less as baseload supplies, for supply security and other reasons. LNG might be utilized in an emergency setting in which the Commission has required that the Spire STL Pipeline shut down operations, but only in such an urgent shortfall scenario.

62. As with the propane option, Spire Missouri would, if necessary, employ LNG as a "band aid" while taking steps to secure new firm pipeline capacity. Consequently, LNG is not a long-term option, and would be displaced by new pipeline facilities, with new capital and other costs, and new and uncertain environmental impacts, which cannot be assessed in this proceeding.

V. Conclusion.

63. For the reasons stated above, the Spire STL Pipeline is needed to ensure affordable, safe and reliable natural gas service to Spire Missouri beyond the current winter season, and Spire Missouri lacks alternatives to meet its needs.

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Spire STL Pipeline LLC	)	**Docket No. CP17-40-000, et al.**

VERIFICATION

Commonwealth of Pennsylvania)
)
City of Philadelphia)

George Godat, being first duly sworn, says that he is the George Godat whose Affidavit in the above-referenced proceeding accompanies this verification.

George Godat further states that the Affidavit bearing his name is true, accurate and complete, to the best of his knowledge, understanding and belief.

George Godat

Subscribed and sworn to before me, the undersigned Notary Public, this 1st day of December, 2021.

Commonwealth of Pennsylvania - Notary Seal
SONYA E. BEY, Notary Public
Delaware County
My Commission Expires September 20, 2025
Commission Number 1267251

My Commission expires 9.20.25

Exhibit 1
to
Attachment A

Spire Missouri East Distribution System

STL to MoGas

UGS

STL Lange

STL Chain of Rocks

Legend

- UGS
- Interconnect
- City Gates
- Supply Feeder

Interstate Pipelines

Company

- Enable MRT
- MoGas Pipeline
- Southern Star Central
- Spire STL Pipeline

Exhibit 2
to
Attachment A

Exhibit 2 to Attachment A

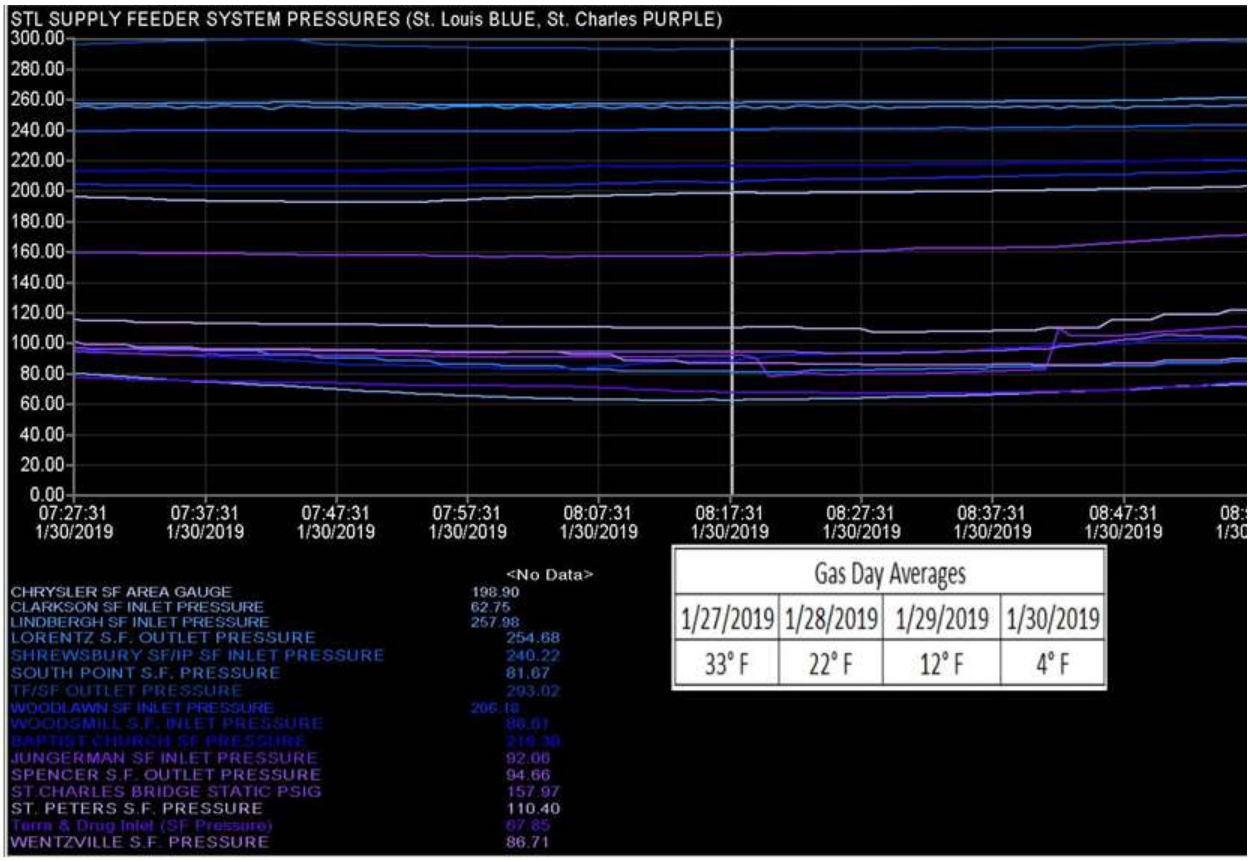
Illustrative Pressure Differentials – Before and After Spire STL Pipeline Commences Service

Top chart – pre-Spire STL Pipeline:

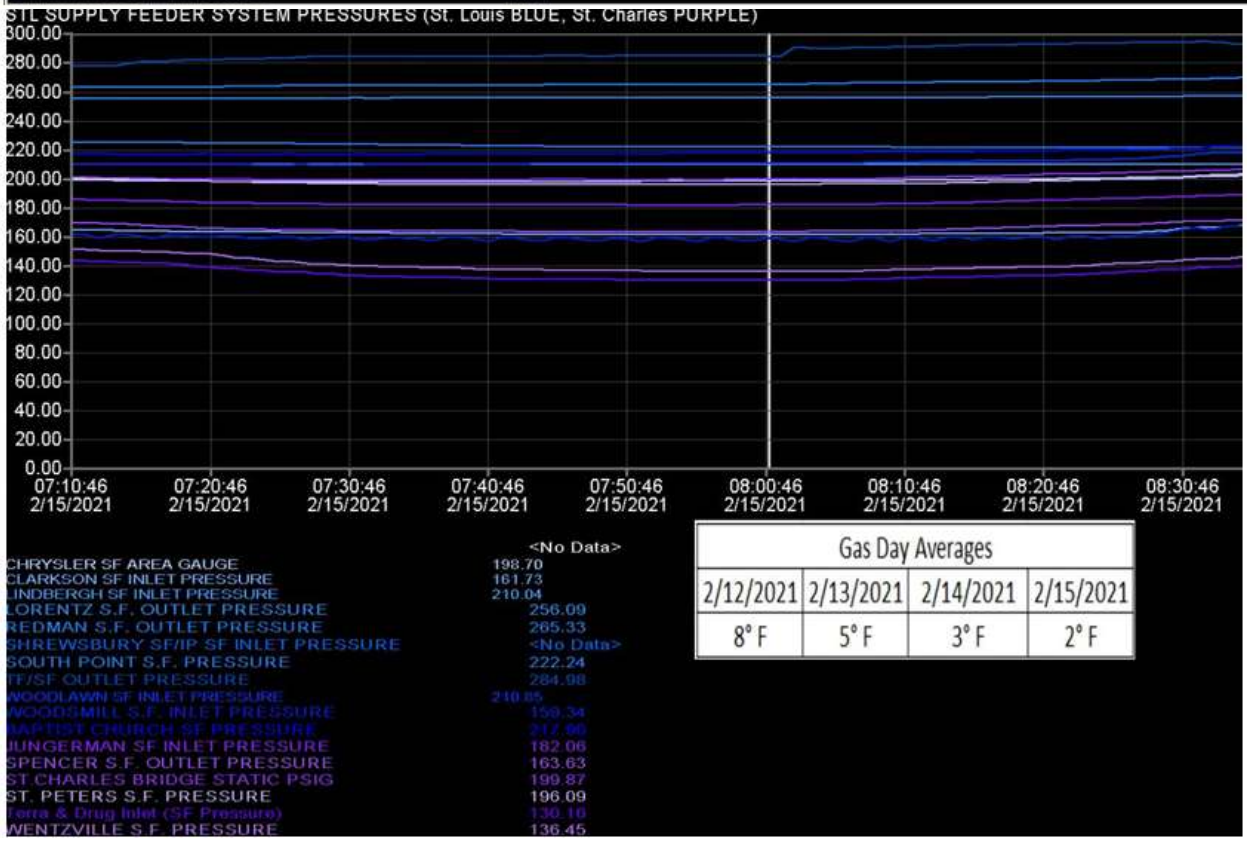
- January 30, 2019 at around 8 AM. Gas Day average temperature of 4 degrees. The previous day temperatures leading up to it were 33, 22, and 12, respectively.
- The chart shows multiple pressures, but of particular interest are the following citygates (on Spire Missouri's 300-pound system, serving St. Charles)
    - South Point: 81.67 psig
    - Wentzville: 86.71 psig
    - Terra & Drug: 67.85 psig

Bottom chart – with Spire STL Pipeline supplying Spire Missouri and MoGas Pipeline:

- February 15, 2021 at around 8 AM. Gas Day average temperature of 2 degrees. The previous day temperatures leading up to it were 8, 5, and 3, respectively. This difference is important to note because it is expected that the system will be in worse shape depending on how cold the temperatures are leading up to the current day (*i.e.*, if there is a series of consecutive very cold temperature days, the impact on system pressure is more severe)
- The chart shows multiple pressures, but of particular interest are the following (these are on Spire Missouri's 300 pound system, serving St. Charles), showing dramatically higher pressures than during the January 2019 cold weather event:
    - South Point: 222.24 psig
    - Wentzville: 136.45 psig
    - Terra & Drug: 130.16 psig



Gas Day Averages			
1/27/2019	1/28/2019	1/29/2019	1/30/2019
33° F	22° F	12° F	4° F



Gas Day Averages			
2/12/2021	2/13/2021	2/14/2021	2/15/2021
8° F	5° F	3° F	2° F

Attachment B

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

NOVEMBER 2021

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TABLE OF CONTENTS

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**

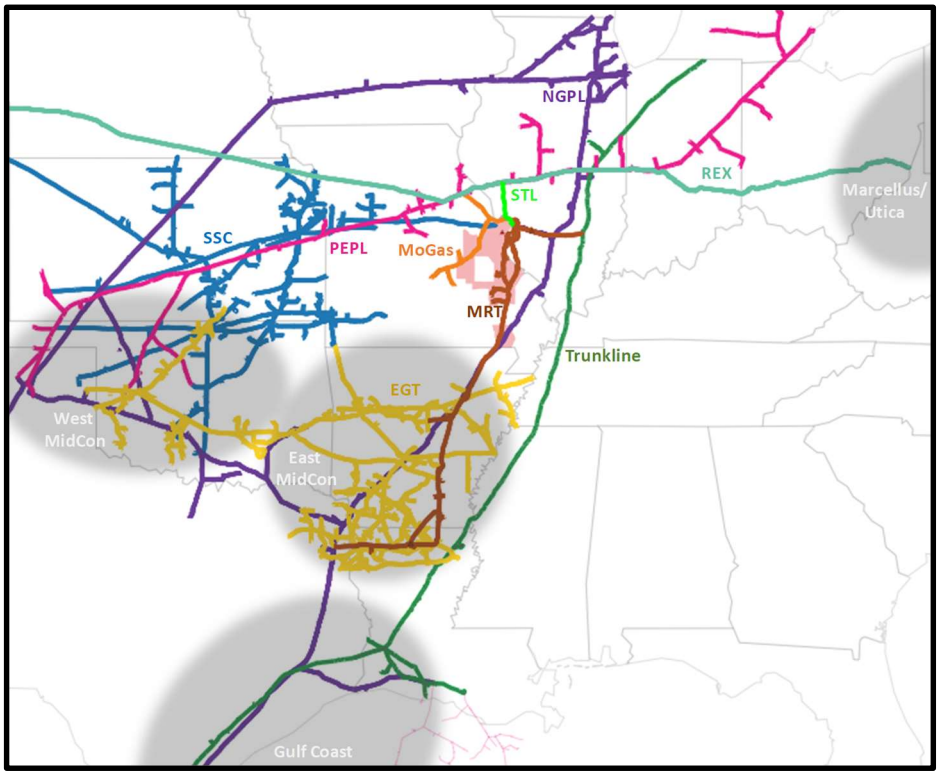
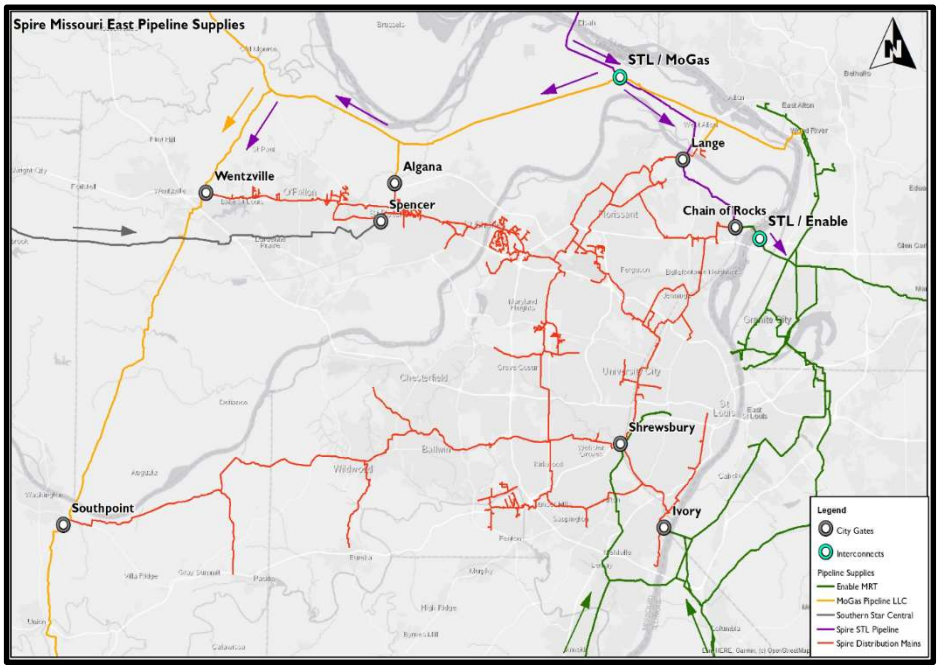


Figure 2: **Detail of the Pipelines Directly Interconnected to the Distribution System**



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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Attachment C

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Risk Assessment of Alternative Gas Supply Options

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Date: November 29th, 2021

Disclaimer

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Table of contents

1. Background

1.1. The STL Pipeline

The STL pipeline is a 65-mile long, 24-inch-diameter interstate natural gas pipeline system connecting the St. Louis metropolitan area to the 1,700-mile Rockies Express Pipeline LLC ("REX") pipeline. The STL pipeline is designed to provide up to 400,000 dekatherms ("Dth") per day of firm transportation services. Spire Missouri has entered a 20-year contract with the STL pipeline for 350,000 Dth per day of firm transportation service. Beyond the interconnection with REX in Scott County, Illinois, the STL pipeline also interconnects with the MoGas Pipeline LLC ("MoGas") and Enable Mississippi River Transmission, LLC ("MRT") downstream pipelines.

1.2. Scope of Work

CRA has been retained by Spire Missouri to provide an independent assessment of the risks associated with certain specified gas supply options to support winter heating demand, should the STL pipeline not be available for or beyond the 2021-2022 winter. Throughout this report, Spire and Spire Missouri are used interchangeably.

The work was performed during the period between October 11th and November 29th, 2021. The risk analysis covers operational risk, public safety impact, property impact, environmental impact, system integrity impact, supply security risk and permitting challenges. The analysis compares the STL pipeline to three alternative supply options identified by Spire Missouri. In addition, CRA considered the use of CNG. Given that CNG provides less than half of the energy content of LNG for a similar size vessel, this option was removed from consideration as impractical given the considerable supply gap created if the STL Pipeline were unavailable. The three alternative supply options considered in the following risk analysis include:

- **Continued operation of Line 880**: Line 880 is a section of Spire Missouri transmission pipeline that historically allowed Spire Missouri to receive gas from Enable MRT and transport it to its underground storage facility. This option requires a reestablishment of an interconnection between Spire Missouri's distribution system and the Enable Mississippi River Transmission, LLC's ("MRT") East Line via Line 880. Line 880 was installed in 1961 with a portion of the pipeline consist of electric resistance weld ("ERW") long-seam pipe; and
- **Propane vaporization:** This option involves the use of propane-peaking facilities at Catalan to vaporize liquid propane. The propane is stored at the Lange storage facility and transported to Catalan via a third-party open access products pipeline, for injection into Spire Missouri's distribution network to cover its peak-day capacity requirements; and
- **Micro-LNG:** This option involves Spire Missouri entering into an LNG supply agreement with a third-party to provide incremental supply and localized pressure support for Spire Missouri's distribution network. The envisioned service would provide 10,000 Dth/day of supply for up to 151 days for future winter seasons.

1.3. Assumptions and Limitations

In preparing this report, CRA primarily relied on data and documents provided by Spire to CRA, as well as public documents in the Spire certificate proceeding CP-17-40. The list of data and documents relied upon for the preparation of this report can be found in Appendix C.

2. Risk assessment of certain supply alternatives

2.1. Risk Assessment Approach

In this section, we present our assessment of the risks associated with gas supply options to replace the STL pipeline, should that not be available for or beyond the 2021-22 winter. The framework for risk assessment comprises seven risk factors as described below:

- **Operational risk:** This is an assessment of the likelihood, but not the magnitude, of an operational error and/or an incident outside of Spire's operational control that could lead to a detriment to public safety, property impact, environmental impact, and a compromise to the integrity of the local gas distribution system;
- **Public safety impact**: This is an assessment of the potential magnitude of direct harm to the public, operators or contractors should there be an abnormal operating condition and/or an incident outside of Spire's operational control;
- **Property impact**: This is an assessment of the potential magnitude of property damage should there be an abnormal operating condition and/or an incident outside of Spire's operational control. Property in this context include pipeline assets, third-party equipment, and other structures locating within the vicinity of the gas supply infrastructure;
- **Environmental impact**: This is an assessment of emissions, leakage, and spills or releases during transport and consumption;
- **System integrity impact**: This is an assessment of the scope of changes to the fuel delivery, increasing the likelihood of service disruptions;
- **Supply security risk**: This is an assessment of the risk to the ability of securing and delivering sufficient fuel supply when needed; and
- **Permitting challenges**: This is an assessment of the risk of securing the necessary permits on a timely basis.

We assess each risk factor in four levels of increasing severity, namely:

- **Low risk**: Operation is unlikely to lead to hazardous situations that may cause accidents or adverse impact, and even if it does, results in only negligible harm;
- **Moderate risk**: Operation will seldom result in hazardous situations that lead to accidents or adverse conditions that results in incidents and/or minor accident damage;
- **Elevated risk**: Operation may create hazardous situations that results in occasional accidents or adverse impact which may lead to accident level injury and equipment damage; and
- **Unacceptable risk**: Operation may create hazardous situations with a higher potential for accidents or materially adverse impacts leading to catastrophic equipment losses, injury, or death.

Figure 1 provides a summary of the risk assessment of the supply options, based on CRA analysis.

Figure 1 Summary of Risk Assessment of Supply Options Based on CRA Analysis

Risk Factor	STL Pipeline	Line 880	Propane Injection	Micro-LNG
Operational risk	Highly automated and monitored operations posing low risks	Aged infrastructure and manufacturing methods contribute to risks	Manual blending using old systems, requiring experienced operators	Require constant monitoring of pressure but state-of-art equipment mitigates risks
Public safety impact	Highly automated and monitored operations posing low risks	Antiquated infrastructure poses risks (ERW pipe). Large portion of pipe located in HCA	Above ground facilities located at low security site	Trucking in bad weather creates risk of road accidents
Property Impact	New materials and state of the art systems / requiring no new construction works	Adjacent properties could be impacted in the event of a release	Risk to appliances and vehicle damages due to exceeding propane interchangeability limit	Limited risks due to limited scale of operations and state-of-art equipment
Environmental impact	Gas transported through pipeline designed and constructed to meet and exceed current industry standards, posing low risk of leakage	Higher risk of gas release resulting from pipeline failure (SMYS > 30%) due to asset age and manufacturing method. Repair and testing work contribute to emissions. Infrastructure in EJ areas of concern	Potential for in-house emissions due to improper blending. Potential for increased emissions at fuel substation. Infrastructure in EJ areas of concern	Trucking of LNG and on-site generators release local emissions, and emissions related to liquefaction process
System integrity impact	Status quo	Asset previously scheduled for retirement due to age, materials and construction	Hydrotest required to check for integrity issues	Requires system change. Third-party interface (REV LNG)
Supply security risk	Extremely high reliability history for pipelines, especially those constructed to meet current industry standards	Risk of inability to re-certify Line 880 for maximum allowable operating pressure	Requires planning lead time for scheduling from third party open access "batched" pipeline supply	Dependence on up to 151 days of consecutive operation, risk of driver shortages and trucking in winter weather
Permitting challenges	Infrastructure in place and operational	Require permits for hydrostatic test	Requires air permits, and hydrotest could uncover issues	Require permits for tap and siting the peaker

Legend: **Low Risk** | **Moderate Risk** | **Elevated Risk** | **Unacceptable Risk**

2.2. STL Pipeline

2.2.1. Risk Assessment

Figure 2 below provides a summary of our risk assessment for the STL pipeline.

Figure 2 A Summary of Risk Assessment Associated with the STL Pipeline

Risk Factor	STL Pipeline
Operational Risk	●
Public Safety	●
Property Impact	●
Environmental Impact	●
System Integrity	●
Supply Security Risk	●
Permitting Challenges	●

Operational Risk

The STL pipeline was placed into service in 2019, making it one of the newest pipelines in the U.S. It was certificated by FERC after an exhaustive review of environmental impacts and construction practices. The operational record for pipelines in general is excellent. With a new pipeline, such as STL, constructed with state-of-the-art materials and construction procedures, the risk of any unintended release of natural gas is extremely low. The pipeline is also monitored 24/7 from a secure gas control center with automated operations including automated shutdown devices in the unlikely event of a gas release.

Public Safety Impact

Given the extremely low likelihood of natural gas releases since the pipeline is designed and constructed to meet or exceed current industry standards, as discussed above, the likelihood of any impact on public safety is also very remote.

Property Impact

As with public safety, absent any release of gas, the likelihood of property damage is extremely low.

Environmental Impact

As part of the original certificate review and certificate conditions, all possible steps were taken to mitigate construction and operating environmental impacts. Given the pipe is in service, well maintained and operating safely and the likelihood of any release is extremely low, the likelihood of future environmental impact should also be extremely low. Further, the STL pipeline was ranked superior to other supply options reviewed in this report.

System Integrity

The state-of-the-art STL pipeline has been integrated into the operation of the Spire Missouri distribution system with modern metering and regulating equipment, which like the pipeline is continually monitored with real time Supervisory Control and Data Acquisition ("SCADA") systems. The likelihood of any system integrity issues with this new system is extremely low.

Unlike Line 880, the STL Pipeline has also been designed to accommodate internal inspection tools.

Supply Security

Pipelines have the highest level of supply security of all of the supply resources available to natural gas utilities. STL receives its gas primarily from the Rockies Express Pipeline ("REX"). REX went into service in 2009 delivering gas from the Rockies Basin to markets in central and eastern U.S. In 2015, the REX pipeline was made bi-directional allowing gas to flow from both the Rockies and Appalachian basins, vastly improving its supply security from both a pricing and availability standpoint. STL also has interconnections with MoGas and MRT on the southern end of its system to add an added layer of supply security. For all the reasons stated above, and demonstrated during winter storm Uri, the likelihood of any supply disruption is extremely low.

Permitting Challenges

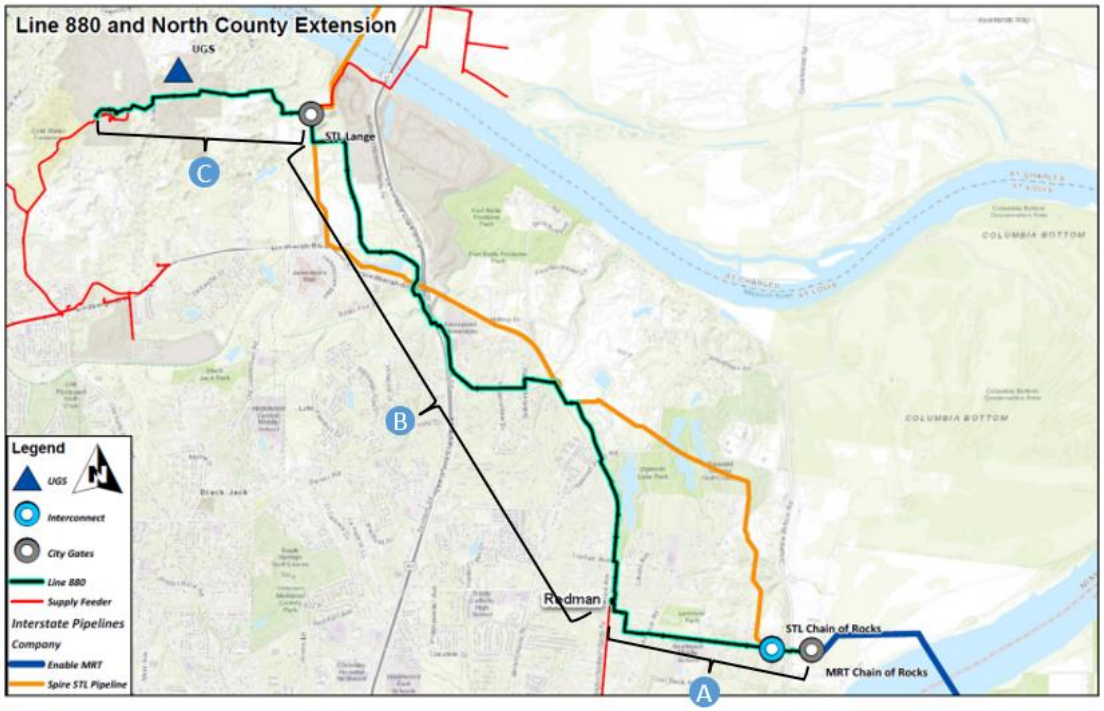
While STL is in the process of obtaining a permanent certificate from FERC, all other permits are in place. The pipeline is currently operating safely and reliably.

2.3. Continued Operation of Line 880

2.3.1. Overview and History of Asset

This option is in relation to the reconnection of Spire Missouri's system to the MRT system via a section of pipe known as Line 880 which consists of approximately seven miles of existing 20" pipeline.[1] Line 880 can be broken down into three distinct operating segments. The first segment (segment A) begins at the retired MRT Chain of Rocks meter station and continues west to Spire's Redmond station. While this pipeline segment will remain in service, with STL pipeline in service, it can operate at lower pressures as it will only be required to support local distribution load. Absent the STL pipeline, it will need to operate at transmission pressures as a feeder line. The second and longest segment (segment B) extends north from the Redmond station to the new STL Lange meter station. With the new supply from STL pipeline, this segment of Line 880 can either be derated or retired. The final segment of Line 880 (segment C) extends east from the STL Lange station west to Lange underground storage. This section will remain in service to move natural gas to the Lange storage facility.

Figure 3 Line 880 and Associated Facilities



While the use of Line 880 was included as part of several supply alternatives in the STL pipeline certificate process[2], these alternatives were deemed environmentally inferior, and FERC ultimately approved the STL pipeline in the Certificate Order[3] over the use of Line 880 in the final supply configuration. As a result, Line 880's supply from the Chain of Rock

1 *See* STL Pipeline LLC, *Resource Report 10*, pg 10-7

2 STL Pipeline Resource Report 10 Alternatives – CP17-40

3 *See* Docket No. CP17-40-007, Certificate Order

metering and regulation station was disconnected. In addition, MRT abandoned its East Line delivery infrastructure at Chain of Rocks and Spire Missouri's direct connection with MRT's East Line at Chain of Rocks was severed and replaced with a connection to the STL pipeline.[4] Thus, the receipt of gas supply from the MRT East Line will require a new interconnect at the Chain of Rocks station. The ultimate volume which could be flowed on this pipeline segment would be limited to the unsubscribed capacity available on MRT's East Line as well as the inlet pressure from MRT feeding Line 880.

History of the asset

The pipeline was installed in the 1960s and is comprised of electric resistance welded ("ERW") pipe and some spiral welded pipe.

The pipeline was constructed prior to the current pipeline safety regulations found in 49CFR192, which were instituted in the 1970s and govern the installation, operations and maintenance of natural gas pipelines across the United States. While the pipeline was constructed using best practices and industry standards prevalent during this time of construction, it was grandfathered from meeting the more stringent regulations when the regulations went into effect in the 1970s. One example is the current specified minimum yield strength ("SMYS") of the pipe is 49.19% at 880 psig, which puts it well above 350 psig which is required to keep it under 20% SMYS.[5] Pipelines with SMYS above 30%, due to higher pressure, have a greater tendency of leaking and/or failure, increasing risk. Since the pipeline SMYS is over 20%, it is considered a transmission pipe, which puts it under more stringent federal pipeline safety integrity management regulations.

In regard to Line 880, while there have not been any reportable incidents like the ones mentioned below, there is concern that the potential for such incidents exists if the line remains in transmission service. It should be noted that there was a rupture in segment C on Line 880 along a longitudinal weld whilst the pipe was being purged of air using Nitrogen during the commissioning stage. The ruptured pipe was replaced, eliminating any localized integrity issues found in commissioning. This would have been a reportable incident and a catastrophic failure if natural gas were in the pipe. Also, to address any similar issues, Spire replaced all main related to the commissioning rupture (0.312" wall thickness) with new stronger pipe with increased wall thickness (0.344" wall thickness) of approximately 2 miles.

Also, there is a section of the pipe that the Missouri PSC has required a pressure test on, in order to maintain current maximum allowable operating pressure ("MAOP"). The pipe has to be pressure tested to 1.5x MAOP. [6] The PSC Staff is focused on the seam on a section of pipe manufactured in 1961 being potential low frequency electric resistance weld ("LFERW") pipe, which is more susceptible to integrity issues and wants that to be pressure tested to confirm integrity. Spire cannot confirm whether it is or not, through paper records, so a sample would need to be extracted and sent to a lab for testing. The section of pipe also was not tested to 1.5x MAOP at the time of installation. The section identified is between New Jamestown & Bellefontaine to the Lange interconnect. Staff's position to pressure test has been a follow-up response to Spire from an audit in 2016. The pipeline issues referenced above occurred in Segment B of Line 880 between the Redmond Station and STL Lange Station. As discussed above, this segment can be derated below transmission pressure or retired with the STL pipeline in service.

4 *See* Docket No. CP17-40-007, Certificate Order, pg. 8

5 As per the definition for a transmission line in United States Code of Federal Regulations 49 § 192.3

6 Based on United States Code of Federal Regulations 49 § 192.619

Electric Resistance Weld ("ERW") Pipe

ERW is made from steel coil and the weld seam runs parallel to the pipe. ERW line-pipe materials and a similar material called electric-flash-welded ("EFW") pipe first appeared in the 1920s. Both processes involved making line pipe by cold forming previously hot-rolled plates or strips into round "cans" and joining the longitudinal edges of the cans by a combination of localized electrical resistance heating and mechanical pressure. The heat-softened edges were forced together extruding excess material to the outside and inside of the newly formed pipe. The excess material was immediately trimmed away leaving smooth surfaces or at most a small protrusion along the bondline. Both types of processes resulted in a narrow bondline and an associated local heat-affected zone. In many instances in the past and in all cases with modern ERW materials, the bondline/heat-affected-zone region was also subjected to a post-weld heat treatment, the purpose of which is to eliminate zones of excessive hardness from the initial welding process as such zones could be susceptible to various forms of environmental cracking.[7]

Spiral weld pipe, like ERW pipe, is also manufactured from steel coil but the difference is the coil is wound at an angle, so the weld runs around the outside of the pipe in the shape of a helix. Both of these types of steel pipe vary from the modern steel pipe used primarily in the natural gas industry today, which is welded circumferentially at the joint ends of pipe vs longitudinally or spiral welds.

This type of longitudinally and spiral welded pipe has historically proven to be a potential source for rupture and the issues with and incidents associated with ERW pipe have been well documented by various government agencies as cited below.

The Office of Pipeline Safety ("OPS")

The Office of Pipeline Safety and its successor the Research and Special Programs Administration ("RSPA") have issued two "Alert Notices" to operators of ERW pipelines on January 28, 1988, and March 8, 1989.[8] From the March 8, 1989, alert notice it cited, "In January 28, 1988, the Office of Pipeline Safety ("OPS") issued an Alert Notice advising pipeline operators who have pipe manufactured by the Electric Resistance Weld ("ERW") process of the occurrence of twelve hazardous liquid pipeline failures and of actions which operators may take to reduce the risks of similar failures. The continuing failure of ERW seams remains a matter of concern to the Research and Special Programs Administration ("RSPA"). Since the issuance of the Alert Notice, the RSPA has data on eight additional hazardous liquid pipeline failures and one on a gas transmission pipeline involving pipe seams manufactured prior to 1970 by the ERW process."[9]

The National Transportation Safety Board ("NTSB")

On 1 November 2007 a 12-inch diameter liquid propane pipeline operated by Dixie Pipeline Company ruptured in a rural area near Carmichael, Mississippi, resulting in two deaths, with seven others suffering minor injuries. The National Transportation Safety Board ("NTSB") determined that the significant length of the rupture that contributed to the large volume of

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7 Kiefner (Feb 2002), *Dealing with Low-Frequency-Welded ERW Pipe and Flash-Welded Pipe with respect to HCA related Integrity Assessments*

8 OPS and RSPA are the predecessors of PHMSA, the current federal agency tasked with oversight of the US pipeline system

9 RSPA (March 1989), *RSPA Alert Notice*

product released was due to running axial fracture in the longitudinal electric resistance weld ("ERW") seam used to make the pipe.[10]

Following their analysis, the NTSB issued Recommendation P-09-1 on the safety and performance of ERW pipe, which called on the PHMSA to conduct a comprehensive study to identify actions that can be implemented by pipeline operators to eliminate catastrophic longitudinal seam failures in ERW pipe. In the PHMSA study, conducted by Battelle, a leading research institution based in Columbus, Ohio, one conclusion was that "the data showed is the older the vintage of the ERW or flash-welded pipe prior to 1970, the more prone it is to seam defect problems." [11]

Representative of systemic issues with ERW pipe is the Rancho Pipeline, operated by the Kinder Morgan Company near Austin, Texas, which had ten incidents reported to the OPS from 1968 to 2002.[12]

Pipeline and Hazardous Materials Safety Board ("PHMSA")

In a report to PHMSA on Pipeline Corrosion, energy industry consultant Michael Baker stated that "Certain vintages of pipe, including pre-1971 manufactured low frequency electric weld resistance ("ERW") pipe, have exhibited seam-related problems that might be particularly susceptible to selective seam corrosion."[13]

Among the worst recent examples of ERW weld seam failures is the 2010 Kalamazoo River spill in Michigan. This largest, costliest inland spill in US history occurred along a 40-year-old reversed pipeline that was carrying diluted bitumen from the Alberta, Canada, tar sands. From an article written about the incident, ERW pipelines were discussed for their risk in the pipeline incident cited above and others stating, "Exacerbating the risks associated with old pipe is a lethal welding flaw that occurs in US pipelines built between 1930 and 1970. Although considered state-of-the-art when it was introduced, low-frequency electric resistance welded pipe ("ERW") was identified as prone to seam failures as early as the 1960s and phased out a decade later when it was replaced by stronger welding techniques. ERW failure has been blamed for a 1976 pipeline blast in Whitharral, Texas, that killed a young mother and her child. In the years since, at least 200 accidents have occurred along the same kind of welded pipe, resulting in at least 14 deaths, according to PHMSA."[14]

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10 Battelle (October 2013), *Final Summary Report and Recommendations for the Comprehensive Study to Understand Longitudinal ERW Seam Failures – Phase One*, pg 4.

11 Ibid., pg 41-42

12 Duckworth-Elder Consultants (June 2004), *Assessment of Pipeline Integrity of Kinder-Morgan Conversion Of the Rancho Pipeline*

13 Baker M. (June 2008), *Pipeline Corrosion Final Report to PHMSA*, pg 13

14 *See* Eberhart (Feb 2014), *The Trouble with Aging Pipelines: Too Many Candles on the Cake Can Spark Disaster*, available at https://canaryusa.com/aging-us-pipelines/; accessed on November 4th, 2021

Figure 4 ERW Longitudinal Failure[15]

2.3.2. Continued operation of Line 880

Continued dependence of the Chain of Rocks to Redmond (Segment A) and Redmond to Lange (Segment B) pipeline segments of Line 880 at transmission pressures raises a number of concerns due to the age of the pipeline, potential for leaks and its operating history, especially given the broader concerns around ERW type pipe. The pipeline is nearly at its end of life and issues discussed will continue and prohibit it from becoming an appropriate option as a Department of Transmission defined transmission pipeline. ERW pipe has been proven to be susceptible to corrosion and subsequent failure along the longitudinal weld and while Spire did a good job keeping the pipeline functioning without incident, there is significant risk in utilizing this pipeline segment in transmission service, to provide a portion of the gas supply needs, vs. using a modern pipeline like the STL pipeline, which is essentially risk free comparatively.

Required New Interconnection with MRT

Spire Missouri has already begun evaluating rebuilding the interconnect but estimates a new interconnection at this site would take 9 to 12 months to construct.[16]

2.3.3. Risk Assessment

Figure 5 below provides a summary of our risk assessment for the continued operation of Line 880. While individual risk elements by themselves are a concern, the cumulative impact

15 *Ibid.*

16 *See* Docket No. CP17-40-007, STL Responses to FERC data requests, Question 2, b

of the broad risk elements renders the operation of Line 880 as a transmission feeder as an unacceptable outcome of the current events.

Figure 5 A Summary of Risk Assessment Associated with Line 880

Risk Factor	Transmission pressures in Line 880	STL Pipeline
Operational Risk		
Public Safety		
Property Impact		
Environmental Impact		
System Integrity		
Supply Security Risk		
Permitting Challenges		

As shown in Figure 5 above, most risk factors for the Line 880 option, indicate elevated risk with one moderate risks and no low-risk items involved. Specifically, operational risk, public safety impact, property impact, supply security risk, permitting challenges are elevated because Line 880 is an aged infrastructure and expedited testing and repairs and continued operation in general of such an asset will contribute to elevated risks, as the line is antiquated infrastructure (ERW pipe), spiral welded pipe adjacent to properties that could be impacted in the event of a release.

Operational Risk

This option would add additional complexity to the system and require more hands-on work. Overreliance on Line 880, especially as a transmission feeder line will be very challenging and inappropriate due to the risk, safety and reliability factors involved.

There is higher risk of gas leakage due to asset age / repair and testing work which contributes to emissions of an asset previously scheduled for retirement or derating due to age, materials and construction.

As the use of the STL is simpler and involves fewer separate elements, it would by definition incur less risk to operational safety than the use of Line 880.

Insomuch as each added element of the system increases risk, attempting to acquire multiple assets to perform the same function as the STL will likely increase operational risk – and with reduced peak supply.

Overall, the risks delineated above make this option inappropriate.

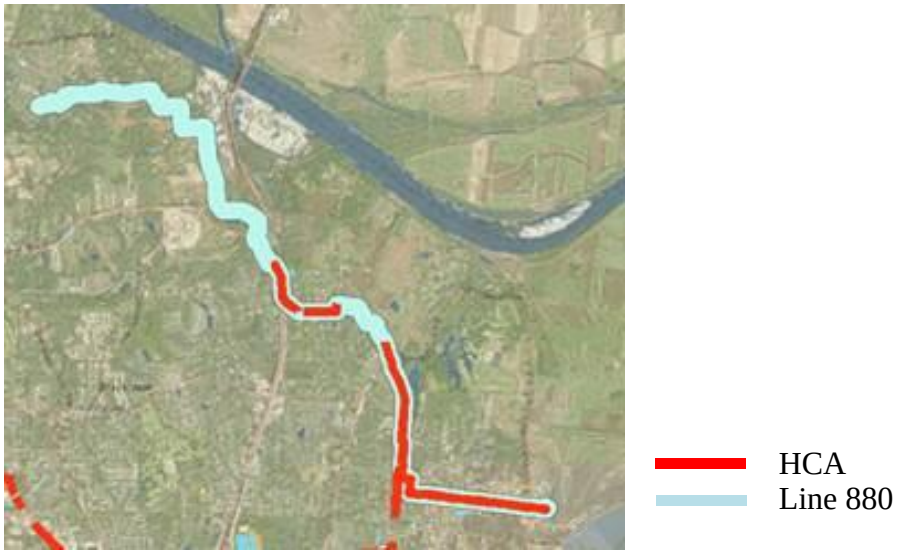
Public Safety Impact

The STL pipeline is very new and is constructed using modern best practices, modern materials, and corrosion prevention. Attempting to utilize any other infrastructure such as Line 880, especially as a transmission feeder, will result in a system with a greater chance of leaks, failures or other issues – particularly since it was installed in 1961 and is nearly 60 years old.

With this option comes an increase in chance of leaks or failures and related increased risk to human health over the use of the STL. One important and accepted measure of public safety

is the identification of High Consequence Areas ("HCA") along a pipeline route.[17] A review of Line 880's path indicates that over 48% of the line's route is contained in HCAs. This is shown in Figure 6 below where Line 880 is shown in light blue, and HCAs are shown in red. As described above, the segments of Line 880 in the HCA areas are the very segments which may be derated or retired with STL pipeline in service. Given the previously discussed elevated risks associated with this pipeline segment, it would create an unacceptable risk in populated areas.

Figure 6 Overlap between Line 880 and HCA



Further, in the event of any failure on the line, it will take time to safely restore service since this must be done on a customer-by-customer basis in person rather than remotely as with electrical outages. This could leave customers without gas for a dangerous amount of time – as seen in the 2020-2021 winter season in the South-Central parts of the country.

As such, it appears that this option incurs a higher risk to human health than the use of the STL pipeline.

17 HCA is defined as the area within a potential impact circle containing: (i) 20 or more buildings intended for human occupancy, unless the exception in paragraph (4) applies; or (ii) An identified site. An identified site being: (a) An outside area or open structure that is occupied by twenty (20) or more persons on at least 50 days in any twelve (12)-month period. (The days need not be consecutive.) Examples include but are not limited to, beaches, playgrounds, recreational facilities, camping grounds, outdoor theaters, stadiums, recreational areas near a body of water, or areas outside a rural building such as a religious facility; or (b) A building that is occupied by twenty (20) or more persons on at least five (5) days a week for ten (10) weeks in any twelve (12)-month period. (The days and weeks need not be consecutive.) Examples include, but are not limited to, religious facilities, office buildings, community centers, general stores, 4-H facilities, or roller skating rinks; or (c) A facility occupied by persons who are confined, are of impaired mobility, or would be difficult to evacuate. Examples include but are not limited to hospitals, prisons, schools, day-care facilities, retirement facilities or assisted-living facilities.

Property Impact

As discussed above, the STL pipeline is very new and is constructed using modern best practices, modern materials, and corrosion prevention. The utilization of any other older infrastructure, such as the 60-year-old Line 880, will result in a system with a measurably greater chance of leaks, failures, or other issues.

The STL pipeline has been installed and is operational. There does not appear to be any additional work required to continue the use of STL pipeline that would impact the risk to property.

Therefore, this option of using Line 880 as a transmission feeder main appears to have greater risk to property than continuing to utilize the STL pipeline.

Environment Impact

As a 60-year-old pipe, Line 880 will inherently experience more leaks than new pipe with modern materials and corrosion mitigation. Line 880 has been in the ground for 60 years and it is clear that the use of this line will result in greater emissions than the use of STL. Any hydro testing, repairs and other work required to get Line 880 back to its pre-STL operation will also have more environmental impact than using the STL which is already installed and in service.

We have also considered the environmental justice indicators ("EJ indexes") of the areas within which the infrastructure associated with the STL pipeline and Line 880 are located, based on the Environmental Justice Screening and Mapping Tool ("EJSCREEN") created by the United States Environmental Protection Agency ("EPA"). The EJ index is defined as:

> *"a combination of environmental and demographic information. The EJ index highlights block groups with the highest intersection of low-income populations, people of color, and a given environmental indicator."*[18]

The formula for the EJ index is:

$$\text{EJ Index} = (\text{Environmental Indicator}) \times$$

$$(\text{Demographic Index for Block Group - Demographic Index for US}) \times$$

$$(\text{Population Count for Block Group})$$ [19]

The EJSCREEN tool reports the EJ indices as percentiles, i.e. how is the EJ index for the area ranked against other areas across the United States. The higher the percentile is, the higher the worse the environmental *in*justice is. The EPA considers an area with a percentile value above 80 to be an area of concern for which to consider additional information.[20]

It is important to note that the EJ indices provide a snapshot of the *current* environmental and demographic condition in the area. It does not consider future potential risks. It is not an indication of the environmental impact or the condition of the asset of the alternative supply options being considered for this report. It is simply the environmental justice condition of the site as it is today.

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18 Environmental Protection Agency, *EJSCREEN Map Descriptions*, available at https://www.epa.gov/ejscreen/ejscreen-map-descriptions; accessed on November 4th, 2021

19 Ibid.

20 Ibid.

In addition, we noted that Spire STL Pipeline has filed a preliminary environmental justice impact assessment prepared by AECOM to support its request for expedited reissuance of certificates.[21] The AECOM report assessed the environmental justice conditions along the route of the Spire STL pipeline, and identifies the environmental justice communities of concern that would be impact by potential service outages due to the removal of the STL pipeline from service.

The environmental justice analysis in this report complements the AECOM analysis. This report focuses on identifying the environmental justice communities of concern along the routes of the alternative supply options that would be impacted should the risk issues we identified for each alternative supply option occur.

Table 1 below compares the EJ indices of Line 880 against the STL pipeline. The Table shows that the EJ indices for Line 880 are generally at a higher percentile relative to the STL pipeline. In particular, there are five environmental aspects for which the EJ index exceeds 80 for Line 880, including Ozone, Diesel Particulate Matter, Lead Paint Indicator, and Superfund Site Proximity and Wastewater Discharge Indicator. There is one environmental aspect for which the EJ index exceeds 80 for the STL pipeline. Therefore, any incident on Line 880 would further exacerbate the environmental injustice in areas that already have relatively worse environmental outcomes relative to the areas where the STL pipeline is located. Therefore, the use of Line 880 appears to result in greater environmental risk than the continued use of the STL pipeline.

21 See Docket No. CP17-40-000, Request of Spire STL Pipeline LLC for Expedited Reissuance of Certificates under CP17-40, Attachment E

Table 1 Comparison of EJ Indicators between Line 880 and the STL Pipeline

EJ Index	STL Pipeline Right of Way	Line 880 Right of Way
Particulate Matter	74	79
Ozone	74	81
NATA Diesel Particulate Matter	78	81
NATA Air Toxics Cancer Risk	74	79
NATA Respiratory Hazard Index	73	77
Traffic Proximity and Volume	66	66
Lead Paint Indicator	76	86
Superfund Proximity	79	82
Proximity to Risk Management Plan Facilities	70	73
Hazardous Waste Proximity	69	70
Wastewater Discharge Indicator	99	98

System Integrity

The system changes that would need to be made for this option to be implemented would inherently increase the complexity of the system. Adding additional system elements, each with their own maintenance and operational needs would increase the effort required by Spire Missouri to maintain system integrity.

If Line 880 were to flow transmission pressure gas from the recommissioned Chain of Rocks station, we understand that the Missouri PSC Staff has recommended, in its correspondence with Spire, that the Line in an HCA have to be pressured tested.

There are no system changes that would need to be made for the STL pipeline to continue to operate. As such, it appears from our analysis that this option would result in increased risk to system integrity.

Supply Security

Maintaining Line 880 in transmission service would necessitate a great deal of ongoing monitoring of the condition of the pipeline segment. Spire has indicated that segments are in disrepair and likely in need of work or replacement before it can be used. In addition, the Missouri PSC staff has required the pipe to be pressure tested as a result of an audit in 2016, which may reveal additional issues.

There are no similar issues with using the STL pipeline.

Permitting Challenges

As noted earlier, Line 880 would need to be hydrostatic tested if it were to flow transmission pressure gas from the recommissioned Chain of Rocks station. Conducting a hydrostatic test would require permits, which represent a challenge for this option.

2.4. Propane

2.4.1. Overview of Supply Option

In order to address the loss of supply deliverability from the removal of the STL pipeline from Spire Missouri's portfolio, the Company has looked at multiple alternate supply options.

This option involves injecting vaporized liquid propane into Spire's local distribution system in order to maintain pressure and provide additional peak capacity to meet the requirements. The propane supply will come from the propane underground storage cavern at Lange. The cavern has a storage capacity of 750,000 barrels. Historically, the propane could be vaporized and injected into the Spire distribution system near the storage cavern (Lange) or transported from the propane underground storage at Lange to Spire's southern propane vaporization point at Catalan through a system of pipelines as shown in Figure 7 below.

These facilities include two propane vaporization installations that, when operational, provided approximately 160,000 Dth/day.[22] The STL pipeline eliminated Spire Missouri's need to rely on these liquid propane peak-shaving facilities, and so these have been retired. The industry has been moving towards less reliance on propane facilities when pipeline capacity becomes available that can meet full supply needs.[23] Note however that unlike other propane facilities in the industry that are usually propane-air, Spire's facilities use pure liquid propane.

This option would require the replacement of some portions of the facilities, as well as integrity work involving the propane pipeline supply system.[24] Furthermore, this option relies on historical supply capabilities for mixing pure propane with flowing natural gas. When these facilities were functional, they were designed to provide up to 160,000 Dth/day of propane.[25] If reestablished, Spire estimates that the design capacity of each facility is 80,000 Dth/day of propane supply. However, interchangeability limits and the volumes of gas flow at the interconnects nearest to the Catalan facility reduces actual capacity to between 53,718 Dth/day and 59,267 Dth/day, as discussed later in Section 2.4.2. This capacity is based on unrestricted downstream take-away capacity from the Catalan facility interconnect with the Spire distribution network. If downstream capacity constraints exist, Catalan's propane injection capacity could be reduced.

This particular situation, of take-away constraints, exists at the Lange site. Through discussions with Spire's operating personnel we have learned that take-away capacity from the Lange site is approximately 360,000 Dth/day. This take-away capacity is shared with withdrawals from the Lange natural gas storage facility. Given the storage withdrawal capacity is 357,000 Dth/day, virtually all propane injections would physically back off storage volumes which could be withdrawn. While this would severely limit the ability to use both

22 Spire Temp Certificate Application, Pg. 4 Paragraph 9. The potential effective capability of the facility is discussed further below in this report.

23 See for example Duke Energy Ohio's decision to retire its propane-air peaking facilities, available at https://www.duke-energy.com/home/natural-gas-projects/central-corridor-pipeline-ext. Also see Docket DG 12-001, Direct Testimony of George R. McCluskey in the Matter of EnergyNorth Natural Gas, Inc. Investigation into Excess Capacity, Pg. 12

24 Spire Missouri is currently pursuing efforts to reestablish the facilities and ability to vaporize liquid propane at the Catalan location for this upcoming winter.

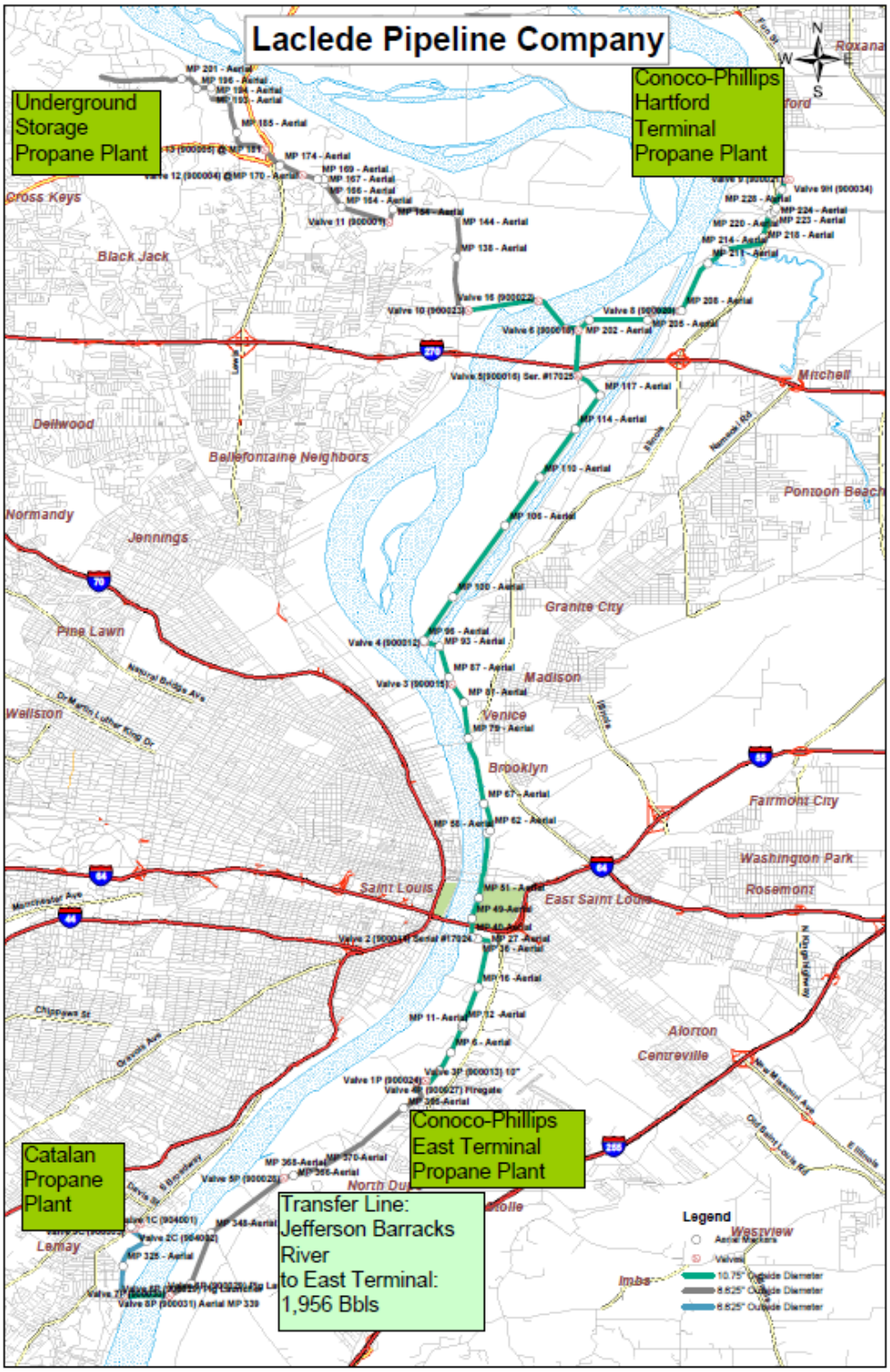
25 Spire Temp Certificate Application, Pg.17 Paragraph 44. The potential effective capability of the facility is discussed further below in this report.

propane injection and storage withdrawals at Lange to provide incremental support for peak day requirements (above the 360,000 Dth/d downstream capacity limitation), reactivation of the Lange propane injection facility would allow Spire to better manage their limited winter inventories of LNG, propane and onsite natural gas storage. In the event that Spire chose to dispatch propane from the Lange site rather than storage withdrawals, the maximum propane injection at the Lange site would be limited to approximately 67,000 Dth/d. This is based on the downstream limitation of 360,000 Dth/d, and the 8% volumetric interchangeability limit calculated below.

A section of the pipeline to be used to ship propane to Catalan is shared with Conoco-Phillips refineries (identified in Figure 7 below). The local refineries are currently using the pipe to ship butane for processing as well. As such, the line would have to be cleared of butane before propane can be transported from Lange to Catalan. This will require coordination with the local refineries in terms of scheduling.

In order for Spire to activate this option, several prerequisite actions must be taken.

Figure 7 Map of Spire's Propane System



Refurbishment and Testing of Propane Vaporization Facilities

The propane vaporization facilities at Lange and Catalan must be replaced and/or refurbished and tested before resuming operations. With respect to the Lange vaporization facility, Spire Missouri indicates that at this facility, propane heaters/vaporizers have been modified, physically moved, and re-purposed as natural gas heaters for withdrawal of gas.[26] In order to resume operation at Lange, Spire would be required to:

- purchase a new pre-heater and another pre-heater/vaporizer, replace the 12" valve (P-45) and the 12" vapor piping that connects to the supply feeder system, replace the 6" regulator system (P-2), and replace the Bingham pump system (three pumps) to pump the liquid propane to the vaporizer system;
- modernize controls and train operators; and
- obtain/modify its St. Louis County air permits to include the pre-heater and vaporization equipment in order to install the equipment.

With respect to the Catalan vaporization facility, Spire indicates that the source of propane on the propane supply pipeline has been physically disconnected from the propane vaporization equipment.[27] In addition to having to reconnect the propane pipeline to the vaporization equipment, there are additional challenges associated with shipping propane from the Lange storage cavern to the vaporization facility as discussed below. Finally, if the propane facility is deemed to be required for an extended period of time, the equipment and controls should be modernized.

Refurbishment and Testing of the Propane Supply Line

As noted above, a section of the pipeline ("the Transfer Line") that connects the propane storage cavern at Lange to the Catalan vaporization facility, constructed in the 1930s, was in the process of being abandoned. Even if the Transfer Line is not abandoned, Spire would be required to do a hydrostatic test to keep it in compliance.[28] Pipe of this vintage has been exposed to corrosive elements for many years. After 80-90 years of exposure to the elements, there is risk that the hydrostatic test may uncover additional integrity issues which would need to be resolved prior to placing the line back into service.

Acquisition of Fuel

Spire indicated that the Company has access to 185,000 barrels in the propane storage cavern at Lange. This would be enough for a normal or typical winter season if it could be delivered and vaporized.

The pipeline that is used to transport propane to Catalan is also now generally used to move butane for refineries in the area and would have to be cleared of butane to transport propane requiring lead times well in excess of the times required to schedule pipeline gas. Changes in weather forecasts and or demand forecasts would present challenges to timely receipt of propane.

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26 *See* STL Responses to FERC DRs, Question 14

27 *See* STL Responses to FERC DRs, Question 14

28 Spire Missouri is working with Spire NGL to have these necessary tests performed.

There is also limitation on the amount of vaporized propane that can be injected to the distribution system at a particular time, which further limits the capacity of the propane option during peak. This is discussed further in Section 2.4.2.

Training of Staff

Spire Missouri has indicated that the dispatching of propane from its vaporization facilities was historically done manually. If this option were to be put back into service, then the dispatching of propane would still need to be done manually in severe weather conditions. Spire has indicated that some staff who have performed this work in the past are still employed by the Company, but that refreshing training would need to be done.

Figure 8 Example of unprotected operating environment[29]

29 Spire Missouri Propane Operating Procedures documentation

Figure 9 Manual operations subject to severe weather conditions

Re-training on how to safely operate and maintain the facilities must also be done. This is particularly important given the aging infrastructure that would need to be relied on in order to activate this option. Further, Spire staff indicated that the mixing of propane into natural gas is done manually, so there is room for error if staff are not fully trained and competent. Inaccuracies in blending can lead to issues ranging from the failure of all CNG vehicles using the blend all the way to incidents at the point of use in residential, commercial, and industrial customers.

As such, it is imperative that staff be fully trained in propane dispatch, facility operations, and facility maintenance. It may be possible that Spire could supply and train the staff necessary but the impact on current operations could be an issue and should be evaluated.

2.4.2. Interchangeability

Interchangeability is defined as:

> *"The ability to substitute one gaseous fuel for another in a combustion application without materially changing operational safety, efficiency, performance or materially increasing air pollutant emissions."*[30]

In order to assure safe and reliable service at consumer end use equipment, when introducing mixed gases into a pipeline network, specific concentrations of supplemental gases must be monitored and maintained. The most recent published analysis of gas interchangeability recommendations, to the authors' best knowledge, was filed as part of the

30 Natural Gas Supply Association (Feb 2005), *Natural Gas Interchangeability and Non-Combustion End Use*

Federal Energy Regulatory Commission ("FERC") Docket PL04-3-000[31]. While the proceeding was specifically focused on understanding the impacts of new LNG deliveries, the formulas governing gas quality requirements remain the same.

As part of this proceeding, the Natural Gas Supply Association ("NGSA") filed a technical white paper entitled *Natural Gas Interchangeability and Non-Combustion End Use* on February 28, 2005. In that paper, the following guidelines were presented.[32]

> *A range of plus and minus 4% Wobbe[33] Number Variation from Local Historical Average Gas or, alternatively, Established Adjustment or Target Gas for the service territory.*
>
> *Subject to:*
>
> *Maximum Wobbe Number Limit: 1,400*
>
> *Maximum Heating Value Limit: 1,110 Btu/scf*

The report presented interim guidelines for gas interchangeability limits stating that

> *"The interim guideline limits proposed in this document have been developed for new gas supplies to those market areas without extended experience with gas supplies characterized by Wobbe Numbers higher than 1,400 or gross heating values higher than 1,110 Btu/scf."*[34]

This guideline applies to Spire given the pipelines serving this market all operate well below the upper limit of 1,110 Btu/scf. The actual heating value of natural gas delivered to Missouri consumers over the last 14 years (2007 through 2020) has averaged 1,015 Btu/scf.[35]

Determination of Interchangeability limits at Spire Missouri's Catalan Propane Plant

The first step in arriving at interchangeability limits is to determine the gas quality of the flowing natural gas at the point of injection. For these values we are using the gas sample analysis provided by Enable Mississippi River Transmission at their Ameren Meramec Missouri station (Loc. 808368)[36] for the period of October 20, 2021, through October 26, 2021. For this period the average specific gravity observed was 0.5818 and the average heating value of the gas stream was 1,017 btu/scf.[37] Applying the maximum Wobbe Index guideline of 1,400 would limit the pure propane to 8% of the total flowing gas volume. The calculation is shown in Box 1 below.

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31 Federal Energy Regulatory Commission (Jun 2007), *Policy Statement on Provisions Governing Natural Gas Quality and Interchangeability in Interstate Natural Gas Pipeline Company Tariffs, Docket Pl04-3-000, pg 7*

32 Natural Gas Supply Association (Feb 2005), *Natural Gas Interchangeability and Non-Combustion End Use*, pg 27

33 The Wobbe Index and Natural Gas Interchangeability, *Wobbe Index = (Btu/scf)/√specific gravity; Application Data Document 1660AD-5a, 7/30/2007, Emerson Process Management*

34 Natural Gas Supply Association (Feb 2005), *Natural Gas Interchangeability and Non-Combustion End Use*, pg 26

35 Energy Information Administration, *Natural Gas – Heat Content of Natural Gas Consumed*

36 Mississippi River Transmission EBB, *Gas Quality – Daily Average Samples Report*

37 See Appendix D

Box 1: Calculation of Interchangeability Limits at Catalan Propane Vaporization Facility

The Wobbe Index is defined as:

$$\text{Wobbe Index} = \frac{V_C}{\sqrt{G_s}}$$

Where V_C is the higher heating value in British thermal units ("BTU") per standard cubic foot ("SCF"), and G_s is the specific gravity of the gas.

The Wobbe Index of the flowing natural gas at the point of injection, based on the gas sample at the Ameren Meramec Missouri station, is

$$\text{Wobbe Index of Flowing Gas} = \frac{V_C}{\sqrt{G_s}} = \frac{1{,}017}{\sqrt{0.5818}} = 1{,}334$$

The Wobbe Index of vaporized propane gas is[38]

$$\text{Wobbe Index of Propane} = \frac{V_C}{\sqrt{G_s}} = \frac{2{,}522}{\sqrt{1.52}} = 2{,}045$$

Applying the maximum Wobbe Index guideline of 1,400 would limit the pure propane to 8% of the total flowing gas volume as shown below

$$\text{Wobbe Index of Mixed Gas at 8\% Propane} = (1{,}333 \times 0.92) + (2{,}045 \times 0.08) = 1{,}390$$

Applying the 4% +/- rule, we can see that the Wobbe index of the mixed gas with 8% propane is just slightly above the 4% guideline

$$\text{Maximum Wobbe Index} = \text{Wobbe Index of Flowing Gas x } 1.04 = 1{,}333\ x\ 1.04 = 1{,}387$$

In addition, calculating the mixed gas heating value results in a value just slightly above the maximum heating value presented in the guideline of 1,110 Btu/scf result. The resulting heating value is, however, within the range of acceptable heating values of 950 and 1,150 btu/scf established in the STL pipeline tariff[39]

$$\text{Heating Value of Mixed Gas} = (1{,}017 \text{ x } 0.92) + (2{,}522 \text{ x } 0.08) = 1{,}137 \text{ btu/scf}$$

Utilizing the measured heating value (Btu/scf) and specific gravity of flowing gas into the Spire Missouri system[40], an 8% mixture of pure propane and 92% flowing (pipeline) natural

38 See *Application Data Document 1660AD-5a, 7/30/2007, Emerson Process Management*

39 See STL Pipeline FERC Tariff General Terms and Conditions, Section 4.2(j)

40 Mississippi River Transmission EBB, *Gas Quality – Daily Average Samples Report*

gas would represent the upper limit of propane as a supplemental gas while reasonably satisfying the generally accepted criteria for safe and reliable service.

Maximum propane injection for Spire's peak day operations

Based on the analysis presented above, the maximum propane gas which could be supplemented into the Spire Missouri system on a peak day would be between 21,300 Mcf/d and 23,500 Mcf/d. This maximum volume is based on experienced winter day gas flow of 245,000 Mcf/d and 270,000 Mcf/d from the Ivory interconnect which feeds gas past the Catalan Propane Plant.

$$Propane\ Volume_{Catalan} = \frac{Flowing\ Gas\ Volume_{Catalan}\ \times 0.08}{0.92} = \frac{245{,}000\ \times 0.08}{0.92} = 21{,}300\ \text{Mcf/d}$$

Given that flows past the Catalan plant will vary considerably between peak morning deliveries and overnight minimum deliveries, hourly (or more frequent) monitoring and adjustment of the equipment will be required on a 24/7 basis.

In order to properly assess the incremental energy delivery to Spire's customers, an additional calculation to adjust for heating value needs to be conducted. The heating value of the propane injected into the Spire distribution system is 2,522 Btu/scf. Applying this heating value to the volume of flowing gas would result in gas supply available from the Catalan facility of between 53,718 Dth/day and 59,267 Dth/day This is lower than the design capacity of the Catalan facility of 80,000 Dth/day due to the interchangeability limit and the projected gas flow at the Ivory interconnect.

Implications of exceeding interchangeability limits on end use equipment

Varying natural gas composition beyond acceptable limits can have the following effects in combustion equipment.[41] This is of particular concern given that Spire Missouri's propane operation involves the direct injection of pure propane into their distribution system rather than the industry practice of injecting a mixture of propane and air (generally a 50/50 mix).

- In appliances, it can result in soot formation, elevated levels of carbon monoxide and pollutant emissions, and yellow tipping. It can also shorten heat exchanger life, and cause nuisance shutdowns from extinguished pilots or tripping of safety switches.
- In reciprocating engines, it can result in engine knock, negatively affect engine performance and decreased parts life.
- In combustion turbines, it can result in an increase in emissions, reduced reliability/availability, and decreased part's life.
- In appliances, flame stability issues including lifting are also a concern.
- In industrial boilers, furnaces, and heaters, it can result in degraded performance, damage to heat transfer equipment and noncompliance with emission requirements.

Given the operational complexity and risks associated with Spire Missouri's propane facility, and the fact that the Catalan facility would be limited to replacing just 15-17% of the STL pipeline's firm flowing gas energy content, CRA does not view propane injection as a prudent alternative to the STL pipeline for reliably serving Missouri's winter heating requirements.

41 Natural Gas Supply Association (Feb 2005), *Natural Gas Interchangeability and Non-Combustion End Use*

2.4.3. Risk Assessment

Figure 10 below provides a summary of our risk assessment for the propane supply option.

Figure 10 A Summary of Risk Assessment Associated with Propane Vaporization

Risk Factor	Propane Vaporization	STL Pipeline
Operational Risk	🟡	🟢
Public Safety	🟡	🟢
Property Impact	🟡	🟢
Environmental Impact	🟡	🟢
System Integrity	🟡	🟢
Supply Security Risk	🟡	🟢
Permitting Challenges	🟡	🟢

Operational Risk

The use of propane-air as a blended fuel is uncommon but does exist across the country as an emergency peak shaving method. Spire's use of liquid propane is very unusual, and to our knowledge, does not exist elsewhere in the country. Therefore, the operation of propane blending facilities is significantly different than any natural gas facilities, and as such – employees must be trained on these operations.

New England, despite its well documented pipeline constraints, has experienced material reductions in propane-air capacity. In 1989, just prior to the construction of the Iroquois Pipeline, 20 natural gas utilities vaporized propane to meet winter peak demand with a total capacity of 593,901 MMBtu/d. Today only 5 natural gas utilities operate propane-air plants with a combined capacity of 99,908 MMBtu/d. This represents an 83% reduction in capacity over the past 32 years.[42] We note that these New England facilities are all propane-air, which further emphasize the uniqueness of Spire's facilities which rely on liquid propane.

Given these operational differences, the use of the propane vaporization option would result in an elevated risk level over the use of the STL pipeline.

Public Safety Impact

The propane vaporization facilities are above ground, subject to winter weather and not in fully secured site. This by itself raises the risk the public safety of this supply option relative to the STL pipeline, which is below ground. In addition, propane is heavier than air and can 'pool' in structures if a leak is present, which exacerbates the potential for an accident.

Regardless, the use of unblended propane is always going to result in greater risk to public safety than the use of pipeline gas. As such, this option is rated as having an elevated risk level relative to the STL pipeline.

Property Impact

Propane has a higher energy content and is more dense than natural gas. As such, it is typically necessary to blend the propane with air in order to reduce the resulting blend's energy content and density to values that match natural gas. A system, like Spire Missouri's,

42 Northeast Gas Association

that contains unblended propane may have impacts to end users such as industrial clients that rely on carefully moderated fuel.

Additionally, blended propane fuels at the percentages Spire used historically could cause issues with CNG vehicles – including those that the Company uses. Spire has discussed dropping the percentage blended to mitigate this, but there is still a potential impact on this equipment.

As such, the use of propane in the Company's system would increase the risk to property over using the STL.

Environment Impact

A blend of too high concentration or one that is not dispatched correctly can result in additional emissions at end use. In addition, this option is a peak shaving option and, as such, would likely be activated after customer curtailment. To the extent that the curtailed customers substitute gas with a higher carbon intensity fuel, emissions at end use will also increase relative to supplying gas through the STL pipeline.

Table 2 below compares the EJ indices of the propane option against the STL pipeline. Again, it is important to note that the EJ indices provide a snapshot of the *current* environmental and demographic condition in the area. It does not consider future potential risks. It simply indicates the environmental justice condition of the site as it is today.

Table 2 shows that the EJ indices for the propane option are generally at the same or higher percentiles relative to the STL pipeline. In particular, there are four environmental aspects for which the EJ index exceeds 80 for this option, including Lead Paint Indicator, Superfund Site Proximity, Proximity to Risk Management Plan Facilities and Wastewater Discharge Indicator. This is in contrast to the STL pipeline where there is only one environmental aspect for which the EJ index exceeds 80. Therefore, any incident on the propane line would further exacerbate the environmental injustice in areas that already have worse environmental outcomes relative to the areas where the STL pipeline is located. As such, this option is rated as having elevated risk of environmental impact.

Table 2 Comparison of EJ Indicators between Propane and the STL Pipeline

EJ Index	STL Pipeline Right of Way	Propane Right of Way
Particulate Matter	74	74
Ozone	74	75
NATA Diesel Particulate Matter	78	78
NATA Air Toxics Cancer Risk	74	74
NATA Respiratory Hazard Index	73	74
Traffic Proximity and Volume	66	69
Lead Paint Indicator	76	80
Superfund Proximity	79	87
Proximity to Risk Management Plan Facilities	70	81
Hazardous Waste Proximity	69	76
Wastewater Discharge Indicator	99	98

System Integrity

All natural gas pipeline operators are required to identify the characteristics of the pipeline's design and operations with the goal of minimizing threats and risks to its gas distribution pipeline. The addition of this propane vaporization facility would meaningfully impact Spire's risk profile. Therefore, it can only be a single injection point at one end of the system away from the propane storage.

Furthermore, the Transfer Line will require a hydrostatic test to assess the integrity of the pipeline. This could unearth additional issues and delay the recommissioning of the Transfer Line. Spire would also need to coordinate with a third-party, i.e., the local refineries, in scheduling fuel delivery.

Given the additional operational complexity, this option is rated as having moderate risk to system integrity.

Supply Security

Propane facilities are typically used for peak-shaving. This type of facility is not intended to be relied on for primary supply to the system. Blending propane-air, and even more so pure propane like Spire Missouri, will always be less reliable than using pipeline natural gas since it is only supporting a part of the distribution system vs a reliable gas supply source from the STL pipeline. There are many more unique parts of the system and procedures than need to be manually and carefully performed to ensure proper blending occurs.

We also understand that there could be up to 36 hours of lead time in order to schedule the pipeline for transporting propane. This is a result of having to rely on a third-party open access "batched" pipeline supply which has to be cleared of butane before propane can be transported.

In its proceedings, New York State ("NYS") has recognized the reliability concerns associated with reliance on peaking services to meet peak day load. In response to that concern, the NYS utilities jointly analyzed this matter and determined that the probability of non-performance could range from 0% to 25% when there are on-system storage facilities, depending on the number of days that can be served by the facilities or the condition of aging facilities.[43] Given the age and condition of Spire's propane facilities, this supply option would be placed at the high end of the proposed derating formula proposed. For more detailed discussion of the findings from NYS utilities, please see Appendix B.

As such, the use of this system for supply will result in decreased reliability over using the STL pipeline.

Permitting Challenges

Installing these facilities would require Spire Missouri to obtain/modify its St. Louis County air permits to include the pre-heater and vaporization equipment. In addition, the required hydrostatic test for the Transfer Line could uncover pipeline issues, necessitating repairs. This may result in delays or an extension of the timeline for Spire Missouri to achieve the supply needed to service its customers this coming winter season.

As such, this option is rated as having an elevated risk of permitting challenges.

2.5. Micro-LNG

2.5.1. Overview of Supply Option

In order to address the loss of supply deliverability from the removal of the STL pipeline from Spire Missouri's portfolio, the Company evaluated utilizing a micro-LNG peak-shaving service. To utilize this service, Spire Missouri would be required to obtain a permit and construct a new supply tap into its existing distribution grid. The arrangements made for this contingency are being extrapolated for future winter seasons.

The envisioned service would provide 10,000 Dth/d of daily base load supply for up to 151 days over the winter between November - March if necessary. The base load operation, while highly inappropriate to serve winter heating demand, would be required to preserve natural gas inventories at Spire's Lange storage facility which could not be replenished during the winter heating season without the pressure and supply provided by the STL pipeline. The service would provide both incremental supply as well as localized pressure support for Spire Missouri's distribution network. The LNG would be sourced from Indiana and require a 250-mile trip taking approximately 4 hours each way to service Spire Missouri's requirements, excluding loading and offloading. To provide the service, the best case is 12 LNG trucks utilizing 18 drivers would be required per day to make deliveries.

While the addition of the envisioned LNG delivery point would help narrow the supply and deliverability gap, it would be significantly less reliable than the supply from the STL pipeline. In addition, the manner in which the LNG deliveries would be made is inconsistent with how these services have been and should be utilized. The LNG service would only supply peaking service to one portion of the Spire distribution system and not replace the gas supply needed and currently supplied by the STL pipeline. To accomplish the replacement of the STL gas supply, the LNG service provider indicated Spire initially considered 40 such LNG peaking units providing 300,000-400,000 Dt/day which could not be met practically nor economically

43 Central Hudson Gas & Electric Corporation et al. (July 2020), *Modernized Gas Planning Process: Standards for Reliance on Peaking Services and Moratorium Management, pg 16*

due to the lack of such equipment, drivers and the logistics and cost of providing such if available. In general, the micro-LNG peaking services are typically used only to provide 3-10 days of peaking service to one part of the gas distribution system not total pipeline gas supply replacement for a pipeline. In addition, the LNG service provider has indicated that service requirements exceeding 6-7 consecutive days would be at risk of insufficient qualified driver availability. This is obviously far short of the duration of the winter.

In addition to the risk elements stated above, there will be a heightened issue related to public perception and concern. While the STL Pipeline is buried and out of public view, the public will be aware of and concerned with ongoing LNG truck traffic through their neighborhoods.

2.5.2. Risk Assessment

Figure 11 below provides a summary of our risk assessment for the micro-LNG option.

Figure 11 A Summary of Risk Assessment Associated with Micro-LNG

Risk Factor	Micro-LNG	STL Pipeline
Operational Risk		
Public Safety		
Property Impact		
Environmental Impact		
System Integrity		
Supply Security Risk		
Permitting Challenges		

Operational Risk

The operation of the new LNG interconnect would require to be manned 24/7 and an operator would be required to perform manual operating procedures during the transfer and connection/disconnection process. The pressure would also have to be monitored, and manually adjusted based on instructions from Spire, adding to operational risk. The risk is partially mitigated as we understand that the equipment is state-of-the-art, and would be operated by skilled technicians from the LNG service provider.

Accordingly, the micro-LNG option is considered to have moderate operational risk.

Public Safety Impact

The public safety impact of this option stems from two sources, the on-site LNG storage and LNG trucking.

Firstly, LNG would be stored in the LNG storage tanker onsite, which could pose a risk to public safety. However, we understand that there would be two security staff as well as four technicians on the site full time. These measures mitigate risks to public safety.

Secondly, LNG would be delivered via truck from Indiana to St. Louis. These deliveries would be made during winter conditions which could pose a higher risk of traffic incidents. While LNG burns slower than gasoline, traffic accidents involving LNG trucks could still present a public issue if the LNG is released.

Given the potential number of trucks containing combustible fuel having to travel long distance during winter conditions, the micro-LNG option is considered to have unacceptable public safety impact.

Property Impact

The footprint of the micro-LNG facility is relatively limited. The equipment, which we understand is state-of-art, would include the vaporizer unit, the LNG storage tanker, and the on-site generators. In addition, the scale of operation would be relatively marginal at 10,000 Dth/day. As such, there is limited risk to property damage comparable to the STL pipeline.

Environment Impact

On a best case basis, the option requires 12 LNG trucks delivering every day. Each truck would be traveling approximately 250 miles from the LNG facility in Indianapolis to St. Louis and back. Over the duration of winter, these trucks would be travelling nearly one million miles. The trucking of LNG would contribute to additional carbon dioxide emissions along the route relative to transporting the equivalent amount of natural gas through the STL pipeline.

In addition, the LNG vaporization site would require two on-site 400 kV generators to provide power to the vaporizer and the reciprocal pump. According to the LNG service provider, these generators would be running on diesel contributing to additional emissions on the site. These emissions are on top of those associated with the natural gas liquefaction process to produce LNG.

Given the small footprint of the LNG facility, the EJ index is less meaningful and as such is not presented for this option.

Given the requirements for fuel trucking and on-site generators, the micro-LNG option has a higher environmental impact relative to the STL pipeline.

System Integrity

With a proposed 151-day winter service, the micro-LNG option should be categorized as a seasonal baseload service. That is not the manner in which this type of service should be relied upon. Per the LNG service providers website[44], the services and solutions they typically provide are listed below. The level of deliverability (duration) required to support Spire Missouri's needs are well in excess of any of these services provided by the LNG service provider or any similar service provider.

- Peak Shaving
- Emergency Services
- Planned Maintenance Services
- Temporary or longer term "gas island" customer services (specific to individual customers with much smaller volumes)[45]

In addition, activating this option would require a new interconnection, which represents a change to Spire's operations. Spire would also have to interface with a third-party operator in coordinating the operations of the LNG facility.

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44 See RevLNG, *Services and Solutions*, available at https://www.revlng.com/services-solutions/; accessed on November 4th, 2021

45 *Ibid.*

Given the additional operational complexity, the micro-LNG option is rated as having a moderate system integrity risk. This is higher than the STL pipeline, which is the status quo.

Supply Security

As proposed, Spire Missouri would require 12 LNG trucks delivering every day in a best case scenario to support its contracted volumes. Traditionally these services are only used a few days each winter, mitigating risk somewhat. Requiring 151 days of service during the winter significantly increases the risk associated with LNG trucking. As noted by NYS Commission Staff[46] and the utilities within NY[47] the transportation logistics related to LNG or CNG deliveries represent an ongoing concern related to reliability (see Appendix B for more information). This is particularly acute in the winter months when driving conditions are likely to impact deliveries.

During extended periods of cold weather, which are highly probable in St. Louis, there would be the additional risk of certified driver availability. Per the DOT regulations after 60 hours of service within a 7-day period or 70 hours of service within an 8-day period, each driver must be off duty for 36 consecutive hours before they can return to service.[48] Accordingly, REV LNG believes it will be required to seek additional qualified drivers if Spire Missouri requires service beyond 6-7 consecutive days. Given the 151-day service request, the need for additional drivers is likely. Also, finding qualified drivers during an extended cold weather event is not a given.

In its proceedings NYS has recognized the reliability concerns associated with overreliance on off system trucked supplies. In response to that concern, the NYS utilities jointly analyzed this matter and determined that the probability of non-performance could range from 0% to as high as 50%. Given the manner in which Spire Missouri is using this service, it is reasonable to expect risk of non-performance would be on the high end of the range proposed by the NYS utilities.

Given the accumulated impacts of the reliability issues raised, it is understandable that the service provided is not a firm service, as would be provided by the STL pipeline. As such, the micro-LNG option has a higher supply security risk relative to the STL pipeline.

Permitting Challenges

This option will require a new connection between the LNG facility and Spire's local distribution system. As a result, a new tap permit would be required. In addition, a noise waiver would also be required due to the elevated noise level associated with the on-site generators.

Due to the additional permits required, the micro-LNG option is rated as having a moderate permitting challenge compared to the STL pipeline which does not need a new permit.

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46 State of New York Public Service Commission (Mar 2020), *CASE 20-G-0131 - Proceeding on Motion of the Commission in Regard to Gas Planning Procedures. ORDER INSTITUTING PROCEEDING*, pg 7

47 Central Hudson Gas & Electric Corporation et al. (Jul 2020), *Modernized Gas Planning Process: Standards for Reliance on Peaking Services and Moratorium Management, pg 17*

48 Federal Motor Carrier Safety Administration (March 2015), *Interstate Truck Driver's Guide to Hours of Service*, pg 5

3. Summary of Findings

In the event that natural gas supply and deliverability provided by the STL pipeline becomes unavailable to Spire and consumers in Missouri, Spire has identified alternative solutions to bridge the considerable supply gap that would be created. It is clear from the analysis that these solutions cannot bridge the supply gap created by the loss of STL from both deliverability and operational perspectives. In addition, the people of Missouri would be subjected to elevated risks related to fuel availability, safety and environmental matters. The analysis has identified a large number of independent findings where each present elevated risks to Missouri and its residents. When the individual risks are considered as a whole, it becomes clear that the alternative solutions represent an unacceptable alternative to the continued operation of the STL pipeline.

Appendix A: List of Acronyms

BTU	British Thermal Units
CNG	Compressed Natural Gas
Dth	Dekatherms
ERW	Electric Resistance Weld
EJSCREEN	Environmental Justice Screening and Mapping Tool
EPA	Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
HCA	High Consequence Areas
LFERW	Low Frequency Electric Resistance Weld
MAOP	Maximum Allowable Operating Pressure
MRT	Mississippi River Transmission
MoGas	MoGas Pipeline LLC
NTSB	National Transportation Safety Board
NGPL	Natural Gas Pipeline Company of America
NGSA	Natural Gas Supply Association
NESI	Northeast Supply Enhancement Project
OPS	Office of Pipeline Safety
PHMSA	Pipeline and Hazardous Materials Safety Board
PSC	Public Service Commission
PNM	Public Service Company of New Mexico
RSPA	Research and Special Programs Administration
REX	Rockies Express Pipeline
SSC	Southern Star Central
SMYS	Specified Minimum Yield Strength
The Company	Spire Missouri
STL	Spire STL Pipeline
SCF	Standard Cubic Foot
SCADA	Supervisory Control and Data Acquisition
Trunkline	Trunkline Gas Company

Appendix B: NYS Review of Risks of Non-Pipeline Options

As part of CRA's review of Spire Missouri's current supply shortfall, we have identified parallel events in New York related to the inability to add pipeline capacity and the resulting overreliance on non-pipeline and peaking services.

As background, in order to support peak day requirements in their market areas, the utilities serving the New York metropolitan area, have attempted to add additional pipeline capacity to reliably serve their markets. Most notable of the recent pipeline proposals to serve New York City is Transco's Northeast Supply Enhancement Project ("NESI"). The NESI Project (CP17-101) filed for a FERC Certificate on 3/27/17 and after over two years of review received its FERC Certificate on 5/03/19. After considerable and prolonged opposition by New York State and various environmental groups the project was placed on hold by its developer, Transcontinental Pipeline, who ultimately filed with FERC for a two-year extension to complete the project on 3/19/21.

The delays in acquiring incremental firm deliveries to New York City, required both Con Edison and National Grid to institute moratoriums on new gas connects. The National Grid moratorium resulted in an investigation into the moratorium (19-G-0678) which required National Grid to investigate other non-pipeline solutions to serve its market. The broader implications of serving New York States markets without new pipelines required the initiation of a new docket entitled the *Proceeding on Motion of the Commission in Regard to Gas Planning Procedures* (20-G-0131).

In the order establishing this proceeding, NYS recognized the significant risk associated with the use of delivered services to meet firm market needs and stated the following:[49]

> *Criteria for reliance on peaking services: Gas utilities are increasingly reliant on peaking services in the form of compressed natural gas (CNG) and delivered services. Delivered services, as opposed to firm capacity procured directly by utilities, are provided by third parties and combine pipeline capacity held by those parties with the commodity they have purchased. These contracts typically: include a term of not more than one year; cannot be relied on for year-over-year renewal; and are priced at market prices, which can be very expensive.* ***Reliance on delivered services for a high percentage of a utility's peak load presents significant risks****. Gas utilities currently rely on peaking services to varying degrees and would need to increase that reliance to serve new load in the near term in the absence of other solutions. Gas utilities have asserted that their moratoria decisions have been based, in part, on the need to avoid over-reliance on delivered services, and Con Edison's and National Grid's near-term winter supply plans rely on increased usage of CNG. At present, though, there are no clear or commonly accepted standards for acceptable levels of reliance on these peaking services. Given the pivotal role of peaking services in moratorium decisions, clear criteria must be developed.*

At New York State's direction, the utilities operating within the state were directed to develop clear criteria related to the reliance on these peaking services. On 7/17/20 the NYS utilities jointly filed their findings in a report titled Modernized Gas Planning Process: Standards for Reliance on Peaking Services and Moratorium Management.[50] In this report, the utilities proposed a few alternatives to address the risk associated with greater use of peaking

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49 State of New York Public Service Commission (Mar 2020), *CASE 20-G-0131 - Proceeding on Motion of the Commission in Regard to Gas Planning Procedures. ORDER INSTITUTING PROCEEDING*, pg 7

50 Central Hudson Gas & Electric Corporation et al. (Jul 2020), *Modernized Gas Planning Process: Standards for Reliance on Peaking Services and Moratorium Management*

services. The utilities' first approach utilized standard limits on the use of peaking services within their portfolio.

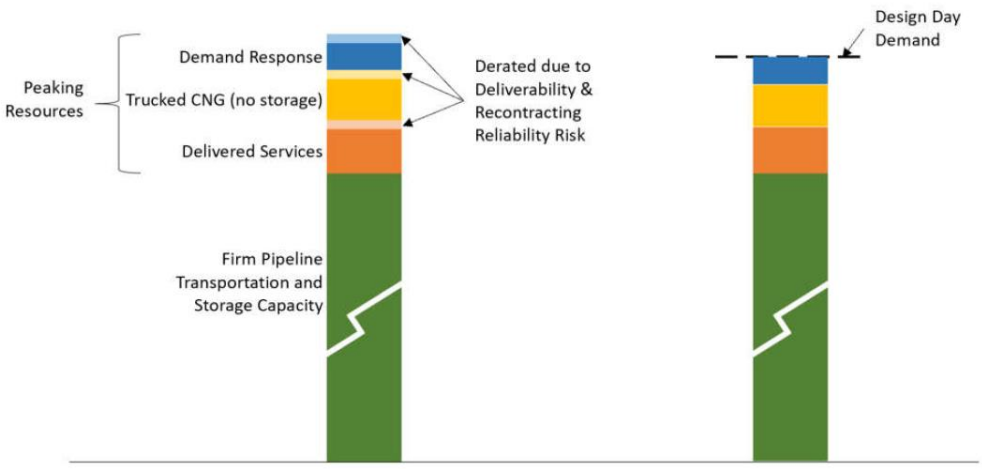
> *"One approach to addressing the concern about the increasing reliance on peaking services is to develop a simple standard that limits peaking services to a particular percentage of an LDC's portfolio, or limits peaking services to a particular volume level."*

Given the broad circumstances facing individual utilities. The joint filing alternatively suggested a framework which derates different types of peaking services based upon their perceived level of risk.

> *"The Joint LDCs' proposed framework and standards for reliance on peaking services distinguishes between deliverability and recontracting/renewal reliability. The framework effectively "derates" the capacity contribution of resources for planning purposes based on historical data (and other relevant information in the absence of historical data). For example, if a particular resource is assumed to be 95% reliable — or, stated another way, if a particular resource is expected to have a 5% chance of a forced interruption — then the capacity of that resource would be derated by 5% when included in demand/supply balance evaluations."*[51]

This approach is presented graphically below.

Figure 12 Illustration of Resource Capacity Derating



Source: Central Hudson Gas & Electric Corporation et al. (Jul 2020), Modernized Gas Planning Process: Standards for Reliance on Peaking Services and Moratorium Management, pg. 13

In their analysis, the joint utilities developed a common derating range for each category of resources, taking into account deliverability and recontracting/renewal reliability. The joint utilities also proposed a common set of guidelines for determining a specific derating value for each resource that lies within the range for the respective category. The joint utilities supported this approach by stating that,

51 Central Hudson Gas & Electric Corporation et al. (Jul 2020), *Modernized Gas Planning Process: Standards for Reliance on Peaking Services and Moratorium Management, pg 12*

> *"This approach provides a common framework and range but preserves the ability to reflect LDC-specific and resource-specific circumstances when identifying a specific assumption to be used in planning analyses. LDC-specific circumstances include local market conditions, the composition of the overall portfolio, and their customer and demand profile."*[52]

The analysis established the following derating ranges for each category of supply resources.

Table 3 NYS Joint Utilities Proposed Portfolio Derating of Peaking Services

Resource	Derating Range	Comment
Firm Pipeline Capacity	0%	
Firm Pipeline Capacity	0-15%	Interruptions/Contracting Issues
On-system CNG/LNG Storage	0-25%	Influenced by days of service
Delivered Services	0-15%	During Term of Contract
Delivered Services	0-35%	Beyond Term of Contract
On-system CNG/LNG Reliant on Trucked Supplies	0-50%	Ongoing trucking results in more risk/ higher derating

With respect to reliance on trucked supplies, the joint utilities went on to explain that,

> *"However, sites with little or no storage — and that therefore rely on constant turnover of trucks to deliver the necessary supplies on an ongoing basis — have lower deliverability reliability. The use of trucks to deliver natural gas supplies introduces a number of reliability concerns. First, there are many issues that could prevent one or more trucks from making on-time deliveries including traffic, bridge/road closures, delays caused by adverse weather conditions, truck breakdowns, and truck loading issues. Second, delayed CNG/LNG trucks cannot be substituted for easily. CNG/LNG needs are local; injecting additional supplies at a location remote from a constrained zone on the distribution system when trucks are unable to reach a specific location may not resolve the issue. Third, there may be little time to implement an alternative plan because there may be little advance warning that a truck may not make its delivery on time."*[53]

After reviewing the filed data and testimony, NYS DPS Staff issued its planning process proposal on 2/12/21. While Staff found that the utilities' derating proposal lacked detail and was subjective in its application, it believed the reliability of delivered services and other peaking assets remained a concern through the following statements.

> *"Reliance on peaking services (also called delivered services) to meet peak day load can have certain risks."*
>
> *"Given this information, Staff is uncertain that reliance on peaking services is a reliable strategy."*
>
> *"Staff will gather data on this subject and make recommendations to the Commission in the future. Unless and until the Commission sets generic standards for reliance on delivered*

52 Central Hudson Gas & Electric Corporation et al. (Jul 2020), *Modernized Gas Planning Process: Standards for Reliance on Peaking Services and Moratorium Management, pg 14*

53 Central Hudson Gas & Electric Corporation et al. (Jul 2020), *Modernized Gas Planning Process: Standards for Reliance on Peaking Services and Moratorium Management, pg 17*

> *services, each LDC should state how much it will rely on delivered services and other peaking assets to meet peak day load and how it justifies that reliance."*

From the facts presented above, it is clear that the absence of firm pipeline capacity is requiring NYS to assess the heightened risk associated with overreliance on peaking services to serve either winter peaking or seasonal firm requirements.

These facts are a direct parallel to the issues now facing Spire Missouri, and due to its specific circumstances (high degree of reliance and off-system resources) places Spire Missouri at the highest level of risk based on the criteria established by the analysis conducted by the New York utilities.

Appendix C: Data Relied Upon

File Name	Date Received	Description
Spire Missouri Propane Vaporization Procedure	10/18/2021	Vaporization operating procedures and calculation tables
Propane Operation	10/18/2021	Spire's answers to questions from data request
590a Propane Initial Start Up	10/18/2021	Procedures for initial startup for propane
590b Circulating Propane	10/18/2021	Procedure for circulating propane through inlet separator
590c Shipping Propane	10/18/2021	Procedure for shipping propane
590d Receiving Propane	10/18/2021	Procedure for receiving propane product
500 Propane Operation	10/18/2021	Lange Plant propane geographic location, safety, and tables with descriptions on pump areas, cavern areas, and pig launcher
503 Characteristics of Propane	10/18/2021	Vapor and liquid characteristics of Propane
505 Emergency Shutdown Procedure for Lange Propane Plant & Cavern	10/18/2021	Procedure for shutting down Lange power plant
506 Propane Power Failure or Surge Procedure	10/18/2021	Procedure if power surge knocks out vaporizers (Johnston Cavern)
510 Schematic of Propane Piping - Lange Propane Facilities	10/18/2021	Schematic of propane flows through the Lange Propane facility
511 Propane Turbine Meters	10/18/2021	Description and calculations behind Daniel turbine meters at Laclede pipeline
520 Operation of the Lange Propane Plant	10/18/2021	Procedures to run Lange plant and taking plant off-line - includes safety
521 Ely Propane Vaporizer Operation	10/18/2021	Startup and shutoff procedure for Ely Vaporizer
560 Propane Meter Proving	10/18/2021	Procedure for proving of propane meters
580 Propane Strainer Cleaning Procedures rev 1-31-14	10/18/2021	Procedure on cleaning strainers
590e Vaporizing Propane	10/18/2021	Procedure for vaporizing propane
Old Propane Piping Drawing #4898	10/18/2021	Old schematic for propane piping
Propane Piping Schematic	10/18/2021	New schematic for propane piping
PROPANE RELIEF VALVE INSPECTION	10/18/2021	Procedure to inspect relief valves
880Line	10/22/2021	Shapefile for 880 line
2731VeteransMemorial_Buffer	10/22/2021	Shapefile for Veterans Memorial
Catalan_Station	10/22/2021	Shapefile for Catalan station
PropaneLine	10/22/2021	Shapefile for Propane line
StLPipeline	10/22/2021	Shapefile for STL Pipeline

Between Laclede Gas and Laclede Pipeline Company	10/26/2021	Amendment for LPG supply contract from 1990
New Big Propane Map	10/26/2021	Propane map with terminals
1990 liquefied petroleum gas supply contract	10/26/2021	LPG supply contract with plant details from Laclede pipeline company
SpireMissouriHCA-Draft20211014 (1)	10/28/2021	ArcMap for Spire stations and pipelines
Temperature thresholds and peak shaving	10/28/2021	Peak shaving operation flow and weather thresholds
Pigging facilities and valves	10/28/2021	Location of pigging facilities and valve numbers
880 Line Map	11/11/2021	880 Map detailed

Appendix D: Historical Gas Data for Interchangeability Calculation

Station	Date	Specific Gravity	BTU
Ameren Meramec Missouri station (Loc. 808368)	10/20/2021	0.5796	1.01657
Ameren Meramec Missouri station (Loc. 808368)	10/21/2021	0.5793	1.01716
Ameren Meramec Missouri station (Loc. 808368)	10/22/2021	0.5793	1.01635
Ameren Meramec Missouri station (Loc. 808368)	10/23/2021	0.5975	1.01779
Ameren Meramec Missouri station (Loc. 808368)	10/24/2021	0.5789	1.01751
Ameren Meramec Missouri station (Loc. 808368)	10/25/2021	0.5789	1.01698
Ameren Meramec Missouri station (Loc. 808368)	10/26/2021	0.5789	1.01748
Averages		**0.5818**	**1.017**

Attachment D

EVALUATION OF ENVIRONMENTAL IMPACTS OF SPIRE STL PIPELINE

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November 2021

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1. EXECUTIVE SUMMARY

Trinity Consultants (Trinity) evaluated the various environmental impacts associated with the new STL Pipeline operated by Spire Missouri Inc. (Spire). This evaluation included a review of both internal assessments conducted by Spire as well as an independent review conducted by Trinity. The following conclusions were made about the operation of the STL Pipeline upon completion of the evaluation:

- The pipeline resulted in reduced emissions and environmental impacts from Spire's Underground Gas Storage Facility.
- The pipeline resulted in reduced emissions and environmental impacts from Spire's Propane Storage Facility.
- The pipeline decreased the use of less efficient fuel sources such as propane and those used during gas curtailment.
- The pipeline allows Spire to source gas that is extracted and transported with less emissions than its other existing gas sources.

Trinity's overall assessment is that the operation of the STL Pipeline allows Spire to maintain their current gas supply operations while decreasing both environmental impacts and the emissions of greenhouse gasses, criteria pollutants, and hazardous air pollutants.

2. INTRODUCTION AND PURPOSE

Spire engaged Trinity to conduct a validation of the data analysis that Spire performed regarding environmental impacts associated with Spire Missouri's decision to take service on the Spire STL Pipeline. The environmental impacts analysis primarily focused on three areas:

- Evaluating the change in emissions at Spire's Underground Gas Storage Facility due to the operation of the pipeline
- Comparing the environmental impact of vaporized propane usage to natural gas usage since additional propane will no longer be needed with the pipeline in service
- Comparing the environmental impact associated with past pipeline operations to the impact associated with using the new pipeline

In completing this evaluation, Trinity also researched other potential environmental impacts with the primary focus being on air quality-related issues. Trinity's findings for both the validation and the additional research are summarized in this report.

3. UNDERGROUND STORAGE FACILITY REDUCTIONS

The STL Pipeline receives gas at a higher pressure, utilizing less compression given the direct path from REX to Spire's city-gate, than the gas previously used for Spire's operations in this area. This allows Spire to reduce the use of equipment such as compressor engines at its underground gas storage facility. This section of the report evaluates the environmental impacts of reducing the use of this equipment due to the installation and operation of the STL Pipeline.

3.1 Emissions Reduction Evaluation

For this evaluation, Spire prepared an Excel spreadsheet named "NOx_GHG_Reductions for STL Changes to UGS (Lange)" that calculated the reduction of NO_X and GHG emissions at its underground storage facility due to the operation of the STL Pipeline. The pipeline came online in November 2019 and the calculations compared compressor engine and heater emissions from 2020 to average emissions from 2016 to 2018.

Trinity confirmed that all emissions calculations were completed correctly and used industry-accepted standards. For NO_X emissions, Spire utilized emissions factors from AP-42 Chapter 3.2 *Natural Gas-fired Reciprocating Engines* (08/2000), which is a widely accepted methodology whenever stack testing or manufacturer's data is not available. For GHG emissions, Spire utilized emission factors from Subpart C of EPA's GHG Mandatory Reporting Rule (40 CFR 98.30-98.38) for its evaluation. For the specific NO_X and GHG factors used, Trinity noticed that they were both approximately 1% different than the respective AP-42 and Subpart C values, and this was most likely due to how the values were either rounded or converted.

Trinity agrees that the reduction in engine operation is directly tied to the operation of the STL Pipeline, but it was not readily apparent how heater emissions are impacted. Trinity assumes that the operation of the heaters are driven more by ambient temperatures, and the operation of the STL Pipeline does not result in a lesser volume of gas needing to be heated. However, engine emissions account for 99% of the overall NOX emissions reductions and 76% of the overall GHG emissions reductions so there is still a significant reduction in these emissions due to the operation of the pipeline even when heater emissions are not considered.

3.2 Other Potential Environmental Benefits

Trinity conducted its own evaluation of the operations at the Underground Gas Storage facility to determine if there are any other changes in environmental-related impacts due to the operation of the pipeline. The following potential impacts were identified:

- Emissions of carbon monoxide (CO), particulate matter (PM), volatile organic compounds (VOC), and hazardous air pollutants (HAPs) also decreased by a similar percentage to that of NO_X and GHG due to the reduced operation of the engines
- NO_X, VOC, and methane are all precursors to ozone formation and their reduction will potentially have an impact on ozone concentrations in St. Louis county and St. Louis city, which are both currently classified as Marginal nonattainment for the National Ambient Air Quality Standard for ozone according to the most recent EPA Green Book data
- The reduction in engine fuel usage results in less natural gas being extracted, processed, and transported
- The reduction in engine operation reduces noise pollution levels

- The reduction in NO_X and PM emissions could have a potential impact on improving the visibility at the Mingo Wilderness Area, which is a Class I area (land classification scheme under the Prevention of Significant Deterioration (PSD) program) located approximately 180 km south of the facility, but the impact would most likely be negligible due to the quantity of emissions reductions and distance between the locations
- The reduction in NO_X and PM emissions could have a potential impact on improving the visibility in the immediate vicinity of the facility
- The reduction in all emissions could potentially reduce the acute and chronic impacts on nearby soil and vegetation

4. COMPARISON OF PROPANE VAPORIZATION & NATURAL GAS USAGE

The installation and operation of the STL Pipeline allowed Spire to discontinue the use of its liquid propane vaporization system that provided additional supply on an as-needed basis. This section of the report compares the environmental impacts of using the propane vaporization system as opposed to only using natural gas.

4.1 GHG Intensity Comparison

For this evaluation, Spire prepared an Excel spreadsheet named "Propane vs NG Emission Calculations" that compared the GHG intensities of using propane versus natural gas. It also calculated actual GHG emissions from the two most recent years where propane vaporization was needed (2014 and 2019) and compared these to what the emissions would have been if only natural gas were used. Propane vaporization requires the use of natural gas combustion to heat the liquified propane, and the emissions from this heating operation were also included in the evaluation.

Trinity confirmed that all emissions calculations were completed correctly and used industry-accepted standards. Spire utilized emission factors from Subpart C of EPA's GHG Mandatory Reporting Rule (40 CFR 98.30-98.38) for its evaluation. However, Trinity noted that the factors for CH_4 and N_2O taken from Subpart C are for "Petroleum Products", which includes propane, but these are general factors used for a variety of fuels and may not be the most representative of GHG emissions from propane combustion specifically. Therefore, Trinity also reviewed GHG emission factors from other commonly available sources such as EPA's *AP-42: Compilation of Air Emissions Factors* and API's *Compendium of GHG Emissions Methodologies for the Oil and Natural Gas Industry* (08/2009). Specifically for natural gas and propane combustion, Trinity reviewed emissions factors published in AP-42 Chapter 1.4 *Natural Gas Combustion* (07/1998) and Chapter 1.5 *Liquified Petroleum Gas Combustion* (07/2008). The API Compendium utilizes these AP-42 Chapters for its factors as well. Compared to Subpart C, the CO_2 factors were approximately the same (within 1%) for both natural gas and propane combustion, as was the CH_4 factor for natural gas combustion. The CH_4 AP-42 factor for propane was one-third of the Subpart C factor, and the N_2O AP-42 factors for both CH_4 and N_2O were an order of magnitude greater than the Subpart C factors. A summary of the combined factors using both approaches on a CO_2e basis is provided in the table below.

Using Subpart C factors, propane combustion results in 16.2% more GHG emissions than natural gas combustion on an equivalent Btu basis. Due to the additional natural gas combustion needed for propane vaporization, this operation results in 16.8% more GHG emissions than natural gas by itself. This equates to an additional 1,310 mt CO_2e being emitted per year when using propane vaporization (based on average of 2014 and 2019 usage). The GHG emissions increase from propane combustion are even greater when using AP-42 factors.

GHG Emissions Comparison for Propane vs. Natural Gas Usage

Source	Propane (kg CO_2e/ MMBtu)	Nat. Gas (kg CO_2e/ MMBtu)	Propane vs Nat. Gas Intensity	GHG Increase for Propane Use (%)	GHG Increase for Propane Use (mt/yr)
MRR Subpart C	61.71	53.11	16.2%	16.8%	1,310
AP-42 1.4 & 1.5	63.32	53.68	18.0%	18.6%	1,463

4.2 Non-GHG Environmental Impacts

Trinity conducted its own evaluation of the propane vaporization process to determine if there are any other changes in environmental-related impacts compared to only using natural gas. The following potential impacts were identified:

- Less fuel usage from discontinuing the vaporization of propane means there are less emissions of CO, NO_X, PM, VOC, and HAPs
- The likelihood of fugitive VOC emissions leaks from piping components would potentially be reduced as additional piping segments will either be out-of-service or depressurized
- With additional equipment being out-of-service, there will be less emissions from routine maintenance and the potential for excess emission events will be reduced
- Similar to the discussion in Section 2, the reduction in emissions could have an impact on ambient ozone concentrations, visibility, and soil and vegetation

5. COMPARISON OF PAST AND CURRENT PIPELINE OPERATIONS

This section of the report evaluates the differences in environmental impacts between Spire's existing operations and Spire's operations without an operational STL Pipeline.

5.1 GHG Intensity for Onshore Production Basins

The installation and operation of the STL Pipeline allows Spire to access gas from the Appalachian Basin, which is one of the geological basins identified by EPA for its Mandatory Reporting Rule. Under this rule, emissions are reported on a basin-wide basis for both the Onshore Production and Gathering and Boosting sectors. Companies are only required to report emissions under this rule if their basin-wide annual GHG emissions exceed 25,000 metric tons of CO_2e. Spire prepared an Excel spreadsheet named "Source Carbon Intensity" that compares the GHG intensity of the Appalachian Basin to other significant basins reported under the MRR. The intensity values in this spreadsheet were taken from the Clean Air Task Force's *Benchmarking Methane and Other GHG Emissions* (6/2021) report, which utilizes GHG data published by EPA in their Envirofacts database.

Trinity reviewed and confirmed that the intensity values calculated by Spire are correct. The benchmarking data shows that the Appalachian Basin has the lowest GHG intensity of the twenty largest-producing basins, and that this intensity is 22% of the average intensity across all basins. This means that the CO_2e emissions per Btu of gas extracted from the Appalachian Basin are almost one-fifth of the emissions from a typical production basin. Therefore, the access to the Appalachian Basin via the STL Pipeline means that Spire is now able to use natural gas that was extracted using production methods with less GHG emissions than that of the natural gas that they were previously purchasing. Specifically, 7.6% of Spire's gas in 2019 was transported through pipelines that pulled gas from the Appalachian Basin. With the operation of the STL Pipeline, Spire is now pulling 55.1% of its gas from the Appalachian Basin.

5.2 Other Impacts from Current Pipeline Operations

Trinity conducted its own evaluation of the current pipeline operations to determine if there are any other changes in environmental-related impacts compared to the past pipeline operations. The following potential impacts were identified:

- Based on data published in EPA's Envirofacts database, Trinity determined that the Appalachian also has the lowest GHG intensity for the Gathering and Boosting Sector among the five largest-producing basins (specifically, the intensity is 43% of the average GHG intensity across all five basins)
- The newer infrastructure associated with the current STL Pipeline will potentially result in less fugitive leaks and reliability issues
- A greater distance to market could potentially increase the amount of emissions from pipeline leaks and support operations, but due to the complexity of the pipeline networks, and due to the limited scope of this assessment, Trinity was not able to determine the difference in the distances to market between existing operations and the STL Pipeline operations (In general, the distance to market for most existing operations (primarily from Oklahoma and Texas) is not significantly different than the distance to market for the STL Pipeline (primarily from Ohio and Pennsylvania))
- Unlike other existing pipelines that serve Spire Missouri, the newer infrastructure and design of the STL Pipeline allows Spire to source gas from the Appalachian Basin without the need for additional compression, which means there are less associated emissions from the transportation of the gas when compared to other pipeline pathways that would otherwise be used to source this gas

- Current operations decrease the likelihood of gas curtailment, which would otherwise potentially result in customers switching to less efficient sources of heating
- Current operations receive more gas from states that have more stringent environmental regulations (i.e., Pennsylvania and Ohio) compared to existing operations (i.e., primarily Oklahoma) as summarized in the table below for typical minor sources

Air Quality Regulatory Comparison

State	Air Permit Threshold for VOC	Leak Monitoring Required?	Tank Control Required?	Loading Control Required?	Engine Testing Required?	Dehy Control Required?
Pennsylvania (GP-5A)	2.7 tpy	Quarterly	If VOC > 2.7 tpy	If VOC > 2.7 tpy	Quarterly for NO_X/CO/VOC	If VOC > 2.7 tpy
Ohio (GP 12.1)	10 lb/day	Quarterly	If VOC > 4.28 tpy	None	If > 500 hp	If VOC > 5 tpy
Oklahoma (GP-OGF)	40 tpy	None	None for Upstream	None for Upstream	Quarterly for NO_X/CO	None

APPENDIX A. SPIRE EVALUATIONS