BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of the Application of Spire Missouri Inc. d/b/a Spire for a Variance from Standards of Quality Rule	)))	**File No. GE-2026-0249**

STAFF RECOMMENDATION

COMES NOW, the Staff of the Missouri Public Service Commission ("Staff"), by and through counsel, and for its *Staff Recommendation* states as follows:

1. On March 25, 2026, Spire Missouri Inc. d/b/a Spire ("Spire") filed its *Application for Variance from Standards of Quality Rule, Request for Waiver of 60-Day Notice Rule, and Motion for Expedited Treatment* ("Application"). Spire requests in its Application: (1) a variance from Commission Rule 20 CSR 4240-10.030(10)(J) on Standards of Quality specifying that renewable natural gas ("RNG") delivered to customers be at a temperature between 40 degrees Fahrenheit (ºF) and 100 ºF, (2) a waiver of the 60-day notice requirement of Commission Rule 20 CSR 4240-4.017(1), and (3) expedited treatment of its Application pursuant to Commission Rule 20 4240-2.080(14).

2. Spire's request is for the variance from Commission Rule 20 CSR 4240-10.030(10)(J) to be granted for the present interconnection and future interconnections; however, Spire expressed a willingness to accept the variance for just the present interconnection.

3. Also on March 25, 2026, the Commission issued an *Order Setting Deadlines for Intervention Applications, Staff Recommendation, and Responses* ("Order"). The Order set a March 31, 2026, deadline for applications for intervention,

and an April 3, 2026, deadline for Staff to file either a recommendation regarding Spire's Application or a status report indicating when it expects to file a recommendation.[1]

4. Staff's Memorandum is attached hereto and incorporated by reference. As stated in the Memorandum, Staff has a concern related to gas temperature where, unlike the interstate natural gas pipelines, natural gas distribution systems often include plastic materials, and the pressure ratings for these plastic materials generally decrease with increasing temperatures. Spire's Application states that RNG will be injected into a steel main, however Spire does not address, for example, the proximity of plastic service lines to the point of injection on the main, or address whether there are any locations along the steel main that have been replaced with plastic segments. Staff has communicated this concern to Spire.

5. Commission Rule 20 CSR 4240-40.030(3)(I) provides the formulas for determining design pressure of plastic pipe and Staff notes that the design pressure limits for plastic pipe materials are determined for specific pipe specifications at specific operating temperatures. Therefore, it is necessary to know specifically what plastic, if any, is installed, and what the anticipated maximum temperature will be to evaluate the effect of elevated gas temperatures on the resulting design pressure limits. Staff does not currently have sufficient information regarding the locations and specifications of plastic materials within Spire's distribution system to perform analyses regarding the effect of elevated gas temperatures on the pressure rating of these materials.

[1] The Order also sets a response deadline of April 6, 2026, for any other parties wishing to respond to Spire's Application and/or Staff's recommendation.

6. Because of this limitation in Staff's knowledge, and to accommodate Spire's request for expedited treatment,[2] Staff has outlined a procedure that Spire can use to demonstrate to the Commission that there will either be no detrimental effects of the elevated gas temperatures on the gas distribution system or that a pressure reduction will be needed prior to injection of RNG at elevated gas temperatures. This limitation applies to the single project identified in Spire's Application and to future interconnections. Staff recommends that for the specific location where Spire intends to inject the RNG for which the waiver is requested, that Spire complete the analysis outlined in Section 3.0 of the Staff Memorandum and provide the results to the Commission prior to accepting the RNG on its distribution system.

7. Staff further recommends that the Commission grant the waiver requested by Spire for the single project identified in its Application and at the specific location where Spire intends to inject RNG, subject to the five conditions outlined in Section 4.0 of the Staff Memorandum.

8. Notwithstanding the foregoing, nothing herein shall be deemed as Staff's recommended approval or acquiescence with respect to matters beyond the requested waiver.

WHEREFORE, Staff respectfully submits this *Staff Recommendation* and respectfully requests that the Commission accept the same, and for such other and further relief as the Commission considers just and reasonable under the circumstances.

[2] Spire's Application at Paragraph 17 states in part that "[t]he harm that will be avoided is a delay to the RNG project beginning injection on the date the project is operational."

Respectfully submitted,

/s/ Alexandra Klaus
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CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing have been transmitted by electronic mail to counsel of record this 3rd day of April, 2026.

/s/ Alexandra Klaus

MEMORANDUM

TO: Missouri Public Service Commission Official Case File,
Case No. GE-2026-0249, Spire Missouri, Inc.

FROM: Clinton Foster, Associate Engineer, Safety Engineering Department
Kathleen McNelis, P.E., Safety Engineering Department

/s/ Kathleen McNelis, P.E. / 04/03/2026
Safety Engineering Department / Date

SUBJECT: Staff Recommendation Regarding Request by Spire Missouri Inc. for Waiver from Requirement of Commission Rule 20 CSR 4240-10.030(10)(J) – Gas Temperature.

DATE: April 3, 2026

1.0 Executive Summary

Spire Missouri Inc. ("Spire") submitted its application for a variance from the Standards of Quality Rule, Request for Waiver from 60-Day Notice Rule, and Motion for Expedited Treatment ("Application") on March 25, 2026. Spire specifically requested a variance for the present interconnection and all future interconnections; however, Spire also indicated a willingness to accept a variance for just the present interconnection.[1]

In its Application, Spire states that it provided a specification sheet for Renewable Natural Gas (RNG) to developers that included a gas delivery temperature range between 40 ºF and 120 ºF. Spire notes that this is the temperature range allowed on interstate pipelines.[2] Spire additionally states that the RNG facility was designed for a maximum delivery temperature of 120 ºF, however, the actual normal delivery temperature is unknown until the plant is operational.[3]

Commission Rule 20 CSR 4240-10.030(10)(J), effective date May 30, 2025, specifies a temperature range between 40 ºF and 100 ºF for RNG delivered to customers.

[1] Paragraph 11 of Spire's Application.
[2] Paragraph 7 of Spire's Application.
[3] Paragraph 9 of Spire's Application.

The Commission ordered that no later than April 3, 2026, Staff shall file either a recommendation regarding Spire's Application or a status report indicating when it expects to file a recommendation.

Staff's concern related to gas temperature is that unlike the interstate natural gas pipelines, natural gas distribution systems often include plastic materials, and the pressure ratings for these plastic materials generally decrease with increasing temperature. Spire's Application states that the RNG will be injected into a steel main, however Spire does not address the proximity of plastic service lines to the point of injection on the main, or address whether there are any locations along the steel main that have been replaced with plastic segments. Spire's Application is also silent regarding the Maximum Allowable Operating Pressure ("MAOP") of the main, and any pressure reductions that Spire may be contemplating to accommodate higher temperature gas in contact with connected plastic materials.

The Commission's rule applicable to the design pressure limits for plastic pipe is provided and discussed in *Section 2.0* of this *Memorandum*. Staff notes that the design pressure limits for plastic pipe materials are determined for specific pipe specifications at specific operating temperatures. Therefore, it is necessary to know specifically what plastic, if any, is installed, and what the anticipated maximum temperature will be to evaluate the effect of elevated gas temperature on the resulting design pressure limits.

Additionally, Staff notes that the U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration ("PHMSA") has recently issued an advisory bulletin regarding certain plastic pipe materials that may be susceptible to slow crack growth or brittle like cracking failure mechanisms as a result of exposure to elevated temperatures. This advisory bulletin is also discussed in *Section 2.0* of this *Memorandum*.

Staff does not currently have sufficient information regarding the locations and specifications of plastic materials within Spire's distribution system to perform analyses regarding the effect of elevated gas temperature on the pressure rating of these materials. This limitation applies to the single project identified in Spire's Application and to future interconnections.

Because of this limitation in Staff's knowledge, and to accommodate Spire's desire for expedited treatment,[4] Staff has outlined a procedure in *Section 3.0* of this *Memorandum* that Spire can use to demonstrate to the Commission either that there will be no detrimental effects of the elevated gas temperature on the gas distribution system, or that a pressure reduction will be needed prior to injection of RNG at elevated gas temperatures.

Staff recommends that the Commission grant the waiver limited to this single project, subject to conditions listed in *Section 4.0* of this *Memorandum*.

2.0 Design Pressure Limits for Plastic Pipe.

Commission Rule 20 CSR 4240-40.030(3)(I) provides the formulas for determining design pressure of plastic pipe (either of the two forms of this equation may be used):

$$P = \frac{2 * S}{(SDR - 1)} * (DF)$$

$$P = 2 * S * \frac{t}{(D - t)} * (DF)$$

Where P = Design pressure, psi gauge[5]
S = the Hydrostatic Design Basis (HDB) determined at a specific temperature
DF = Design Factor
SDR = Standard Dimension Ratio
t = Specified wall thickness (inches or millimeters)
D = Specified outside diameter (inches or millimeters)

The HDB is "determined in accordance with the listed specification at a temperature equal to 73 °F (23 °C), 100 °F (38 °C), 120 °F (49 °C), or 140 °F (60 °C)."[6] "In the absence of an HDB established at the specified temperature, the HDB of a higher temperature may be used in determining a design pressure rating at the specified temperature by arithmetic interpolation using the procedure in Part D.2. of Plastic Pipe

[4] Paragraphs 16 and 17 of Spire's Application address Spire's request for expedited treatment. To meet the schedule set out by Spire, Staff does not believe there is sufficient time to obtain information from Spire through discovery in this case.
[5] Staff notes that the term "Design Pressure" is used in the Commission Rule 20 CSR 4240-40.030(3)(I) and Federal Rule 49 CFR 192.121. In the Plastic Pipe Institute (PPI) document TR-3, which is incorporated by reference, the term "Pressure Rating" is used in place of "Design Pressure" in the equation. The PPI TR-3 document defines "Pressure Rating" as the "estimated maximum pressure that the medium in the pipe can exert continuously with a high degree of certainty that failure of the pipe will not occur."
[6] Commission Rule 20 CSR 4240-40.030(3)(I)

Institute (PPI) TR–3 (incorporated by reference in 49 CFR 192.7 and adopted in subsection (1)(D)"[7] of Commission Rule 20 CSR 4240-40.030).

The PPI additionally tests materials upon request and publishes these as a TR-4[8] document. Both the TR-3 and TR-4 are protected by copyright but are available free of charge from PPI. The 2024 versions of these documents are currently adopted in 49 CFR 192.7, however please note that for pipe manufactured prior to 2024, older versions will need to be obtained from the PPI.

Additionally, Staff notes that the PHMSA has recently issued an advisory bulletin regarding certain plastic pipe materials that may be susceptible to slow crack growth or brittle like cracking failure mechanisms as a result of exposure to elevated temperatures.[9] Specifically, PHMSA identified susceptible materials of plastic assets may include:

- Plastic pipe installed between 1960 and early 1980s.
- Low-ductile inner wall Aldyl A piping manufactured by DuPont Company before 1973.
- Polyethylene gas pipe designated PE 3306.
- Aldyl A tees with Delrin polyacetal insert.
- Plexco service tee Celcon (Polyacetal) caps.
- Driscopipe 7000 and 8000 High Density Polyethylene Pipe.

While this advisory bulletin did not provide specific temperature ranges of concern, at least one of the documents referenced did provide specific temperature information for one of the listed materials. The referenced NTSB Pipeline Investigation Report PIR-25-01[10] includes the following statement: "The NTSB reviewed the specifications for Aldyl A service tees with Delrin inserts. The specifications indicate a maximum ground temperature of 100°F."[11] Staff has inferred from this limitation on ground temperature that a gas temperature above 100 °F may also be problematic for this specific plastic component.

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[7] *Id*.
[8] This is a document incorporated by reference into federal rule 49 CFR 192.7, and by the Commission in 20 CSR 4240-40.030(1)(D).
[9] PHMSA Advisory Bulletin (ADB-2026-01), published in the January 23, 2026, *Federal Register*, 91 FR 2995, available at: https://www.govinfo.gov/content/pkg/FR-2026-01-23/pdf/2026-01321.pdf.
[10] PIR-25-01 refers to the Pipeline Investigation Report published by the NTSB on March 18, 2025 tilted *UGI Corporation Natural Gas-Fueled Explosion and Fire, West Reading, Pennsylvania, March 24, 2023*, available at: https://www.ntsb.gov/investigations/AccidentReports/Reports/PIR2501.pdf.
[11] Quotation from page 17 of the NTSB PIR-25-01.

3.0 Staff Recommended Analysis to be Completed by Spire

Staff recommends that for the specific location where Spire intends to inject the RNG for which this waiver is requested, Spire complete the analysis outlined below and provide the results to the Commission prior to accepting the RNG on its distribution system.

1. Identify the length along the steel main for which gas temperatures will be elevated by addition of RNG. If the temperature increase extends beyond this main segment, connected main segments should also be evaluated.
2. Along this length of main, identify each plastic pipe or other plastic component connected to the steel main.
3. For each plastic pipe or other plastic component installed at a location experiencing elevated temperatures, estimate what the maximum gas temperature may be at that location following the injection and co-mingling of RNG. In the absence of such estimate, the maximum estimated RNG temperature of 120 ºF may be used.
4. Utilizing the method of interpolation provided in the PPI TR-3, and data from the version of TR-4 applicable to the pipe vintage, calculate the Design Pressure for each of the identified connected plastic pipe and component using the equations from Commission Rule 20 CSR 4240-40.030(3)(I) at the temperature estimated in Step 3.
5. Compare the calculated Design Pressure for each of the identified plastic pipe segments and components to the current Maximum Allowable Operating Pressure (MAOP) for that part of the system and indicate if a reduction in MAOP will be required.
6. For each segment of pipe evaluated, Spire must enter the information on the log sheet provided in Appendix A.
7. A copy of each log sheet must be filed in Case No. GE-2026-0249 prior to injection of RNG at elevated temperature.
8. In the event that the results of the analyses indicate that a reduction in pressure is needed, the pressure must be reduced prior to injection of RNG at elevated temperatures.

Staff has provided an example calculation and completed log sheet for a hypothetical connected segment of plastic main in Appendix B. In this example, the MAOP would need to be reduced to not greater than 47 psig.

4.0 Staff Recommendation to the Commission

Staff recommends that the Commission grant the waiver requested by Spire for the single project identified in its Application and at the specific location where Spire intends to inject RNG, subject to the following conditions:

A. Spire must provide within a filing in Case No. GE-2026-0249 the specific location where the RNG will be injected into Spire's distribution system at a temperature that may exceed 100 ºF,
B. Spire must determine if there are plastic materials within the distribution system into which it is requesting to inject RNG at a temperature above 100 ºF.
    1. If Spire determines that there are no plastic materials within the distribution system into which it is requesting to inject RNG at a temperature above 100 ºF, Spire must file a statement in Case No. GE-2026-0249 that there are no plastic materials installed within the distribution system into which RNG will be injected at a temperature that may exceed 100 ºF,
    2. If Spire determines that there are existing plastic materials within the distribution system into which RNG will be injected at an elevated temperature, Staff recommends that the waiver be granted with the following additional conditions:

        a. Prior to injection of RNG at a temperature exceeding 100 ºF, Spire must complete the Staff recommended analysis in *Section 3.0* of this *Memorandum*, and file a completed "Plastic Pipe and Component Design Pressure Log" (*Appendix A* of this *Memorandum*) in Case No. GE-2026-0249,
        b. In the event the analysis conducted in accordance with *Section 3.0* of this *Memorandum* shows that a reduction in system pressure will be required, that pressure reduction must occur prior to injection of the RNG at a temperature exceeding 100 ºF,
        c. In the event Spire completes Steps 1 and 2 of *Section 3.0* of this *Memorandum* and determines that there are existing plastic pipe materials connected to the steel main but anticipated temperatures will not be high enough to affect design pressures, Spire will file a completed "Plastic Pipe and Component Design Pressure Log" for the three segments of plastic pipe that are nearest to the point of RNG injection at a temperature exceeding 100 ºF,
        d. If there are any Aldyl A service tees with Delrin inserts within the distribution system to which the RNG will be injected, and those components are installed at a location where gas temperatures may exceed 100 ºF, Spire will remove and replace these prior to injection of RNG at a temperature exceeding 100 ºF,
        e. If any of the materials listed below are installed within the distribution system to which the RNG will be injected, Spire will review and determine the specifications for these materials for any temperature limitations prior to injection of RNG at a temperature exceeding 100 ºF:

i. Plastic pipe installed between 1960 and early 1980s,
ii. Low-ductile inner wall Aldyl A piping manufactured by DuPont Company before 1973,
iii. Polyethylene gas pipe designated PE 3306,
iv. Plexco service tee Celcon (Polyacetal) caps,
v. Driscopipe 7000 and 8000 High Density Polyethylene Pipe,

The results of Spire's review will be reported to the Commission in Case No. GE-2026-0249 prior to injection of the RNG at a temperature exceeding 100 ºF,

C. Prior to connecting any future plastic pipe or plastic components to this distribution system, Spire must first determine the Design Pressure limits for the new pipe at the temperature anticipated at the installation location,
D. This waiver is only applicable to RNG injected at the location that Spire provided in response to Condition A, and
E. If following start up and initial operation of the RNG system Spire learns that the maximum gas temperature can be controlled to 100 ºF or lower, Spire may request that the waiver be rescinded.

Appendix A
Plastic Pipe and Component Design Pressure Log
(To be completed for each downstream plastic segment exposed to elevated temperature gas)

Plastic Segment Identifier:

Pipe Data for Evaluation	
Distance from RNG Injection Location (Feet)	
Pipe Specification	
Pipe Outside Diameter (inches)	
Pipe Wall Thickness (inches)	
System Maximum Allowable Operating Pressure at Point Pipe Connects (PSIG)	
Estimated Maximum Gas Temperature a Point Pipe Connects (ºF)	
Basis for Estimated Temperature if less than 120 ºF	
Year Pipe Installed	
Year Pipe Manufactured	
Other Relevant Information	

Literature (HDB) and Calculated (P) Values	
Version of PPI TR-4 used (year)	
Temperature 1 (T1) from TR-4 (probably 73 ºF)	
Hydrostatic Design Basis 1 (HDB-1) at T1	
Temperature 2 (T2) from TR-4	
Hydrostatic Design Basis 2(HDB-2) at T2	
Temperature for which to interpolate HDB(x) (Temperature anticipated at plastic pipe inlet)	
HDB(x) at T(x) by Linear Interpolation Method in TR-3	
Design Factor used (use 0.32 unless exceptions in 20 CSR 4240-40.030(3)(I)3.B. apply)	
Calculated Design Pressure (PSIG)	
MAOP Reduction Needed?	

Appendix B
Example Calculation and Completed Log Sheet

Plastic Segment Identifier: Hypothetical Plastic Main Connected to Steel Main

Pipe Data for Evaluation	
Distance from RNG Injection Location (Feet)	10
Pipe Specification	Duraline PolyPipe Y-20-A, PE2708
Nominal Pipe Diameter	4-inch IPS
Pipe Outside Diameter (inches)	4.5
Pipe Wall Thickness (inches)	0.333
System Maximum Allowable Operating Pressure at Point Pipe Connects (PSIG)	60
Estimated Maximum Gas Temperature a Point Pipe Connects (ºF)	120
Basis for Estimated Temperature if less than 120 ºF	N/A
Year Pipe Installed	2019
Year Pipe Manufactured	(unknown, assumed 2018-2019)
Other Relevant Information	

Equation to Calculate Design Pressure (from Commission Rule 20 CSR 4240-40.030(3)(I)):

$$P = 2 * S * \frac{t}{(D - t)} * (DF)$$

Where:

P = Design Pressure (to be solved for)

S = Hydrostatic Design Basis (to be determined by interpolation using PPI TR-3 method and TR-4 data)

t = Wall thickness = 0.333 for this example

D = Outside Diameter = 4.5 for this example

DF = Design Factor = 0.32 for this example (Material designation PE2708 manufactured before January 22, 2019).

Equation to use to interpolate value of S at system temperature, based on method provided in PPI TR-3 (Note – in the TR-3 method, temperatures must be converted to Kelvin).

$$S(x) = S(L) - \frac{(S(L) - S(H)) * (\frac{1}{T(L)} - \frac{1}{T(T)})}{(\frac{1}{T(L)} - \frac{1}{T(H)})}$$

Where:

S(x) = Hydrostatic Design Basis to be Determined by Extrapolation
S(L) = Hydrostatic Design Basis at Lower Temperature (in this example 1250)
S(H) = Hydrostatic Design Basis at Higher Temperature (in this example 800)
T(L) = Lower Temperature (in this example 73ºF = 295.9278 Kelvin)
T(T) = Interpolation Temperature (in this example 120 ºF = 322.038889 Kelvin)
T(H) = Higher Temperature (in this example 140 ºF = 333.15 Kelvin)

Substituting values into equation and Solving for S(x):

$$S(x) = 1250 - \frac{(1250 - 800) * (\frac{1}{295.9278} - \frac{1}{322.0389})}{(\frac{1}{295.9278} - \frac{1}{333.15})}$$

S(x) = 923.4369 at 120 ºF

Substituting the interpolated value of S(x) into the design formula and calculating for P:

$$P = 2 * 923.4369 * \frac{0.333}{(4.5 - 0.333)} * (0.32)$$

Design Pressure (P) at 120 ºF = 47.23 psig.

Literature (HDB) and Calculated (P) Values	
Version of PPI TR-4 used (year)	2019
Lower Temperature (T(L)) from TR-4 (probably 73 ºF)	73
Hydrostatic Design Basis at Lower Temperature (S(L))	1250
Higher Temperature (T(H)) from TR-4	140
Hydrostatic Design Basis at Higher Temperature (S(H)).	800
Temperature for which to interpolate S(x) (Temperature anticipated at plastic pipe inlet)	120
HDB(x) at T(x) by Interpolation Method in TR-3	923.4369
Design Factor used (use 0.32 unless exceptions in 20 CSR 4240-40.030(3)(I)3.B. apply)	0.32
Calculated Design Pressure (PSIG)	47.22
MAOP Reduction Needed?	Yes

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of the Application of Spire Missouri, Inc. d/b/a Spire for a Variance from Standards of Quality Rule	)))	**Case No. GE-2026-0249**

KATHLEEN A. MCNELIS, PE

STATE OF MISSOURI)
) ss
COUNTY OF COLE)

COMES NOW Kathleen A. McNelis, PE, and on her oath states that she is of sound mind and lawful age; that she contributed to the foregoing *Staff Recommendation, in Memorandum form*; and that the same is true and correct according to her best knowledge and belief.

Further the Affiant sayeth not.

Kathleen A. McNelis, PE

JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 1st day of April, 2026.

Notary Public

DIANNA L. VAUGHT
Notary Public - Notary Seal
State of Missouri
Commissioned for Cole County
My Commission Expires: July 18, 2027
Commission Number: 15207377

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of the Application of Spire Missouri, Inc. d/b/a Spire for a Variance from Standards of Quality Rule	)))	**Case No. GE-2026-0249**

CLINTON L. FOSTER

STATE OF MISSOURI)
) ss
COUNTY OF JACKSON)

COMES NOW Clinton L. Foster, and on his oath states that he is of sound mind and lawful age; that he contributed to the foregoing *Staff Recommendation, in Memorandum form*; and that the same is true and correct according to his best knowledge and belief.

Further the Affiant sayeth not.

Clinton L. Foster

JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Jackson, State of Missouri, at my office in Kansas City, on this 1st day of April, 2026.

B. L. STIGGER
NOTARY PUBLIC - NOTARY SEAL
STATE OF MISSOURI
MY COMMISSION EXPIRES JANUARY 2, 2028
JACKSON COUNTY
COMMISSION #24332661

Notary Public