BEFORE THE

Office of Electricity, Department of Energy (DOE)

WASHINGTON, D.C.

Codes, Standards, Specifications, and Other Guidance for Enhancing the Resilience of Electric Infrastructure Systems Against Severe Weather Events

Notice of Request for Information (RFI).

Comments of Spire Inc.

August 23rd, 2019

Spire Inc. ("Spire") is a holding company consisting of utility companies that provide natural gas to 1.7 million retail customers across Missouri, Alabama and Mississippi. Spire's marketing company is also engaged in the marketing of natural gas and related services on a non-regulated basis.

Spire's essential messages for this RFI are that:

1. Diversity is key to energy reliability and resiliency.
2. Natural gas, as an alternative to electricity at the point-of-use, should not be overlooked for what it presently contributes to energy reliability, resiliency and the economy, and should not be discarded by short sighted policy,
3. These contributions can and should be used to further lower overall consumer costs and more promptly respond to customer needs in the event of severe weather events.

Spire fully supports a diverse "all the above" energy policy that also seeks to safeguard affordability and reliability. So far, however, it seems that an "all the above" policy is mainly being applied to the diversity of energy sources for electric generation. If diversity of electricity primary energy sources is desirable, so should energy alternatives to electricity be paramount. Having such alternatives available would best serve consumer interests. Alternatives to electricity at the point of end use, such as natural gas, takes unnecessary strain off the electricity system, thus making it more reliable especially during weather emergencies and other disasters.

How Natural Gas Direct Use Adds Reliability to the Electricity System

The inherently reliable and resilient attributes of natural gas transmission and distribution (T&D) systems were recently validated by a MIT study titled "Interdependence of the Electricity Generation System and the Natural Gas System and Implications for Energy Security"[1] as shown by the following excerpt:

> *The natural gas network has few single points of failure that can lead to a system-wide propagating failure. There are a large number of wells, storage is relatively widespread, the transmission system can continue to operate at high pressure even with the failure of half of the compressors,* ***and the distribution network can run unattended and without power****. This is in contrast to the electricity grid, which has, by comparison, few generating points, requires oversight to balance load and demand on a tight timescale, and has a transmission and distribution network that is vulnerable to single point, cascading failures.* (emphasis added)

Another report titled Natural Gas Systems: Reliable & Resilient (from the Natural Gas Council)[2] included similar reliability findings for the natural gas T&D system as shown by the following excerpts:

> *This was demonstrated on January 7, 2014 during a "polar vortex" weather event that stretched across large parts of the United States and caused total delivered gas nationwide to reach an all-time record of 137.0 Bcf in a single day. Despite the unprecedented performance levels required, the industry honored all firm fuel supply and transportation contracts.*

[1] https://www.serdp-estcp.org/content/download/19069/208608/file/TR-1173.pdf
[2] http://www.ngsa.org/download/analysis_studies/NGC-Reliable-Resilient-Nat-Gas-WHITE-PAPER-Final.pdf

The joint Federal Energy Regulatory Commission ("FERC")-NERC Southwest Cold Weather Report made similar findings about the reliability of the natural gas system during another weather-related event. In the first week of February 2011, the southwest region of the United States experienced historically cold weather that resulted in significant impacts on the electric system in Texas, New Mexico and Arizona, and natural gas service disruptions in those states as well. During the 2011 Southwest outages, 50,000 retail gas customers experienced curtailments when gas pressure declined on interstate and intrastate pipelines and local distribution systems due to the loss of some production to well freezing at a time of increased gas system demand. In contrast, 4.4 million electric customers were affected over the course of the same event.

This inherent reliability was demonstrated during Hurricane Harvey, as just one exemplar. Reports stated that local gas utility distribution systems remained operational:

- AGA Updates on Hurricane Harvey
  Excerpt:
  1. *Even under all of that water, the gas distribution system in the Houston area continues to operate as designed and continues to serve all customers who can physically take service.*

- Harvey cleanup efforts for gas utilities may be cheaper than post-Sandy repairs
  Thursday, August 31, 2017 9:27 AM ET
  Excerpts:
  1. *CenterPoint's gas system has continued operating normally despite the storm and flooding, according to company updates.*
  2. *Texas Gas Service Co., too, has service territory in southeastern Texas and also has been able to maintain normal service on its system.*

Many gas utility customers depend on natural gas system resiliency during times of weather emergencies as the following article illustrates: How Waffle House's hurricane response team prepares for disaster. Excerpt:

- *"If we have gas for the grills, we can open," said Warner. "We tailor the menu for what we can cook. Obviously, without electricity we're not gonna have waffles, but we can bring in water and porta potties. If we don't have electricity we can bring in generators. We've had some cases that before the generator came, we were there with candle light*."

Of course, natural gas can also fuel generators, if a facility is so equipped. Here are some examples:

- Microgrids pass crucial test for H-E-B during Harvey in Houston
- CHP Installation Keeps Hospital Running During Hurricane Harvey
- Backup systems enable H-E-B resiliency amid Harvey

Such was also the case for Hurricane Sandy, at least for those with the foresight to do so. The use of natural gas for small-scale generation is well documented in news reports from the areas affected by Sandy.[3]

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As for the electric grid, equivalent resiliency is not as robust. According the U.S. Chamber of Commerce's Global Energy Institute coverage titled Harvey's Impact on Energy Daily Update, at times during the storm between 170,000 and over 300,000 customers were without power.

Regarding Hurricane Irma, the State of Florida's Division of Emergency Management reported that 62.05% of all electric utility accounts (totaling 6,516,564 accounts) were without power (as of 9/11/2017 at 18:01). There were no reports of natural gas T&D systems damage from Irma. Indeed, natural gas-fueled back-up generators and CHP performed admirably. This is evidenced by Florida disaster preparedness organizations such as Miamidade.gov's on-line resource that reported most stores with natural gas fueled back-up generators remained open after the storm.

The fact that nearly 100 percent of gas T&D systems are buried underground, and modern gas distribution systems are quickly migrating to high density polyethylene (HDPE) pipe, makes reliability inherent. Per TECO Peoples Gas, outages are "usually caused by a third-party doing damage." Electricity lines can also be buried, but at enormous cost and of dubious benefit. Such problems are detailed by the following articles:

- After Irma, Florida prepares for days — and maybe weeks — without power
- Should we bury our power lines?

None of this is meant to detract from the heroic efforts of those involved with restoring electric service. Rather, it is intended to illustrate that the potential exists for improved grid resilience via the direct use of natural gas and CHP.

Obviously, hurricanes are not the only weather-related emergencies that can and do significantly impact the electric grid. On August 23rd, the Department of Energy (DOE) released a report titled Staff Report to the Secretary on Electricity Markets and Reliability. The term "polar vortex" was mentioned 21 times and is clearly a weather-related emergency. This type of weather-related emergency is one that the direct use of natural gas (and propane) is ideally suited for alleviating. More recently, the Electricity Reliability Council of Texas (ERCOT) issued an emergency declaration when reserves dropped in response to high temperatures and record demands[4]. They saw wholesale prices skyrocket to $9,000/MWh.

Cold weather and hurricanes are not the only weather-related emergency for which infrastructures need to account. There are multiple types of weather-related emergency that would be very unwise to burden solely on the electric grid.

- *How CHP Stepped Up When the Power Went Out During Hurricane ...*
- *CHP Kept Schools, Hospitals Running Amid Hurricane Sandy ...*
- *Enabling Resilient Energy Infrastructure for Critical Facilities*
- *Lessons From Where The Lights Stayed On During Sandy - Forbes*
- *Hospital Plans Ahead for Power, Serves the Community Through ...*
- *Case study: Microgrid at Princeton University | Facilities*

[4] https://www.utilitydive.com/news/ercot-reserves-drop-below-2300-mw-forcing-texas-grid-to-call-for-energy-e/560833/?fbclid=IwAR3GErj_rN8w1HWSGjIXu7v00plhaXMCbVloi9qQO4Yx8ujJl3Y5Okn8qW4

Transitioning to an all-electric energy infrastructure capable of handling a "polar vortex" via "clean" electric energy may be technically feasible, but it would also be economically devastating. In the case of Spire's peak Winter send-out for the St. Louis region, our analyses indicate that it would take about 50,000 MW of new generation to replace natural gas use during such cold weather events. Given that Ameren Missouri's (electric utility with an overlapping service territory) current total generation is 10,200 MW, replacing Spire's peak natural gas send-out with electricity would require about 5 times Ameren's existing capacity. Such a large capital investment would be relied on only during such emergencies. On top of that, Ameren's electric transmission & distribution systems would need to be increased to handle such generation capacity additions. These combined costs would need to be recovered by massive electric rate increases, yet would not eliminate the potential for cascading failure of the grid.

Policies Should Encourage, not Discourage, Economic and Strategic Energy Diversity

Regardless of the inherent resilience and reliability of natural gas T&D systems relative to electricity, there are many who seek to move away from the direct consumption of natural gas (and propane), or any fuel, and electrify everything from water heaters to automobiles. It is important to recognize that electrification at the site of consumption appears to be the current mission of DOE's Office of Energy Efficiency and Renewable Energy (EERE). EERE's website states its mission is "to create and sustain American leadership in the transition to a global clean energy economy." However, the term "clean energy" is ill-defined.

The most concise definition Spire could find for "clean energy" is contained within the text of the "Clean Energy Standard Act of 2012 (a.k.a., S. 2146) is defined as:

1. ***electricity*** *generated at a facility placed in service after 1991 using renewable energy, qualified renewable biomass, natural gas, hydropower, nuclear power, or qualified waste-to-energy.* (emphasis added)
2. ***electricity*** *generated at a facility placed in service after enactment that uses qualified combined heat and power (CHP), generates electricity with a carbon-intensity lower than 0.82 metric tons per megawatt-hour (the equivalent of new supercritical coal), or as a result of qualified efficiency improvements or capacity additions at existing nuclear or hydropower facilities.* (emphasis added)
3. ***electricity*** *generated at a facility that captures and stores its carbon dioxide emissions.* (emphasis added)

While the term "CHP" is included in S. 2146, nowhere is the efficient and reliable direct use of natural gas for any other purposes deemed as qualifying as "clean energy."

On September 12th, 2017 DOE issued a press release titled Energy Department Invests Up to $50 Million to Improve the Resilience and Security of the Nation's Critical Energy Infrastructure. Spire is concerned with the emphasis that is placed upon "clean energy" as shown by the following excerpt (with emphasis added):

> *The seven Resilient Distribution Systems projects awarded through DOE's Grid Modernization Laboratory Consortium (GMLC) will develop and validate innovative approaches to enhance the*

> *resilience of distribution systems – including microgrids – with high penetration of **clean distributed energy resources** (DER) and emerging grid technologies at regional scale.*

Of course, clean distributed energy resources can and should include natural gas fired engine generators as recommended by FEMA.

Many free market advocates have deemed renewables "unreliable" since they are highly variable. While this is debatable, it is much less debatable during weather emergencies such as Hurricanes Harvey and Irma. What people need is something they can count on during such emergencies through systems fueled by energy that is affordable and capable of being delivered in quantities sufficient to get them through the crisis. One solution that fits the bill are old-fashioned reciprocating engine-driven generators and the fossil fuels that power them. Follow Publix's lead as recommended by FEMA (Federal Emergency Management Agency) in Publix Powers Up When the Power Goes Down; Full Mitigation Best Practice Story::

> *Publix decided to install 500-kilowatt generators at 360 store locations. Each generator has a 1,000-gallon diesel fuel tank, and the majority includes a bi-fuel option using natural gas. With full tanks and the bi-fuel connection, the generators have the capacity to power an entire store, including all needed refrigeration and air conditioning. The generators were designed to operate for a minimum of 72 hours, far exceeding the 23-hour average of the current 65-kilowatt backup generators.*

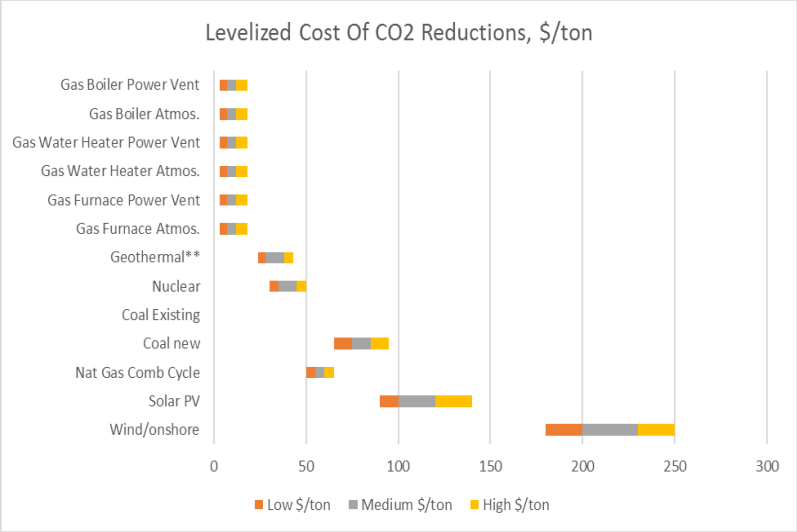
Electrification of Everything is Poor Planning

Our economy is built and dependent upon diverse and affordable energy. Natural gas is a partner, not a competitor, to the electric system in serving and protecting America's consumers. The direct consumption of natural gas provides major economic benefits as well as environmental and reliability benefits. These benefits are listed as follows:

- Natural gas delivers 38% more consumer energy than electricity.[5]
- Direct use of natural gas delivers about 92% of its initial (source) energy content on average (relative to 32% for electricity).[6]
- Natural gas delivers 38% more energy for 15% of the comparable electric costs.[7]
- Natural gas appliances can significantly reduce carbon emissions relative to electric appliances and do so at much lower costs.

The following chart illustrates the economics of the last bullet point:[8]

[5] EIA Annual Energy Outlook 2017, Energy Consumption in 2015
[6] American Gas Association 2017 Playbook
[7] EIA Electric Power Annual Table 2.3, Revenue from Sales of Electricity to Ultimate Customers
[8] Levelized Cost of Energy: Expanding the Menu to Include Direct Use of Natural Gas



Note:
"Coal Existing" represents the baseline power plant from which CO2 reductions and costs are measured and thus do not have associated incremental costs.

U.S. energy and environmental policies are being misdirected in the mistaken belief that the direct use of highly-efficient natural gas is something from which American society should be weaned. Most importantly, the ultimate objective of electrifying every end use will be at the expense of resiliency in the face of weather and other extreme events. If everything is electrified and the power goes out, people have nothing to heat their homes, boil their water or cook their meals.

Summary and Conclusions

Increasing the reliability and resiliency of the electric grid is important, but so too is increasing the resilience and reliability of all energy systems. By diversifying the types of energy delivered, natural gas direct use reduces strain on the electric grid and enables quicker disaster response. DOE's Office of Electricity should acknowledge natural gas direct use's contribution to reliability of both the electric grid and overall energy system and convey that acknowledgement to DOE, their sister Offices and the National Labs.

Spire appreciates the Office of Electricity's decision to cast a wide net for solutions to improve the resiliency of the electric grid. One of those solutions remains the direct use of natural gas.

If you need more specific information, please contact:

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Sincerely,

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