Exhibit No.:	
Issues:	CHP Outreach Initiative for Critical Infrastructure Resiliency
Witness:	Jane Epperson
Sponsoring Party:	Missouri Department of Economic Development – Division of Energy
Type of Exhibit:	Direct Testimony
Case Nos.:	GR-2018-0013

MISSOURI PUBLIC SERVICE COMMISSION

LIBERTY UTILITIES (MIDSTATES NATURAL GAS)

d/b/a LIBERTY UTILITIES

CASE NO. GR-2018-0013

DIRECT TESTIMONY

OF

JANE EPPERSON

ON

BEHALF OF

MISSOURI DEPARTMENT OF ECONOMIC DEVELOPMENT

DIVISION OF ENERGY

Jefferson City, Missouri
March 2, 2018

(Revenue Requirement)

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BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Liberty Utilities (Midstates Natural Gas) Corp. d/b/a Liberty Utilities' Tariff Revisions Designed to Implement a General Rate Increase for Natural Gas Service in the Missouri Service Areas of the Company	))))))	**File No. GR-2018-0013**

AFFIDAVIT OF JANE EPPERSON

STATE OF MISSOURI)
) **ss**
COUNTY OF COLE)

Jane Epperson, of lawful age, being duly sworn on her oath, deposes and states:

1. My name is Jane Epperson. I work in the City of Jefferson, Missouri, and I am employed by the Missouri Department of Economic Development, Division of Energy as a Senior Energy Policy Analyst.
2. Attached hereto and made a part hereof for all purposes is my Direct Testimony on behalf of the Missouri Department of Economic Development – Division of Energy.
3. I hereby swear and affirm that my answers contained in the attached testimony to the questions therein propounded are true and correct to the best of my knowledge.

Jane Epperson

Subscribed and sworn to before me this 2nd day of March, 2018.

LAURIE ANN ARNOLD
Notary Public - Notary Seal
State of Missouri
Commissioned for Callaway County
My Commission Expires: April 26, 2020
Commission Number: 16808714

Notary Public

My commission expires: 4/26/20

I. INTRODUCTION AND PURPOSE OF TESTIMONY

Q. Please state your name and business address.

A. My name is Jane Epperson. My business address is 301 West High Street, Suite 720, PO Box 1766, Jefferson City, Missouri 65102.

Q. On whose behalf are you testifying?

A. I am testifying on behalf of the Missouri Department of Economic Development – Division of Energy ("DE").

Q. Please describe your educational background and employment experience.

A. I received my Masters of Science in Geology from the University of Missouri – Columbia and my Bachelor of Arts degree in Geology from Stephens College, Columbia, Missouri. I began work with DE in 2014 as an Energy Policy Analyst. In that capacity I have filed testimony in prior rate cases (ER-2014-0370, ER-2014-0351, ER-2014-0258, ER-2016-0179, GR-2017-0215/GR-2017-0216), participated in Missouri Energy Efficiency Investment Act ("MEEIA") rule revision dockets and various electric and natural gas collaboratives on docketed issues, contributed to the development of the Missouri Comprehensive State Energy Plan ("CSEP"), and served as project manager for the development of the statewide Technical Reference Manual. Prior to working with DE, I was employed by the Missouri Department of Conservation as Supervisor of the Policy Coordination Unit, which was responsible for statewide and regional planning, statewide compliance with environmental and cultural resource laws, Missouri, Mississippi, White River basin interstate coordination, and human dimensions research. Prior to working with

the Missouri Department of Conservation, I was employed as a Hydrologist III with the Missouri Department of Natural Resources – Director's Office, focusing on interstate water policy and management issues.

Q. What information did you review in preparing this testimony?

A. In preparation of this testimony, I reviewed Direct Testimony and Tariff Filing No. YG-2018-0036 filed by Liberty Utilities in this case.

Q. What is the purpose of your testimony?

A. Section I provides an introduction and summary of my recommendation.

Section II describes combined heat and power ("CHP") technologies and provides information regarding existing and potential CHP resources in Missouri.

Section III describes the role CHP can play at the community level in meeting the goal of ensuring ongoing operation of critical infrastructure during grid outages due to natural disasters, cyber or physical attacks, while also promoting more efficient use of energy resulting from the use of waste heat.

Section IV defines critical facilities, resiliency, threats to Missouri energy reliability, and describes DE's recent and current activity relating to advancing CHP's role at the state and national levels in efforts to identify and plan for continued operation of facilities critical to local communities, the state, and nation in the event of natural disaster, physical attack or cyberattack.

Section V submits the recommendation that the Commission authorize Liberty Utilities to complete a CHP outreach initiative intended to provide information and technical assistance to customers that might benefit from CHP technologies.

Q. What key recommendations in the Missouri Comprehensive State Energy Plan (CSEP) are related to your testimony?

A. The CSEP[1] includes recommendations related to: public-private partnerships to implement energy conservation measures (including CHP); eliminating barriers to on-site customer generation; identifying cost-effective energy efficiency, demand response, and on-site generation opportunities for large customers; encouraging utilities to support technologies that enhance the distribution grid.

Q. What CHP initiative are you recommending the Commission approve in this case?

A. The Commission should authorize Liberty to collaborate with DE and the Midwest Combined Heat and Power Technical Assistance Partnerships ("CHP TAP") to complete an outreach initiative in which customers within the Liberty service territory in Missouri are offered information about CHP and offered a free screening to determine if their facility is a good candidate for CHP application from a financial and technical perspective. The screening tool would be provided and evaluated by the CHP TAP. The initiative would focus on public, commercial, institutional and industrial customers with consistent gas consumption throughout the year, indicative of consistent thermal load requirements. Example customers that may generally fit this profile include hospitals, large residential facilities such as nursing homes and correctional facilities, universities, and food

[1] Missouri Department of Economic Development – Division of Energy, 2015, *Missouri Comprehensive State Energy Plan*, https://energy.mo.gov/energy/docs/MCSEP.pdf.

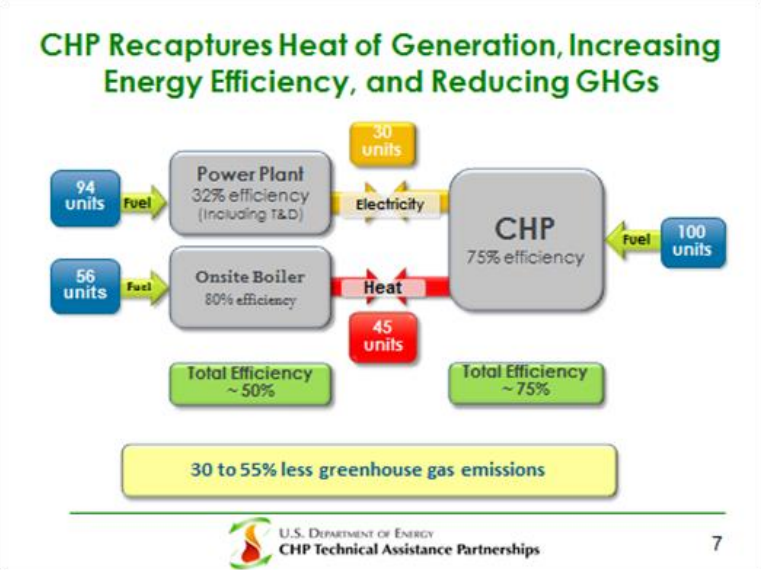
manufacturers. Customer participation would be voluntary and initially involve responding to the CHP TAP survey. Those surveyed customers with favorable evaluations will be invited to take the next step of contacting the CHP TAP for complimentary follow-up technical assistance services, which could include a more detailed CHP feasibility study.

II. COMBINED HEAT AND POWER

Q. What is CHP?

A. CHP refers to an array of proven technologies that concurrently generate electricity and useful thermal energy from the same fuel source (conventional or renewable). A simple illustration of a separate heat and power system is a typical commercial or industrial building that purchases electricity generated by a utility; but has a boiler in the basement that makes hot water to heat the building. Thus, two sources of fuel are needed to meet the building's electric and thermal energy needs. CHP systems utilize one fuel to make both electric and thermal energy. This is accomplished by recovering the otherwise wasted heat from the electric generation process and using it to provide the thermal load of the building. Combined heat and power results in a total system efficiency of around 75 percent, compared with separate heat and power at around 50 percent (see Figure 1).

Figure 1: Energy Efficiency Comparison of CHP versus Separate Heat and Power Production.[2]



Q. What CHP facilities exist in Missouri?

A. Table 1 below shows the CHP installations in Missouri and illustrates that CHP technology is diverse in applications; including schools, colleges, universities, hospitals, government facilities, agriculture, chemicals, and hotels.

[2] U.S. Department of Energy, Midwest CHP Technical Assistance Partnerships, 2017, "CHP, The Concept – Combined Heat and Power and Waste Heat to Power for Industrial, Institutional, and Commercial Facilities," Presentation, June 27, Toledo, Ohio, http://www.midwestchptap.org/events/20170627/5_Cuttica_CHP_the_Concept_6-27-17.pdf, slide 7,

Table 1: Combined Heat and Power Installations in Missouri.[3]

City	Facility Name	Application	Op Year	Prime Mover	Capacity (KW)	Fuel Class-Primary Fue
Butler	Butler	District Energy	1946	ERENG	13,100	OIL - Distillate Fue
Columbia	University Of Missouri Power Plant	Colleges / Univ.	1961	B/ST	99,500	BIOMASS - Biomass
Columbia	Columbia Landfill	Solid Waste Facilities	2008	ERENG	3,000	BIOMASS - LFG
Florissant	Service Merchandise Company, Inc	General Merch. Stores	1985	ERENG	60	NG - Natural Gas
Hannibal	Clemmons Hotel	Hotels	1990	ERENG	150	NG - Natural Gas
Jefferson City	Jefferson City Correction Center	Justice / Public Order	2009	ERENG	3,200	BIOMASS - LFG
Kansas City	Bolling GSA office	General Gov't.	2000	BPST	100	WAST - Steam
Kansas City	Veolia Energy Kansas City	District Energy	2012	B/ST	5,000	BIOMASS - Biomass
Kansas City	Trigen-Kansas City Energy Corporation	District Energy	1990	B/ST	6,000	COAL - Coal
Laddonia	POET Biorefining - Missouri Ethanol	Chemicals	2007	CT	13,000	NG - Natural Gas
Lewistown	Lewistown School District	Schools	2003	MT	60	NG - Natural Gas
Louisiana	Hercules, Inc.	Chemicals	1942	B/ST	15,000	COAL - Coal
Macon	Northeast Missouri Grain	Chemicals	2003	CT	10,000	NG - Natural Gas
Mountain View	Smith Flooring, Inc.	Wood Products	1989	B/ST	500	WOOD - Wood
Neosho	La-Z-Boy Chair Company	Furniture	1984	B/ST	750	WOOD - Wood
North Kansas City	North Kansas City	Agriculture	1987	CC	4,000	NG - Natural Gas
St. Louis	Anheuser-Busch	Food Processing	1939	B/ST	26,100	COAL - Coal
St. Louis	Ashley Plant	District Energy	2000	CT	15,000	NG - Natural Gas
St. Louis	Southwestern Bell Telephone	Communications	1992	ERENG	6,000	OIL - Distillate Fue
St. Louis	Brandonview Building	Office Building	1969	ERENG	4,300	NG - Natural Gas
	Agricultural Facility	Agriculture	2014	ERENG	800	BIOMASS - Digester G

As Table 2 shows, compared to other Midwestern states with cost of service regulation, Missouri ranks the lowest in terms of percent of total installed generating capacity from CHP.

[3] Modified from U.S. Department of Energy, 2016, *U.S. DOE Combined Heat and Power Installation Database*, "Combined Heat and Power Installations in Missouri," https://doe.icfwebservices.com/chpdb/state/MO.

Table 2: Total Electric Generating Capacity versus State CHP Capacity.[4]

Regulated State	Total Electric Capacity	State CHP Capacity (MW)	CHP as % of Total Capacity (MW)	Number of CHP Installations
Iowa	15,757	630	4	35
Indiana	30,928	2,266	7.3	38
Minnesota	16,608	918	5.5	55
Wisconsin	19,050	1,570	8.2	94
Missouri	23,499	236	1	21

Table 3 provides the technical detail that underscores the strengths of CHP technology and shows that CHP is not an untested technology. Note the performance parameters that quantify the benefits of high efficiency (55 to 80 percent), range of capacity (.005 to several hundred MW), high availability (72 to 99 percent), fuel diversity, and lower emissions of air pollutants.

[4] U.S. Department of Energy Midwest CHP Technical Assistance Partnership, John J. Cuttica, Clifford P. Haefke, 2012.

Table 3: Comparison of CHP Technology Sizing, Cost, and Performance Parameters.[5] [6]

Technology	Recip. Engine	Steam Turbine	Gas Turbine	Microturbine	Fuel Cell
Electric efficiency (HHV)	27-41%	5-40+%	24-36%	22-28%	30-63%
Overall CHP efficiency (HHV)	77-80%	near 80%	66-71%	63-70%	55-80%
Effective electrical efficiency	75-80%	75-77%	50-62%	49-57%	55-80%
Typical capacity (MWe)	.005-10	0.5-several hundred MW	0.5-300	0.03-1.0	200-2.8 commercial CHP
Typical power to heat ratio	0.5-1.2	0.07-0.1	0.6-1.1	0.5-0.7	2-Jan
Part-load	ok	ok	poor	ok	good
CHP Installed costs ($/kWe)	1,500-2,900	$670-1,100	1,200-3,300 (5-40 MW)	2,500-4,300	5,000-6,500
Non-fuel O&M costs ($/kWhe)	0.009-0.025	0.006 to 0.01	0.009-0.013	0.009-.013	0.032-0.038
Availability	96-98%	72-99%	93-96%	98-99%	>95%
Hours to overhauls	30,000-60,000	>50,000	25,000-50,000	40,000-80,000	32,000-64,000
Start-up time	10 sec	1 hr - 1 day	10 min - 1 hr	60 sec	3 hrs - 2 days
Fuel pressure (psig)	Jan-75	n/a	100-500 (compressor)	50-140 (compressor)	0.5-45
Fuels	natural gas, biogas, LPG, sour gas, industrial waste	all	natural gas, synthetic gas, landfill gas, and fuel oils	natural gas, sour gas, liquid fuels	hydrogen, natural gas, propane, methanol
Uses for thermal output	space heating, hot water, cooling, LP steam	process steam, district heating, hot water, chilled water	heat, hot water, LP-HP steam	hot water, chiller, heating	hot water, LP-HP
Power Density	35-50	>100	20-500	May-70	20-May
NOx (lb/MMBtu) (not including SCR)	0.013 rich burn 3-way cat.	Gas 0.1-.2 Wood 0.2-.5			
	0.17 lean burn	Coal 0.3-1.2	0.036-0.05	0.015-0.036	0.0025-.0040

[5] U.S. Environmental Protection Agency Combined Heat and Power Partnership, 2015, *Catalog of CHP Technologies*, https://www.epa.gov/sites/production/files/2015-07/documents/catalog_of_chp_technologies_section_1._introduction.pdf, page 1-6.

[6] HHV (high heat value in units of mmbtu or Mj); MWe (megawatts-electric); kWe (kilowatts-electric); psig (pounds per square inch at gage); SCR (selective catalytic reduction)

III. ENERGY RELIABILITY AND RESILIENCY THROUGH CHP

Q. Why is CHP a key technology to improve energy reliability and resiliency?

A. CHP is a proven technology**,** as demonstrated by entities with CHP systems in place during Hurricane Sandy. According to the U.S. Environmental Protection Agency and U.S. Department of Energy ("USDOE"):

> During and after Hurricane Sandy, combined heat and power … enabled a number of critical infrastructures and other facilities to continue their operations when the electric grid went down. Time and again, CHP has proved its value as an alternative source of power and thermal energy (heating and cooling) during emergencies, and demonstrated how it can be a sound choice in making energy infrastructure more resilient in the face of extreme weather events. (Footnotes omitted)[7]

Examples of successful CHP utilization are not limited to Hurricane Sandy.[8]

Q. How could CHP improve reliability and resiliency at the community level?

A. To serve at the community level, CHP systems can be configured as part of a microgrid, which is, "… a group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that act as a single controllable entity with respect to

[7] U.S. Environmental Protection Agency and U.S. Department of Energy, 2013, "Guide to Using Combined Heat and Power for Enhancing Reliability and Resiliency in Buildings," https://www.epa.gov/sites/production/files/2015-07/documents/guide_to_using_combined_heat_and_power_for_enhancing_reliability_and_resiliency_in_buildings.pdf, page 2.

[8] Environmental and Energy Study Institute, 2013, "Energy Efficient Infrastructure for More Resilient Local Economies: The Role of District Energy, CHP, and Microgrids," http://www.eesi.org/briefings/view/energy-efficient-infrastructure-for-more-resilient-local-economies-the-role.

the grid."[9] Microgrids typically consist of multiple generating assets (for example, CHP and solar), energy storage, and an automated control system that enables the microgrid to function with and without connection to the grid (often referred to as islanding).[10] CHP configured as the heart of a microgrid that serves multiple facilities and/or customers can mitigate the short- and long-term impact of emergencies; for example by sustaining not only fire, police, and/or other emergency response facilities, but also a grocery store, a gas station, and a multi-family residential building so that residents (particularly vulnerable populations) can shelter-in-place during an emergency (preserving life by avoiding danger and stress to relocate).

IV. INITIATIVES TO SECURE CRITICAL INFRASTRUCTURE

Q. Under what circumstances should infrastructure be considered critical?

A. Critical infrastructure is that infrastructure which, if incapacitated, would have a substantial negative impact on public health and safety or economic security, including hospitals, nursing homes, public water and wastewater treatment facilities, government facilities (military, correctional, police, and fire), emergency shelters (schools, universities, or community centers) and data centers.[11, 12]

[9] Sandia National Laboratories, 2014, *The Advanced Microgrid: Integration and Interoperability*, https://energy.gov/sites/prod/files/2014/12/f19/AdvancedMicrogrid_Integration-Interoperability_March2014.pdf.
[10] Baier, Martin, Bhavaraju, Vijay, Murch, William, and Sercan Tleke, 2017, "Making Microgrids Work: Practical and technical considerations to advance power resiliency," http://www.eaton.com/ecm/groups/public/@pub/@electrical/documents/content/wp027009en.pdf.
[11] U.S. Department of Homeland Security, Federal Emergency Management Agency, 2017, *Critical Facility*, "Definition/Description," http://www.fema.gov/national-flood-insurance-program-2/critical-facility.
[12] USA Patriot Act of 2001, Public Law 107-56, Section 1016 (e), https://www.gpo.gov/fdsys/pkg/PLAW-107publ56/pdf/PLAW-107publ56.pdf.

Q. What attributes are essential in meeting the energy needs of critical infrastructure?

A. Critical infrastructure requires a higher level of reliability (ideally 100 percent) and resiliency. Reliability is characterized by the frequency and duration of outages. While some customers may be willing and/or able to tolerate fairly numerous, short outages that do not compromise their heating, cooling, and food refrigeration functions, critical facility customers may not have similar flexibility. Critical facility customers are less willing and/or able to tolerate outages that may result in compromised medical and/or emergency support functions.

Resiliency is the relative ability of a facility to recover to partial or full function after an interruption in energy service. New hospitals, for example, are required under Missouri regulations to have standby emergency generators so that full voltage and frequency is available and supplying power to emergency loads within 10 seconds after normal power is interrupted.[13] The challenges associated with standby emergency generators, which are typically diesel-fueled reciprocating engines, include: a) difficulty in maintaining more than a few days of on-site fuel storage; b) fuel delivery that is subject to weather and transportation vulnerabilities; and c) the need to be regularly maintained, fuel instability (diesel goes bad over time). CHP is an alternative, high-efficiency, low-emissions technology that can provide continual on-site power generation to reliably serve part or all the energy and thermal load of a facility in coordination with, or independently of, the utility grid.

[13] 19 CSR 30-20.030 (26) (E) (3).

Q. What threats to energy reliability have been identified for Missouri?

A. The "State of Missouri Energy Sector Risk Profile,"[14] produced by the USDOE, Office of Electricity Delivery & Energy Reliability, highlights natural and manmade hazards to the electric, natural gas, and petroleum infrastructures. The leading event affecting electric transmission outages in Missouri from 1992 to 2009 was "natural force" (i.e., thunderstorms, winter storms, high wind, and ice). The average duration of electric outages between 2008 and 2013 was 45 hours per year. Thunderstorms and lightning caused the greatest overall property loss from 1996 to 2014, at $58.9 million per year. Flooding was the second most costly cause of property damage at $48.8 million per year. Since natural gas transmission and distribution is via underground pipeline, it is less vulnerable to the natural forces that result in costly electric outages. The leading events affecting natural gas transmission (at an average of one incident per 3.4 years) and distribution pipelines (at an average of 1.23 incidents per year) in Missouri from 1986 to 2014 were "outside forces," which are pipeline failures due to vehicular accident, sabotage, or vandalism. The average annual loss due to natural gas from outside forces was $1.5 million, which is 2.5 percent of the losses due to thunderstorms and lightning from electricity outage. I should note that the electricity data reflects an 18-year period that excludes the great flood of 1993, while the natural gas data reflects a 28-year period of time.

[14] U.S. Department of Energy, Office of Electricity Delivery & Energy Reliability, 2016, "State of Missouri Energy Sector Risk Profile," https://energy.gov/sites/prod/files/2016/09/f33/MO_Energy%20Sector%20Risk%20Profile_2.pdf.

Q. Why focus on critical infrastructure for improved energy reliability and resiliency from emergencies?

A. Infrastructure that, by definition, affects public safety and health or economic security is an appropriate priority to focus efforts to improve energy reliability and resiliency.

Q. Who will benefit from improved reliability and resiliency of critical infrastructure?

A. Increased reliability of critical infrastructure will enable continued access to critical services when they are needed most, such as during a natural disaster or act of terrorism. Continuity of these services is paramount to lessening the impacts of supply disruptions and will aid in emergency response before, during and after disruptive incidents. This enhanced response capability will alleviate strains on the economy due to energy supply disruptions and support faster post-disaster economic recovery. Economic development will also occur as a result of the design and construction of resilient infrastructure.

Q. Has DE been actively engaged in efforts to identify critical infrastructure and improve resiliency?

A. Yes. DE is one of 24 states, communities, utilities, and others participating in a two-year, USDOE-sponsored CHP for Resiliency Accelerator ("Accelerator"). The purpose of the Accelerator is to expand the consideration and implementation of CHP and other forms of distributed generation for critical infrastructure. Table 4 provides a list of official partners in the Accelerator. USDOE is providing informational resources to assist the partners in developing CHP goals and identifying opportunities and next steps toward meeting those goals.

Table 4: USDOE CHP for Resiliency Accelerator Partners.

Communities	States	Utilities	Ambassadors
Boston, MA	Commonwealth of Massachusetts	Bath Electric Gas Water	Edison Electric (EEI)
Hoboken, NJ	Maryland Department of Commerce	National Grid	International District Energy Association (IDEA)
Miami-Dade County, FL	NYSERDA	Long Island Power Authority	Health Care Without Harm
Montgomery County, MD	Pennsylvania Public Utility Commission	PSEG Long Island	
New York, NY	State of Missouri	Tennessee Valey Authority	
Pittsburgh, PA	State of Utah	United Illuminating	
Thermal Energy Corporation (TX Medical Center - Houston)		Nicor Gas	
Woodbridge, CT Partnership			

Q. Please describe the upcoming CHP Summit.

A. DE is co-hosting a CHP Summit for Critical Infrastructure Resiliency ("Summit"), scheduled for April 10, 2018. The purpose of the Summit is to increase awareness of the applicability of CHP technologies in the institutional sector, specifically hospitals, universities or colleges, correctional facilities, and nursing homes or assisted living facilities. The Summit will inform potential CHP candidates within the critical infrastructure sector of the mechanics, economics, and benefits of CHP technology. We have also committed to holding a similar, second Summit in Kansas City on October 16, 2018.

Q. Has DE previously participated in a CHP outreach effort similar to the program DE is proposing in this case?

A. Yes. As part of the Stipulation and Agreement in File No. EM-2016-0213.[15] DE worked with the Empire District Electric Company ("Empire") and the CHP TAP to complete a CHP outreach effort within Empire's service territory in Missouri. Empire staff characterized the effort upon completion as very beneficial. CHP TAP products associated with the initiative include a CHP flyer (Attachment 1) that was a bill insert, and a fact sheet that includes the screening questions (Attachment 2). My recommendation in this case is to replicate the CHP outreach model implemented as a result of the Empire case.

V. RECOMMEDATION

Q. Do you propose that Liberty implement a CHP outreach initiative?

A. Yes. The CHP outreach initiative proposed is a win-win for Liberty and their customers, and is built upon the process, materials, and lessons learned through the Empire CHP outreach effort. It is a win for customers because they are introduced to a free screening to determine if CHP could benefit them. It is a win for Liberty because of the positive interaction and extra customer service provided to large account customers. The CHP TAP has again agreed to provide complimentary services for this initiative. DE anticipates that such an initiative will benefit the public by enabling institutional

[15] Missouri Public Service Commission Case No. EM-2016-0213, *In the Matter of the Empire District Electric Company, Liberty Utilities (Central) Co. and Liberty Sub Corp, Concerning an Agreement and Plan of Merger and Certain Related Transactions,* Amended Stipulation and Agreement as to Division of Energy and Renew Missouri, August 23, 2016, pages 2-4.

customers who would benefit from CHP to consider it as an option for increasing resiliency of services and critical loads.

Q. Do you anticipate externals cost associated with Liberty's participation in an outreach effort?

A. No. However, the CHP outreach effort would involve Liberty staff time in identifying and contacting large volume customers with consistent thermal demand within the service territory to invite them to learn more about CHP and in coordinating services from CHP TAP.

Q. Please provide a detailed proposal for the CHP outreach effort.

A. Within one year of the completion of the rate case, Liberty will collaborate with DE and the CHP TAP in completing an outreach effort for screening potential CHP customers within the Liberty service territory in Missouri. The screening tool to be provided by the CHP TAP is a survey to help determine if CHP is a good fit for the customers from a financial and technical perspective. Target sectors will include commercial, institutional and industrial customers with consistent gas consumption throughout the year, indicative of consistent thermal load requirements. Example customers that may generally fit this profile include hospitals, large residential facilities such as nursing homes and correctional facilities, universities, and food manufacturers. Those surveyed customers with favorable evaluations will be invited to take the next step of contacting the CHP TAP for follow-up technical assistance services, which could include a more detailed CHP feasibility study. Detailed process/roles are as follows:

Liberty will utilize its knowledge of its large volume customers and the service territory to develop a list of large volume customers with consistent thermal demand. The customers on this list would be the focus of the outreach initiative.

CHP TAP will provide Liberty with an educational packet explaining CHP and a tailored CHP Screening Survey tool that can be completed with customer-specific use data, handled confidentially.

Liberty will email or mail the educational packet and screening tool and personally follow up by phone with target sector customers to encourage participation in the survey, offer assistance in obtaining the necessary customer-specific data, and encourage them to access a prerecorded CHP webinar and/or participate in a live webinar (both at no cost) presented by CHP TAP and posted on the Liberty website as well as and accessed at the convenience of customers. Interested customers will complete the CHP Screening Survey tool and email or mail them to CHP TAP. CHP TAP will score the surveys and share the results with surveyed customers, and offer those who "scored well" a follow-up conversation to discuss other available CHP TAP services, which could include a more detailed CHP feasibility study.

CHP TAP will provide Liberty with a survey report, with information aggregated to a level that does not disclose customer-specific information. Then Liberty will develop a written summary of the CHP outreach initiative, including the process, number of customers addressed at each step, organized by sector, and overall results. The

summary report will be shared with interested stakeholders, including DE, CHP TAP, the Statewide Natural Gas Collaborative, Office of the Public Counsel, and PSC staff.

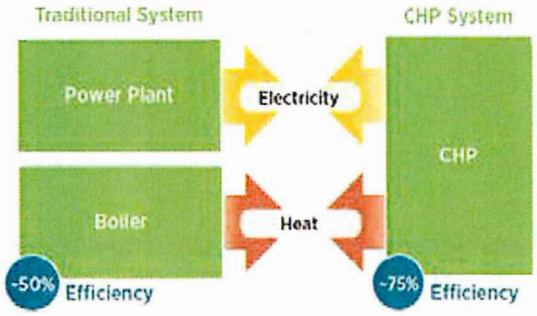
Q. Does this conclude your Direct Revenue Requirement Testimony?

A. Yes.

DOES COMBINED HEAT AND POWER (CHP) MAKE SENSE AT YOUR FACILITY?

WHAT IS CHP?

Combined heat and power (CHP) — sometimes referred to as cogeneration, is the simultaneous production on-site of electric power and heat from a single fuel source. CHP provides a cost-effective alternative to a site separately purchasing electricity from the local utility and burning fuel in a boiler or furnace to produce heat needed by the facility.



WHAT ARE THE BENEFITS OF CHP?

- CHP is a **proven technology**, able to serve a large range of industrial, institutional, and commercial applications from small to very large
- CHP improves **business competitiveness** and contributes to a **healthier local and state economy,** by dramatically increasing energy efficiency and **lowering operating costs**, when compared to separate generation of electricity and heating/cooling
- CHP increases **energy reliability and resiliency** of local businesses and of such critical community services as police, fire/emergency services, water/wastewater treatment facilities, hospitals, nursing homes, etc.
- CHP contributes to **keeping all utility customers' rates down** by reducing grid congestion, electric distribution costs, and the utility's need to invest in new infrastructure
- CHP **reduces emissions** of all pollutants through its higher efficiency and creates a more **diverse energy supply.**

WHO HAS INSTALLED CHP?

The DOE database of CHP installations provides information about CHP systems currently operating across the United States (see map), including 22 locations in Missouri. Features include search and filter options and the ability to download a list of operating CHP systems and state-level summary tables.

Source: doe.icfwebservices.com/chpdb/

More than 30 CHP Project Profiles of Midwest CHP projects have been compiled by the U.S. Department of Energy's Midwest Combined Heat and Power Technical Assistance Partnership (Midwest CHP TAP). The two-page profiles describe successful projects at manufacturers, hospitals, universities, wastewater treatment plants, ethanol plants, data centers, and municipal facilities in the Midwest region. (www.midwestchptap.org/profiles/)

NEXT STEPS: *FIND OUT IF CHP COULD BE A GOOD FIT FOR YOUR FACILITY*

1. **Answer the brief questions at the following weblink and the US DOE Midwest CHP TAP will contact you to provide a no-cost CHP screening**: http://www.midwestchptap.org/CHPScreening/
2. To learn more about the concepts and benefits of CHP, attend a 45 minute LIVE webinar (at no cost), on August 10, 2017 @ 11AM CT. Register at the following: http://www.midwestchptap.org/CHP101Webinar/
3. Or view this 10-minute archived presentation: http://www.midwestchptap.org/BenefitsofCHP/
4. Any questions, contact:

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MIDWEST U.S. DOE CHP Technical Assistance Partnerships

The Midwest CHP TAP is a U.S. DOE sponsored program managed by the Energy Resources Center located at the University of Illinois of Chicago

This notice is being provided to customers of The Empire District Gas Company as required by Missouri Public Service Commission case #EM-2016-0213. The content was authored by Midwest CHP TAP.

Attachment 1

U.S. DOE

MIDWEST

CHP
TECHNICAL ASSISTANCE
PARTNERSHIPS

Technical Assistance for Potential CHP Projects

U.S. DOE CHP Technical Assistance Partnerships

The U.S. DOE Midwest CHP Technical Assistance Partnership assists regional businesses and communities reduce their energy costs, improve efficiency, and strengthen their energy resiliency and reliability through the use of combined heat and power (CHP). The U.S DOE Midwest CHP Technical Assistance Partnership (CHP TAP) is one of seven regional CHP TAPs formed by the U.S. Department of Energy to promote and assist in transforming the market for CHP throughout the United States.

We provide unbiased, fuel-neutral and technology-neutral resources and expertise to help industrial, commercial, federal, institutional, and other large energy users consider and evaluate CHP for their facilities. The Midwest CHP TAP assists facilities through the project development process, from initial CHP screening to project installation.

ake the First Step: CHP Screening / Site Qualification

CHP can provide enormous benefits to large energy users, utilities, communities, and other stakeholders, but it is not the right fit for every application.

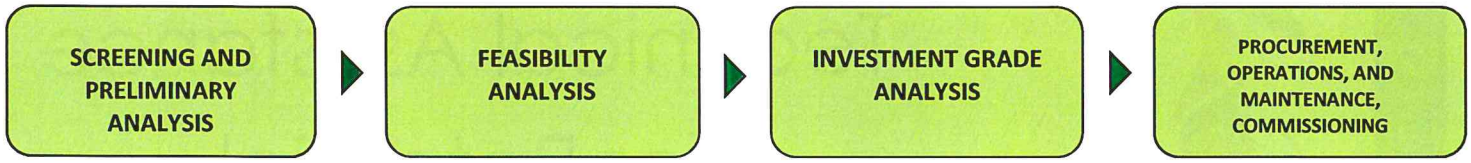
CHP experts at the U.S. DOE Midwest CHP TAP can help you determine if CHP is worth a closer look for your facility, both technically and financially. The first step is talking through a series of screening questions (shown to the right), combined with a first-cut qualification assessment of the economic and technical viability of CHP at your site, using basic site information. We help you evaluate if energy costs, thermal loads, site operating hours, and other key site characteristics show potential for a good, cost-effective CHP project. If the screening and site qualification suggest favorable CHP potential, we recommend continuing with a more detailed feasibility analysis.

Screening Questions

If you can answer "yes" to three or more of the following questions, your facility may be a good candidate for CHP! The U.S. DOE Midwest CHP Technical Assistance Partnership offers technical assistance to evaluate your site for CHP feasibility.

- **Do you pay more than $.06/kWh on average for electricity (including generation, transmission and distribution)?**
- **Are you concerned about the impact of current or future energy costs on your business?**
- **Are you concerned about power reliability? Is there a substantial financial impact to your business if the power goes out for 1 hour? For 5 minutes?**
- **Does your facility operate for more than 3,000 hours per year?**
- **Do you have thermal loads throughout the year (including steam, hot water, chilled water, hot air, etc.)?**
- **Does your facility have an existing central plant?**
- **Do you expect to replace, upgrade, or retrofit central plant equipment within the next 3-5 years?**
- **Do you anticipate a facility expansion or new construction project within the next 3-5 years?**
- **Have you already implemented energy efficiency measures and still have high energy costs?**
- **Are you interested in reducing your facility's impact on the environment?**
- **Do you have access to on-site or nearby biomass or waste heat resources (i.e. landfill gas, farm manure, food processing waste, excess industrial heat, etc.)?**

CHP TAP Project Development Process



The Next Step: Feasibility Analysis

When the results of the screening show that CHP could be both cost-effective and technically viable, the next step is a Feasibility Analysis using more detailed site-specific information. The Midwest CHP TAP can assist you with this level of feasibility analysis.

This analysis is based on utility bills from the previous year, information on daily and seasonal electric and thermal load profiles, and insights into site-specific issues such as expansion plans or power reliability problems that may factor into CHP system selection or sizing. Different CHP technology or system options may be evaluated with budgetary pricing and economic analysis developed for each option. The results of the analysis:

- Provide a sense of the estimated economic, operational, reliability, energy security, and other benefits that CHP might offer your facility
- Help determine if investing in CHP can meet your facility's long-term goals
- Give you the necessary information to decide on investing funds in an investment grade audit and system design
- Help you understand the energy savings and emissions reductions from a potential project, and
- Help you understand other state or local energy policies which may affect the project.

More Advanced Technical Assistance

In addition to assisting with initial discussions, screenings, and feasibility analyses, the U.S. DOE Midwest CHP Technical Assistance Partnership offers additional technical assistance to help CHP projects in our region succeed, including:

- *Expert Technical Advice* providing unbiased information and solutions from the initial screening to project installation.
- *Customized Presentations* tailored to targeted end-users and/or upper management for understanding the opportunities, barriers, and benefits of CHP.
- *Analyzing an Organization's Fleet of Facilities* to provide a strategic course of evaluating and analyzing CHP opportunities pertaining to an organization's overall energy, environmental, and sustainability goals.
- *Unbiased, Technical, Third-Party Reviews* of vendor proposals and engineering-grade analyses.
- *Understanding Current Regulations and Policies* impacting CHP development at federal, regional and state levels.
- *Identifying Financing, Grant, and Incentive Opportunities* that promote the implementation of CHP.
- *Development of Request for Proposals* for CHP projects advancing to next stages of project development.
- *Updates on New Technology or Operational Advancements* that could affect project economics.

Get In Touch with Us to Get Started

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