

Exhibit No.:
Issue: Combined Heat and Power
Witness: Jane E. Epperson
Sponsoring Party: Missouri Department of
Economic Development,
Division of Energy
Type of Exhibit: Direct Testimony
Case No.: GR-2019-0077

MISSOURI PUBLIC SERVICE COMMISSION

UNION ELECTRIC COMPANY d/b/a/ AMEREN MISSOURI

CASE NO. GR-2019-0077

DIRECT TESTIMONY

OF

JANE E. EPPERSON

ON

BEHALF OF

MISSOURI DEPARTMENT OF ECONOMIC DEVELOPMENT

DVISION OF ENERGY

Jefferson City, Missouri

May 3, 2019

**BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI**


In the Matter of Union Electric Company)	File No. GR-2019-0077
d/b/a Ameren Missouri's Tariffs to Increase)	Tracking Nos. YG-2019-0112
Its Revenues for Natural Gas Service)	YG-2019-0113

AFFIDAVIT OF JANE E. EPPERSON

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

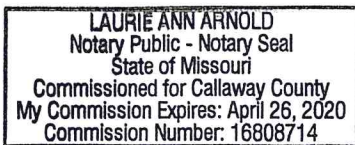
Jane E. Epperson, of lawful age, being duly sworn on her oath, deposes and states:

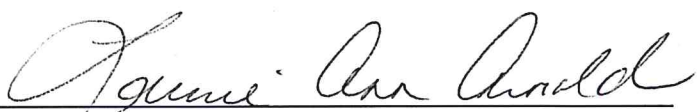
- 1. My name is Jane E. Epperson. I work in the City of Jefferson, Missouri, and I am employed by the Missouri Department of Economic Development as the Senior Energy Policy Analyst, Division of Energy.
- 2. Attached hereto and made a part hereof for all purposes is my Direct Testimony on behalf of the 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 E. Epperson

Subscribed and sworn to before me this 3rd day of May, 2019.





Notary Public

My commission expires: 4/26/20

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LIST OF ATTACHMENTS

- Attachment 1: Case No. ER-2014-0258 Nonunanimous Stipulation and Agreement
Regarding Supplemental Service Issues
- Attachment 2: Missouri Division of Energy Position Paper (November 10, 2015) Ameren
Standby Service Tariff
- Attachment 3: Case No. ER-2016-0179 Union Electric Company Electric Service,
Missouri Service Area, Rider SSR Standby Service Rider
- Attachment 4: Case Nos. ER-2018-0145 and ER-2018-0146 Non-Unanimous Partial
Stipulation and Agreement Conserving Rate Design Issues (related
excerpts only)
- Attachment 5: Case Nos. ER-2018-0145 and ER-2018-0146 Kansas City Power & Light
Company and KCP&L Greater Missouri Operations Company Standby
Service Riders, corrected and refiled February 12, 2019 for Missouri
Public Service Commission approval
- Attachment 6: Case No. EM-2016-0213 Amended Stipulation and Agreement as to
Division of Energy and Renew Missouri

1 **I. INTRODUCTION**

2 **Q. Please state your name and business address.**

3 A. My name is Jane E. Epperson. My business address is 301 W. High Street, Suite
4 720, PO Box 1766, Jefferson City, Missouri 65102.

5 **Q. By whom and in what capacity are you employed?**

6 A. I am employed by the Missouri Department of Economic Development – Division
7 of Energy (“DE”) as a Senior Energy Policy Analyst.

8 **Q. Please describe your educational background and employment experience.**

9 A. I received my Masters of Science in Geology from the University of Missouri-
10 Columbia and my Bachelor of Arts degree in Geology from Stephens College,
11 Columbia, Missouri. Since joining DE, I filed CHP testimony before the Missouri
12 Public Service Commission (“Commission”) in Case Nos. ER-2014-0370, ER-
13 2014-0351, ER-2014-0258, WR-2015-0301, SR-2015-0302, ER-2016-0179, GR-
14 2017-0215, EO-2018-0211, and ER-2018-0145/0146. In addition to providing
15 expert testimony for DE, I contributed to the development of the 2015 Missouri
16 Comprehensive State Energy Plan, served as project manager for development of
17 Missouri’s first statewide Technical Reference Manual, and participated in Missouri
18 Energy Efficiency Investment Act rule revision proceedings, and electric and
19 natural gas utility collaboratives. I currently chair the statewide natural gas
20 collaborative. Prior to my current position with DE, I served the Missouri
21 Department of Conservation for 15 years in various positions, including Supervisor
22 of the Policy Coordination Unit, which was responsible for statewide, regional, and
23 area planning and policy, statewide compliance with environmental and cultural

1 resource laws, Missouri River, Mississippi River and White River basin interstate
2 coordination, and human dimensions (surveys) research. Prior to my employment
3 by the Department of Conservation, I served as a hydrologist for five years for the
4 Missouri Department of Natural Resources, where I focused on interstate water
5 law, policy, and management issues.

6 **II. PURPOSE OF TESTIMONY**

7 **Q. What is the purpose of your Direct Testimony in this proceeding?**

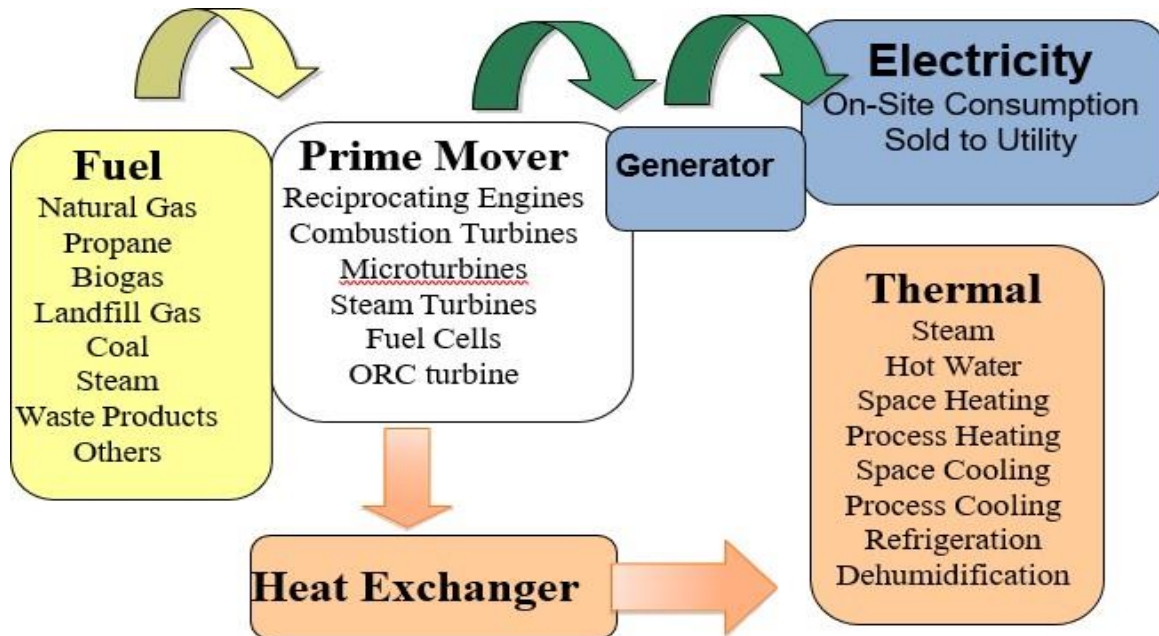
8 A. The purpose of my testimony is to a) describe combined heat and power (“CHP”)
9 technology and associated energy efficiency, economic, and resiliency benefits to
10 customers, b) summarize Commission case history on the issues of CHP, as well
11 as related efforts to support customer utilization of CHP, and c) recommend
12 implementation of a CHP outreach effort by Ameren Gas Company.

13 **III. COMBINED HEAT AND POWER**

14 **Q. What is CHP?**

15 A. CHP is an array of proven, commercially available technologies that concurrently
16 generate electricity and useful thermal energy from the same fuel source. CHP
17 results in a significant increase in energy efficiency over separate heat and power
18 systems because the thermal energy that is normally wasted is utilized. Figure 1
19 is a schematic that summarizes the basic elements of a CHP system. The figure
20 illustrates the diversity of fuel sources, prime movers, and thermal applications that
21 are available with CHP.

Figure 1. CHP System Schematic.¹



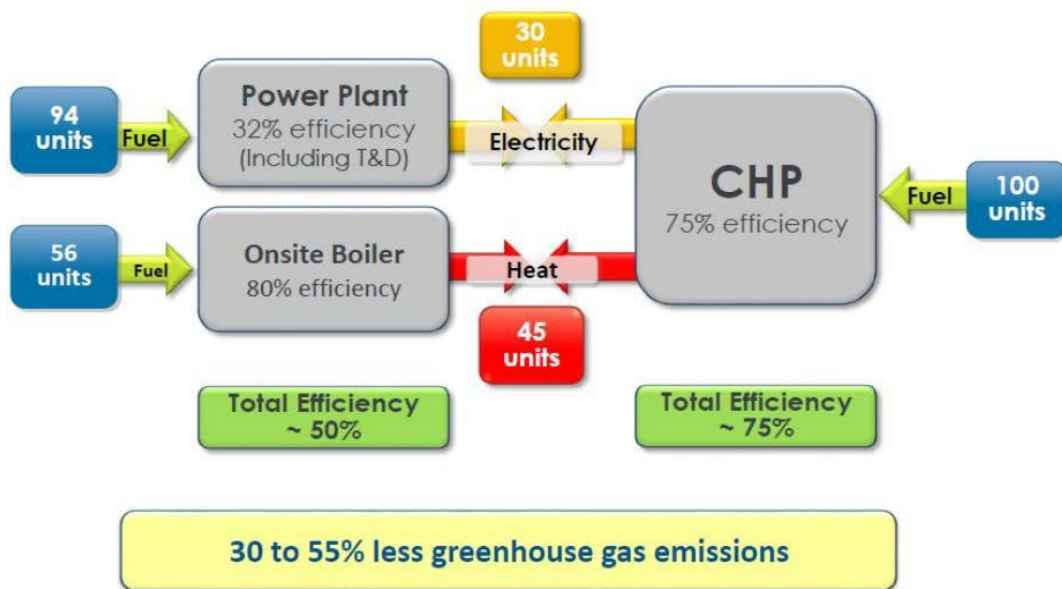
¹ Miller, Graeme. 2018. Understanding Standby Rates and their impact on Customer-Sited Combined Heat and Power Resources. U.S. Department of Energy Midwest CHP Technical Assistance Partnerships. Slide 9, presentation to the Midwest Cogeneration Associations May 17, 2018.

1 Q. How much energy does a CHP system save?

2 A. Figure 2 illustrates the efficiency achieved through the use of CHP.

3 **Figure 2. Energy Efficiency Comparison of CHP versus Separate Heat and Power Production.²**

CHP Recaptures Heat of Generation, Increasing Energy Efficiency, and Reducing GHGs



4 The left half of Figure 2 depicts separate heat and power production using two fuel
5 inputs, resulting in an overall efficiency of 50 percent. An example of separate heat
6 and power production would be a business owner who buys electricity from a utility
7 and has a boiler in the basement that provides hot water and space heating for

² Haefke, Cliff, 2018. Combined Heat and Power (CHP) for Missouri Institutional Facilities: Reducing Energy Costs, Lowering Emissions, and Increasing Resiliency. U.S. Department of Energy Central CHP Technical Assistance Partnerships. Slide 9, presentation to CHP for Resiliency of Critical Facilities Summit, April 10, 2018. <https://energy.mo.gov/chp-summit>

1 their facility. The right half of Figure 2 depicts CHP with the use of a single fuel
2 input, resulting in an overall efficiency of 75 percent. The CHP system produces
3 both electricity and heat from a single-fuel source, increasing energy efficiency by
4 25 percent.

5 **Q. What type of Ameren Missouri Gas customers might benefit from**
6 **consideration of a CHP system?**

7 **A.** Customers with a steady demand for both thermal and electrical energy are prime
8 candidates for utilization of CHP generation. Commercial sector candidates
9 include hospitals and nursing homes, public water and wastewater treatment
10 facilities, data centers, hotels, government facilities (federal, state, county, and
11 city) and universities and colleges. Industrial sector candidates include food and
12 beverage distributors as well as manufacturers of chemical, wood, agricultural, and
13 furniture products.

14 **Q. Is CHP a proven technology for which there is significant technical potential**
15 **for application in Missouri?**

16 **A.** Yes. CHP is a proven technology nationally.³ There are 19 CHP installations in
17 Missouri with a total capacity of 235 megawatts.⁴ The technical potential of CHP
18 in Missouri is 3,290 megawatts.⁵

³ U.S. Department of Energy CHP Installation Database, 2019. <https://doe.icfwebservices.com/chpdb/>.

⁴ Combined Heat and Power Installations in Missouri. 2019.
<https://doe.icfwebservices.com/chpdb/state/MO>.

⁵ U.S. Department of Energy Combined Heat and Power (CHP) Technical Potential in the United States, March 2016.

1 **Q. Why is there such a gap between the number of CHP customers and the**
2 **technical potential of CHP in Missouri?**

3 A. Lack of CHP deployment in Missouri is because of numerous factors including, but
4 not limited to: a lack of awareness of the energy efficiency, resiliency and economic
5 benefits that CHP can provide to businesses and communities; longer project lead
6 times compared to other energy efficiency measures; additional regulatory
7 complexity and cost, such as the impacts of standby service tariffs; lack of
8 Commission or legislative public policy support; lack of utility administered CHP
9 rebates or incentives; lack of favorable energy efficiency financing options; and
10 relatively few businesses that sell and service CHP equipment in Missouri.^{6,7}

11 **Q. What specific energy efficiency, resiliency and economic benefits can CHP**
12 **provide to businesses and communities?**

13 A. Utilization of CHP can provide numerous benefits, including: 1) reduced energy
14 consumption and associated fuel cost savings; 2) increased business and
15 community competitiveness, which can contribute to economic growth or deter
16 economic losses; and 3) increased system reliability and the reduction of
17 unplanned outages. Specifically, the significant (estimated 25 percent) total
18 process efficiencies CHP can provide compared to separate heat and power
19 systems correlate directly to reduced energy consumption and fuel costs.

⁶ Friedman, Julia and Garth Otto 2013 Combined Heat and Power: A Resource Guide for State Energy Officials. National Association of State Energy Officials.

<https://www.naseo.org/data/sites/1/documents/publications/CHP-for-State-Energy-Officials.pdf>.

⁷ Chittum, Anna and Nate Kaufman. 2011. Challenges Facing Combined Heat and Power Today: A State-by-State Assessment. pages 6-22, 51

<https://aceee.org/sites/default/files/publications/researchreports/ie111.pdf>.

1 Depending upon the facility, energy fuel costs may constitute a significant and
2 ongoing business expense. The real capital resulting from reduced fuel costs can
3 be reinvested or otherwise applied by a business or community to improve its
4 competitiveness and contribute to local and state economic vitality. A business or
5 community can save additional real capital by becoming more resilient – reducing
6 the frequency and duration of grid outages – through CHP application. A
7 Department of Defense national study reported approximately 127 utility outages
8 that lasted eight hours or longer in 2015, with a financial impact estimated to be
9 \$179,087 per day.⁸ A Ponemon Institute research report estimated the average
10 cost of unplanned outages for 67 data centers to be \$690,204 per incident.⁹ The
11 U.S. Department of Energy (“U.S. DOE”)’s Energy Sector Risk Profile for the state
12 of Missouri states that: a) Missouri electric transmission outages affect 1,660,305
13 customers 45 hours per year on average (2008-2013), b) electric distribution
14 outages caused by weather and falling trees affect 214,783 customers 45 hours
15 per year annually, and c) severe weather causes average property loss of \$58.9
16 million per year (1996-2014).¹⁰ CHP technologies are proven to be highly reliable
17 – not prone to outages – because of their on-site location (which eliminates
18 transmission and distribution outages) and high performance, as measured by
19 their “availability” parameter, which is the percent of time in a year that a CHP
20 system runs without an unplanned outage. Depending upon the specific prime

⁸ Department of Defense Annual Energy Management Report Fiscal Year 2015, 2016. Office of the Assistant Secretary of Defense. Pages 45-47.

⁹ 2013 Cost of Data Center Outages, 2013. Ponemon Institute. Pages 7-9.

¹⁰ https://energy.gov/sites/prod/files/2016/09/f33/MO_Energy%20Sector%20Risk%20Profile_2.pdf.

1 mover of the CHP, systems provide reliable and available service 72-99 percent
2 of the time.¹¹ CHP systems can be designed to provide continuous power, peak
3 load shaving, and back-up functions (ex: through the use of two, single-megawatt
4 systems instead of one, two-megawatt system).

5 **Q. Do other investor-owned utilities (“IOUs”) administer CHP programs?**

6 A. Yes. A recent national review of IOUs documented 20 CHP programs, 16 of which
7 were part of an energy efficiency portfolio in support of state energy efficiency
8 standards. The review reported five natural gas utilities with CHP programs:
9 Philadelphia Gas Works, Nicor Gas, SoCalGas, Southwest Gas, and UGI. About
10 half the utility-led CHP programs are offered as part of business-custom energy
11 efficiency programs, while the other half are standalone programs, which may
12 more fully address the specifics of CHP systems. The various IOU CHP programs
13 offer a wide range and combination of incentives, including: capacity incentives
14 from \$75-\$1,800/kW; production incentives from 2-30 cents/kWh for 12-18
15 months; up to 50-70 percent of total project cost; and 25-50 percent of feasibility
16 assessment costs.¹² For example, in Illinois, ComEd and Nicor Gas jointly offer 75
17 percent of the feasibility assessment cost (up to \$37,000) for a CHP system. In
18 addition, ComEd provides 7 cents per kWh without a cap, while Nicor Gas provides
19 \$1 per therm savings (capped at \$500,000).¹³

¹¹ U.S. Environmental Protection Agency Combined Heat and Power Partnership, 2017. Catalog of CHP Technologies, p.1-6.

¹² Kelly, M. and A. Hampson. 2018. ‘A National Review of Combines Heat and Power Programs in Utility Energy Efficiency Portfolios.’ Proceedings of the 2016 ACEEE Summer Study on Energy Efficiency in Buildings. Washington, DC: ACEEE. <https://aceee.org/files/proceedings/2018/#/paper/event-data/p113>.

¹³ *ibid*

**IV. SUMMARY OF CASE HISTORY TO SUPPORT CUSTOMERS WHO WOULD
BENEFIT FROM CHP**

1 **Q. Please summarize the case history specific to the CHP issue.**

2 A. Ameren Missouri's 2014 electric rate case (Case No. ER-2014-0258) resulted in a
3 Nonunanimous Stipulation and Agreement Regarding Supplemental Services
4 Issues in which Ameren Missouri committed to develop and file, in collaboration
5 with the signatories, a Standby Service Tariff by December 31, 2015 (Attachment
6 1). While the Company worked collaboratively, and the effort was productive with
7 regard to definitions, the signatories did not reach agreement regarding tariff
8 charges. The tariff elements that needed to be addressed for DE to agree to the
9 specific rates in the proposed Ameren Standby Service Rider ("SSR") were
10 detailed in the November 10, 2015 Position Paper (Attachment 2). The impasse
11 regarding the specific tariff charges remained. The Company filed a proposed
12 SSR, materially the same as the one resulting from the collaborative workshop
13 (except for the forced outage profile), in its next rate case (Case No. ER-2016-
14 0179). In that rate case, DE pursued the tariff rate elements detailed in the
15 November 10, 2015 Position Paper and testified that the rates proposed by
16 Ameren Missouri in the draft SSR were not based on accurate data and consistent
17 system-wide costing principles. In response to Data Request No. DED-DE 009,
18 Ameren Missouri stated that no studies had been done or existed to quantify the
19 difference in the cost of providing service to a CHP customer and a non-CHP
20 customer with similar load or other cost characteristics. Nonetheless, the
21 Commission approved the Company's proposed SSR, which is currently in effect

1 (Attachment 3). The Company provides a contact on its website through which
2 assistance is provided for using Excel-based tools to estimate the impact of the
3 Standby Service Rider tariff on a customer's bill, based upon inputted projected
4 load profiles and generation assumptions.¹⁴ In the recent Kansas City Power &
5 Light Company and KCP&L Greater Missouri Operations ("KC&PL and GMO") rate
6 cases (Case Nos. ER-2018-0145 and ER-2018-0146) Division of Energy filed
7 testimony by Ms. Barbara Meyer and myself regarding CHP and the need for a
8 cost-based SSR. An alternate Standby Service Rider was included in the Non-
9 Unanimous Partial Stipulation and Agreement Concerning Rate Design Issues
10 filed in those cases (Attachment 4). However, the SSRs that were filed and
11 approved at the conclusion of the case inadvertently had not been adjusted to
12 reflect the final revenue requirement. To address the oversight, KCP&L and GMO
13 filed corrected SSR tariffs for Commission approval (Attachment 5). The corrected
14 SSR tariffs are pending review by the Commission Staff at the time of this writing.
15 The Empire District Electric and Liberty Utilities merger Case No. EM-2016-0213
16 Amended Stipulation and Agreement as to Division of Energy and Renew Missouri
17 included a commitment by Empire to assist DE and the U.S. Department of Energy
18 Midwest CHP Technical Assistance Partnership ("CHP TAP") in completing an
19 outreach effort for screening potential CHP customers within the Empire District
20 Gas Company's ("Empire Gas") service territory in Missouri (Attachment 6). At no
21 cost to the customers or the Company, the resulting outreach effort created a

¹⁴<https://www.ameren.com/missouri/business/rates/electric-rates/rider-ssr>.

1 replicable process model, lessons learned, and positive response from those
2 customers contacted (see Table 1).

3 Table 1. CHP Technical Assistance Outreach to Empire Gas Utility Contacts

Facility Type	Sites Contacted	Completed Questionnaire	Good Candidates	Calls Completed	Screening Completed
Colleges/ Universities	2	2	2	1	1
Correctional	1	1	1	--	--
Healthcare	3	3	3	1	1
Manufacturing	5	4	4	2	2
Total	11	10	10	4	4

4 Outreach included calls from Empire Gas account managers to large volume
5 customers inviting them to discuss CHP with CHP TAP and inclusion of a bill insert
6 (trifold 8" X 10" flyer) referring customers to the Empire Gas website. The website
7 includes a pre-recorded, 10-minute webinar introduction to CHP, an invitation to a
8 live webinar, and CHP TAP contact information regarding the no-cost screening
9 service.

10 **Q. Has progress been made toward increasing the awareness of CHP solutions**
11 **to Missouri businesses who could benefit from them?**

12 A. Yes. In 2015, DE updated its public website with additional information about CHP
13 technologies and hyperlinks to reference resources¹⁵.

14 In 2018, DE and Spire Missouri Inc. co-hosted two CHP summits focused on
15 energy resiliency for critical facilities. Attendees affiliated with, and providing
16 services to, hospitals, universities and colleges, correctional facilities, and nursing

¹⁵ <https://energy.mo.gov/clean-energy/combined-heat-power>.

1 homes spent a day learning about the benefits of CHP. The participation of
2 sponsors and exhibitors with direct experience in CHP systems brought a breadth
3 of resources to the summits, benefiting all participants. SSM Health shared
4 experiences with resiliency and working with the CHP TAP on a CHP qualification
5 screening for DePaul Hospital. Each summit provided a program of speakers
6 coupled with an exhibit area and time for networking. A presentation entitled
7 “Valuing Energy Resiliency” by Jonathan Flannery, Senior Associate Director of
8 Advocacy for the American Society for Healthcare Engineering, was a particular
9 highlight of the western summit. Presentations and materials from both CHP
10 Summits are publically available through DE’s website.¹⁶

11 **Q. Are any efforts applicable to Ameren Gas customers underway to address**
12 **the perception of risk associated with capital investment in CHP?**

13 A. Yes. In recognition of the significant energy efficiency and resiliency benefits of
14 CHP, the U.S. DOE Packaged CHP Accelerator program was created to a)
15 develop a national web-based catalog of U.S. DOE-recognized packaged CHP
16 suppliers and b) validate that packaged system installations save 20 percent or
17 more of project costs and 30 percent of project time when compared to individually
18 engineered CHP applications.¹⁷ Many CHP applications require design and
19 engineering tailored to the specific facility and are assembled onsite. As CHP
20 deployment increases, it has become apparent that different facilities might share
21 similarities in size, operations, configurations, and energy usage. In response,

¹⁶ <https://energy.mo.gov/chp-summit>.

¹⁷ <https://betterbuildingsinitiative.energy.gov/accelerators/packaged-chp>.

1 manufacturers have started offering “factory-built” CHP systems that eliminate
2 many of the site-specific engineering requirements and associated costs. The
3 packaged CHP systems reduce customer uncertainty regarding performance,
4 shorten installation time, streamline permitting, reduce design errors, and reduce
5 the overall cost. Because of the economic development potential of CHP to benefit
6 Missouri businesses, DE is participating in the Packaged CHP Accelerator
7 Program as an engagement partner. DE is encouraging packaged CHP suppliers
8 to expand their service territories to include Missouri and will promote utilization of
9 the newly created national eCatalog of recognized packaged CHP suppliers¹⁸
10 through information on DE’s website.

11 **Q. Are any federal incentives available to Ameren Missouri Gas customers for**
12 **CHP?**

13 A. Yes. The Federal Business Energy Investment Tax Credit was extended to 2021
14 and provides a 10 percent tax credit for the purchase of CHP projects with no
15 maximum limit on total cost.¹⁹

16 **Q. Does CHP qualify for financing through the state’s Energy Loan Program?**

17 A. Yes. The Energy Loan Program is administered by DE and provides low-interest
18 loans for energy efficiency projects, including CHP.²⁰

¹⁸ <https://chp.ecatalog.industrialenergytools.com/>.

¹⁹ <http://programs.dsireusa.org/system/program/detail/658>.

²⁰ <https://energy.mo.gov/assistance-programs/energy-loan-program>.
<https://energy.mo.gov/sites/energy/files/emlp-fact-sheet.pdf>.

1 **Q. Is CHP an eligible measure in Ameren Electric's Business Custom Energy**
2 **Efficiency Program?**

3 A. Yes.

4 **V. RECOMMENDATION**

5 **Q. What is your recommendation in this case regarding CHP?**

6 A. DE recommends that the Company complete a CHP outreach effort similar to that
7 which was approved by the Commission in Case No. EM-2016-0213. Specifically,
8 within one year of the conclusion of this rate case, DE recommends that Ameren
9 Missouri Gas complete a CHP outreach effort supported by DE and the CHP TAP²¹
10 at little to no monetary cost to the Company or the customers. The proposed
11 process includes the following:

12 (i) Ameren Missouri Gas will identify non-residential customers that receive both
13 gas and electric service from Ameren Missouri, as well as municipalities served by
14 Ameren Gas where the municipality's electrical system may be constrained. From
15 this subset of Ameren Gas customers, the Company will develop a list of
16 customers with a steady demand for both thermal and electrical energy throughout
17 the year. Examples of customers that are good candidates for CHP include
18 hospitals, large residential facilities, such as nursing homes or correctional
19 facilities, universities and colleges, government emergency facilities, and industrial
20 manufacturers.

²¹ <http://www.midwestchptap.org/>.

1 (ii) Ameren Missouri Gas will review CHP outreach products previously created by
2 the CHP TAP and publish selected products on the Company's website in a
3 location that is easily accessible by customers. Products include an informational
4 flyer, CHP Screening Survey, Project Profiles, pre-recorded Introduction to CHP
5 video, announcement of a live webinar, example bill insert, and additional resource
6 hyperlinks.

7 (iii) Ameren Missouri will contact customers identified in step (i) to alert them to
8 new information on its website that may be of particular interest to them and offer
9 to facilitate a complimentary, confidential CHP screening survey by the CHP TAP.
10 Initial contact may be by email or postal mail, followed by a personal conversation.
11 With the customer's agreement, Ameren Missouri will authorize CHP TAP to
12 contact the customers and complete a complimentary, confidential CHP Screening
13 Survey.

14 (iv) Ameren Missouri and CHP TAP will coordinate to obtain load data for those
15 customers interested in a CHP Screening Survey.

16 (v) CHP TAP will perform the complimentary, confidential CHP Screening Surveys.

17 (vi) CHP TAP will provide survey reports to the customers and offer a follow-up
18 conversation to discuss potential next steps and additional CHP TAP services.

19 (vii) CHP TAP will provide Ameren Missouri with a final report of all survey results,
20 with information aggregated to a level that does not disclose customer-specific
21 information. Ameren Missouri will share the final report with interested
22 stakeholders, including DE, staff, and the Office of Public Counsel.

1 **Q. Does this conclude your Direct Testimony?**

2 A. Yes.