Exhibit No.:	
Issues:	Energy Efficiency and Water Loss Reduction Deferral Mechanism
Witness:	Jane Epperson
Sponsoring Party:	Missouri Department of Economic Development - Division of Energy
Exhibit Type:	Direct Testimony
Case No:	WR-2015-0301 and SR-2015-0302

MISSOURI PUBLIC SERVICE COMMISSION

MISSOURI-AMERICAN WATER COMPANY

CASE NO. WR-2015-0301
CASE NO. SR-2015-0302

DIRECT TESTIMONY

OF

JANE EPPERSON

ON

BEHALF OF

MISSOURI DEPARTMENT OF ECONOMIC DEVELOPMENT

DIVISION OF ENERGY

Jefferson City, Missouri
December 23, 2015

(Revenue Requirement)

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Missouri American Water Company's Request for Authority to Implement a General Rate Increase for Water and Sewer Service Provided in Missouri Service Areas	))))	WR-2015-0301 and SR-2015-0302

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 as an 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 Epperson

Subscribed and sworn to before me this 23rd day of December, 2015.

Melissa Ann Adams
Notary Public

My commission expires:

MELISSA ANN ADAMS
Notary Public - Notary Seal
State of Missouri
Commissioned for Cole County
My Commission Expires: March 09, 2019
Commission Number: 15633820

MELISSA ANN ADAMS NOTARY PUBLIC NOTARY SEAL COMMISSION #15633820 COLE COUNTY STATE OF MISSOURI MY COMMISSION EXPIRES 03/09/2019

TABLE OF CONTENTS

I. INTRODUCTION

Q. Please state your name and business address.

A. Jane Epperson, Missouri Department of Economic Development, Division of Energy, 301 West High Street, Suite 720, Jefferson City, Missouri 65102.

Q. Have you previously filed testimony in this case?

A. No.

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 Bachelor of Arts degree in Geology from Stephens College, Columbia, Missouri and my Masters of Science in Geology from the University of Missouri-Columbia.

I began work with the Missouri Department of Economic Development, Division of Energy, as an Energy Policy Analyst in September, 2014. I have written testimony in rate cases for Ameren Missouri, Kansas City Power & Light, and Empire District Company. I participated in development of the recently released State Comprehensive Energy Plan, specifically the Energy and the Environment Chapter. I participated in the technical collaborative led by Ameren Missouri to develop a Standby Service Tariff that is cost-based and does not discriminate against Combined Heat and Power (CHP) Cogeneration customers. Over the next two years, I will be directly involved in a collaborative project that will result in production of the Missouri Statewide Technical Reference Manual. Prior to working for the Missouri Department of Economic

Development I served fifteen years with the Missouri Department of Conservation in progressively more responsible positions, from Policy Analyst to Policy Coordinator to Supervisor of the Policy Coordination Unit within the Director's Office. As Supervisor of the Unit for six years, I led an interdisciplinary team of high-level professionals who, on behalf of the Agency, coordinated environmental and cultural resource compliance, strategic, regional and area planning, statewide area management policy, human dimensions, and inter- state river basin resource coordination. Prior to working with the Missouri Department of Conservation, I served five years for the Missouri Department of Natural Resources, establishing a Statewide Wetland Advisory Council and resulting policies and recommendations, providing technical assistance to local communities participating in the National Flood Insurance Program and, finally in the Director's office, focusing on inter and intra state water policy and management issues.

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

A. I reviewed the direct testimony of Frank L. Kartmann, Philip C. Wood, Kevin H. Dunn, Gregory P. Roach, Karl A. McDermott, and Jeanne M. Tinsley, filed on behalf of the Missouri American Water Company (MAWC). I reviewed the Company's website looking for energy and water efficiency programs and rebates available within their national territory. I reviewed the Company's response to Staff's Data Request 198. I reviewed information from numerous sources on opportunities for increasing energy efficiency and water loss reduction in water and wastewater systems. Specific sources are cited within this testimony.

II. PURPOSE AND SUMMARY OF TESTIMONY

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to present the Division of Energy's recommendation for the PSC to authorize MAWC to defer costs associated with up to $100M (cap) in incremental investments in infrastructure to promote supply-side energy efficiency and water loss reduction made prior to the next general rate proceeding. The authorization would apply to investments made in excess of $100M (threshold annual investment) per year. A deferral mechanism to promote supply-side energy efficiency and water loss reduction will facilitate necessary and timely investments in supply-side infrastructure.

Q. Does DE also propose to address demand-side efficiency?

A. Yes. Missouri Division of Energy witness Martin Hyman will address demand-side energy efficiency initiatives.

III. SUPPLY-SIDE ENERGY EFFICIENCY AND WATER LOSS REDUCTION

Q. Why is special attention to supply-side energy efficiency prudent?

A. Water and wastewater supply processes are energy-intensive. Large pumps, motors, drives and other equipment associated with water and wastewater facilities draw energy twenty- four hours a day, seven days a week. The U.S. Environmental Protection Agency estimates energy costs account for 25-30% of total operating costs for water and wastewater utilities.[1] Significant energy is required to move water through each of the three infrastructure components: pumping stations, treatment facilities, and the distribution system.

[1] U.S. Environmental Protection Agency. 2013a. Water: Sustainable Infrastructure: Cutting Energy Usage and Costs.

Pumping stations exist on the front and back end of the water treatment process. In Missouri, MAWC operates 432 pump stations.[2] Large pumps are used to move untreated water from an aquifer or surface stream or reservoir to the treatment facility. Large pumps are then used for moving the water, after being treated, to the distribution system. Pumping has been estimated to constitute over 80% of the total energy used by a potable water utility.[3]

Once delivered to the treatment facility, of which MAWC has 11 water treatment facilities and 46 mechanical wastewater treatment facilities,[4] energy is required to power the equipment that tests for and removes contaminants to meet federal and state water quality standards. Electricity accounts for almost all energy used in public water systems to operate mechanical pumps, filtration, flocculation, and chemical treatment.[5] While wastewater systems may utilize some natural gas for space heating and heating of anaerobic digesters, electricity is the main energy source for pumping, dewatering, air compression, aeration, and filtration.[6]

Energy is also required in the third infrastructure component—delivery of the water to customers through pipes under pressure. For drinking water, this amounts to over 6,700 miles of transmission and distribution mains.[7] Energy is required to create and maintain that water pressure twenty-four hours a day, seven days a week. The American Council

[2] Kartmann, Frank, Direct Testimony, 2015, July 31, Case No. WR-2015-0301, SR-2-15-0302, page 5, line 20.
[3] Copeland, C. 2014. Energy-Water Nexus: The Water Sector's Energy Usage. January 3. Washington, DC: Congressional Research Service.
[4] Kartmann, Frank, Direct Testimony, 2015, July 31, Case No. WR-2015-0301, SR-2-15-0302, page 5, line 13.
[5] Cairns, K. 2005. Bringing Energy Efficiency to the Water & Wastewater Industry: How Do We Get There?" Presented at the Water Environment Federation's Annual Technical Exhibition and Conference, Washington, DC. November 2.
[6] Hamilton, G.,C. Arzbaecher, R. Ehrhard, and J. Murphy. 2009. Driving Energy Efficiency In the U.S. Water & Wastewater Industry by Focusing on Operating and Maintenance Cost Reductions. ACEEE Industrial Energy Efficiency Summer Study Proceedings.
[7] Kartmann, Frank, Direct Testimony, 2015, July 31, Case No. WR-2015-0301, SR-2-15-0302, page 5, line 20.

for an Energy Efficient Economy (ACEEE) and the National Association of Water Companies (NAWC) surveyed NAWC member companies, which includes Missouri American Water, regarding the amount of energy use to obtain, treat and distribute water. The survey measured energy usage in three categories: water source and conveyance, water treatment, and water distribution. Water intensity ranged from 0 – 2,800 kWh/million gallons, with an average of 2,300 kWh/million gallons.[8] The range reflects a number of variables, including:

water source: ground water requires additional energy to pump it to the surface, compared to surface water source such as a river or reservoir.

water travel distance: the longer the pipe, the greater the energy required to pump it.

topography: the larger the cumulative increase in elevation between transmission or distribution points, the greater the energy needed to, in essence, move the water uphill.

utility size: economy of scale applied in which larger pumps and motors generally run more efficiently than smaller ones.

Q. Can you provide examples of projects undertaken in Missouri to reduce supply-side energy use?

A. Yes. The City of O'Fallon participated in a pilot project called the Missouri Water Utilities Partnership (MOWUP) Energy Management Initiative for Water and Wastewater Utilities, with a goal of reducing energy consumption by 10% by 2014 (from

[8] Young, Rachel, 2015. A Survey of Energy Use in Water Companies, American Council for an Energy Efficient Economy.

2009 baseline).[9] Through this pilot project, 1) an energy audit was conducted at the city's wastewater treatment plant, 2) EPA's free online energy management tool, Portfolio Manager, was adopted to track energy use and costs, 3) aeration blowers at the wastewater treatment plant were replaced with turbo blowers that are 10 – 20% higher efficiency, 4) energy efficient panel diffusers were incorporated into the wastewater aeration system, 5) 12,000 older water meters were replaced with radio transmitter technology that can be read remotely, which is expected to increase meter reading accuracy to 98.5 % (older water meters tend to under report actual usage).[10] The aeration equipment upgrades cost $450,000 and are expected to save the city $53,000 per year. The city learned of and received a $367,000 grant from the Missouri Department of Natural Resources for the project, which reduced the payback period to two years. The pilot project also resulted in implementation of a leak detection program which reduced unaccounted water loss by 5% (and associated savings in electricity and chemical treatment costs).

Other examples of projects undertaken to reduce energy use at wastewater treatment facilities include the Pulaski County Sewer District utilizing the Division of Energy's Energy Loan Program in 2013 to replace inefficient pumps at six lift stations with new, more efficient pumps resulting in $11,211 annual energy savings. The Energy Loan Program also assisted the City of Harrisonville in upgrading their blower, lagoon pump,

[9] U.S. Environmental Protection Agency, 2013. Energy Efficiency in Water and Wastewater Facilities, Local Government Climate and Energy Strategy Series, A Guide to Developing and Implementing Greenhouse Gas Reduction Programs. pp 32-33.
[10] Ibid

basin motor and variable frequency drive raw water pump to save approximately $42,833 in annual energy costs.[11]

Q. As pumping is a common and energy-intensive function of both water and wastewater systems, are there opportunities for significant increases in energy efficiency there?

A. Yes. Conventional practices may be used to save energy (and money) during the pumping process by proper pump operations, variable frequency drives, efficient pump motors, in-line turbines, hydraulic modeling, and appropriate distribution system piping.[12]

Q. Why is special attention to reducing water loss necessary?

A. The Environmental Protection Agency estimates that 16% of water is lost through the system before it can be utilized by customers.[13] In response to PSC Staff Data Request 198 for this case, MAWC provided water audit reports for 2013 and 2014 for the municipalities of Brunswick, Jefferson City, Joplin, Mexico, Parkville, St. Charles, St. Joseph, St. Louis County, and Warrensburg. The 2013 MAWC water loss audit report indicated a range from 10.3 % to 22.9% loss of water supplied, at a total lost cost of $3,844,120.[14] The 2014 MAWC water loss audit report indicated a range from 6.4% to 23.8% loss of water supplied, at a total lost cost of $4,442,689.[15] The percent loss of water supplied data do not reflect the one and one quarter percent loss deemed for authorized consumption including firefighting and training, flushing of mains and sewers,

[11] Missouri Department of Economic Development, Division of Energy ,Missouri Comprehensive State Energy Plan, page 93 (2015, October). Pp 93-94. Retrieved from https://energy.mo.gov/energy/docs/MCSEP.pdf
[12] Water Research Foundation, Strategies to Save Energy During the Pumping Process. Retrieved from http://www.waterrf.org/knowledge/energy-management/FactSheets/EnergyMgt-EEPumping-FactSheet.pdf
[13] U.S. Environmental Protection Agency. 2013c. Water Audits and Water Loss Control for Public Water Systems.
[14] Company response to Staff Data Request 198.
[15] Ibid

street cleaning, watering of municipal gardens, public fountains, etc. Nor does it reflect the one quarter of one percent deemed loss for inaccuracies associated with customer metering and data handling errors. "Lost" water carries with it the significant energy costs associate with extraction, treatment and transportation. This wasted energy from lost water costs the Company money without yielding any revenue, is not available to customers, and increases the cost to provide water, the cost of which is passed on to consumers in rate cases such as this one.

Q. Can you provide an example of a project undertaken to reduce water loss through supply-side system optimization?

A. Yes. The Leak Detection Pilot Program was launched in 2008 by Southern California Edison to help water utilities audit their distribution systems for leaks and make repairs. The pilot program was implemented over 18 months with a $300,000 budget allocated by the California Public Utilities Commission.[16] The pilot program is a good example of a water savings program that acknowledges the value of saving energy costs embedded in water. Water audits on three relatively small sized municipal water systems (Las Virgenes Municipal Water District, Apple Valley Ranchos Water Company, and Lake Arrowhead Community Services District), were completed by Water System Optimization, Inc. (WSO). WSO calculated the economically recoverable leakage by correlating expenditures for leakage control with the avoided cost to the utility from water loss. WSO's analysis estimated that 60 – 116 million gallons per year in leakage, resulting in between $69,368 - $502,380 in annual avoided costs, could be recovered cost effectively. The annual budget estimated to achieve the savings ranged from $27,500 -

[16] Young, Rachel and Eric Mackres, 2013. Tackling the Nexus: Exemplary Programs that Save Both Energy and Water, American Council for an Energy Efficient Economy, Report Number E131, page 50.

$40,000.[17] Although only three water agencies participated in the pilot, WSO estimated that if a similar program were to be applied elsewhere, the energy and water savings could be large. They estimated that, in California, around one third of the water losses through distribution pipes could be cost-effectively prevented.

Q. What other ways is supply-side water "lost" besides leakage from transmission and distribution lines?

A. Water can also be lost via leakage or overflowing of water storage tanks, of which MAWC has 119 in Missouri.[18]

Q. Does a mechanism already exist to incent the Company to replace old, potentially leaky, infrastructure?

A. Yes. An infrastructure system replacement surcharge (ISRS) was approved by the Missouri PSC for the St. Louis County of MAWC in 2003 and adjusted in 2006 (Case No. WO-2007-0272) and 2015 (Case No. WO-2015-0211). St. Louis County residential customers now pay approximately seven and six tenths cents per 100 gallons of water used.[19] The ISRS is used to replace water mains and hydrants that are deteriorated, to clean and/or reline mains, and to manage relocations due to a public works project.

[17] Ibid
[18] Kartmann, Frank, Direct Testimony, 2015, July 31, Case No. WR-2015-0301, SR-2-15-0302, page 5, lines 19-20.
[19] Missouri Public Service Commission, 2015 Press Release (PR-15-156). Accessed on December 18, 2015. http://psc.mo.gov/WaterSewer/Missouri-American_Infrastructure_System_Replacement_Surcharge_Change_Approved

Q. Is St. Louis County the only geography in Missouri in need of infrastructure replacement?

A. No. The Company anticipates that, by January 31, 2016, MAWC will invest $215 million in capital improvements outside of the ISRS.[20]

Q. Would the deferral mechanism you are recommending begin to address the infrastructure replacement needs in other parts of the state?

A. Yes, it could. The proposed deferral mechanism would allow costs associated with infrastructure improvements to be recovered in a more comprehensive manner. The costs will be offset by savings associated with reduced energy costs and increased system efficiency.

Q. You recommend that MAWC be authorized to defer costs associated with up to $100M (cap) in incremental investments in infrastructure to promote supply-side energy efficiency and water loss reduction made prior to the next general rate proceeding. How does this level of investment compare to MAWC's past level of investment?

A. MAWC witness Kevin Dunn reports that MAWC will have invested just over $436M from January 2012 to January 2016. The proposed cap on supply-side energy efficiency and leak reduction represents less than 25% of the historic four year investment. DE views this level of incremental investment as both reasonable and significant.

[20] Kartmann, Frank, Direct Testimony, 2015, July 31, Case No. WR-2015-0301, SR-2-15-0302, page 13, line 10.

Q. You recommend that the authorized deferral apply to investments made in excess of $100M (threshold annual investment) per year. Why do you recommend a threshold level of investment be required?

A. Requiring that the authorized deferral apply to investments made only in excess of $100M (threshold annual investment) per year is designed to ensure that this mechanism promotes additional investment in supply-side energy efficiency and water loss reduction rather than providing a deferral for an average level of investment.

Q. How would you recommend that MAWC identify projects for recovery under the deferral mechanism?

A. As pumping is the largest energy user in both water and wastewater systems, DE recommends starting with pumping stations. One of many ways to identify specific facilities is to utilize the U.S. Environmental Protection Agency's Energy Use Assessment Tool, a free Excel-based program, to identify energy-intensive processes such as pumping and aeration in water and wastewater systems.[21] When assessing a specific facility, signs of inefficiency include: pumps with high maintenance requirement, oversized pumps operating in a throttle condition, cavitation or badly worn pumps, throttled control valves, pumping systems with large flow rate and pressure variations, pumping systems with bypass flow.

Q. Do you recommend that MAWC report on projects?

A. Yes, DE recommends that once potential projects have been identified, MAWC should report to Staff, Office of Public Counsel, and DE to share and discuss the merits of the projects.

[21] http://www3.epa.gov/region9/waterinfrastructure/docs/energy_use_assess_tool_presentation.pdf

Q. What cost should be deferred for potential future recovery?

A. Potential cost should include a return on capital investment, and depreciation expense.

Q. Should continuation of the deferral mechanism be reviewed in the next general rate proceeding?

A. Yes. The mechanism should be reviewed during the next general rate proceeding to ensure a need still exists to encourage greater investment in energy efficiency and water loss reduction.

Q. How would the proposal benefit MAWC's customers?

A. Increased supply-side energy efficiency and water loss reduction can benefit customers because energy usage is a large component of water and wastewater operations, and energy not used amounts to a reduction in the cost of production which can be passed along to the customer through lower rates.

Q. How would the proposal benefit the state?

A. The state of Missouri can benefit from the creation of a mechanism to address an important and ongoing need for water and wastewater infrastructure replacement, linked to energy efficiency and water loss reduction. Reduced energy use by the Company also benefits the state by reducing the need for additional energy generation sources and a reduction in associated air emissions.

IV. CONCLUSION

Q. Please restate your recommendation.

A. The Division of Energy's recommendation is that the PSC authorize a supply-side energy efficiency and water loss reduction deferral mechanism to facilitate necessary and timely investments in supply-side infrastructure. MAWC should be authorized to defer costs

associated with up to $100M (cap) in incremental investments in infrastructure to promote supply-side energy efficiency and water loss reduction made prior to the next general rate proceeding. The authorization should apply to investments made in excess of $100M (threshold annual investment) per year.

Q. Does this conclude your direct testimony?

A. Yes, thank you.