

BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

DIRECT TESTIMONY OF

Gregory M. Vaudreuil

ON BEHALF OF THE
RETAIL ENERGY SUPPLY ASSOCIATION
AND NRG ENERGY, INC.

Docket No. R-2021-3023618

UGI Utilities, Inc. – Electric Division
2021 Base Rate Proceeding

TOPIC:
Energy Storage

May 3, 2021

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1 **I. INTRODUCTION**

2 **Q. PLEASE STATE YOUR NAME.**

3 A. Gregory M. Vaudreuil.

4 **Q. PLEASE STATE YOUR CURRENT EMPLOYER AND TITLE.**

5 A. I am currently the CEO of Mosaic Power. I have been the CEO of Mosaic Power since co-
6 founding the company in 2011.

7 **Q. WHAT IS YOUR BUSINESS ADDRESS?**

8 A. My business address is 45 East All Saints Street, Frederick, Maryland 21701.

9 **Q. PLEASE SUMMARIZE YOUR BACKGROUND AND EXPERIENCE.**

10 A. In 2011, I co-founded Mosaic Power to create a virtual power plant using residential-scale,
11 electric resistance water heaters and the associated network. Mosaic Power’s Water Heater
12 Efficiency Network (“WHEN”) manages the demand of thousands of residential water as
13 a grid-scale energy storage asset. The WHEN can provide to PJM many of the same
14 competitive wholesale services as conventional generators and grid-connected batteries.
15 Mosaic has a primary focus on the high-value Frequency Regulation (“FR”) market.

16 Mosaic Power’s competitive technology is based on the knowledge and experience
17 from my 20-year experience in the telecom and internet technology industry. Before
18 founding Mosaic Power, I was employed in various senior technology, marketing, and
19 consulting roles at Alcatel-Lucent. In these roles, I used Internet communications
20 technology to provide messaging services to millions of mobile customers. It was this
21 experience that made it possible to design and market a system that today delivers 15
22 megawatts of fast-response FR by aggregating the control of thousands of residential water
23 heaters. 1.4MW of this capability is deployed in Pennsylvania.

1 I graduated from Duke University with a degree in Electrical Engineering and
2 Public Policy in 1989. My early career began creating standards for the then young
3 internet, and grew into a technical career earning over 20 patents in telecommunications
4 and distributed electrical generation. Prior to founding Mosaic Power, my roles include
5 product management, strategic consulting including mergers and acquisitions, practical
6 training useful when co-founding Mosaic Power in the rapidly evolving energy market. At
7 Mosaic Power, I have contributed substantial research as an active participant in the PJM
8 frequency regulation senior task force.

9 **Q. HAVE YOU EVER PROVIDED TESTIMONY BEFORE THIS COMMISSION?**

10 A. No.

11 **Q. HAVE YOU PROVIDED TESTIMONY IN UTILITY PROCEEDINGS IN OTHER**
12 **STATES?**

13 A. I have provided testimony in Maryland before the Public Service Commission.

14 **II. OVERVIEW AND SCOPE OF TESTIMONY**

15 **Q. ON WHOSE BEHALF ARE YOU TESTIFYING?**

16 A. I am testifying on behalf of the Retail Energy Supply Association (“RESA”) and NRG
17 Energy, Inc. (“NRG Energy”).

18 **Q. PLEASE DESCRIBE THE RETAIL ENERGY SUPPLY ASSOCIATION.**

19 A. Retail Energy Supply Association (“RESA”) is a trade association of energy companies
20 including Pennsylvania licensed electric generation suppliers (“EGSs”), many of whom
21 either offer or have relationships with third party providers that develop and offer electric
22 storage options and/or electric vehicle charging infrastructure.¹

¹ The comments expressed in this filing represent the position of the Retail Energy Supply Association (“RESA”) as an organization but may not represent the views of any particular member of the Association. Founded in 1990, RESA is a broad and diverse group of retail energy suppliers dedicated to promoting

1 **Q. PLEASE DESCRIBE NRG ENERGY, INC.**

2 A. NRG Energy is a leading integrated power company built on dynamic retail brands and
3 diverse generation assets. A Fortune 500 company, NRG Energy brings the power of
4 energy to consumers by producing, selling and delivering electricity and related products
5 and services to consumers in competitive markets across the U.S. and Canada, as well as
6 23,000 MW of electric power generation including nuclear, coal, gas, oil and solar
7 nationwide. NRG Energy’s retail brands serve more than six million customers across
8 North America, including a significant share in Pennsylvania – so significant, in fact, that
9 NRG Energy’s northeast retail business is headquartered in Philadelphia. We have several
10 licensed retail electricity suppliers that are actively serving residential, commercial,
11 industrial and institutional customers.² NRG Energy’s retail companies offer customers a
12 range of products including demand response and energy efficiency, 100% renewable
13 energy, energy plans bundled with energy efficiency technology, such as Nest or Hive
14 thermostats, as well as loyalty rewards and our charitable giving products through our
15 “Choose to Give” plans.

16 **Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?**

17 A. The purpose of my testimony is to address UGI Utilities, Inc. – Electric Division’s (“UGI
18 Electric” or “Company”) proposed battery storage project. In addressing the Company’s

efficient, sustainable and customer-oriented competitive retail energy markets. RESA members operate throughout the United States delivering value-added electricity and natural gas service at retail to residential, commercial and industrial energy customers. More information on RESA can be found at www.resausa.org.

² NRG’s license retail supply companies include: Reliant Energy Northeast LLC d/b/a NRG Home/NRG Business A-2010-2192350; Green Mountain Energy Company A-2011-2229050; Energy Plus Holdings LLC A-2009-2139745; XOOM Energy New Jersey, LLC A-2012-2283821; Stream Energy New Jersey, LLC A-2010-2181867; Direct Energy Services, LLC A-110164; Direct Energy Business, LLC A-110025; Direct Energy Business Marketing, LLC A-2013-2368464; and Gateway Energy Services Corporation A-2009-2137275.

1 battery storage proposal, I will discuss the Direct Testimony of UGI Electric witnesses Eric
2 W. Sorber and John D. Taylor. In my testimony, I describe the positions of RESA and
3 NRG Energy with respect to issues raised by UGI Electric's battery storage proposal.

4 RESA and NRG Energy support the general policy objective of utilizing battery
5 storage to enhance reliability and resiliency within UGI Electric's distribution system.
6 However, RESA and NRG Energy oppose UGI's proposal to require all distribution
7 customers to pay for its battery storage proposal. Because battery storage is at its heart a
8 generation function that would best be provided by the competitive market, I am advised
9 by counsel that permitting UGI's proposal to recover the costs of its proposal from all
10 distribution ratepayers is inconsistent with the Electricity Generation Customer Choice and
11 Competition Act, 66 Pa. C.S. § 2801, et seq., ("Competition Act"). Apart from legal
12 considerations, battery storage options provided by the competitive market serves good
13 public policy from a consumer perspective. Allowing utilities to use ratepayer money to
14 fund generation projects such as this that can and should be provided by the competitive
15 market leads to inefficient cost allocations ultimately costing ratepayers more money than
16 necessary and crowding out the market for competitive products leaving consumers
17 without the benefit of competitive market alternatives. Battery storage solutions are an
18 important forward-looking part of the developing electricity market and the optimal way
19 for Pennsylvania to ensure that its consumers are receiving the best value and products in
20 this space is to support competitive market development of battery storage solutions.
21 Approving UGI Electric's proposal here will not lead to that result and, in fact, will stymie
22 such development.

1 **Q. WHAT IS YOUR RECOMMENDATION REGARDING UGI ELECTRIC'S**
2 **BATTERY STORAGE PROPOSAL?**

3 A. I recommend that it be rejected. If the Commission permits UGI's proposal, then at a
4 minimum it must reject UGI Electric's plan to participate in PJM's Wholesale Energy and
5 Ancillary Services markets including Frequency Regulation ("FR") Market while the
6 battery is in grid-connected mode. Participation in PJM's FR Market by a rate-based
7 distribution asset performing the functions of a generation asset will distort the market for
8 energy storage and may delay the goal of widespread adoption of battery technology within
9 UGI's territory. It will also lead to a faster depletion of the asset that may ultimately cost
10 ratepayers more money particularly given that the Market D clearing price is – as explained
11 by UGI Witness Taylor – “fairly volatile.” (UGI Statement No. 6 at 46).

12 **III. UGI ELECTRIC'S BATTERY STORAGE PROPOSAL**

13 **Q. WOULD YOU PLEASE EXPLAIN UGI ELECTRIC'S PROPOSED BATTERY**
14 **STORAGE PROJECT?**

15 A. UGI Electric plans to interconnect a 1.25MWh energy storage battery into its distribution
16 system near Wapwallopen, PA to enhance the reliability of its service to 67 customers.
17 (UGI Statement No. 3 at 25–27). The Company expects the project will cost approximately
18 \$1.5 million. (UGI Statement No. 3 at 26). According to Mr. Sorber's Direct Testimony,
19 the battery storage system is designed to support the expected peak load of the 67 customers
20 for approximately four hours.³ (UGI Statement No. 3 at 26). UGI Electric chose the circuit
21 near Wapwallopen because the customers on the circuit experienced multiple interruptions
22 in recent years and geographical restraints to traditional reliability improvements.

³ Mr. Sorber also claims that the four-hour duration can be extended for outage events, which would occur during non-peak periods.

1 The Company also hopes to recover some of the costs of the battery storage project
2 by participating in PJM’s wholesale market. Specifically, UGI Electric expects to use the
3 battery storage project in PJM’s FR Market while the battery is in grid-connected mode.
4 (UGI Statement No. 3 at 28). Initially UGI Electric resisted providing an estimate of the
5 level of revenues from participation in the PJM frequency regulation market but during
6 discovery has offered the estimate of revenue from the FR Market to be \$88,653/year,
7 totaling \$1.3 million in 15 years. (RESA/NRG Exhibit GV-1, UGI Electric Supplemental
8 Response to OCA Set I, No. 26).

9 **Q. WOULD YOU PLEASE EXPLAIN PJM’S FREQUENCY REGULATION**
10 **MARKET?**

11 A. PJM’s FR Market is one of several competitive Ancillary Services that corrects for short-
12 term changes in electricity. It matches short-term generation with short-term demand to
13 ensure the desired electrical frequency and operate normally. Market participants submit
14 their offer for a fixed quantity of capability the day before the operating day and if selected
15 are committed to rapidly adjust the net megawatts on the automated control signal of the
16 generation dispatcher hourly throughout the operating day. PJM operates an hourly auction
17 for the service, which sets the hourly price and determines which units will provide the
18 service based on the lowest price offers and historical performance. As I will explain
19 further below, participation in PJM’s FR Market is a generation function, i.e. the asset is
20 adding generation into the PJM market that is then moved to ultimate consumers.
21 Therefore, revenues derived from participation in PJM’s FR Market are derived based on
22 generating electricity similar to how a generating plant provides its generation to PJM for
23 ultimate transfer and use by end user customers. There is no “distribution” component
24 present as a result of participation in the FR Market.

1 **Q. WHAT IS THE USEFUL LIFE OF THE BATTERY STORAGE SYSTEM?**

2 A. The Company predicts that the expected life of the battery storage system is 20 years.
3 Participation in Wholesale Energy and Ancillary Services ultimately results in a higher
4 overall cost to the ratepayer. Battery storage has a finite cycle lifetime. As I discuss later
5 in my testimony, by cycling the battery for use other than its intended purpose of resolving
6 the distribution need of the 67 customers, UGI Electric’s ratepayers may not receive the
7 suggested reduction in distribution costs associated with the battery storage project.

8 **Q. HOW DOES UGI ELECTRIC PROPOSE TO RECOVER THE COSTS OF THE**
9 **BATTERY STORAGE PROJECT?**

10 A. UGI Electric proposes to fully recover the capital costs associated with the battery storage
11 project from all ratepayers, which are distribution customers. The Company classified the
12 battery storage costs as demand-related, then allocated the costs among its distribution
13 customers based on each customer class’s non-coincident peak demand. (UGI Statement
14 No. 6 at 46). While UGI Electric also noted that participation in the PJM FR Market
15 presents an “opportunity” for “UGI Electric to receive revenues for providing frequency
16 response to PJM with the use of this asset,” UGI Electric does not account for how such
17 revenue will be applied as an offset to the capital costs that ratepayers are being asked to
18 pay for this project. Moreover, it is important to note that UGI Electric stated that
19 projecting the generation related revenues from the PJM FR Market is difficult due to its
20 “volatility.” Therefore, even if it were appropriate to utilize revenue received from a
21 generation function to support a distribution asset, which it is not, the actual ability of such
22 generation revenue to offset the capital costs of the battery storage project sought here is
23 speculative.

1 **IV. UGI ELECTRIC'S OWNERSHIP OF BATTERY STORAGE**

2 **Q. ARE PUBLIC UTILITIES IN THE COMMONWEALTH, SUCH AS UGI**
3 **ELECTRIC, PERMITTED TO RECOVER COSTS ASSOCIATED WITH**
4 **GENERATION RESOURCES?**

5 A. No, I am advised by counsel that they are not. The General Assembly unbundled electric
6 utility generation, distribution, and transmission services with the Competition Act. As a
7 result, generation of electricity is no longer regulated as a public utility service in the
8 Commonwealth. The Competition Act, therefore, provides consumers with the
9 opportunity to choose their electric generation supplier.

10 **Q. IS THE COMPANY'S BATTERY STORAGE PROJECT ACTING AS A**
11 **GENERATION RESOURCE?**

12 A. Yes. Although the Company presents its battery storage project as a way to enhance the
13 reliability and resiliency of its distribution system, the battery will be acting as a generation
14 resource. The purpose of UGI Electric's battery storage proposal is to retain energy
15 resources that can be called upon as needed to serve generation needs of connected
16 customers.

17 **Q. IS THE COMPANY IMPROPERLY SEEKING RECOVERY OF THE COST OF**
18 **THE PROPOSED BATTERY STORAGE PROJECT FROM ALL DISTRIBUTION**
19 **CUSTOMERS AS PART OF ITS RATE BASE?**

20 A. In my opinion, yes. In addition to my understanding from counsel that the regulation of
21 generation is explicitly prohibited by the Competition Act, energy storage development is
22 not a natural extension of the traditional role of utilities to justify a utility using its
23 distribution monopoly status to recover costs through rate base. Nor does the utility have
24 any type of "monopoly" on energy storage development. Many developers can, and do,
25 develop such projects. Embarking upon a path whereby the EDCs could now own
26 generation in the form of energy storage while subjecting that ownership to rate regulation

1 as part of a utility rate base results in the Commission regulating generation and threatens
2 the ability of third-party providers to offer such products to consumers in the competitive
3 market. I discuss this issue more fully later.

4 **V. PARTICIPATION IN PJM'S FREQUENCY REGULATION MARKET**

5 **Q. WHY IS UGI ELECTRIC PROPOSING TO PARTICIPATE IN THE PJM FR**
6 **MARKET?**

7 A. UGI Electric intends to participate in the PJM FR Market in order to reduce the costs
8 associated with the proposed battery storage system.

9 **Q. PLEASE EXPLAIN THE PJM FR MARKET.**

10 A. The PJM FR market is a competitive wholesale service that is designed to correct for short-
11 term changes in electricity use by matching generation and demand while providing
12 market-based compensation to resources that can adjust output or consumption in response
13 to an automated signal.⁴ At its core, the FR Market is a competitive service used to match
14 up generation and demand to help the grid maintain its desired electrical frequency and
15 operate normally. Proposed participation by a utility in this competitive market by
16 contributing a generation resource (paid for by distribution customers) is unreasonable and
17 inappropriate.

18 **Q. DOES UGI'S PROPOSED PARTICIPATION IN THE PJM FR MARKET RESULT**
19 **IN A FASTER DEPLETION OF THE RESOURCE?**

20 A. Yes. PJM implemented a redesigned Regulation D signal for use in the FR Market on
21 January 9, 2017, which is used to dispatch faster, dynamic resources such as battery
22 storage.⁵ The 2017 Regulation D signal change has resulted in complaints from FR market

⁴ *Frequency Regulation Compensation in the Organized Wholesale Power Markets*, 137 FERC ¶ 61,064, para 4, n.5 (Oct. 20, 2011) ("FERC Order 755").

⁵ *PJM Interconnection, L.L.C.*, 170 FERC ¶ 61,258, para 3 (Mar. 26, 2020) (Order on Contested Settlement).

1 participants that the new signal has directed resources to operate outside their design
2 parameters resulting in performance and efficiency issues, reduced compensation, and
3 adverse impacts on their energy storage equipment.⁶ Because frequency regulation
4 requires frequent cycling and the more a battery is cycled – whether through participation
5 in the FR Market or otherwise – the battery resource will more rapidly reach the end of its
6 useful life.⁷

7 **Q. DOES THE COMPANY PROVIDE AN EXPECTED RETURN FROM ITS**
8 **PROPOSED PARTICIPATION IN PJM’S FR MARKET?**

9 A. Initially, UGI Witness Taylor stated that “the level of revenues from participation in the
10 PJM frequency regulation market is unknown.” According to him, the clearing price is
11 “fairly volatile.” (UGI Statement No. 6 at 46). In a supplemental response to Office of
12 Consumer Advocate’s discovery request, the Company estimates the FR Market revenues
13 to be \$88,653 per year over a 15-year period. (RESA/NRG Exhibit GV-1, UGI Electric
14 Supplemental Response to OCA Set I, No. 26).

15 **Q. DOES THE NEWLY PROJECTED EXPECTED RETURN FROM**
16 **PARTICIPATION IN THE PJM FR MARKET CHANGE YOUR**
17 **RECOMMENDATIONS?**

18 A. No. Given UGI’s own initial acknowledgement of the difficulty of projecting the level of
19 revenues from participation in the PJM FR Market, I believe it is speculative to rely on the
20 newly provided estimates. Also, I would note that UGI Electric has only stated that there
21 is an “opportunity” for UGI Electric to receive revenues for participating in the PJM FR
22 Market. UGI Electric does not affirmatively commit or detail how any such revenues

⁶ See, e.g., Complaint at 15–16, *Energy Storage Assoc. v. PJM Interconnection, L.L.C.*, Nos. EL17-64-000 and EL17-65-000 (Apr. 13, 2017).

⁷ Reply Comments of the AES Corporation and Duke Energy Corporation In Support of Settlement at 5–6 *Energy Storage Assoc. v. PJM Interconnection, L.L.C.*, Nos. EL17-64-000 and EL17-65-000 (May 23, 2019).

1 received would be used to offset the capital costs that it is seeking now from distribution
2 ratepayers. Setting these issues aside, though, and assuming any FR Market revenues are
3 used to offset the capital costs of the project, I do not agree that the use of revenues acquired
4 from a generation asset are properly used to offset the costs paid by distribution customers.
5 This is not consistent with relieving utilities of the generation function and creates further
6 distortions regarding cost allocations and the unbundling of distribution and generation
7 services. Quite simply, UGI Electric must not be permitted to require all distribution
8 ratepayers to pay for a resource under the theory that it is a distribution asset and then have
9 that asset perform a generation function to acquire revenue that offsets the costs paid by
10 distribution ratepayers. These are the types of intermingling of utility functions that stand
11 in the way of competitive market development of generation resources, such as battery
12 resources.

13 **Q. CAN YOU PLEASE EXPLAIN FURTHER WHY YOU BELIEVE**
14 **PARTICIPATION IN PJM'S FR MARKET FUNDAMENTALLY UNDERMINES**
15 **THE CLAIM THAT DISTRIBUTION CUSTOMERS SHOULD BE REQUIRED**
16 **TO PAY FOR THE CAPITAL COSTS OF THE PROJECT?**

17 A. Yes. The Company classifies the entire cost of the battery storage project as distribution
18 (FERC Account 363) presumably so that it can seek full cost recovery of anticipated capital
19 costs. (UGI Electric Exhibit D, Schedule 4, Page 1). However, the Company's proposal
20 to offset the costs of battery by participating in PJM's FR Market requires that the battery
21 be classified as generation (Account 348) for cost recovery purposes because it will be
22 performing a generation function. As I explained previously, recovering costs associated
23 with battery storage performing a generation function and then using it to offset costs paid
24 by all ratepayers for a distribution asset is inconsistent with the policy and purpose of the

1 Competition Act. As I discuss later, private development of battery storage avoids this
2 issue and is the optimal way to reduce the cost shouldered by the Company's ratepayers.

3 **Q. WHY DO YOU BELIEVE THAT UGI ELECTRIC'S PARTICIPATION IN THE**
4 **PJM FR MARKET WILL NOT RESULT IN COST OFFSETS TO THE BENEFIT**
5 **OF RATEPAYERS?**

6 A. Even if the Commission permits UGI Electric to participate in the FR Market, it is unlikely
7 that the ratepayers will receive the full benefit of the estimated offsets of the costs of the
8 battery storage. Even if the amount of revenues to be received from the FR Market can be
9 accurately estimated, which they cannot, it is important to remember that the frequent
10 cycling of the battery will cause it to more rapidly reach the end of its useful life. By using
11 a storage asset to defer a distribution substation investment while also proposing to use the
12 asset to offer frequency regulation service, there is a high likelihood that the asset will
13 depreciate at a faster rate. As the life span of the battery decreases, the utility will need to
14 recover additional depreciation expenses over a shorter period (increasing the rate). The
15 reduced life span results in less total frequency regulation revenue to offset the cost of the
16 battery. As such, the depreciation rate assumed in the distribution ratemaking calculation
17 will be understated and lead to stranded distribution costs when the asset prematurely
18 reaches the end of its useful life. The combined result – increased cost and decreased
19 revenue to offset costs – may actually tilt the cost benefit analysis in favor of an alternate
20 to the proposed battery. In other words, a basis for UGI's proposal is that ratepayers benefit
21 from battery storage by deferring the need for presumably costlier traditional substation
22 investment. The reality of participating in the FR Market, however, is that the asset will
23 deplete faster than anticipated and may ultimately cost ratepayers more money than more
24 traditional substation investment. For example, if the battery storage asset lasts only 5

1 years and a substation would last for 50 years, UGI would have to invest in 10 batteries to
2 achieve the same outcome as one substation investment.

3 **Q. IS THERE A BETTER WAY TO BRING COST SAVINGS, BENEFITS TO**
4 **RATEPAYERS?**

5 A. Yes, for the reasons I will discuss further below, the way to achieve optimal cost benefits
6 for consumers is to allow the competitive market to develop and offer storage resources.
7 The availability of these resources will necessarily assist with the larger goals of enhancing
8 the reliability and resilience of the electric distribution system in the most cost effective
9 way that also encourages innovation and market development.

10 **VI. INEFFICIENT COSTS AND RISK ALLOCATION**

11 **Q. IN YOUR VIEW, COULD UGI'S PROPOSAL ACTUALLY COST RATEPAYERS**
12 **MORE MONEY?**

13 A. Yes, because of the different cost recovery options and motivations present when a project
14 is funded by ratepayers vs private investment. Ratepayer funded electric storage leads to
15 inefficient costs and risk allocation resulting in investment decisions that cost ratepayers
16 more than they should. EDCs will seek full cost recovery of the energy storage resource,
17 plus a rate of return on the capital deployed for the project. That is the case here where
18 UGI is seeking to recover the full capital costs of its battery storage project with vague and
19 speculative information about potential generation revenue offsets (even if such offsets
20 were appropriate, which they are not).

21 Conversely, private developers of energy storage resources must risk their own
22 capital without authorization to seek cost recovery or a return from ratepayers. The
23 investment decision for an energy storage developer that does not have a guaranteed way
24 to receive cost recovery is much different than that of a utility. Specifically, for private
25 energy storage development, the decision to invest in energy storage is based on the desires

1 of the customer who wishes to receive the benefits and the economics to the private
2 developer of providing that option. Importantly, the private developer cannot depend on a
3 subsidy from all ratepayers to fund its research and development and to ensure a return on
4 investment. Further, only those customers wishing to receive the benefits are at risk for
5 bearing the costs of over-runs, on-going operating and maintenance costs and performance
6 issues.

7 **Q. HOW CAN GUARANTEED FULL COST RECOVERY FROM RATEPAYERS**
8 **IMPACT A UTILITY’S INVESTMENT DECISIONS?**

9 A. If a utility is guaranteed full cost recovery from ratepayers, the utility will be much more
10 likely to build (or purchase) the energy storage resource, even if the economics do not make
11 sense. This is because the utility is assured of receiving full cost recovery, including a
12 return of, and the opportunity to earn a return on investment, from ratepayers. Again, this
13 is seen here because UGI is seeking full recovery of the capital costs of the project. In
14 addition, by spreading the costs of the resource to all customers, the utility project puts all
15 customers at risk for bearing the costs over-runs, ongoing operating and maintenance costs,
16 and performance – even for customers who are not direct beneficiaries of the energy storage
17 resource. Allowing recovery from all customers of capital costs associated with energy
18 storage that can only be used to serve a subset of customers permits a utility to build
19 generation assets with very limited risk to its shareholders, which places costs on customers
20 who derive no real or direct benefit from the energy storage resource.

21 **Q. WHY IN YOUR VIEW IS PRIVATE INVESTMENT IN BATTERY STORAGE A**
22 **BETTER APPROACH?**

23 A. Private companies taking on the risk of their own capital are incentivized to seek out
24 innovative solutions that can increase customer value through efficient capital investment.
25 If the private company’s offering is unsuccessful, the risk is borne by investors and not by

1 all utility ratepayers. When a company has no risk at stake and only a potential for return,
2 an incentive to pursue the proposal at any cost is necessarily present.

3 There is a dynamic market for energy storage services that extends beyond
4 batteries. Many of the benefits proposed by UGI can be met by a range of established and
5 emerging technologies including direct load control and systems like Mosaic's WHEN.
6 Other solutions would be aggregated residential behind-the-meter batteries. These
7 technologies in many cases can deliver the desired benefits at a fraction of the cost of a
8 battery. The benefits of using a market to procure storage technologies increases the
9 likelihood of finding the most cost effective solution to address a given constraint.

10 **Q. HOW ELSE DO CONSUMERS BENEFIT FROM PRIVATE OWNERSHIP OF**
11 **BATTERY STORAGE?**

12 A. The private ownership model enables customization of technology in an innovative way
13 for customers and promotes robust competition to reduce costs and advance technological
14 progress. Innovation and responsiveness to customer needs are enhanced when services
15 are provided by entities that must compete to win and retain customer relationships.
16 Permitting utility ownership removes important demand from the storage marketplace,
17 pushing out the point where storage solutions can compete on economic merit. Ownership
18 does not simply undercut participants in the competitive market, it may prevent the market
19 from forming in the first place, which will lower the likelihood of innovative approaches
20 that will be made available in Pennsylvania. At this point in time, there is available
21 technology and a revenue case for private investment in storage. A modest incremental
22 revenue to a project sited to resolve distribution constraints would further incentivize
23 private developers to respond to an identified need and compete to provide a contracted
24 service that can be much more flexible and useful from that of a distribution utility that

1 receives guaranteed cost recovery from ratepayers. A private entity must keep costs low,
2 and size projects that are designed to be the most economically efficient, because they
3 know this will be the only way they earn a profit on their investment. As discussed
4 previously, a utility has less incentive to keep costs down, because – absent a disallowance
5 (which is uncommon) – the utility is guaranteed to recover its full project costs recovered
6 from ratepayers. An incentive to over-build is also created because the utility’s only
7 opportunity to earn a return on the project is based on the size of the capital investment.
8 Thus, the larger the project, the more the utility has an opportunity to earn.

9 **Q. CAN ELECTRIC VEHICLE (“EV”) CHARGING STATIONS ALSO PROVIDE**
10 **ENERGY STORAGE SERVICES?**

11 A. Yes. EV charging stations can, and do, present opportunities to provide storage value to
12 the grid as highly controllable distributed demand resources. When integrated with
13 wholesale and utility distribution systems, the high power draw of a charging station can
14 be modulated to reduce power flows during times of distribution constraint as a generation
15 service on the wholesale energy market. Grid interactive charging services offer the
16 highest value when integrated with car electronics to ensure that essential charging is
17 available and that non-essential charging is performed when there is available capacity or
18 advantageous pricing.

19 **Q. DOES THE PRESENCE OF UTILITY OWNED BATTERY STORAGE IMPACT**
20 **THE DEVELOPMENT OF THIRD PARTY OFFERINGS?**

21 A. Yes. Factoring in the presence of utility owned energy storage is another consideration of
22 significant importance for private developers and one that will discourage investment. This
23 is because a private developer would have to overcome the significant obstacle of a utility’s
24 socialized cost recovery of the energy storage resource. Moreover, private developers must
25 work with the utility before and during the energy storage construction to ensure

1 interconnection with the grid. Often the utility plays a prominent role in determining the
2 costs to interconnect into the distribution system and these costs can be substantial.
3 Therefore, concerns arise when the EDC is acting as a competitor of the private developers
4 and the gatekeeper to interconnection. While rules and regulations may be in place, placing
5 the utility in a position to make these decisions for both its own utility-owned generation
6 assets and privately-owned projects is unwise and creates perceived and real conflicts of
7 interest (i.e., the utility favors its generation over private developers), notwithstanding the
8 existence of rules intended to prevent abuses.

9 **Q. YOU MADE THE CASE FOR COMPETITIVE MARKET DEVELOPMENT OF**
10 **ENERGY STORAGE, BUT DO YOU HAVE ANY INFORMATION ABOUT**
11 **WHETHER SUCH SOLUTIONS ARE CURRENTLY AVAILABLE IN**
12 **PENNSYLVANIA?**

13 A. Mosaic Power currently offers grid storage services to PJM in the PECO and PPL zones
14 on a completely investor-funded, commercial basis.

15 **Q. ARE THERE WAYS THAT A UTILITY COULD SUPPORT THE**
16 **DEVELOPMENT OF THIRD PARTY ENERGY STORAGE SOLUTIONS?**

17 A. Yes, one way this could be accomplished could be to run a competitive RFP to solicit the
18 type and quantity of services they need from private developers who will own and operate
19 the resource to meet the utility distribution need. Under this approach competition will
20 drive innovation and lower costs which could also include utilizing the resource to provide
21 services in the competitive wholesale markets where it may have the opportunity and would
22 be economic to do so. This optimization and alignment of incentives only occurs where
23 private developers, without guaranteed cost recover assume the risk for their return on
24 investment.

1 VII. **CONCLUSION**

2 Q. **DOES THAT COMPLETE YOUR DIRECT TESTIMONY?**

3 A. Yes.

Exhibit GV-1

UGI Utilities, Inc. - Electric Division
Docket No. R-2021-3023618
UGI Electric 2021 Base Rate Case
Responses to OCA Set I (Supplemental Responses)
Delivered on April 30, 2021

OCA-I-26 (Supplemental Response)

Request:

Reference the Direct Testimony of John D. Taylor, page 45, lines 7-9. Please identify the revenues UGI anticipates to realize under its battery storage project. Include copies of any studies/analyses prepared which evaluate potential revenues.

Response:

Please see Attachment OCA-I-26, provided in Excel format, for a preliminary estimate of projected revenues for UGI Electric's battery storage project. Over a 15 year period, the anticipated PJM frequency regulation market revenues are estimated at \$88,653 annually.

Prepared by or under the supervision of: John D. Taylor

UGI Electric Battery Energy Storage System (BESS) Revenue Projection for PJM Frequency Regulation (FR) Market

PROJECTED ANNUAL FR REVENUE VALUES			PERFORMANCE VARIABLES		
Yr	FR Revenue		Yr	Performance Score	BESS Uptime
1	\$	91,214	1	95%	94%
2	\$	91,214	2	95%	94%
3	\$	91,214	3	95%	94%
4	\$	91,214	4	95%	94%
5	\$	91,214	5	95%	94%
6	\$	88,333	6	92%	94%
7	\$	88,333	7	92%	94%
8	\$	88,333	8	92%	94%
9	\$	88,333	9	92%	94%
10	\$	88,333	10	92%	94%
11	\$	86,413	11	90%	94%
12	\$	86,413	12	90%	94%
13	\$	86,413	13	90%	94%
14	\$	86,413	14	90%	94%
15	\$	86,413	15	90%	94%
Total	\$	1,329,800.90			

BESS Capacity	500	KW	1,250	KWhrs
Frequency Regulation				
BESS Capacity	500 KW (Inverter Maximum Capacity)			
Annual Hours of Operation	8,760			
Frequency Regulation Rate	\$	23.42	MWhr	

Projection Notes

Performance Score: System deration factor modeled on other active units that sets the expected average battery capacity considering continual charge & discharge operations. Factor also considers the eventually decline of system performance over time.

BESS Uptime: Factor that reduces the annual hours of operation to account for days in which the BESS will be removed from the FR Market in advance of forecasted severe weather events. Percentage is based on a 4-year historical average (2017-2020) of predicted severe weather days provided by UGI Electric's weather service.

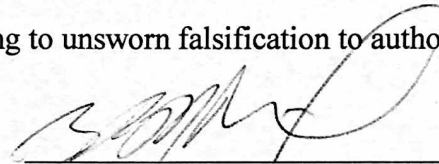
FR Rate: Three-year annual historic average (2018-2020). Rates based upon published PJM Regulation Market Data (Ancillary Services), and summarized by Monitoring Analytics in their annual "State of the Market Report"

Analysis Period: Considers the battery warranty period.

VERIFICATION

I, Gregory Vaudreuil, hereby state that: (1) I am the CEO of Mosaic Power, LLC; (2) that I am authorized to submit this testimony on behalf of the Retail Energy Supply Association and NRG Energy, Inc.; (3) the facts set forth in this testimony are true and correct (or are true and correct to the best of my knowledge, information and belief); and (4) that I expect to be able to prove the same at a hearing held in this matter. I understand that the statements herein are made subject to the penalties of 18 Pa. C.S. § 4904 (relating to unsworn falsification to authorities).

Dated: April 29, 2021



Gregory Vaudreuil, CEO
Mosaic Power, LLC