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PUBLIC UTILITY COMMISSION OF TEXAS

Aggregated Distributed Energy Resource (ADER) ERCOT Pilot Project	))))	Project No. 53911

COMMENTS OF SONNEN, INC.

INTRODUCTION

Sonnen Inc. USA ("Sonnen") is a subsidiary of sonnenGroup, with manufacturing facility headquarters in Stone Mountain, Georgia. Sonnen is a global leader in energy storage and virtual power plant solutions with more than 180,000 batteries installed worldwide and virtual power plants operating on three continents. On August 29, Sonnen filed a letter of interest in membership on the Public Utility Commission of Texas Aggregate Distributed Energy Resource ("ADER") task force in response to the memo filed by Commissioner Glotfelty on August 14, 2024. In this filing, Sonnen is pleased to provide additional information about experiences launching virtual power plant models which can be transferable to Texas as the ADER program evolves to include more ancillary services and differentiated participation models.

I. CONTACT

Enrique Colmenares
Head of Regulatory
Sonnen, Inc. – US
e.colmenares@sonnen-batterie.com

II. COMMENT SUMMARY

Sonnen welcomes ERCOT's recent proposals in the Governing Document Phase 2 to enable Aggregate Distributed Energy Resources (ADERs) to provide primary frequency response services within the current pilot program. This change would invite more investment into Texas in dispatchable residential and small commercial battery energy storage systems and open up opportunities for existing retailers and other load-serving entities with populations of mixed or homogenous residential battery energy storage devices. This development aligns with Sonnen's experience launching virtual power plant (VPP) technology, where stability services like frequency response have proven critical to enhancing grid reliability in complex load-generation balancing scenarios. Sonnen is eager to contribute its knowledge in upcoming technical meetings, support the swift implementation of high-value grid services using behind-the-meter battery systems, and would welcome the opportunity to participate as an ADER Task Force member to provide that expertise and experience.

Frequency response represents an ideal use case for residential-scale battery systems, offering a balanced solution for both grid support and customer benefits. Battery energy storage systems can react within seconds to grid disturbances; this provides crucial support to grid operators to maintain stability. The rapid response capability allows for swift mitigation of generation-load imbalances, potentially preventing more severe grid events like load shedding. Importantly, this service can be provided at a level that is imperceptible to the residential customer, while still offering them the dual advantages of emergency backup power and the opportunity to earn returns on their energy bills through VPP services. This approach not only enhances grid resilience but also creates a mutually beneficial scenario for customers, utilities, and grid operators. Enabling these services also solves for an issue noted in the Commissioner Glotfelty memo regarding a lack of diversity in ADER participation and uptake today: enabling the easiest and highest value use case for ADER batteries will reduce participation hurdles for both aggregators and customers.

III. VIRTUAL POWER PLANTS PROJECTS AND EXPERIENCES

In Germany, Sonnen operates a VPP that has eclipsed 250 MWh and is on track to reach 1 GWh in the next few years, making it the largest residential VPP in Europe. In the United States, Sonnen has worked on various models for VPP design and continues to build strategic partnerships to launch this business model in hybrid regulated and deregulated market types. Sonnen's largest US VPP today is in the Wattsmart program administered by Rocky Mountain Power. Further, Sonnen has programs underway in California, Puerto Rico, Florida, and Michigan[1] and efforts to grow Sonnen VPP services are also underway in ERCOT, ISO-NE, NYISO areas. Sonnen has presented at the ERCOT ADER VPP Experiences workshop on its Texas investment plans.[2]

Importantly, higher solar penetrations can be incentivized to be reversed by VPP structures as well, adding additional grid dispatchability value for residential MWs and solving for distribution system investments and upgrades. For this reason, Sonnen is exploring the utilization of batteries for reverse demand response programs in US markets.[3] This is like what is occurring in Australia, where home batteries are solving for solar hour overproduction and curbing system stress: customers of retail energy providers are rewarded for aligning their charging behavior, receiving incentives from poles-and-wires network operators through their retail energy bill. These time-of-

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[1] Florida and Michigan are additional planned communities similar to Mandalay Homes and Soleil Lofts: Pearl Homes Hunter's Point Development – Florida; Veridian at the County Farm, Ann Arbor – Michigan.

[2] PowerPoint Filing, VPP Experiences, No. 11, Materials Presented at the ADER Task Force workshop titled VPP Experiences, Project 53911 (August 31, 2022).

[3] Explanatory Note: "When the electricity grid is peaking, demand response programs compensate you to curtail your energy demand. But what do utilities do when growth of electricity use has flattened, renewable energy generation continues to grow, and there's excess renewable generation available leading to negative pricing? This opposite scenario calls for an opposite strategy – *reverse* demand response, where end users are incentivized to actually *turn up* demand, rather than turn down. Arizona Public Service recently proposed this new program to help balance their grid during times of excess renewable generation." See, Reverse Demand Response, at https://watchwire.ai/reverse-demand-response/.

use network tariffs rely on partnerships between network providers and retail entities serving customer loads.[4] Such tariffs are also known commonly as "solar sponge tariffs", a concept that has been discussed in prior comments filed in the ADER Project.

Model Sonnen Programs for Affordable, Accessible, Dispatchable VPP

Mandalay Homes – Sonnen-Prescott Valley Virtual Power Plant Project Structure:

- The VPP is an aggregated 11.6 MW energy storage project located in Arizona, US, with a rated storage capacity of 23MWs. [5]
- The Mandalay Homes project is a planned development expected to grow to more than 2,900 homes through 2040.
- Value for Service: Renewables capacity firming, renewables energy time shifting, zero-cost nuclear energy hours storage.
- Parties: Storage Developer and Technology Hardware and Software: Sonnen; Construction Developer, Mandalay Homes; Solar Duck Curve tariff optimization, Arizona Public Service.
- Technology: energy storage lithium-ion batteries, proprietary battery management system, third-party inverter and software integrations.
- Each Home: 8 – 16 kWh batteries, 3.9 kW solar

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[4] SA Power Networks, Time-of-Use Network Tariffs, "By encouraging more energy use in the middle of the day, we can facilitate more rooftop solar exports and increase the amount of low-cost renewable energy available in South Australia. To take advantage of these tariffs, speak with your electricity retailer." *See,* Empowering South Australia, at https://www.sapowernetworks.com.au/future-energy/projects-and-trials/timeofuse-network-tariffs/#:~:text=These%20tariffs%20encourage%20more%20consumption,of%20the%20normal%20network%20tariff.

[5] Explanatory Note on how Residential Batteries Power Homes: A single Sonnen battery in the aggregated resource has a system discharge duration at full power of 2 hours, similar to the aggregation as a whole. Assume a standalone battery size of 10 kW for calculation ease. This means a two-hour duration 10kW battery can deliver 20kwh in 2 hours while being consumed at full power (10kW of load in an hour). How much load is being served in that hour determines how many hours the battery can support – residential homes do not consume 10kW in an hour. Average home load in Arizona based on public state energy consumption data is 1,048 kWh/month, or 34 kWh/day, 1.45 kW in an hour. A 20kWh fully charged to serve household loads (without the benefit of solar) can thus last for 13 hours as a sole source of power to an average hourly load of 1.45kW (20kWh/1.45kW load per hour). With solar powering home loads through solar hours and simultaneously charging the battery twice a day, the battery covers average electricity needs for the balance of the day and overnight and provides several backup hours of support during grid outage conditions; in normal grid conditions a solar-paired battery retains excess capacity the average home never uses – allowing for grid-sharing behavior in a virtual power plant. In a scenario where customers seek to extend the total loads that can be powered in these time frames, additional batteries may be added. For example, an additional battery system could be added to serve pool pumps, more AC loads, etc. which increase hourly consumption needs to more than 1.45 kW per hour, or, to extend the time frames for backup (*i.e.*, to stretch out total number of "hours in the tank" to carry the average hourly home load.)

- This project received a US Department of Energy Grand Award for Grid-Interactive Efficient Building Innovation in 2021 (Product Homes category). [6]

Rocky Mountain Power Wattsmart: A Multi-Service Territory, Multi-OEM Sonnen VPP

- The Wattsmart VPP is a tariff-based VPP delivered by Rocky Mountain Power today in its multistate footprint, with the original program design beginning in Utah with Soleil Lofts, a Sonnen pilot for a 600-unit apartment complex with 4.5 MW of dispatchable capacity and a 12.6 MWh energy reservoir.[7]

- This pilot has turned into a scalable multi-service territory program for Rocky Mountain Power (in three states today). As of January 2024, more than 3,300 customers were involved in the program. The program is open to six battery models from four manufacturers: Sonnen, Solar Edge, Fortress, and Torus. Sonnen enables participation of all these battery providers as follows:

    - The Rocky Mountain Power Distributed Battery Grid Management System (DBGMS) is entirely operated by Sonnen's VPP software platform and program management service. The Sonnen VPP uses a cloud-to-cloud IEEE 2030.5 integration with other energy storage OEMs. Thereby, the Sonnen VPP platform controls all Sonnen and non-Sonnen batteries in Utah Wattsmart.

    - Sonnen's software platform is integrated directly into Rocky Mountain Power's greater grid management system without a DERMs platform intermediating and is dispatched daily for a variety of grid services. The multi-device inclusive, direct integration VPP platform approach represents Sonnen's philosophy that a utility grid operator should embrace a direct electrochemical energy storage VPP experience, as opposed to simply deploying an aggregator DERMs.

- Parties: Rocky Mountain Power worked with Sonnen to develop battery specifications that would support a complete array of grid service reliability needs at Soleil Lofts and thereafter for its wider multistate program. Although the pilot started exclusively with Sonnen as the OEM provider, the permanent and scalable VPP services program has expanded to more batteries: Solar Edge, Fortress, and Torus with standardized criteria that are available to the public and to any manufacturer for program qualification.

- Value for Services: The Wattsmart program allows for VPP participants to access a wide range of grid services, including non-wires alternatives for local load pocket decongestion

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[6] Sonnen virtual power plant project features on the Department of Energy 2021 Housing Innovation Award List: https://www.energy.gov/eere/buildings/2021-housing-innovation-award-winners.

[7] Utility Dive Awards – 2019, Project of the Year: Soleil Lofts solar + storage development: https://www.utilitydive.com/news/project-soleil-sonnen-pacificorp-rmp-batteries-solar-dive-awards/566230/.

and T&D deferral; demand response; capacity planning; energy; frequency response; mitigation of the "duck curve" effect; individual and system-level resiliency; and spinning and non-spinning reserves. The program boasts a fair value for residential and commercial customers in its up front incentive structure: $400 per kW of storage capacity for residential customers and for both commercial and residential battery customers with existing solar systems at $600 per kW. This is in addition to bill credits for VPP events structured for monthly payments/credits. Grid services are a critical tool for achieving valuable dispatchability and distribution grid support. Exhibit A provides details on all services the Wattsmart program enrolled assets are used for. In summary these include:

  - Non-Wires Alternative or "NWA" - Locational Value, Congestion Management (sub-station level)
  - DR - Load Shedding
  - Capacity Planning
  - Energy
  - Frequency Response (secondary)
  - Daily Cycle Mitigation of the Duck Curve Effect, Reverse Load Shaping
  - Resiliency
  - Dispatched Swarm Grid Charge, Grid Balancing Mechanism (Not yet implemented)
  - Spinning and Non-Spinning Reserves

- Each Home: customers seeking enrollment have a choice of system sizes ranging from stackable 4.8 kW batteries (Sonnen Core+) to a 15kW battery in the Torus Station Core product. The utility provides incentives for installation based on the kW size and has an expedited approval process for customer seeking larger batteries or multiple batteries. Exhibit B provides details on the incentives related to various system sizes.

- Technology: energy storage lithium-ion batteries, proprietary battery management system, third-party inverter and software integrations.

IV. TEXAS VIRTUAL POWER PLANT MARKET DESIGN EXPANSION WITH FREQUENCY RESPONSE SERVICE

Sonnen is positioned to bring its experience and investment to Texas to support dispatchable residential ADER projects. This includes Sonnen's experience delivering grid response services in VPP projects like those described above, representing full value stack use cases for batteries.[8] One of those critical services, for which ERCOT has a product definition and approach today that is unavailable to residential batteries, is primary and secondary frequency response.

[8] See, Sonnen Blog (December 2023), at https://sonnenusa.com/en/blog/flexibility-capital-why-sonnenvpp-pools-battery-capacities/.

Residential battery systems could significantly enhance ERCOT grid stability by implementing frequency support functionality. This capability is particularly crucial for maintaining grid equilibrium. By integrating a frequency/Watt curve, residential batteries can offer additional grid support, potentially creating more value for customers, their load-serving entities or retailers, and grid operators. The necessary responsive inverter settings are integrated at an equipment level, and batteries today are sold with smart inverter capabilities which already achieve these settings and can be fine-tuned to the requirements of the local grid's system frequency needs. Having the necessary frequency-watt curve technology built-in, residential battery systems continuously monitor grid frequency and can dynamically adjust their charging or discharging operations in response to frequency fluctuations, based on predefined parameters. This frequency support acts as a power offset to the system's primary (real power) control settings.

One of the key advantages of frequency support services is their simplicity. As has been described in prior ADER filings, this is a gentle use case for the device hardware and for the customer. [9] Compared to capacity-based dispatch programs (which is what the ERCOT ADER nonspin program is), these services require neither complex scheduling, extensive API interoperability, nor multilayer networked infrastructure that is costly and difficult to integrated between VPP providers and third parties. In fact, these services are most beneficial in complex utility systems with multiple vulnerabilities, multiple parties (differentiated generation, load-serving, and poles-and-wires structures as opposed to an integrated utility area), and challenges in maintaining generation-load equilibrium. This certainly describes the ERCOT grid at the transmission and distribution level and describes many other grids undergoing dynamic and substantial electrification challenges.

Batteries operating under this framework contribute to grid frequency stabilization, especially during load changes. They can respond almost instantaneously (in less than a second) to disturbances in the generation-load balance, whether that is a transmission or distribution bottleneck or an unexpected generator outage. This rapid response provides grid operators and slower-reacting resources valuable time to adjust, minimizing frequency deviations. Consequently, swift action from residential batteries (at a level of power charge or discharge that is effectively unnoticeable to the residential customer) can prevent the escalation of events, potentially averting scenarios like automatic load shedding.

Sonnen is pleased to hear that ERCOT has enabled to-date in the pilot, a pathway for ADER participants to demonstrate the provision of primary frequency response and a proposal to qualify ADERs to provide this service and related services.[10] Instantaneous, low-power high-fidelity

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[9] Quarterly ADER Update, Q1 2024 submission from Tesla, Inc, document 76, Project 53911: https://interchange.puc.texas.gov/Documents/53911_76_1387116.PDF.

[10] ERCOT's Phase 2 Governing Document provides that the grid operator will consider opportunities for ADER-qualified VPP aggregations to provide frequency response through a product available in the market today, responsive reserve service. The governing document discusses a "system-wide cap [which] will be sufficiently high to allow ERCOT to assess the adequacy of ADERs to provide frequency response from the distribution system without posing a threat to the reliability of the system." ERCOT further provides that it

autonomous response from residential energy battery storage equipment should be available as soon as possible to expand and refine the ADER pilot and provide the grid operator and local network managers the opportunity to understand the value of batteries: this is an ideal use case for the system specifications and the customer. More grid flexibility resources, *i.e.*, systems that can quickly switch between receiving and supplying energy, will become more important for reliability and should be compensated for in the ADER pilot and ultimately in the market. Home energy storage systems in Sonnen VPP specialize in providing this service. Finally, frequency response is an ideal use case for residential scale systems. It is a service more load-serving entities could offer to customers with lower costs to operationalize aggregations in an ADER. This service is also customer-friendly to enrollees who wish to retain higher battery energy reserve levels and seek to earn a stable return in their energy bills for VPP services.

V. CONCLUSION

As ERCOT and the ADER Task Force develop recommendations and review ERCOT's proposals to enable grid services, Sonnen looks forward to offering its expertise in technical meetings held by ERCOT or the ADER Task Force. Sonnen supports a fast path to enabling high-value grid services from behind-the-meter battery systems and requests expedient changes to the ERCOT Governing Document to enable this path. Please contact my team at the information provided for any further questions or discussion of opportunities to support the ADER pilot.

Respectfully submitted,

Blake Richetta

Blake Richetta
Chairman and CEO
Sonnen Inc., US

Enc: Exhibits.

Dated: August 30, 2024

"may also consider ADERs providing PFR without the ability to be SCED-dispatchable as part of Phase 2 or future phases." ADER Pilot Project Website, Governing Document Phase 2 (February 27, 2024): https://www.ercot.com/files/docs/2024/02/28/aggregate-distributed-energy-resource-pilot-project-phase-2-governing-document-ercot_02272024.docx.

Exhibit A

Sonnen Presentation Excerpt – Wattsmart Program Grid Services Value Stack

Wattsmart BGMS Grid Services Value Stack

Grid Service	Technical Summary	Primary Purpose
Non-Wires-Alternative or "NWA" - Locational Value, Congestion Management (sub-station level)	Dispatchable load shed, based on local congestion conditions. (Herriman UT)	Local load pocket decongestion, infrastructure investment deferral. (application can be T&D systemwide, as opposed to localized)
DR – Load Shedding	Dispatchable load shed, based on specific system conditions and events	System decongestion and stabilization. Peaking Power plant mitigation.
Capacity Planning	Firm dispatchable capacity for system requirements. Considering both load shed and injection. (MW not MWh)	System planning / capacity forecasting
Energy	Dispatchable energy, by way of load shed + potential injection, in order to meet energy system (grid) load requirements. (MWh over X time)	Peaking Power plant mitigation.
Frequency Response (secondary)	Dispatched by RMF based on system frequency imbalance. a) Regulation UP - Frequency has dipped, excess load, insufficient generation. Rapid battery swarm discharge to load + inject. Future Consideration: b) Regulation DOWN – excess generation, insufficient load. c) Local Primary or "Self-Dispatched" Frequency Response: reading grid frequency from the sonnen unit, self-dispatching, and reporting to grid operator ... (like sonnenVPP in Germany, "FCR" - Frequency Containment Reserve)	Aide in grid frequency stabilization.
Daily Cycle Mitigation of the Duck Curve Effect, Precise Load Shaping	Solar time-shift on the daily cycle, preventing low-value, un-dispatched grid injection, and voltage imbalance / grid stress, during PV window ("belly"). Time-shift through battery, battery ultimately offsets peak period (load following), preventing congestion and expensive, high CO2 peaking power plant utilization ("neck and head"). (Grid charge can also be utilized by Daily Cycle, in the event of insufficient solar. See "Swarm Grid Charge") (Example: Go Back Program)	Reduce duck curve effect, enable greater renewables penetration into the grid, aka "renewable grid harmonization." Eliminate the duck's 1) belly (harness PV), 2) neck and 3) head. Ultimately, deliver "firm fixed" Load Shape.
Resiliency	BGMS Nodes (single-family homes, apartments and buildings) form individual solar battery nano-grids in the event of an outage, providing local backup power. Further, DR and FR add system level resiliency (grids scale), preventing outages for the entire community.	Energy security, peace-of-mind.
Dispatched Swarm Grid Charge, Grid Balancing Mechanism (Short-Term Aspirational – Not Yet Implemented)	Grid charge battery network as a dispatchable load during times of excess generation and the grid load (especially as a result of excess grid-scale renewable production – i.e. wind, solar). Battery network acts as a giant load sink. Time shift and offset peak periods. AKA "grid load shift" or "reverse demand response."	Demand meets supply as opposed to supply meeting demand. Enable greater utility scale renewables penetration by "soaking up" excess utility scale renewables like a "solar and wind sponge" or "solar load sink." RMF may also deploy this technique in order to better utilize low cost, clean base load generation during other super-off peak periods, "in the middle of the night" for instance, again, as a grid balancing lever. Time shift to offset peak period, decongesting the grid and off-setting peaking power plant usage.
Spinning and Non-Spinning Reserves	Reserve capacity that can provide emergency stabilization power for the energy system (grid) in less than 10 minutes. (RMF has three dispatch thresholds for this use case: 50 seconds, 7 minutes or 20 minutes) This is already happening in Wattsmart, by way of Frequency Response. That said, there are additional use cases around power / energy to explore.	Spin and Non-Spin are utilized primarily to protect against contingencies, notably unplanned outages of major facilities such as transmission lines or generators.

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- *Aspirational: voltage regulation and support.*
- *Note: Localized value streams on the Daily Cycle, specific to each meter, like Demand Charging Reduction by way of Peak Shaving, and TOU Bill Management, are in addition to the above "battery network level" Wattsmart VPP grid services.*

Explanatory Note: Frequency Response is provided in the Wattsmart program as secondary grid service, designed to address grid instability and fluctuations. The service is defined to allow batteries to respond to both positive and negative frequency deviations. In cases where frequency has dipped, excess load is shed, and when there is insufficient generation, battery energy is injected into the grid. The system is capable of responding to various scenarios including insufficient load, insufficient generation, and local primary or "Self-Dispatched" Frequency Response. Future considerations include: reading grid frequency from the Sonnen VPP itself, self-dispatching, and reporting to the grid operator, similar to conventional generators providing Primary Frequency Control or "Governor Response". The primary purpose of this service is to aid in grid frequency stabilization. Additionally, the Spinning and Non-Spinning Reserves service provides reserve capacity that can be quickly mobilized for emergency stabilization of the power system grid in less than 10 minutes, further contributing to overall grid stability and resilience against contingencies such as unplanned outages of major facilities like transmission lines or generators.

Exhibit B

Rocky Mountain Power Rebates and Incentives – Utah Wattsmart[11]

Rebates and incentives

Eligible batteries and incentives are based on battery output (kW)

Sonnen Core	4.8 kW x $400 = $1,920
Sonnen Eco	7.2kW x $400 = $2,880
Sonnen Core+	4.8 kW/up to 3-stacked batteries 1 battery = $1,920 2 batteries = $3,840 3 batteries = $5,760
Sonnen EcoLinx	30 kW/up to 6-stacked batteries 1 battery = $18,000
SolarEdge	5kW x $400 1 battery = $2,000 2 batteries = $4,000
Fortress Power Envy True 8kW Based Systems (paired with a minimum of 2 eFlex 5.4 batteries or 1 eVault Max 18.5 battery)	8kW x $400 = $3,200
Fortress Power Envy True 12kW Based Systems (paired with a minimum of 3 eFlex 5.4 batteries or 1 eVault Max 18.5 battery)	12kW x $400 = $4,800
Torus Station Core with 8kW inverter	5kW battery system = $2,000 10kW battery system = $3,200 15kW battery system = $3,200
Torus Station Core with 16kW inverter	10kW battery system = $4,000 15kW battery system = $6,000
Torus Station Core with 24kW inverter	15kW battery system = $6,000

More than one battery requires pre-approval

*Commercial customers receive $600/kW and residential customers with solar installed prior to 9/1/2021 receive $600/kW

[11] Visit Rocky Mountain Power battery incentive website for more information: https://www.rockymountainpower.net/savings-energy-choices/wattsmart-battery-program.html (accessed August 25, 2024).