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BEFORE THE ARIZONA CORPORATION COMMISSION

**TOM FORESE
CHAIRMAN**

**BOB BURNS
COMMISSIONER**

**DOUG LITTLE
COMMISSIONER**

**ANDY TOBIN
COMMISSIONER**

**BOYD DUNN
COMMISSIONER**

**IN THE MATTER OF THE APPLICATION
OF TUCSON ELECTRIC POWER COMPANY
FOR APPROVAL OF ITS 2016 RENEWABLE
ENERGY STANDARD IMPLEMENTATION
PLAN**

DOCKET NO. E-01933A-15-0239

**IN THE MATTER OF THE APPLICATION
OF TUCSON ELECTRIC POWER COMPANY
FOR THE ESTABLISHMENT OF JUST AND
REASONABLE RATES AND CHARGES
DESIGNED TO REALIZE A REASONABLE
RATE OF RETURN ON THE FAIR VALUE
OF THE PROPERTIES OF TUCSON
ELECTRIC POWER COMPANY DEVOTED
TO ITS OPERATIONS THROUGHOUT THE
STATE OF ARIZONA AND FOR RELATED
APPROVALS**

DOCKET NO. E-01933A-15-0322

**THE ALLIANCE FOR SOLAR
CHOICE'S AND ENERGY
FREEDOM COALITION OF
AMERICA'S NOTICE OF FILING
PHASE 2 REDACTED
SURREBUTTAL TESTIMONY OF
BRIAN WARSHAY**

The Alliance for Solar Choice ("TASC") and Energy Freedom Coalition of America ("EFCA") hereby provides notice of filing the Redacted Surrebuttal Testimony of Brian Warshay in the above referenced matter. A copy of Mr. Warshay's un-redacted, confidential Surrebuttal Testimony will be provided to the Legal Divison and to Tucson Electric Power Company ("TEP"). Parties who have signed the TEP Protective Agreement will be able to view the confidential portion of Mr. Warshay's testimony by accessing the TEP-UNS Rate Case website.

Arizona Corporation Commission

DOCKETED

SEP 29 2017

DOCKETED BY

Respectfully submitted this 29th day of September, 2017.

ROSE LAW GROUP pc

/s/ Court S. Rich

Court S. Rich

Attorney for EFCA and TASC

**Original and 13 copies filed on
this 29th day of September, 2017 with:**

Docket Control
Arizona Corporation Commission
1200 W. Washington Street
Phoenix, Arizona 85007

*I hereby certify that I have this day served a copy of the foregoing document on all parties of
record in this proceeding by regular or electronic mail to:*

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**REDACTED SURREBUTTAL TESTIMONY OF
BRIAN WARSHAY**

on behalf of

**The Alliance for Solar Choice
and
the Energy Freedom Coalition of America**

**Docket Nos. E-01933A-15-0239 (TEP)
E-01933A-15-0322 (TEP)
E-04204A-15-0142 (UNSE)**

September 29, 2017

REDACTED

Redacted Summary of the Surrebuttal Testimony of Brian Warshay

This is the surrebuttal testimony of Brian Warshay of Tesla on behalf of The Alliance for Solar Choice (TASC) and the Energy Freedom Coalition of America (EFCA) in Phase 2 of these general rate cases (GRCs) for Tucson Electric Power (TEP) and UNS Electric (UNSE) (UNSE and TEP are collectively referred to as the Companies or the Utilities). This testimony responds to the rebuttal testimony that TEP and UNSE filed on August 29, 2017.

This testimony responds to statements by the Utilities' witness Craig Jones relating to the impact of daily cycling on battery life. Specifically, I demonstrate the following inaccuracies inherent in Mr. Jones's claims:

- Daily cycling does not have a negative impact on customer economics. In fact, most batteries used for behind the meter applications on the market today are designed and warrantied to allow for daily cycling;
- Even though daily cycling of a battery does not have a negative impact on project economics, Mr. Jones's argues that a demand ratchet rate design minimizes cycling. I demonstrate, using the Utilities' own analysis, that a battery cycled to maximize customer bill savings on a ratcheted rate may require daily cycling due to the presence of the ratchet and the uncertainty of future demand. This portion of my testimony supports TASC and EFCA witness Beach's concerns about including a demand ratchet as part of this optional storage-friendly rate.
- The Utilities make an unsupported claim to dismiss a proposed residential storage rate due to daily battery cycling but provide little evidence to support this claim. The Utilities' analysis contains multiple modeling errors and incorrect assumptions, yet their analysis still demonstrates that a ratchet mechanism does not reduce cycling. Perhaps most importantly, as a result of the significant analytical flaws I identify, I conclude that the Utilities' perspective on storage-friendly rates is not reliable or based on a reasonable understanding of storage technology.

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1 **Surrebuttal Testimony of Brian Warshay**
2 **on behalf of The Alliance for Solar Choice**
3 **and the Energy Freedom Coalition of America**
4 **Docket Nos. E-01933A-15-0239 (TEP), E-01933A-15-0322 (TEP),**
5 **and E-04204A-15-0142 (UNSE)**
6

7 I. INTRODUCTION AND QUALIFICATIONS
8

9 **Q: Please state for the record your name, position, and business address.**

10 A: My name is Brian Warshay. I am a Senior Analyst at Tesla. My business address is 3500
11 Deer Creek Rd, Palo Alto, CA 94304.
12

13 **Q: Please describe your experience and qualifications, including your experience**
14 **applicable to energy storage.**

15 A: My experience and qualifications are provided as **Exhibit BW-1** to this testimony. I hold
16 Bachelor of Science degrees in Natural Resources and Environmental Engineering
17 Technology from Cornell University in New York. I also hold a Master of Science in
18 Engineering Systems and Management from the Masdar Institute of Science and
19 Technology in Abu Dhabi, UAE that was issued in conjunction with a joint certificate from
20 the Massachusetts Institute of Technology in Massachusetts. In my current role at Tesla, I
21 am responsible for developing tools to analyze customer savings associated with our suite
22 of products. Prior to Tesla, I worked at Bloomberg New Energy Finance (BNEF) in New
23 York. At BNEF, I led our North American Energy Smart Technologies research team,
24 which focused on energy storage technologies, economics, and policies.
25

26 **Q: Have you testified or appeared previously before this Commission?**

27 A: No, I have not. However, I have submitted testimony related to distributed energy resources
28 in other dockets, including California.
29

30 **Q: On whose behalf are you testifying today?**

31 A: I am appearing on behalf of The Alliance for Solar Choice (TASC) and the Energy

Freedom Coalition of America (EFCA). Both TASC and EFCA were parties to Phase 1 of the TEP GRC, and TASC was party to Phase 1 of the UNS Electric (UNSE) GRC.

Q: What is the purpose of your testimony?

A: My testimony responds to assertions made by the Utilities' witness Craig Jones regarding the impact of storage cycling on battery life. I am providing testimony on the technical performance aspects of energy storage technology in response to specific testimony offered by the Utilities. Specifically, I demonstrate that daily cycling of a storage system does not have a negative impact on customer economics mainly because storage products have a limited useful product lifespan, like any other electrical or mechanical devices, regardless of cycling. In fact, industry standard battery warranties take both cycling and calendar life into account to ensure the lifetime project economics can be accurately quantified. In addition, I dispel the Utilities' claims that the demand ratchet included on the Utilities' proposed optional energy storage rate reduces cycling by evaluating and critiquing the Companies' inaccurate energy storage modeling assumptions. This element of my testimony complements arguments presented in opposition to the Utilities' proposed ratchet by TASC/EFCA witness Beach.

II. TEP and UNSE Falsely Assert that Daily Battery Cycling is Costly

Q: What does it mean to say a battery is cycling?

A: Cycling is the charging and discharging of an energy storage system. A complete "cycle" would be the full discharging and charging of a battery. Cycling of a battery can be compared to driving. A complete cycle can be thought of as the equivalent of driving until your truck's gas tank is empty and then filling it up completely at the gas station. Batteries are also able to partially "cycle" much like a gas tank can be topped off before it is completely emptied.

To better quantify how much energy is used throughout a battery's life, cycling is often accounted for as energy throughput. Throughput is the total energy that passes through a battery over a period of time. For example, one cycle of a 10 kWh battery will have a

1 throughput of 10 kWh. Similarly, daily cycling of a 10 kWh battery for one year would
2 have a maximum potential throughput of 3,650 kWh.

3
4 **Q: What do the Utilities state with regard to battery cycling?**

5 A: In response to EFCA's proposal for a daily demand charge storage rate, TEP and UNSE
6 witness Jones claims that a daily demand charge would require daily cycling of the battery,
7 which would, in turn, reduce the battery's life and therefore create significant costs for the
8 storage owner. Specifically, Jones states:

9 A rate that encourages daily cycling of a battery can't be cost-based if designed to
10 encourage participation because it would have to be heavily subsidized to offset the
11 significantly reduced battery life caused by frequent cycling. As battery technologies
12 change so too could this reality but if the goal is to incent battery storage with current
13 technology, then daily cycling should be avoided to reduce battery costs. The second
14 proposal could possibly be salvaged with several modifications. First, the daily demand
15 charge must be removed because as previously stated, daily cycling is expensive to the
16 storage owner.¹

17
18 **Q: Is it true, as stated by Jones in the quote above, that "daily cycling should be avoided
19 to reduce battery costs?"**

20 A: No. This is a conclusion drawn from an incomplete picture of the value that energy storage
21 provides a customer. Increased throughput does decrease energy retention but this is just
22 how batteries work. A battery which has 10 kWh of usable energy capacity at the
23 beginning of its life may have 7 kWh at the end of its life. However, it is important to
24 recognize that reduced retention does not mean reduced return to the customer or reduced
25 usefulness. Decreasing energy retention due to throughput is standard to the technology, is
26 accounted for in product warranties, and can be factored into project economic models.

27
28 **Q: How do typical energy storage product warranties account for cycling and product
29 life?**

30 A: Each of the major residential energy storage product providers with warranties that I was
31 able to review provide battery warranties based on cycling or throughput *and* calendar life.
32 This is similar to a truck warranty that covers the vehicle performance for three years or
33 36,000 miles, whichever comes first. Similarly, batteries may be warrantied for something

¹ Jones (TEP and UNSE Rebuttal Testimony) 46:5-14.

1 like 10 years or 10 MWh of throughput, or 10 years or 10,000 cycles, whichever comes
2 first.

3
4 Importantly, many of these warranties account for more than the 365 annual cycles that
5 would result from daily cycling. For example, Sonnen guarantees 2.7 cycles per day while
6 Tesla warranties unlimited cycles for its solar self-consumption operations over ten years
7 or a specified lifetime throughput for other applications.² The Tesla and Sonnen warranties
8 both guarantee the battery retains at least 70% of its energy storage capacity in year ten if
9 the systems are cycled within their throughput or cycling limits, both of which allow for at
10 least daily cycling.

11
12
13 **Q: What do you recommend?**

14 A: I recommend the Commission adopt witness Beach's proposal to implement an optional
15 daily demand charge or time differentiated two-part rate for residential storage customers,
16 and reject the Utilities' claims that such a rate would result in increased costs for storage
17 customers due to daily cycling. This is simply not the case.

18
19 III. The Utilities' Assertion that a Demand Ratchet Extends the Life of a Battery Relies on
20 Incorrect Modeling
21

22 **Q: What do the Utilities propose with regard to a demand ratchet?**

23 A: As discussed in detail in Witness Beach's testimony, TEP is proposing to implement a 75%
24 demand ratchet applied to on-peak periods for the optional residential storage rate. The on-
25 peak demand is therefore measured by the greater of:

- 26 1) The greatest measured 15-minute interval demand read of the meter during the on-
27 peak hours of the billing period; or

² Sonnen Warranty, and Tesla Warranty are attached as **Exhibits BW-2** and **BW-3** respectively. I also reviewed warranties for LG Chem, Mercedes-Benz Energy Storage, Samsung SDI/Sharp, and Sunverge, all of which warranted their batteries' performance if cycled daily or for ten years without specifying cycling limitations.

1 2) 75% of the greatest on-peak period billing demand used for billing purposes in the
2 preceding 11 months.³
3

4 **Q: How do the Utilities justify this proposal?**

5 A: The Company asserts that demand ratchets “focus a customer's attention to only a few
6 hours a year which means that the cycling of the battery is reduced which extends the life
7 of the battery and reduces the battery costs for the customer.”⁴
8

9 **Q: Do you agree with the Utilities that demand ratchets reduce cycling requirements for**
10 **batteries?**

11 A: No. I disagree with the Utilities’ assertion that ratchets reduce the need to frequently cycle
12 the battery. A battery cycling strategy designed to maximize bill savings on a demand
13 ratchet would result in daily cycling due to the uncertainty of future load over a 12 month
14 horizon as explained in more detail below. Remember, as I explained above, daily cycling
15 of a storage system does not have a negative impact on customer economics. So, not only
16 do I disagree that demand ratchets reduce cycling, I disagree with the Utilities’ premise
17 that avoiding cycling would improve project economics.
18

19 **Q: How do the Utilities determine that a demand ratchet can reduce battery cycling?**

20 A: While the Utilities stated in discovery that they did not perform any studies with regard to
21 its residential ratchet rate proposal,⁵ the Company did perform an evaluation of commercial
22 battery storage on its LGST (or LGSTOU) and LGSTB tariffs in response to a discovery
23 question from Staff.⁶ The Company describes the LGST tariff as its Large General Service
24 Time-of-Use tariff and LGSTB as its Large General Service Time-of-Use Storage tariff.⁷
25 The LGST rate includes a 75% ratchet much like the one proposed for the residential
26 storage rate while the LGSTB rate does not include a ratchet. Both also have monthly
27 demand charges typical to many commercial rates.

³ See Jones 47:26-48:4 (TEP and UNSE Rebuttal Testimony); see also <https://www.tep.com/wp-content/uploads/2017/02/221-TGLGST.pdf>

⁴ Jones, 46:24-25 (TEP and UNSE Rebuttal Testimony)

⁵ See TEP Response to EFCA Data Request 7.1 attached hereto as **Exhibit BW-4**.

⁶ See Response to EFCA Data Request 6.1 attached hereto as **Exhibit BW-5**.

⁷ See TEP’s response to Staff’s Fourth Set of Data Requests, STF 4.05 attached hereto as **Exhibit BW-6**.

1
2 The Utilities state in the response provided with the savings evaluation that “any new
3 storage rate, regardless of customer size, be based on TEP’s Large General Service Time-
4 of-Use Tariff (LGSTOU).” Due to a lack of specific analysis relating to a residential rate
5 or demand ratchet cycling, the only information available was TEP’s LGST and LGSTB
6 analysis which is the only data or analysis provided that shows how the Companies came
7 to the conclusion that demand ratchets can reduce battery cycling.⁸
8

9 **Q: Does the Companies’ analysis support their conclusion that the ratcheted rate reduces**
10 **cycling?**

11 A: No. [REDACTED]
[REDACTED]
[REDACTED]
14

15 We can compare the cycling of one battery to another by adding up all of the energy
16 discharged over a period of time (throughput) and dividing that by the nameplate battery
17 rating. For example, a 10 kWh battery that has a throughput of 2,500 kWh in one year is
18 said to have fully cycled 250 times (eg. 2500 kWh / 10 kWh). [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
23

24 [REDACTED]
[REDACTED] Not only does their model not support
26 their conclusion, there are several other modeling issues as well that further demonstrate
27 that the proposed demand ratchet will not reduce battery cycling, in addition to a clear
28 misunderstanding by the utilities of storage-friendly rates and storage technology.
29

⁸ This analysis was provided in a confidential DR response to STF 4.05. The analysis is identified as: *STF P2 4.5 Comp Sen Confidential.xlsx*. Portions of the analysis are attached hereto as **CONFIDENTIAL EXHIBIT BW-7**

Q: What modeling issues do you identify in the Companies' analysis?

A: The Companies' analysis has the following flaws:

These flaws in combination result in the incorrect conclusion about storage cycling on a demand ratchet tariff and discredit the Companies' conclusions relating the economic costs and benefits that storage can provide on the existing and proposed rates.

[illegible]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

1

[REDACTED]

[REDACTED]

22

23

[REDACTED]

[REDACTED]

[REDACTED]

Rates with a 12-month ratchet result in a lag between the commencement of battery operations and the realization of full bill savings from peak demand reductions. This is because it may take a full 12 months before the lower ratcheted peak set by the battery is used in the bill calculation. A customer with a battery with an industry standard warranty of ten years will effectively miss out on 10% of the potential savings if it is installed on a rate with a ratchet that takes one year of peak demand reductions to realize any significant savings.

[REDACTED]

[REDACTED]

¹⁰ <https://www.greentechmedia.com/articles/read/record-breaking-quarter-for-u-s-behind-the-meter-energy-storage-market> <http://www2.greentechmedia.com/Q3USESM17>

1 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

6

7

8 [REDACTED]

19

20 **Q: Based on the Utilities' incorrect modeling assumptions, what do you recommend?**

21 A: The Commission should reject the Utilities' arguments related to the cycling of battery
22 storage systems offered in support of the Utilities' proposal to implement a demand ratchet
23 on any rate that is designed to encourage the deployment of storage. Ratchets do not reduce
24 cycling needs for batteries with operational strategies to maximize customer savings.
25 Furthermore, the Companies' analysis of the economics of storage are based on flawed
26 modeling and incorrect battery design assumptions and therefore cannot be relied upon.

27

28 IV. Conclusion

29 Q: Does this conclude your testimony?

30 A: Yes.

BW-1

BRIAN WARSHAY

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WORK EXPERIENCE

- Sept. 2015 to present **Tesla/SolarCity, Senior Analyst, Product Economics & Grid Services, San Francisco, CA**
- *Product economics:* Inform product specs and warranties for next gen Powerwall and Powerpack based on cost-benefit analysis of design tradeoffs and market potential.
 - *Project development:* Supported financial analysis based on wholesale market production cost simulation in Plexos to win a 129 MWh storage project in Australia.
 - *Analysis:* Lead analytical approaches to evaluate solar roof and electric truck economics.
 - *Tool development:* Led development, validation, and release of ISO power market model in Quickbase to empower sales team to evaluate project economics nationally.
 - *Modeling:* Developed rate analysis model to evaluate PV & storage customer economics.
 - *Business development:* Provide market, policy, and economic analysis for proposal responses to RFPs for innovative grid service pilot projects, demand response and grants.
 - *Policy:* Contribute testimony to public proceedings on rates and CA Title 24 standards.
- 2013 to 2015 **Bloomberg New Energy Finance, Lead US Energy Smart Technology Analyst, NYC**
- *Research:* Led subscription-based technology, finance, and policy research on energy storage, demand response, electric vehicles, smart grid, and rooftop PV for global clients.
 - *Modeling:* Built client-facing tools that model PV & storage economics (LCOE, NPV).
 - *Consulting:* Provided recommendations to utility, vendor, and government clients regarding clean energy investments, economics, and overall business strategies relating to DG.
- 2011 to 2013 **Lux Research, Inc., Analyst, Smart Grid & Grid Storage Team, NYC**
- Evaluated startup companies and provided strategic advice to VC/PE and utility clients.
- 2006 to 2009 **Malcolm Pirnie, Inc., Project Environmental Consultant, Fort Lauderdale and Boston**

LEADERSHIP EXPERIENCE

- Summer 2017 Led software upgrade for PV & storage utility bill savings calculations for novel rate structures.
- Early 2017 Led behaviour and energy consumption survey to gather data informing new product designs.

EDUCATION

- Aug. 2009 to June 2011 **Masdar Institute of Science & Technology, Abu Dhabi, UAE** with joint certificate from MIT
- Master of Science (MSc) in Engineering Systems and Management** GPA: 3.76
- *Thesis:* LCA, GHG and Risk Assessment of a Biofuel Production System in Abu Dhabi.
 - *Publications:* Lead author of peer reviewed journal articles published in [2011](#) and [2016](#).
- Aug. 2002 to Jan. 2006 **Cornell University, College of Agriculture and Life Sciences, Ithaca, NY**
- B.S. Natural Resources & B.S. Environmental Engineering Technology – Cum Laude**
- *Dean's Award:* Highest GPA in Natural Resources (3.5); Dean's List 4 of 6 semesters.

MEDIA ATTENTION, CONFERENCE PRESENTATIONS & QUOTES (additional upon request)

Authored "[Upgrading the Grid](#)" article for *Foreign Affairs Magazine* published in March/April 2015 issue.

Presented research at global conferences in Singapore, Germany, the UAE, Mexico, Canada, and the US.

Quoted in *Scientific American*, *Forbes*, *Bloomberg Business Week*, *The Boston Globe*, and others publications.

SOFTWARE SKILLS & EXPERIENCE

Excel & VBA; Quickbase; Managed Python projects; Plexos ISO market production cost simulation; LEED AP.

BW-2



PRODUCT FACTORY WARRANTY

I. WARRANTY

1. Warrantor.

Warrantor is sonnen, Inc. (formerly “sonnenBatterie”), 10800 Burbank Blvd., Suite #C, Los Angeles, CA, 91601

2. Products.

The following limited warranty terms and conditions (collectively, the “Factory Warranty”) apply exclusively to sonnen, Inc.’s products of the following types (“Covered Products”):

- US eco 2.0 (or higher), installed after July 31, 2015,
- US pro 1.0 (or higher), installed after January 1, 2016,

which:

- were manufactured by and bear the original manufacturing label of sonnenBatterie or sonnen, Inc.
- were sold by sonnen, Inc. directly or through a certified sonnenBatterie dealer (“Authorized Dealer”) as new products in the United States and Canada;
- were installed and commissioned by an Authorized, Certified Dealer within the United States and Canada.

3. Product Warranty.

For Covered Products, sonnen, Inc. covers all defects in workmanship and materials during the Warranty Period under normal application, installation, use and service conditions as specified in sonnen, Inc.’s standard product documentation, and subject to the conditions listed below (“Product Warranty”). The Product Warranty is not intended to be a durability warranty, as end-user conditions and usage is variable. Sonnen specifically disclaims any warranty to include specific components in any product or service.

4. Performance Warranty.

Sonnen, Inc. guarantees that the actual storing capacity of the original battery pack included in the Covered Product ("Battery Pack") will be not less than 70% of the labeled storing capacity.

5. Warranty Obligations.

(a) During the Warranty Period, sonnen, Inc. will, at its option, repair the defective parts (if economically feasible) or replace the defective part free of charge, provided that you properly notify sonnen, Inc. of the product defect within the Warranty Period, and provided that sonnen, Inc., through inspection, establishes the existence of a defect covered by this Limited Warranty.

(b) Sonnen, Inc. will, at its option, use new and/or reconditioned parts in building replacement parts. Sonnen, Inc. reserves the right to use parts or products of original or improved design in the repair or replacement of your product. If sonnen, Inc. repairs or replaces a product part, its warranty continues for the remaining portion of the Warranty Period or 90 days from the date of the repair or replacement, whichever is greater.

(c) This Factory Warranty covers sonnenBatterie costs for materials necessary to reestablish trouble free operation of the Covered Product. This Factory Warranty does NOT cover, however, costs of installation, cost of removal, cost of labor for repair, cost of shipping or cost of reinstallation of a Covered Product or parts thereof.

(d) In the event of a defect of products or services supplied by sonnen, Customer's sole remedy shall be, at sonnen's cost and expense up to 100% of the cost of the equipment, (a) repair or replacement of defective product at sonnen's discretion, or (b) re-performance of defective services.

(e) Except for visible defects of products and services for which Customer shall provide notice to sonnen immediately under Section 6.3 of sonnen, Inc's Terms & Conditions, Customer shall provide written notice of any defect to sonnen within 10 days after discovery of such defect.

(f) Should sonnen be unable to repair or replace defective products or re-perform defective services to the agreed-upon standard within 30 days after written notice from Customer of such defect, Customer shall grant sonnen a 10 day cure period in writing. Should sonnen fail to replace defective products or re-perform defective services to the agreed-upon standard within such 10 day cure period after written notice from Customer, Customer shall have the right to rescind the contract and sonnen shall

promptly reimburse Customer for all invoices paid to sonnen on account of such defective product(s) or service(s).

(g) sonnen's liability with respect to any product, including without limitation sonnen's obligation to repair or replace defective products or to re-perform defective services, shall be excluded if (a) Customer fails to inspect products or services as required under Section 6.4 of sonnen, Inc's Terms & Conditions or elsewhere in those Terms, (b) Customer fails to inform sonnen about defects as required under Sections 6.4 of the Terms & Conditions or section (e) or (f) above or elsewhere in this Warranty document, (c) Customer fails to observe product operating and maintenance instructions provided by sonnen, (d) any product or product part has been opened, modified, repaired, processed, replaced or installed, or any other work has been performed in relation to or that affects any product, by a non-certified or otherwise unauthorized person, (e) any other act or omission has occurred that otherwise has resulted in a loss of product warranty.

(h) In the event sonnen determines that an alleged product or services defect did not exist or, if existed, was excluded from sonnen's liability by sonnen's Terms & Conditions, Customer shall reimburse sonnen for all costs and expenses incurred by sonnen as a result of sonnen's attempt to repair, replace or re-perform.

(i) Sonnen is not liable for product(s) damaged through installer error or installation error regardless of the installer's status of having attended or not attended the sonnen provided Certified Installer Training. Determination of warranty coverage is as set out in this Warranty document, and at the discretion of the sonnen Service team.

(j) EXCEPT AS OTHERWISE PROVIDED BY APPLICABLE LAW, THE FOREGOING REMEDIES STATE SONNEN'S SOLE AND EXCLUSIVE OBLIGATION AND YOUR SOLE AND EXCLUSIVE REMEDY FOR A BREACH OF THE FOREGOING LIMITED WARRANTY.

6. Product Suitability.

Sonnen's products are designed to meet stated U.S. safety standards and regulations. Because local safety standards and regulations vary significantly, sonnen cannot guarantee that products meet all applicable requirements in each locality. Customer assumes responsibility for compliance with such safety standards and regulations in the localities in which a product will be shipped, sold or used. Before purchase and use of any product, Customer shall review the product application, and national and local codes and regulations, and must verify that the use and installation of the product will be in compliance therewith.

7. Warranty Term.

(a) The warranty period (“Warranty Period”) for the Covered Product commences upon the initial purchase from sonnen, Inc. or from an Authorized Dealer (as evidenced by the purchase invoice date).

(b) The Warranty Period for the Product Warranty (Section 3) terminates upon the earlier of (i) 123 months after purchase of the Covered Product, or (ii) 120 months after installation of the Covered Product by an Authorized Dealer.

(c) The Warranty Period for the Performance Warranty (Section 4) terminates upon the earlier of (i) 123 months after purchase of the Covered Product, or (ii) 120 months after installation of the Covered Product by an Authorized Dealer, or (iii) 10,000 full (100%) charging cycles of the Battery Pack.

8. Persons Entitled to Make Warranty Claims.

Warranty claims may only be made by the original purchaser of a Covered Product, if the Covered Product has been registered through sonnen’s product registration website during the installation process by the Authorized Dealer, or a person to whom the title to the Covered Product has been transferred, provided that the Covered Product remains in its original location and configuration (including, without limitation, a purchaser of a building, who acquires the covered product as a fixture to the building).

9. Claim Notice.

(a) If you believe that you have a justified claim covered by this Factory Warranty, you must submit the claim in writing (“Claim Notice”) to sonnen, Inc. within the applicable Warranty Period to sonnen, Inc.’s address set forth above, or such future address as sonnen, Inc. may provide from time to time. Any Claim Notice must include the following information:

- the serial number of the Covered Product for which a Claim Notice is being sent;
- a copy of the dated purchase receipt for the Covered Product;
- a copy of the installation protocol for the Covered Protocol signed by an Authorized Dealer;
- information about the use of the Covered Product in reasonable detail;

- information about the defect in reasonable detail.

(b) Upon receipt of your Claim Notice sonnen, Inc. may ask for further information or claim verification from you, receipt of which will be required prior to processing the claim.

(c) Upon acceptance of your warranty claim, sonnen, Inc. may require that you send the Covered Product at your own costs to a sonnen, Inc. warranty claim center located in the United States.

II. WARRANTY LIMITATIONS

1. Excluded Warranty Claims

(a) sonnen, Inc. makes no warranties, either expressed or implied, orally, or in writing, with respect to any other warranty coverage except those expressly stated in this limited Factory Warranty

(b) The Factory Warranty does not cover damages that occur due to:

- Transport damage;
- Installation or commissioning through any person which is not an Authorized, Certified Dealer;
- Failure to observe the user manual, maintenance regulations and intervals;
- Modifications, changes, or attempted repairs, except as conducted by an Authorized Dealer;
- Incorrect use or inappropriate operation;
- Insufficient ventilation of the Covered Product;
- Failure to observe the applicable safety regulations;
- Force majeure.

(c) This factory warranty does not cover cosmetic defects which do not directly influence energy production, or degrade form, fit, and function.

(d) Claims that go beyond the scope of this limited Factory Warranty, in particular claims for compensation for direct or indirect damages arising from the defective device, for compensation for costs arising from disassembly and installation, or loss of profits, are expressly NOT covered by this Factory Warranty.

(e) In no event will sonnen, Inc. be held responsible or liable for any personal injuries resulting from the use of the system, or for any other damages, whether direct, indirect, incidental, or consequential; even if sonnen, Inc. has been advised of such damages.

2. Internet Connectivity.

As a condition to this limited Factory Warranty, sonnen, Inc. requires continuous online access to the Covered Product via internet connection. This Factory Warranty requires that the Covered Product will be properly connected to the internet through your internet provider and expressly excludes any defects resulting from your acts or omissions that prevent sonnen, Inc. from accessing the Covered Product online as may be required for software upload or performance data download.

III. GENERAL

This limited Factory Warranty and the terms contained herein supersede all statements contained in any and all user manuals, installation manuals, other equipment literature or catalogs, or orally with respect to any product or performance warranty for Covered Products.

BW-3



TESLA POWERWALL LIMITED WARRANTY (USA)

Effective Date: February 9, 2017

Applies to:

13.2 kWh Powerwall 2 AC	Part Number 1108567-xx-x
Energy Gateway	Part Number 1099752-xx-x
Backup Energy Gateway	Part Number 1109752-xx-x
Energy Gateway Meter	Part Number 1112484-xx-x

Ten Year Limited Warranty

Tesla, Inc. warrants that:

- (1) Your Powerwall will be free from defects for ten years following its initial installation date; and
- (2) Your Powerwall will have an energy capacity of 13.2 kWh on its initial installation date, and will retain energy capacity as shown in the table below.

Application	Energy Retention¹	Operating Limitation
Solar self-consumption/ backup only ²	70% at 10 years following initial installation date	Unlimited cycles
Any other application or combination of applications	70% at 10 years following initial installation date	37 MWh of aggregate throughput ³

Note that this Limited Warranty (including its duration) is subject to a number of important exclusions and limitations, which are set out in detail below. It also includes a mandatory arbitration provision and waiver of your right to request a jury trial or make a claim through a class action, which you should read carefully.

¹ Expressed as a % of 13.2 kWh rated capacity.

² Storing solar energy generated by an onsite array, and using that stored solar energy (i) for daily self-consumption and/or (ii) for use as backup power.

³ Measured at the battery AC output.

Remedies

If your Powerwall fails to comply with the above Limited Warranty, Tesla will, in its sole discretion, either repair your Powerwall (using new or refurbished parts), replace your Powerwall with an equivalent product (new or refurbished), or refund you the market price of an equivalent product at the time of the warranty claim. If your Powerwall is repaired or replaced under this Limited Warranty, the remainder of the original warranty period will apply to the repaired or replacement product. Under no circumstances will the original warranty period be extended as a result of your Powerwall being repaired or replaced.

What Products are Covered?

This Limited Warranty applies to any Tesla Powerwall that (1) was purchased from Tesla or a Tesla certified installer in the United States of America; (2) has one of the part numbers referenced above; and (3) is installed in the United States of America. Please contact Tesla if you have any concerns regarding whether you purchased your Powerwall from a Tesla certified installer.

Who Can Make a Claim?

Limited Warranty claims can be made by or on behalf of the end user who acquired and put the Powerwall into use for the first time. A subsequent owner of the Powerwall who provides proof of ownership is also entitled to make Limited Warranty claims.

Limitations and Disclaimer

THIS LIMITED WARRANTY IS THE ONLY EXPRESS WARRANTY MADE IN CONNECTION WITH YOUR POWERWALL. Any other warranties, remedies and conditions, whether oral, written, statutory, express or implied (including any warranties of merchantability and fitness for purpose, and any warranties against latent or hidden defects) are expressly disclaimed. If such warranties cannot be disclaimed, Tesla limits the duration of and remedies for such warranties to the durations and remedies described in this Limited Warranty.

Relationship with Applicable Law

This Limited Warranty gives you specific legal rights. You may also have other legal rights, which vary from state to state. For example, some states do not allow limitations on how long an implied warranty lasts, meaning the limitations in the "Limitations and Disclaimer" section above may not apply to you. The terms of this Limited Warranty will apply to the extent permitted by applicable law. For a full description of your legal rights you should refer to the laws applicable in your jurisdiction.

General Exclusions

This Limited Warranty does not apply to any defect or energy capacity shortfall resulting from any of the following, each of which may result in your Limited Warranty being voided: (i) abuse, misuse or negligence, (ii) accidents or force majeure events, including but not limited to lightning, flood, earthquake, fire, or other events outside the reasonable control of Tesla; (iii) storage, installation, commissioning, modification or repair of your Powerwall, or opening of the external casing of your Powerwall, that is performed by anyone other than Tesla or a Tesla certified installer; (iv) failure to operate or maintain your Powerwall in accordance with the Owner's Manual; (v) any attempt to modify your Powerwall, whether by physical means, programming or otherwise,

without the express written consent of Tesla; or (vi) removal and reinstallation of your Powerwall at a location other than the original installation location, without the express written consent of Tesla.

In addition, this Limited Warranty does not cover (a) normal wear and tear or deterioration, or superficial defects, dents or marks that do not impact the performance of your Powerwall; (b) noise or vibration that is not excessive or uncharacteristic and does not impact your Powerwall's performance; (c) damage or deterioration that occurs after the expiration or voiding of the warranty period; or (d) theft of your Powerwall or any of its components.

Exclusion for Failure to Connect to the Internet or Failure to Register your Powerwall

In order to provide this Limited Warranty for the full ten year warranty period, Tesla requires the ability to update your Powerwall through remote firmware upgrades. Installation of these remote upgrades may interrupt the operation of your Powerwall for a short period. By installing your Powerwall and connecting it to the Internet, you consent to Tesla updating your Powerwall through these remote upgrades from time to time, without further notice to you. If your Powerwall is not connected to the Internet for an extended period, or has not been registered with Tesla, we may not be able to provide important remote firmware upgrades. In these circumstances, we may not be able to honor your full ten year Limited Warranty. We would prefer to avoid this, so will try to notify you if your Powerwall's Internet connection is interrupted for an extended period. It is difficult for us to contact you if you have not registered your Powerwall with us, so **please register your Powerwall with Tesla at the website identified below**. Even if we can't honor your full ten year Limited Warranty for the above reasons, we will always honor your Limited Warranty for at least four years following the date your Powerwall was installed for the first time.

California Proposition 65 Warning

We are required to advise you that lithium-ion batteries may contain chemicals known to the State of California to cause cancer, birth defects and reproductive harm. We don't expect you to come into contact with any part of your Powerwall other than the external casing. If you do, please wash your hands afterwards.

Modifications and Waivers

No person or entity, including a Tesla employee or authorized representative, can modify or waive any part of this Limited Warranty. Tesla may occasionally offer to pay some or all of the cost of certain repairs that are not covered by this Limited Warranty, either for specific Powerwall models or on an ad hoc, case-by-case basis. Tesla reserves the right to do the above at any time without incurring any obligation to make a similar payment to other Powerwall owners.

Limitation of Liability

TESLA SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, INDIRECT, SPECIAL, EXEMPLARY OR PUNITIVE DAMAGES ARISING OUT OF OR RELATED TO THIS LIMITED WARRANTY, REGARDLESS OF THE FORM OF ACTION AND REGARDLESS OF WHETHER TESLA HAS BEEN INFORMED OF, OR OTHERWISE MIGHT HAVE ANTICIPATED, THE POSSIBILITY OF SUCH DAMAGES. TESLA'S LIABILITY ARISING OUT OF A CLAIM UNDER THIS LIMITED WARRANTY SHALL NOT EXCEED THE AMOUNT YOU PAID FOR YOUR POWERWALL.

SOME STATES DO NOT ALLOW, OR RESTRICT, THE EXCLUSION OR LIMITATION OF DAMAGES, INCLUDING INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU, OR MAY ONLY APPLY TO A LIMITED EXTENT.

Limitation on Use

YOUR POWERWALL IS NOT INTENDED FOR USE AS A PRIMARY OR BACKUP POWER SOURCE FOR LIFE-SUPPORT SYSTEMS, OTHER MEDICAL EQUIPMENT, OR ANY OTHER USE WHERE PRODUCT FAILURE COULD LEAD TO INJURY TO PERSONS OR LOSS OF LIFE OR CATASTROPHIC PROPERTY DAMAGE. TESLA DISCLAIMS ANY AND ALL LIABILITY ARISING OUT OF ANY SUCH USE OF YOUR POWERWALL. FURTHER, TESLA RESERVES THE RIGHT TO REFUSE TO SERVICE ANY POWERWALL USED FOR THESE PURPOSES AND DISCLAIMS ANY AND ALL LIABILITY ARISING OUT OF TESLA'S SERVICE OR REFUSAL TO SERVICE YOUR POWERWALL IN SUCH CIRCUMSTANCES.

Governing Law

This Limited Warranty shall be governed by the internal substantive laws of the State of California, without respect to its conflict of laws principles. The parties acknowledge that this Limited Warranty may evidence a transaction involving interstate commerce. Notwithstanding the preceding sentences with respect to the substantive law, any arbitration conducted pursuant to the terms of this Limited Warranty shall be governed by the Federal Arbitration Act (9 U.S.C. §§ 1-16). The application of the United Nations Convention on Contracts for the International Sale of Goods is expressly excluded. You agree to submit to the personal jurisdiction of the federal and state courts located in Santa Clara County, California for any actions for which we retain the right to seek injunctive or other equitable relief in a court of competent jurisdiction to prevent the actual or threatened infringement, misappropriation or violation of our copyrights, trademarks, trade secrets, patents, or other intellectual property or proprietary rights, as set forth in the Arbitration provision below, including any provisional relief required to prevent irreparable harm. You agree that Santa Clara County, California is the proper forum for any appeals of an arbitration award or for trial court proceedings in the event that the arbitration provision below is found to be unenforceable.

Arbitration

READ THIS SECTION CAREFULLY. ARBITRATION REPLACES THE RIGHT TO GO TO COURT, INCLUDING THE RIGHT TO A JURY AND THE RIGHT TO PARTICIPATE IN A CLASS ACTION OR SIMILAR PROCEEDING. IN ARBITRATION, A DISPUTE IS RESOLVED BY AN ARBITRATOR INSTEAD OF A JUDGE OR JURY. If we have a dispute of any kind related to this Agreement (other than a dispute about intellectual property rights), you and Tesla each agree to first attempt to resolve the dispute informally. If we have not resolved the dispute after 60 days, we each agree that we will not go to court, and instead agree to binding arbitration with Judicial Arbitration and Mediation Services ("JAMS"), under the Streamlined Arbitration Rules that JAMS then has in effect. Contact information for JAMS is at www.jamsadr.com.

All claims must be brought in the name of an individual person or entity and must proceed on an individual (non-class, non-representative) basis. If either of us arbitrates a claim, neither of us may pursue the claim as a class action, class arbitration, private attorney general action or other representative action, nor may any such claim be pursued on your or our behalf in any litigation in any court. Unless we agree otherwise, the arbitrator may not consolidate more than one person's claims. You agree that you and Tesla are each waiving the right to a trial by jury or to participate in a class action, collective action, private attorney general action, or other representative proceeding of any kind.

The arbitrator will be selected pursuant to the applicable JAMS rules. If you are using your Powerwall for commercial purposes, the arbitration will be conducted in San Francisco, California, each of us will bear our own expenses in the arbitration and each of us will share equally the costs of the arbitration; provided, however, that the arbitrator may, in his or her discretion, award reasonable costs and fees to the prevailing Party. If you are an individual using your Powerwall for non-commercial purposes: (i) the arbitration will be conducted at the JAMS site closest to your home unless we agree to a different location (ii) JAMS may require you to pay a fee for the initiation of your case, unless you apply for and obtain a fee waiver from JAMS, while Tesla will pay the remaining JAMS costs and fees; (iii) the award rendered by the arbitrator may include your costs of arbitration, your reasonable attorney's fees, and your reasonable costs for expert and other witnesses; and (iv) you may sue in a small claims court of competent jurisdiction instead of engaging in binding arbitration, but you still must engage in the informal dispute resolution process first.

The existence, content and result of the arbitration shall be held in confidence by all participants, except that any final judgment on the award rendered by the arbitrator may be entered in any court of competent jurisdiction. This Section does not apply to intellectual property disputes between us.

Class Action/Jury Trial Waiver

WITH RESPECT TO ALL PERSONS AND ENTITIES, REGARDLESS OF WHETHER THEY HAVE OBTAINED OR USED THE PRODUCT FOR PERSONAL, COMMERCIAL OR OTHER PURPOSES, ALL CLAIMS MUST BE BROUGHT IN THE PARTIES' INDIVIDUAL CAPACITY, AND NOT AS A PLAINTIFF OR CLASS MEMBER IN ANY PURPORTED CLASS ACTION, COLLECTIVE ACTION, PRIVATE ATTORNEY GENERAL ACTION OR OTHER REPRESENTATIVE PROCEEDING. THIS WAIVER APPLIES TO CLASS ARBITRATION, AND, UNLESS WE AGREE OTHERWISE, THE ARBITRATOR MAY NOT CONSOLIDATE MORE THAN ONE PERSON'S CLAIMS. YOU AGREE THAT YOU AND TESLA ARE EACH WAIVING THE RIGHT TO A TRIAL BY JURY OR TO PARTICIPATE IN A CLASS ACTION, COLLECTIVE ACTION, PRIVATE ATTORNEY GENERAL ACTION, OR OTHER REPRESENTATIVE PROCEEDING OF ANY KIND.

Claims Process

In order to make a claim under this Limited Warranty, please contact the Tesla certified installer who sold you your Powerwall. If you are unable to contact the Tesla certified installer who sold you your Powerwall, or if you purchased your Powerwall directly from Tesla, you should contact Tesla at the address, email address or telephone numbers identified below. For a warranty claim to be processed, it must include (i) proof of the original purchase of your Powerwall and any subsequent transfers of ownership, (ii) a description of the alleged defect(s), and (iii) your Powerwall's serial number and original installation date. Prior to returning any Product to Tesla, you should obtain an RMA (Return Merchandise Authorization) number from Tesla by submitting a Service Request Form at the link indicated below.

Tesla Contact Details

- **Tesla website for registering a Product or submitting a Service Request Form:**
<https://www.tesla.com/support/powerwall>
- **Tesla email:** powerwallsupport@tesla.com
- **Tesla address:** 3500 Deer Creek Road, Palo Alto, California 94304, Attn: Powerwall Warranty Claims
- **Tesla telephone numbers:**
 - Australia: +61 1 800 294431
 - Austria: +43 800 80 2480
 - Belgium: +32 800 26614
 - Canada: +1 (844) 498-3752
 - Germany: +49 800 724 4529
 - Italy: +39 800 59 6849
 - Luxembourg: +35 280 08 0921
 - Netherlands: +31 800 3837301
 - New Zealand: +64 800 99 5020
 - Portugal: +35 180 018 0397
 - South Africa: +27 87 550 3480
 - Switzerland: +41 800 002634
 - US: +1 (844) 378-3752
 - UK: +44 800 098 8064

BW-4

**TUCSON ELECTRIC POWER COMPANY'S AND UNS ELECTRIC, INC.'S JOINT
RESPONSE TO EFCA'S SEVENTH SET OF DATA REQUESTS REGARDING PHASE 2
OF THE 2015 TEP RATE CASE AND THE 2015 UNSE RATE CASE
DOCKET NO. E-01933A-15-0322 AND E-04204A-15-0142
September 20, 2017**

EFCA P2 7.1

On page 46 of his testimony, Mr. Jones states, "the daily demand charge must be removed because as previously stated, daily cycling is expensive to the storage owner."

- a. Please provide copies of any and all documentation that Mr. Jones relied upon in concluding that "daily cycling is expensive to the storage owner."
- b. Please provide copies of any and all documentation that Mr. Jones is aware of, that supports the conclusion that "daily cycling is expensive to the storage owner."
- c. Has Mr. Jones performed any studies or analysis that support this statement? If yes, please provide copies of all studies, analysis, or calculations that Mr. Jones performed or is aware of, that support this portion of his testimony.
- d. Has Mr. Jones performed or reviewed any analysis comparing the cost to the storage owner of daily cycling with the cost to the storage owner of other cycling time periods? If yes, please provide copies of any and all such analysis.

RESPONSE:

- a.-d. The statement in Mr. Jones testimony is based on what he believes to be widely held industry knowledge that the primary components of electro-chemical storage service life are the chemistry of the battery, the environment where the battery is stored, total shelf life, characteristics of discharge-recharge cycles, and the frequency of discharge-recharge cycles. The more frequently a cell is cycled, the quicker it degrades, and thus the quicker it will need to be replaced which increases expense. In the Companies' experience, and based on a cursory internet search, there are no current battery technologies that do not degrade with continued cycling as that would violate the second law of thermodynamics. Depending on battery chemistry, it is possible to increase cycle life by installing a larger capacity battery that decreases depth of discharge but a bigger battery requires a larger expense. For daily cycling, either the battery will wear out quickly or the battery will have to be sized such that only a small portion of its total charge is ever used in a single cycle. Accordingly, the Company did not rely on any specific documentation nor perform any studies as no study is required because simple logical deductions from the practical realities of battery operation make such costly studies unnecessary.

RESPONDENT:

Greg Strang

WITNESS:

Craig Jones

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**TUCSON ELECTRIC POWER COMPANY'S AND UNS ELECTRIC, INC.'S JOINT
RESPONSE TO EFCA'S SIXTH SET OF DATA REQUESTS REGARDING PHASE 2 OF
THE 2015 TEP RATE CASE AND THE 2015 UNSE RATE CASE
DOCKET NO. E-01933A-15-0322 AND E-04204A-15-0142
September 15, 2017**

EFCA P2 6.1

In the STF P2 4.5 Comp Sen Confidential spreadsheet, the Summary tab appears to include a list of battery storage system characteristics that TEP used in its analysis. Please list and explain all of the assumptions used by the Companies that support these figures, including the following, descending from cell A2 to cell A17.

- a. Max
- b. Reduction
- c. New Max
- d. Max kW Discharge LGST
- e. Max kWh Discharge LGST
- f. Hours of Discharge LGST
- g. Battery Cost LGST
- h. LGST Annual Bill
- i. LGST Annual Bill w/ Bat
- j. Payoff Period in Years LGST
- k. Max kW Discharge LGSTB
- l. Max kWh Discharge LGSTB
- m. Hours of Discharge LGSTB
- n. Battery Cost LGSTB
- o. LGSTB Annual Bill
- p. Payoff Period in Years LGSTB

RESPONSE:

The logic and assumptions underlying these data are available in any of the individual LGS## tabs in the STF P2 4.5 Comp Sen Confidential.xlsx workbook.

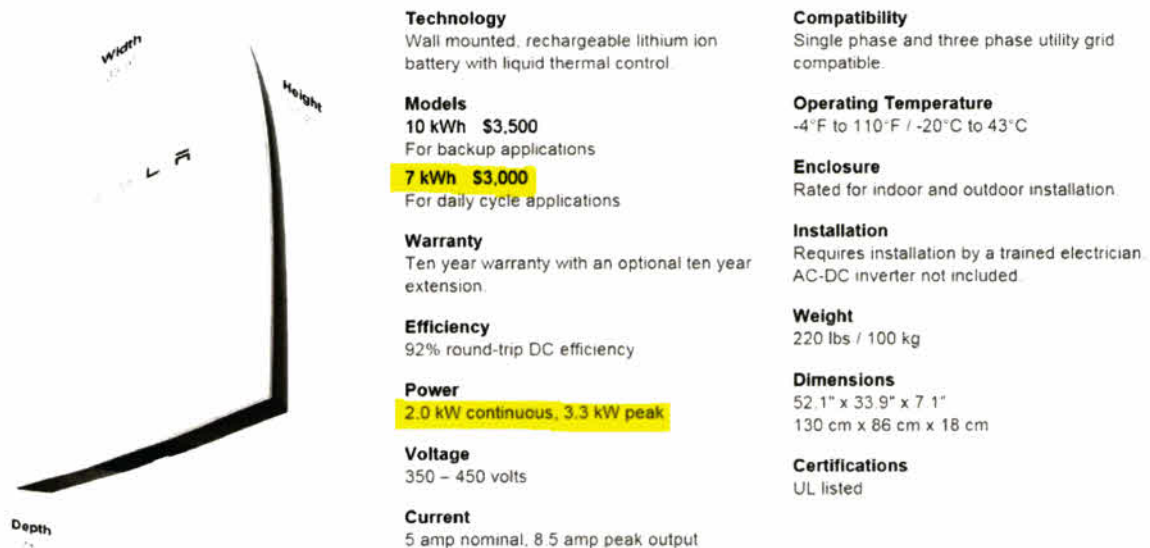
- a. Customer's current peak kW
- b. Percent billing kW reduction from storage
- c. Customer's peak post storage
- d. Max power discharge necessary on LGSTOU = LGST = Large General Service Time-of-Use to reduce peak kW by the assumed reduction amount.
- e. Max Energy discharge necessary on LGSTOU to reduce peak kW by the assumed reduction amount.

**TUCSON ELECTRIC POWER COMPANY'S AND UNS ELECTRIC, INC.'S JOINT
RESPONSE TO EFCA'S SIXTH SET OF DATA REQUESTS REGARDING PHASE 2 OF
THE 2015 TEP RATE CASE AND THE 2015 UNSE RATE CASE
DOCKET NO. E-01933A-15-0322 AND E-04204A-15-0142**

September 15, 2017

- f. Maximum hours the battery will be producing power before being fully recharged
- g. The formula is self-explanatory. The price used was based on publicly available marketing materials from Tesla's website stating the cost of a 7kWh and 3.3kW battery was \$3,000. Using the residential Powerwall specifications most likely overstates the system costs which overstates the payoff periods.

Specs



- h. LGST Annual bill
- i. LGST Annual bill with battery
- j. Formula is self-explanatory resulting in payoff period in years
- k.-p. same as above except for LGSTB = LGSTOUB = LGSTOU Storage = Large General Service Time-of-Use Storage tariff.

RESPONDENT:

Greg Strang

WITNESS:

Craig Jones

BW-6

**TUCSON ELECTRIC POWER COMPANY'S AND UNS ELECTRIC, INC.'S JOINT
RESPONSE TO STAFF'S FOURTH SET OF DATA REQUESTS REGARDING PHASE 2
OF THE 2015 TEP RATE CASE AND THE 2015 UNSE RATE CASE
DOCKET NO. E-01933A-15-0322 AND E-04204A-15-0142**

September 5, 2017

STF P2 4.05

Refer to the Rebuttal Testimony of Craig Jones filed on August 28, 2017. Identify and provide:

- a. The analysis and cost basis for the LGS Storage pilot rate for TEP mentioned at pages 47-48.
- b. Details of how the 75% ratchet applied to on-peak demand rate component would apply (mentioned on page 48, line 4, as the third (iii) component of the TEP proposed LEG Storage Pilot rate.

RESPONSE:

- a. **THE FILE LISTED BELOW CONTAINS COMPETITIVELY-SENSITIVE CONFIDENTIAL INFORMATION THAT IS ONLY BEING PROVIDED TO THE REQUESTING PARTY PURSUANT TO THE TERMS OF THE PROTECTIVE AGREEMENT.**

The analysis TEP performed for evaluating battery storage is contained in file **STF P2 4.5 Comp Sen Confidential.xlsx**. TEP is proposing that any new storage rate, regardless of customer size, be based on TEP's Large General Service Time-of-Use Tariff (LGSTOU). The LGSTOU tariff was already found to be cost based in phase one of this proceeding and the analysis provided shows it provides a significant incentive towards energy storage because of its 75% ratchet mechanism making additional storage rates unnecessary. The findings of TEP's analysis show that removing the ratchet was a significant economic detriment to energy storage.

- b. There is currently no ratchet in TEP's LGS energy storage pilot tariff consistent with the decision in phase one of this proceeding. Going forward, to provide a strong incentive for energy storage, a 75% ratchet should apply in the same manner as the ratchet currently applies in the LGSTOU tariff at TEP to any new energy storage rates.

RESPONDENT:

Greg Strang

WITNESS:

Craig Jones

CONFIDENTIAL

BW-7

REDACTED