



# **Retail Solar Workshop II**

## **Market Operations & Customer Experience**

August 2, 2022

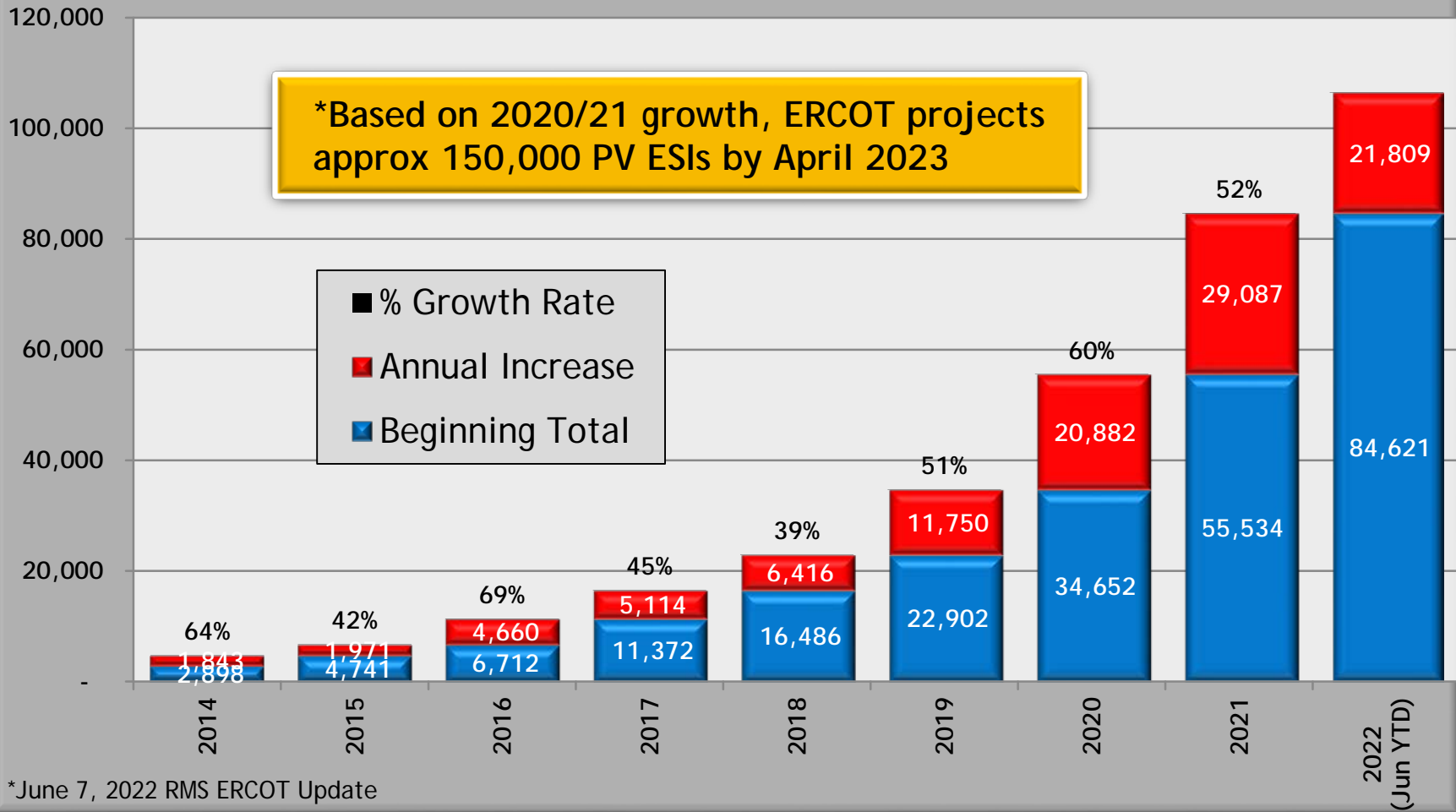
# Agenda

- I. Growth of Residential Solar
- II. Solar Customer Experience
- III. Solar Customer Questions & Concerns
- IV. Type of Solar Customers
- V. TDSP and Solar REP Roles
- VI. Market Operations- ERCOT and Verifying Load Profile
- VII. REP Solar Questions & TDSP Response Matrix
- VIII. Conclusion & Open Discussion
- IX. Appendix

# Growth of ERCOT Residential Solar

## ERCOT Residential PV (Solar) Profiled ESIs\*

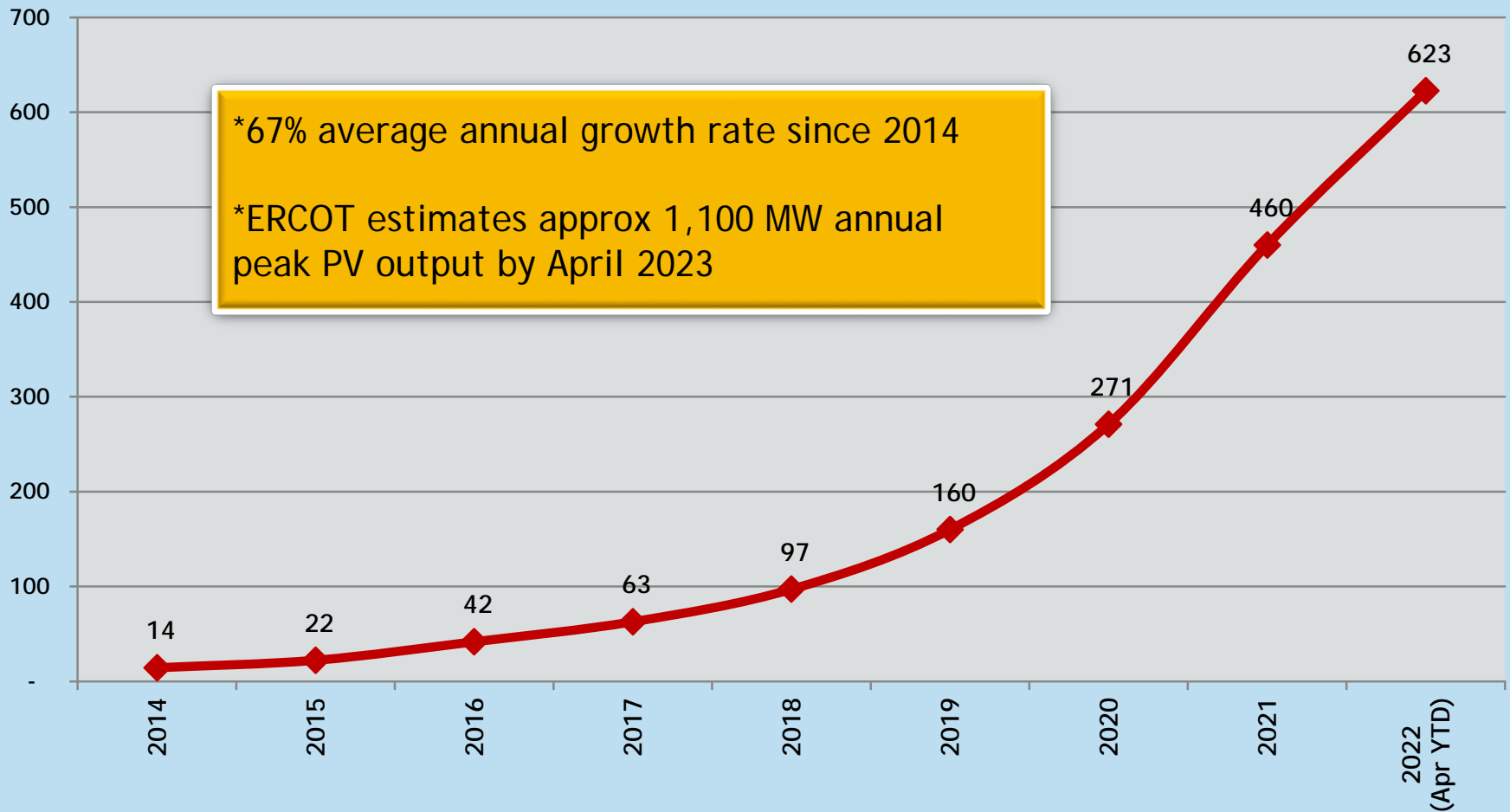
\*Based on 2020/21 growth, ERCOT projects approx 150,000 PV ESIs by April 2023



\*June 7, 2022 RMS ERCOT Update

# Growth of ERCOT Residential Solar MW Output

## ERCOT Residential PV (Solar) Monthly Max (MW) Output\*



\*June 7, 2022 RMS ERCOT Update

# Solar Customer Experience

## From a Customer Perspective:

- Many customers are approached by solar sales teams that often set unachievable expectations like:
  - Zero dollar electric bill
  - The ability to make a lot of money off credits provided by solar panels
  - Buy-back programs - "How do they work?"
- Installers often over-simplify information, which leads to confusion about the process of adopting solar and the primary benefits of going solar.
- Customers are confused about the roles for which REPs, TDSPs, and installers are responsible.
- They are unsure where to find information on the basics of how solar panels work, the benefit they provide, and whether the technology is right for them.

# Solar Customer Experience

## From a TDSP Perspective:

- Over the span of five years, the TDSPs have experienced an increasingly higher volume of residential solar interconnection applications.
- Customers have expressed an increase of conflicting information from solar sales teams, installers, REPs and the TDSPs during their solar enrollment experience.
- The increase of applications resulted in an increase of dissatisfied customer calls to the TDSPs' call centers.

# Solar Customer Questions & Concerns

Why am I only getting credit for 400 kWh when I produced 2000 kWh?

Is my surplus generation being measured correctly and can you send someone to check my meter?

Why am I still getting a bill?

Why is the amount of my credit different than what I generate?

Why was the surplus generation reported to my REP not matching my solar production?

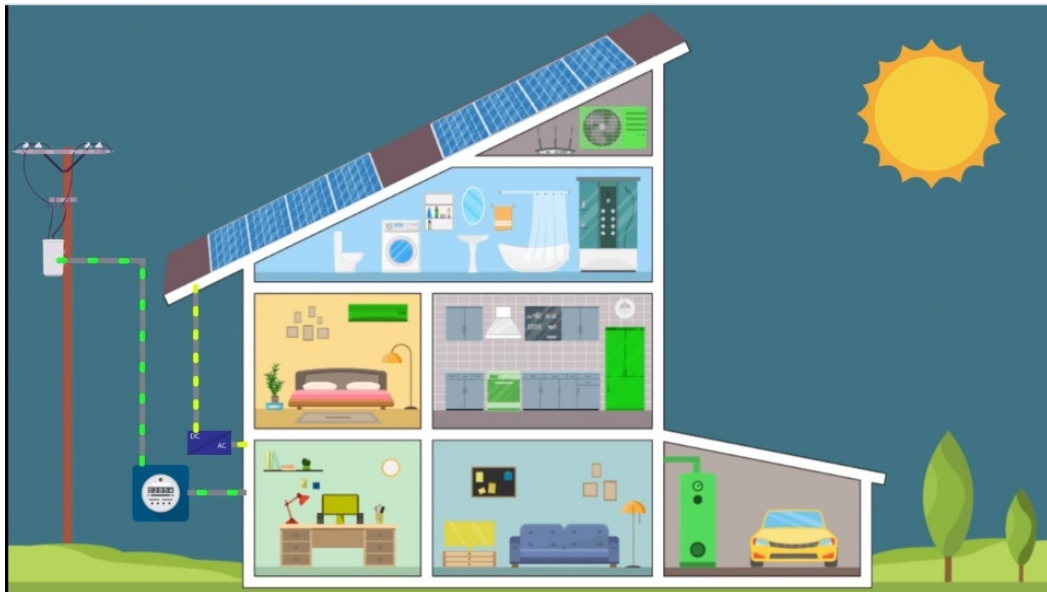
Why am I not getting credit for what my solar system is producing?





# Types of Solar Customers

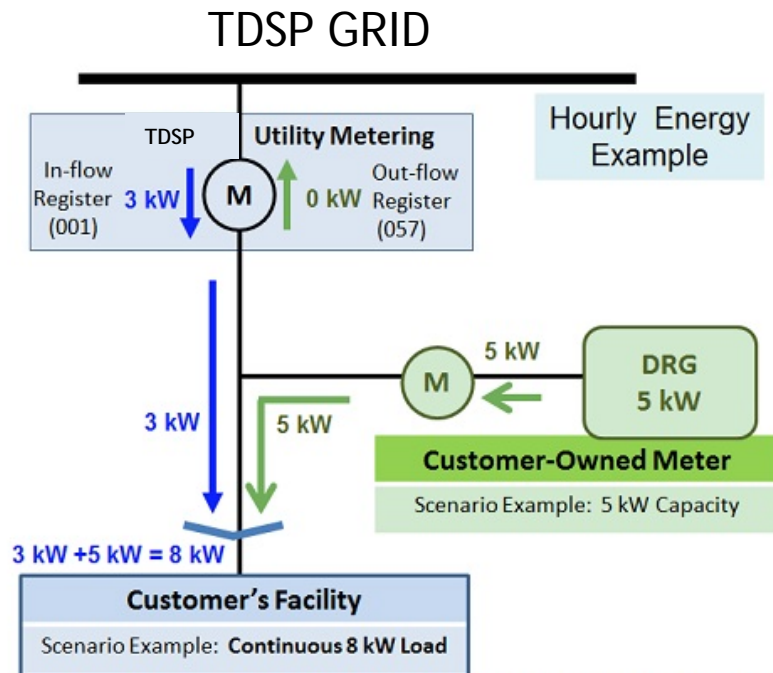
1. Customers who consume more than they generate.
  - “Why is the amount of my credit different than what I generate?”
2. Customers who generate more than they consume.
  - “Why am I getting a bill?”
3. Customers who consume the same as they generate.
  - ▶ “Where is my credit?”





# Customer Consumes More than They Generate

## Inflow-Outflow Example #1:



The customer's facility consumes 8 kW for one hour = 8 kWhs

The solar panels (DRG) generate 5 kW for one hour = 5 kWhs

Therefore, during the hour the customer's facility consumes 5 kWhs from their solar panels and 3 kWhs from the grid.

Therefore:

**Customer Load = 8 kWhs**

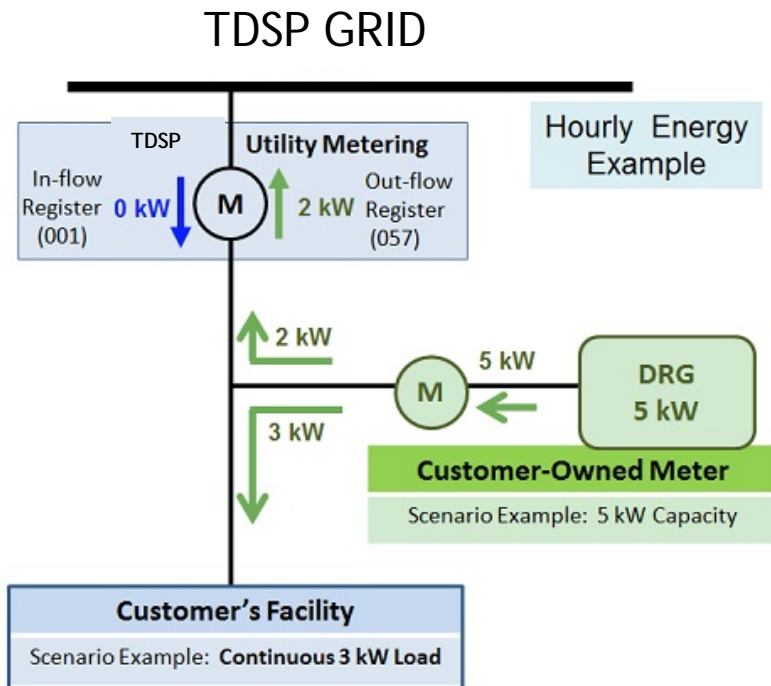
**Customer DRG = 5 kWhs**

***In-Flow Register = 3 kWhs***

***Out-Flow Register = 0 kWhs***

# Customer Generates More than They Consume

## Inflow-Outflow Example #2:



The customer's facility consumes 3 kW for one hour = 3 kWhs

The solar panels (DRG) generate 5 kW for one hour = 5 kWhs

Therefore, during the hour the customer's facility consumes 3 kWhs from their solar panels and 2 kWhs are exported to the grid.

Therefore:

**Customer DRG = 5 kWhs**

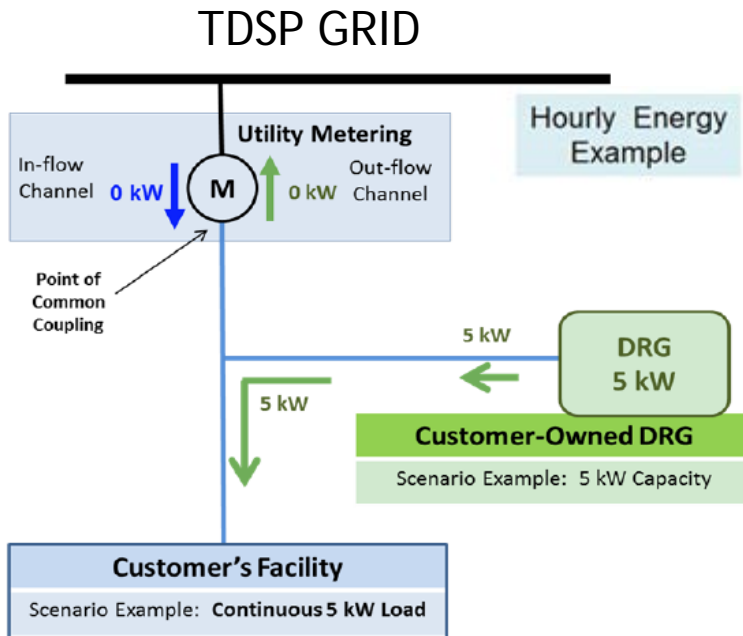
**Customer Load = 3 kWhs**

**Out-flow Register = 2 kWhs**

**In-Flow Register = 0 kWhs**

# Customer Consumes the Same as They Generate

## Inflow-Outflow Example #3:



The customer's facility consumes 5 kW for one hour = 5 kWh

The solar panels (DRG) generate 5 kW for one hour = 5 kWh

Therefore, during the hour the customer's facility consumes 5 kWh from their solar panels and 0 kWh are consumed from or exported to the grid.

Therefore:

Customer DRG = 5 kWh

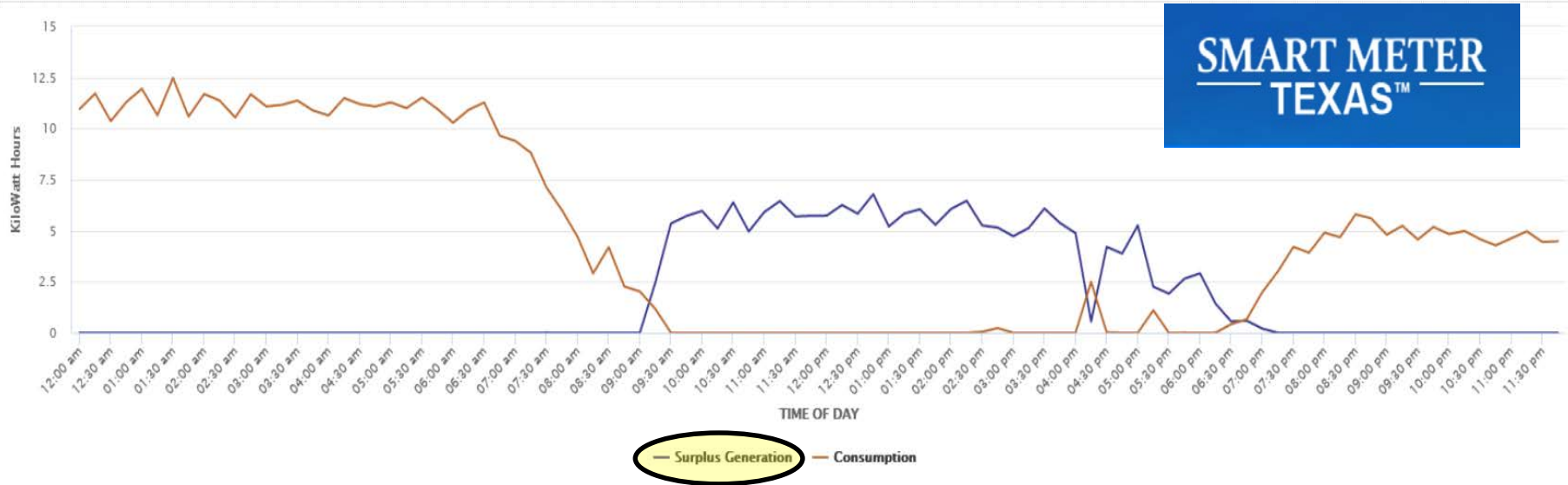
Customer Load = 5 kWh

**Out-flow Register = 0 kWh**

**In-Flow Register = 0 kWh**

# Example of Surplus Generation via SMT

Energy Data Graph (15 Minute Intervals) - Kilowatt Hours for 07/11/2022



Energy Data Table (15 Minute Intervals) - Kilowatt Hours for 07/11/2022

Consumption = Consumption in excess of Generation ; Surplus Generation = Generation in excess of Consumption

[View in Excel](#)

Start Time	End Time	Consumption(Kwh)	Act./Est.	Surplus Generation(Kwh)	Act./Est.
08:30 am	08:45 am	4.192	Actual	0	Actual
08:45 am	09:00 am	2.272	Actual	0	Actual
09:00 am	09:15 am	2.024	Actual	0	Actual
09:15 am	09:30 am	1.168	Actual	2.472	Actual
09:30 am	09:45 am	0	Actual	5.352	Actual
09:45 am	10:00 am	0	Actual	5.72	Actual

# TDSP and Solar REP Roles

Listed below are presumed roles of the TDSPs and REPs for further discussion and collaboration:

## ▶ TDSP Roles

### ❖ Interconnection Process

- ✓ Explain the interconnection process to the customer and interact with installers
- ✓ Review and approve the Customer's interconnection application
- ✓ Reprogram the Customer's AMS meter to add an outflow channel

### ❖ Market Operations Process

- ✓ Update the Customer's Load Profile to include the solar designation (PV)
- ✓ Send measured surplus generation and monthly usage to the REP
- ✓ Answer customer questions regarding the measurement of surplus generation and the interconnection process

## ▶ REP Roles

- ✓ Enroll the customer in a buy-back plan (if available) or discuss rate options
- ✓ Answer customer questions regarding surplus generation versus gross generation
- ✓ Receive measured surplus generation and monthly usage from the TDSP
- ✓ Explain the customer's billing rate plan, surplus generation credits and total invoice, including usage & surplus generation readings received from the TDSP
- ✓ Inquire with the TDSP if the load profile has not changed or surplus generation readings are not received after the interconnection process is complete

# Market Operations

- After the customer's meter is reprogrammed, the load profile is updated to reflect that they are an active solar customer. An 814\_20 transaction is sent from the TDSP to the associated REP indicating the solar designation.
- This allows the TDSP's system to provide monthly surplus generation values to the REP's system via EDI transactions.
- The customer should begin seeing any surplus generation on their bill beginning one full billing cycle (30-60 days) after the Permission to Operate is granted.

Interconnection  
Application  
submitted to TDSP

TDSP provides  
customer permission  
to Operate

TDSP reprograms  
the meter to  
measure surplus  
generation

Load Profile  
is updated

30 Days

15 Days

One Full Billing  
Cycle (30 - 60  
Days)

# Electric Meter Display

How can a customer read the In-flow, Out-flow and kW Demand on their Meter?

**In-flow “Consumption”**: The first three numbers indicate the In-flow kWh register. The following five numbers are a cumulative register - similar to your car’s odometer – which represents kWh consumption. Yesterday’s reading subtracted from today’s reading would yield one day of kWhs usage, if the meter multiplier is one.

**Maximum kW**: The first three numbers indicate the Max kW register. This register indicates the peak 15-minute demand since this register was last reset. Max kW is not currently used for billing purposes on residential accounts and thus is not reset monthly on residential meters.

**Out-flow “Surplus Generation”**: The first three numbers indicate the Out-flow kWh register. The following five numbers are a cumulative register representing out-flow kWhs, or surplus energy flowing from the customer to the grid. Yesterday’s reading subtracted from today’s reading would yield one day of surplus kWhs generated and sent to the grid, if the meter multiplier is one.

	Oncor	AEP	CNP	TNMP
In-flow kWhs	• 001	• 007	• 01H	• 004
Max kW Demand	• 020	• 008	• 03A	• ---
Out-flow kWhs	• 057	• 021	• 029	• 005



# ERCOT and Verifying Load Profile

## ERCOT Wholesale Settlement Impacts

During the ERCOT settlement process, the Adjusted Meter Load (AML) for ESI IDs producing surplus generation is reduced by the amount of the Out-flow. This reduction effectively compensates the REP's QSE at the Load Zone Settlement Point Price.

## How does the Market know if an ESI ID has Distributed Generation (DG)?

One of the last steps in the TDSP's interconnection process is to update the ERCOT load profile for the ESI ID. Profile segments ending in **PV** (photovoltaic), **WD** (wind) and **DG** (distributed generation other than photovoltaic or wind) indicate to ERCOT to reduce the AML by the Out-flow during the settlement process.

Examples:      RESHIPV\_SCENT\_IDR\_WS\_NOTOU  
                  RESLOWD\_NORTH\_IDR\_WS\_NOTOU  
                  BUSHIDG\_WEST\_IDR\_WS\_NOTOU

# REP Solar Questions & TDSP Response Matrix



Adobe Acrobat  
Document

# Conclusion & Open Discussion



# Appendix

# REP Workshop - TDSP Solar

## Customer FAQs



Microsoft Edge  
PDF Document

# Appendix - Meter Roles in the 867\_03

The 867\_03 Transaction is used by the TDSP to deliver monthly or final usage data to ERCOT and the REP. The 867\_03 may display any of the following three meter roles:

- A = Additive (Consumption - this will typically be In-Flow)
- I = Ignore (Surplus generation exported to the grid - this will be Out-flow)
- S = Subtractive (Consumption subtracted - this is used when an ESI ID of one customer is served from another customer's facilities and their usage -must be subtracted from the primary customer's consumption - typically -used in oil fields)

In the 867\_03, the meter role (JH) is indicated in the payload data like this:

**REF~JH~I**

This example shows an ignore meter role, which is an element in the 867\_03 ignore loop.

# Appendix - Meter Roles in the 867\_03

- ▶ The ignore loop was named to infer that the value in this Texas SET loop can be ignored.
- ▶ In the ERCOT market, when the current PUCT DRG rules were passed in 2008, market participants decided to utilize the ignore loop for reporting surplus generation values (Out-flow).
- ▶ REPs have the option to reimburse customers for their Out-flow. If they choose not to, the values in the ignore loop can be ignored. However, if the REP does choose to reimburse the customer for their Out-flow, the ignore loop provides the value of the total kWhs that were exported to the grid for that billing cycle.



# Appendix - 867\_03 Payload for a DG ESI ID

$(34-3) \times 50 = 1550$

Additive Loop  
(In-Flow)

Ignore Loop  
(Out-Flow)  
 $(34-0) \times 50 = 1700$

TDSP to ERCOT Original Monthly Summarized Usage with Ignore Flag for Distributed Generation	
ST~867~000000001	Transaction Type, Transaction Set Control Number
BPT~00~200805101201001~20080510~DD	Original, Unique Reference Identification, Date, Report Type
REF~Q5~12345678910111231	ESI ID
REF~SR~ERCOT	Power Region
N1~8S~TDSP NAME~1~009876543~41	TDSP Name, DUNS Number, Sender
N1~AY~ERCOT~1~183529049~40	ERCOT, DUNS Number, Receiver
N1~SJ~CR NAME~1~987654321	CR Name, DUNS Number
PTD~PL~MG~123456LG	Non-Interval Detail, Meter Number
DTM~150~20090129	Service Period Start Date
DTM~151~20090227	Service Period End Date
REF~JH~A	Meter Role
REF~MT~KHMON	Meter Type
QTY~QD~1550	Quantity Delivered
MEA~AA~PRQ~1550~KH~3.0~34.0~51	Meter Reads
MEA~MU~50.0	Meter Multiplier
PTD~PL~MG~123456LG	Non-Interval Detail, Meter Number
DTM~150~20090129	Service Period Start Date
DTM~151~20090227	Service Period End Date
REF~JH~I	Meter Role
REF~MT~KHMON	Meter Type
QTY~QD~1700	Quantity Delivered
MEA~AA~PRQ~1700~KH~0.0~34.0~51	Meter Reads
MEA~MU~50.0	Meter Multiplier
PTD~SU	Non-Interval Usage Summary
REF~MT~KHMON	Meter Type
QTY~QD~1550	Quantity Delivered
MEA~PRQ~1550~51	Consumption
DTM~150~20090129	Service Period Start Date
DTM~151~20090227	Service Period End Date
SE~30~000000001	Number of Segments, Transaction Set Control Number

# Solar Customer Resources

- ▶ [Smart Meter Texas](#)
- ▶ [Power to Choose](#)
- ▶ [Go Solar Texas](#)
- ▶ [Oncor Residential Solar](#)
- ▶ [AEP Texas Installing Generating Equipment](#)
- ▶ [CenterPoint Energy Wind and Solar](#)
- ▶ [TNMP Interconnections](#)

# Appendix – Registration Requirements Overview

## PUCT

- No specific registration requirement for DG
- May require registration as
  - **Power Generation Company**, if generating electricity intended to be sold at wholesale or
  - **Self-Generator**, if rating is greater than or equal to 1MW and not a PGC
- DRG facilities are not required to register

## ERCOT

- DG with installed capacity of greater than 1MW, must register
- Optional registration for capacity less than 1MW
- Registration required if capable of providing energy or Ancillary Service to the ERCOT system

# Appendix - Specific DG-Related Statutes\*

## **PURA 35.036 – Distributed Natural Gas Generation Facilities**

- Enacted to address a specific situation
- Develops provisions for:
  - Owners/operators to sell electric power
  - Use of T&D Facilities to transport electric power
  - Utilities to recover costs of facilities for used for interconnection

## **PURA 39.916 – Interconnection of Distributed Renewable Generation**

- Develops provisions for:
  - Interconnection of DRG
  - PUCT creation of rules and requirements for DRG
  - Requirement for TDSP to measure out-flow
  - Ownership of Renewable Energy Credits
  - Selling surplus electricity to REP

## **PURA 39.101 – Customer Safeguards**

- Customers entitled to have access to on-site distributed generation

## **PURA 39.914 – Credit for Surplus Solar Generation by Public Schools**

- Develops provisions for:
  - Allowing Independent School Districts to sell surplus energy from solar generation
  - Requiring utilities to provide metering to allow the sell of energy

\*Other statutes may be applicable to DG based on operation in the ERCOT wholesale market

Source: "Current DG Framework for Competitive Areas of ERCOT", ERCOT DREAM Task Force, September 28, 2015

# Appendix – Selected DG-Related PUC Substantive Rules and ERCOT Protocols and Guides

## Selected PUC Substantive Rules

- PUC Subst. Rules 25.5 – Definitions
- PUC Subst. Rule 25.109 – Registration of Power Generation Companies and Self Generators
- PUC Subst. Rules 25.211 – Interconnection of On-Site DG
- PUC Subst. Rule 25.212 – Technical Requirements for Interconnection and Parallel Operation Of On-Site DG
- PUC Subst. Rules 25.217 – Distributed Renewable Generation

## Selected ERCOT Protocols and Guides

- ERCOT Protocols Section 2.1 – Definitions
- ERCOT Protocols Section 10.2 – Scope of Metering Responsibilities
- ERCOT Protocols Section 10.9 – Standards for Metering Facilities
- ERCOT Protocols Section 11.4.4.2 and 11.4.4.3 – Load Reduction for Excess DRG and DG
- ERCOT Protocols Section 16.5 – Registration of a Resource Entity
- ERCOT Retail Market Guide Section 7.14 – Out-flow Energy from DG Facilities
- ERCOT Commercial Operations Market Guide Section 10.3 – Unregistered DG Reports
- ERCOT Load Profiling Guide Appendix D – Load Profiling Decision Tree