Southface

Electric Bills Decoded Appendix

Electric Bills Decoded is Southface Institute's 2023 blog series exploring how Georgia Power residential customers can use data to help determine whether changing their electricity rate plan can lower their utility bills and offset recent rate hikes. Follow along to understand different types of rates and charges; identify electricity usage patterns; use your data strategically; consider the impact of going solar; and learn about battery storage as a cost-saving tool. We're decoding it all!

Georgia Power Residential Rate Overview (Versions Used in Analysis)

This addendum summarizes the terms of Georgia Power's 2022 residential electricity rates. Note that each of these electricity rates plans is subject to the rate riders listed below.

My family receives an itemized bill from Georgia Power. This is available upon request from the utility. Figure A1 below is a snapshot of the itemized charges from my July 2022 bill. This may help understand how the specific electricity rate charges (basic service charge and energy charges) and the rider charges are billed.

Georgia Power Residential Electricity Rates

Standard Residential Service (aka R rate) – a tiered energy-only rate that includes a basic service charge (BSC) and features a three-step inclining block rate in summer and a three-step declining block rate in winter

- *Version Used in This Analysis* – R-25
- *Pricing*
  - WINTER - For the Billing Months of October through May
    - Basic Service Charge $0.4603 per day
    - First 650 kWh 5.8366¢ per kWh
    - Next 350 kWh 5.0062¢ per kWh
    - Over 1000 kWh 4.9143¢ per kWh
  - SUMMER - For the Billing Months of June through September
    - Basic Service Charge 0.4603 per day
    - First 650 kWh 5.8366¢ per kWh
    - Next 350 kWh 9.6943¢ per kWh
    - Over 1000 kWh 10.0336¢ per kWh

Nights and Weekend (aka TOU-REO) – a TOU energy-only rate with a BSC and two TOU buckets (on-peak and off-peak)

- *Version Used in This Analysis* – TOU-REO-13
- *Pricing*
  - Basic Service Charge $0.4603 per day
  - Energy Charges:
    - On-Peak kWh 20.3217¢ per kWh
    - Off-Peak kWh 5.1638¢ per kWh
- *Time of Use designations*
  - On-peak hours are 2:00 – 7:00 pm, Monday – Friday (minus days on which Independence Day and Labor Day are observed), during the months of June – September.
  - Off-peak hours are all other hours in the year. All other hours are off-peak.

Plug-In Electric Vehicle (aka TOU-PEV) – a TOU energy-only rate with a BSC and three TOU buckets (on-peak, off-peak, and super off-peak)

- *Version Used in This Analysis* – TOU-PEV-9
- *Pricing*
  - Basic Service Charge 0.4603 per day
  - Energy Charges:
    - On-Peak kWh 20.3217¢ per kWh
    - Off-Peak kWh 6.9728¢ per kWh
    - Super Off-Peak kWh 1.4993¢ per kWh
- *Time of Use designations*
  - On-peak hours are 2:00 – 7:00 pm, Monday – Friday (minus days on which Independence Day and Labor Day are observed), during the months of June – September.
  - Super Off-Peak are the hours from 11:00 pm though 7:00 am the next day, all days of the year.
  - Off-Peak are all other hours not defined as peak or super off-peak. In other words, the TOU-PEV off-peak hours are the same as for TOU-REO and TOU-RD, with the difference of excluding those hours designated as super-off-peak (11:00 pm – 7:00 am all days).

Smart Usage (aka TOU-RD) – a TOU demand rate with BSC, peak demand charge and two TOU buckets (on-peak and off-peak)

- *Version Used in This Analysis* – TOU-RD-6
- *Pricing*
  - Basic Service Charge 0.4603 per day
  - Energy Charges:
    - On-Peak kWh 9.6052¢ per kWh
    - Off-Peak kWh 1.0268¢ per kWh
  - Demand Charge:
    - Maximum kW 8.21 per kW
- *Time of Use designations*
  - On-peak hours are 2:00 – 7:00 pm, Monday – Friday (minus days on which Independence Day and Labor Day are observed), during the months of June – September.
  - Off-peak hours are all other hours in the year. All other hours are off-peak.

Pre-Pay Service (aka PPS) – a flat / fixed rate with a BSC and a fixed per-kWh summer price and fixed per-kWh winter price

- *Version Used in This Analysis* – PPS-5
- *Pricing*
  - Basic Service Charge: $0.66 per day
  - Energy Charges:
    - SUMMER – Months of June - September: 7.9562¢ per kWh
    - WINTER – Months of October - May: 5.6040¢ per kWh

Flat Bill (billed according to Standard Residential Service) – not examined in this analysis

Pay by Day (billed according to Pre-Pay Service) – not examined in this analysis

<u>Applicable Georgia Power Rate Riders</u>

Fuel Cost Recovery Schedule, with Interim Fuel Rider in effect (FCR/IFR) – recovers the cost of utility fuel (i.e., natural gas, coal, uranium, purchased power, etc.). The FCR rider is assessed on a per-kWh basis.

- *Version Used in This Analysis* – FCR-25 / IFR-4

Nuclear Construction Cost Recovery Schedule (NCCR) – recovers a portion of the financing costs (aka carrying costs) for the construction of Vogtle units 3 and 4. The NCCR rider is assessed as a percentage of your base bill (made up of your basic service charge, your energy charges and your demand charge, if applicable).

- *Version Used in This Analysis* – NCCR-11

Environmental Construction Cost Recovery Rider (ECCR) – recovers the costs for utility environmental remediation investments such as acid rain scrubbers, NOx reduction units, coal ash clean up, etc. The ECCR rider is assessed as a percentage of your base bill (made up of your basic service charge, your energy charges and your demand charge, if applicable).

- *Version Used in This Analysis* – ECCR-9

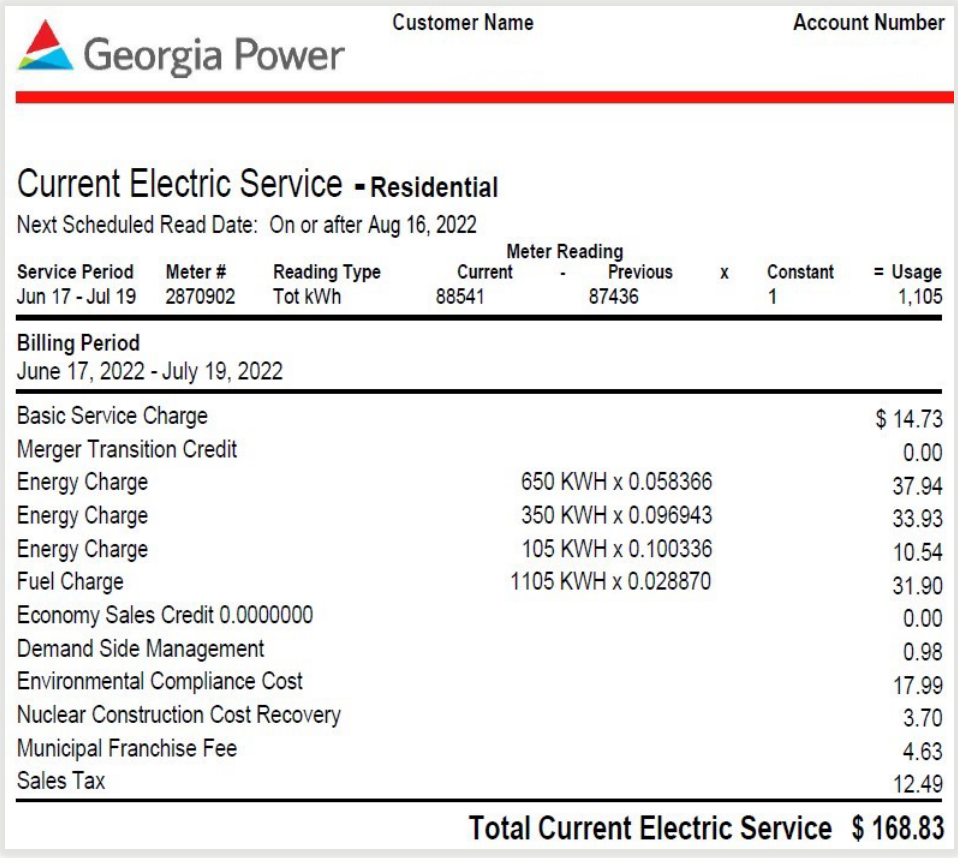
Demand Side Management Residential Schedule (DSM-R) – recovers administrative costs, incentive costs, and utility earnings related to the operation of the utility's residential energy efficiency programs. The DSM rider is assessed as a percentage of your base bill (made up of your basic service charge, your energy charges and your demand charge, if applicable).

- *Version Used in This Analysis* – DSM-R-10

Municipal Franchise Fee Rider (MFF) – recovers the costs of franchise fees paid to municipalities. The MFF rider is assessed as a percentage of your "usage revenue" (made up of your basic service charge, your energy charges, your demand charge, if applicable, your fuel charge, and other riders described above).

- *Version Used in This Analysis* – MFF-8

Figure A1. Snapshot of Itemized Georgia Power Bill (for Standard Residential rate)



Georgia Power

Customer Name | Account Number

Current Electric Service - Residential

Next Scheduled Read Date: On or after Aug 16, 2022

Service Period	Meter #	Reading Type	Meter Reading Current	- Previous	x	Constant	= Usage
Jun 17 - Jul 19	2870902	Tot kWh	88541	87436		1	1,105

Billing Period
June 17, 2022 - July 19, 2022

Basic Service Charge		$ 14.73
Merger Transition Credit		0.00
Energy Charge	650 KWH x 0.058366	37.94
Energy Charge	350 KWH x 0.096943	33.93
Energy Charge	105 KWH x 0.100336	10.54
Fuel Charge	1105 KWH x 0.028870	31.90
Economy Sales Credit 0.0000000		0.00
Demand Side Management		0.98
Environmental Compliance Cost		17.99
Nuclear Construction Cost Recovery		3.70
Municipal Franchise Fee		4.63
Sales Tax		12.49
	Total Current Electric Service	**$ 168.83**

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Modeling Notes

1. Results & Observations

1.1. Summary Results

Tables M1-M5 summarize my energy use and energy cost modeling.

Table M1. Energy Use Breakdown – Existing Use

	Energy Use					
Rate Plan	kWh	On Peak kWh	Off Peak kWh	Super Off Peak kWh	Summer kWh	Winter kWh
Standard Res Service	6,811					
Nights & Wknds (TOU-REO)	6,811	10%	90%			
Plug-In EV (TOU-PEV)	6,811	10%	68%	22%		
Pre-Pay Service	6,811				48%	52%
Smart Usage (TOU - Res Demand)	6,811	10%	90%			

Table M2. Energy Use Breakdown – Post Solar

Energy Use Breakdown (Post-Solar)												
	Post-Solar Energy Use						Change from Existing/Pre-Solar Use					
Rate Plan	kWh	On Peak kWh	Off Peak kWh	Super Off Peak kWh	Summer kWh	Winter kWh	Total kWh	On Peak kWh	Off Peak kWh	Super Off Peak kWh	Summer kWh	Winter kWh
Standard Res Service	5,674						-17%					
Time of Use - Res Energy Only	5,674	10%	90%				-17%	0%	0%			
Time of Use - Plug-In Electric Vehicle	5,674	10%	64%	26%			-17%	0%	-6%	20%		
Pre-Pay Service	5,674				49%	51%	-17%				2%	-2%
Time of Use - Res Demand	5,674	10%	90%				-17%	0%	0%			

Table M3. Peak Demand by Month – Existing and Post Solar

Peak Demand Breakdown			
Month	Existing / Pre-Solar Peak Demand (kW)	Post-Solar Peak Demand (kW)	Change in Peak Demand Due to Solar
Feb-22	5.0	4.9	-2%
Mar-22	5.0	4.2	-17%
Apr-22	4.5	3.8	-16%
May-22	4.5	4.2	-7%
Jun-22	5.3	5.3	0%
Jul-22	7.0	6.8	-3%
Aug-22	5.1	4.6	-10%
Sep-22	3.6	3.6	0%
Oct-22	4.2	4.1	-3%
Nov-22	4.2	4.0	-4%
Dec-22	4.4	4.4	0%
Jan-23	4.2	4.2	0%
		Average (unweighted by use or cost)	-5%

Table M4. Electricity Pricing of Existing Use By Rate

Pricing - Existing Use Under Available Tariffs									
Rate	Basic Service Chg	Energy Chg	Demand Chg	Base Bill	Fuel	Riders & Tax	Solar Credit	Total Bill	Bill Difference from Current
Standard Res	$168	$429		$597	$194	$245	$0	$1,036	N/A - Current
Nights & Wknds	$168	$454		$622	$196	$254	$0	$1,071	3%
Plug-In EV	$168	$484		$652	$198	$265	$0	$1,115	8%
Pre-Pay	$241	$458		$699	$194	$282	$0	$1,176	13%
Smart Usage	$168	$128	$468	$764	$196	$307	$0	$1,266	22%

Base Bill = Basic Service Charge + Energy Charges + Demand Charge (if applicable)

Table M5. Electricity Pricing of Post-Solar Use By Rate

Pricing - Post-Solar Use Under Available Tariffs										Change from Pre-Solar Cost for Same Rate
Tariff	Basic Service Chg	Energy Chg	Demand Chg	Base Bill	Fuel	Riders & Tax	Solar Credit	Total Bill	Diff from Stan. Res	Total Bill
Standard Res	$168	$348		$516	$162	$211	-$8	$881	N/A	-15%
Nights & Wknds	$168	$378		$546	$163	$222	-$8	$923	5%	-14%
Plug-In EV	$168	$390		$558	$164	$226	-$8	$940	7%	-16%
Pre-Pay	$241	$383		$624	$162	$251	-$8	$1,029	17%	-12%
Smart Usage	$168	$106	$443	$718	$163	$286	-$8	$1,158	31%	-9%

Base Bill = Basic Service Charge + Energy Charges + Demand Charge (if applicable)

2. Data & Data Sources

2.1. Hourly Electricity Use Data

Georgia Power now offers residential customers access to hourly electric use data through the company's My Power Usage tool available for registered customers on Georgia Power's website. The My Power Usage offers 24-hour graphic visualization of hourly data and electronic download of the data. A registered customer may download up to 33 days' worth of their hourly electric use data in Comma Separated Value (CSV) format.

I compiled this data into one continuous hourly record and added an additional hourly record on 11/6/2022 at 1:00 - 2:00 am to make the file accurately reflect the end of daylight savings time (DST); November 6, 2022, consisted of 25 hours with this hour repeated. In this instance, I replicated the hourly use of the prior hour. For more information about this adjustment, see "Hours Table" entry in *Electricity Use Modeling* section below.

I reconciled my hourly electricity use and monthly bill data for general data validation. For the purpose of rate comparison, I use my hourly data alone and "calendarize" it on monthly basis, that is from the first of each month to the last day of each month. In rendering my monthly bills, Georgia Power uses a mid-month "meter ready" data, so each month of my bill data straddles the second half of one month and the first half of the next month. I've opted to re-calendarize my hourly data for rate comparison to enhance data accessibility – when I refer to January or June, I want the readers interpretation of those reference to match the underlying data.

2.2. Hourly Solar Generation Data

The U.S. Department of Energy's National Renewable Energy Laboratory's online PV Watts Calculator provides detailed estimates of solar system output based on geographic location and system position. I downloaded estimated hourly generation data for seven different size systems (1.0 – 4.0 kW in 0.5 kW increments) with the following characteristics:

- ***Location***: my street address in Decatur, GA
- ***Module Type***: standard

- ***Array Type***: fixed (roof mount)
- ***System Losses (%)***: 14.08 (default value)
- ***Tilt (deg)***: 22.6 degree to match 5/12 pitch roof
- ***Azimuth (deg)***: 140 degrees azimuth to reflect SE orientation of available roof space on my house

I made the same DST adjustment described above, adding an additional hourly record on 11/6/2022 from 1:00 - 2:00 am to make the file accurately reflect the end of daylight savings time (11/6/2022 consisted of 25 hours with two 2:00 am). In this instance, I replicated the hourly generation of the prior hour, which was zero.

3. Electricity Use Modeling

3.1. Tools: Access & Excel

The three datasets that underpin my modeling are:

1. record of hours (date, hour start, hour end) with associated rate designations (e.g., peak, off-peak, super off-peak) based on the specific characteristics of each hour and the rules of the applicable rates
2. hourly electric use, as downloaded from Georgia Power, with hour description, hourly kW use, and hourly temperature
3. hourly solar system generation, including hour description, and hourly AC output (provided in watts and converted to kilowatts).

I initially compiled each data set in Microsoft Excel and then converted those datasets into tables in Microsoft Access to allow easier querying. After developing the appropriate queries in Microsoft Access, I exported (via data query link) those queries to Microsoft Excel for cost modeling. The cost modeling was completed in Excel.

3.2. Hours Table (Access)

The hours table consists of basic fields describing each hour, including date, hour start, and hour end. It also indicates whether the hour occurs on a holiday. The remaining data fields in hours table relate to how Georgia Power's time-of-use residential rates price electricity use in specific hours. Those fields include a month code (peak/off-peak based on season), day code (peak/off-peak depending on day of the week and holidays[1]) and a "two-bucket" and a "three-bucket" hour code (based on the terms of the time-of-use rates).

The relevant terms of the Georgia Power time-of-use residential rates include:

- TOU-REO (two buckets)
  - On-peak hours are 2:00 – 7:00 pm, Monday – Friday (minus days on which Independence Day and Labor Day are observed), during the months of June – September. All other hours are off-peak.
- TOU-RD (two buckets)
  - Same as TOU-REO
- TOU-PEV (three buckets)
  - On-Peak are defined the same as in TOU-REO and TOU-RD
  - Off-Peak are, generally, the same as for TOU-REO and TOU-RD, with the difference of excluding those hours designated as super-off-peak (11:00 pm – 7:00 am all days)
  - Super Off-Peak are the hours from 11:00 pm though 7:00 am the next day, all days of the year.

[1] For holidays, I used list of 2022 federal holidays

- Holidays – using federal holidays, generally 10 per year in 2019-2021, moving to 11 per year in 2022 and 2023

3.3. Hourly Use Table (Access)

The Hourly Use table consists of data fields related to my hourly electricity use, including (a) date, (2) hour (as provided in My Power Usage downloads), (3) hour start, (4) kWh use, (5) temperature (as provided by My Power Usage), and (6) bill period end date. The last field was assigned by me based on meter read dates of my monthly bills for the purpose of monthly-hourly data reconciliation discussed above. I aligned this table with the Hours table via a foreign key.

3.4. Solar Gen Table

The Solar Gen table consists of data fields related to estimated hourly electricity generation seven potential solar systems located on my roof (see *Hourly Solar Generation Data* subsection above), including (a) date, (2) hour, (3) hour start, and (4) AC kWh output for seven different size solar systems. I aligned this table with the Hours table via a foreign key.

3.5. Base Hourly Query

The purpose of this query is to designate relevant hourly data by applicable time-of-use pricing "buckets" and calculate post-solar hourly use. This query selects data from the three tables described above (Hours, Hourly Use, Solar Gen). The query identifies my hourly energy use in each hour and labels that hourly use by the appropriate time-of-use designations (see *Hours Table (Access)* subsection above). This query also calculates my post-solar hourly demand (existing use net estimated hourly solar generation) for different size systems and labels that hourly use by the appropriate time-of-use designations.

3.6. KWH-BucketMonth Query

This query aggregates my existing monthly hourly energy use by the applicable time-of-use designations used in Georgia Power's three time-of-use residential rates.

3.7. Net10-BucketMonth Query

This query aggregates my post-solar monthly hourly energy use (assuming 1 kW system) by the applicable time-of-use designations used in Georgia Power's three time-of-use residential rates.

3.8. Peak Demand Query

This query identifies my existing and post-solar peak demand in each calendar month.

3.9. Solar System Sizing

Using my hourly electricity use data and estimated hourly solar generation data for seven possible size systems located on my roof (1.0 kW to 4.0 kW in 0.5 kW increments), I selected what I believed was an appropriate size solar system to model.

For the purposes of this modeling, I assume that export of excess onsite solar generation is netted on an instantaneous basis and valued at an average avoided cost rate (see 4.3 subsection below). Accordingly, I selected the solar system size that I thought struck the right balance of displacing my electricity use while minimizing electricity exports to the grid. Table 1 summarizes the data I used in selecting a 1 kW solar system for modeling.

Table M6. Analysis of Electricity Exports by System Size

System Size (kW)	Total Hours in Period	Hours with Exports	%	Total System Gen (kWh)	Total Exports (kWh)	% Energy Exported
1.0	8,760	1,134	13%	1,433	296	21%
1.5	8,760	1,511	17%	2,149	635	30%
2.0	8,760	1,802	21%	2,760	1,005	36%

4. Electricity Cost Modeling

4.1. Pricing Models

I developed cost models for each of the four relevant rates and, using the electricity use outputs described above, priced my existing and estimated post-solar usage under each rate.

4.2. Rate Plans and Riders

I used the rates and riders in effect during 2022, including:

- R-25
- TOU-RD-6
- TOU-REO-13
- TOU-PEV-9
- FCR25 / IRF-4 (Secondary Service)
- ECCR-9
- NCCR-11
- DSM-R-10
- MFF-8MFF (Inside City Limits option)
- Sales Tax – estimated at 7.995% to match my existing bills

4.3. Solar Exports

I have assumed all solar excess generation exported to the grid are “instantaneously” netted and valued at 2.722 cents per kWh. I based this value on that used by Georgia Power in its recent revised response to data request STF-PIA-7-1 in the 2022 Georgia Power rate case. [2]

[2] Georgia Power Revised Response to STF-TIA-7-1, Dkt 44280, at Attachment B (Oct. 21, 2022), available at https://psc.ga.gov/search/facts-document/?documentId=191879.