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Evolution of Electric Rates & Rate Structures

SCAMPS – South Carolina Association of Municipal Power Systems
2025 Annual Conference, June 3, 2025

Presenter:
Chris Lund
Financial Consultant, Project Manager
Utility Financial Solutions, LLC (UFS)

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Utility Financial Solutions, LLC

- International consulting firm providing cost of service, financial plans and rate design services to utilities across the country, Canada, Guam and the Caribbean
- Instructors and guest speakers for:
  - SCAMPS – South Carolina Association of Municipal Power Systems
  - ElectriCities – ElectriCities of North Carolina
  - APPA – American Public Power Association
- Hometown Connections preferred vendor

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Overview

Today's Topics

- Value of municipal utilities
- Why need for rate increase
- Electric rate basics
- Rate evolution

Value of Municipal Utilities

- Value often overlooked or forgotten
- Critical, essential services
- Provided at cost
- Reinvest back into systems for benefit of customers

Why Need for Rate Increase?

- Municipal utilities = enterprise funds
- Enterprise funds = financed through revenue from customers (not tax based, can't count on grants or outside funds)
- Power supply costs are single largest expense for most electric utilities – often outside of their direct control
- Avoiding capital improvement projects just causes exponential need for future rate increases (kicking the can down the road)
- Infrastructure costs increasing at a much higher rate than general inflation – tough to "out save" inflation
- Industry is evolving at a rapid pace and the need for skilled employees is only increasing
- General inflation has been recently higher
- "Profit" intended to be used for the benefit of the customers
- Transfer to City (PILOT)

Financial Planning Basics

Revenues − Expenses = Profit (Loss) *

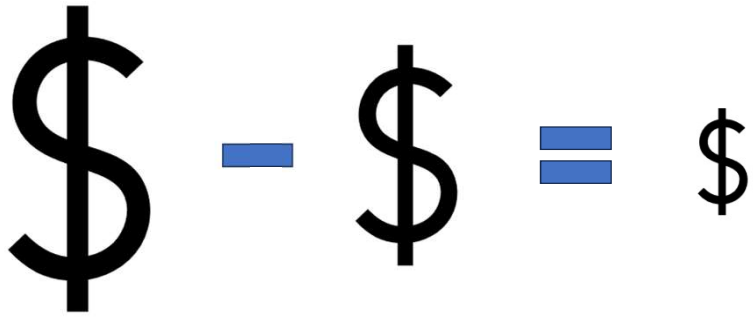
$ − $ = ($)

* ROR – Rate of return for municipal utilities

Connecting Financial Planning to Retail Rates

X% Increase

Revenues – Expenses = Profit (Loss) *



Calculate percent changed needed in retail rates to meet financial objectives while minimizing customer impacts

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* ROR – Rate of return for municipal utilities

Communicating with Governing Body

Rate Changes – 10 Year History and Plan

History

- 6% decrease in 2015
- 2.5% decrease in 2016
- 3.5% decrease in, 2017
- No Rate changes since 2017 through 2025

Plan

- Review FY2026 – FY2030 rate plan

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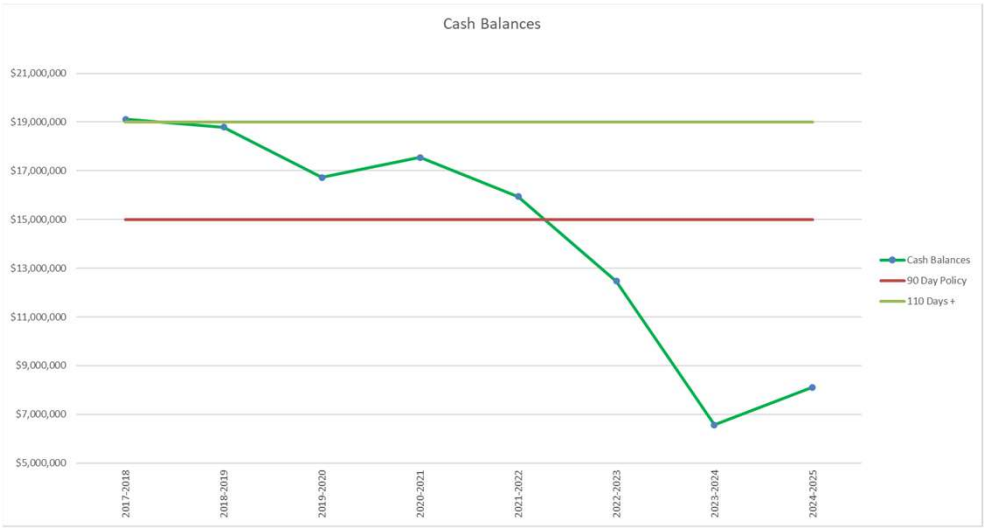
Cash Going Down



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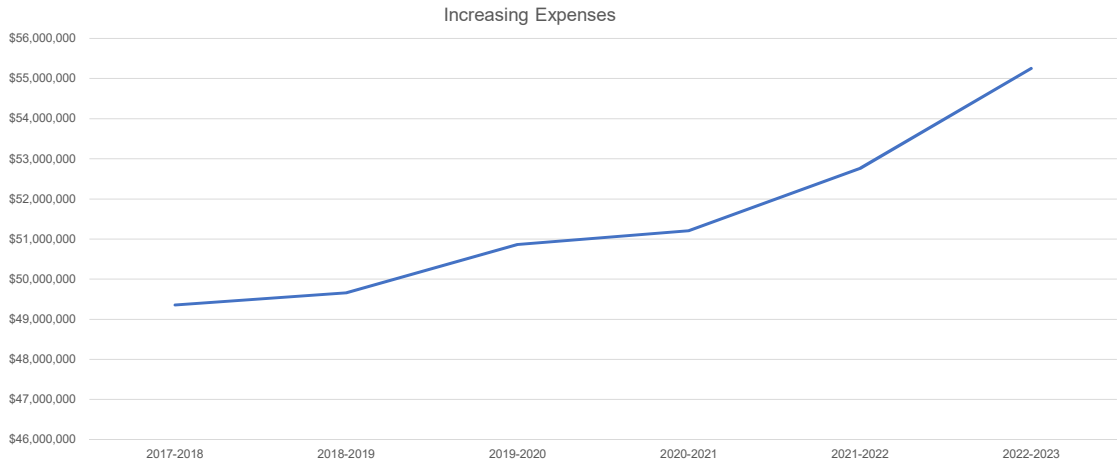
Expenses Going Up



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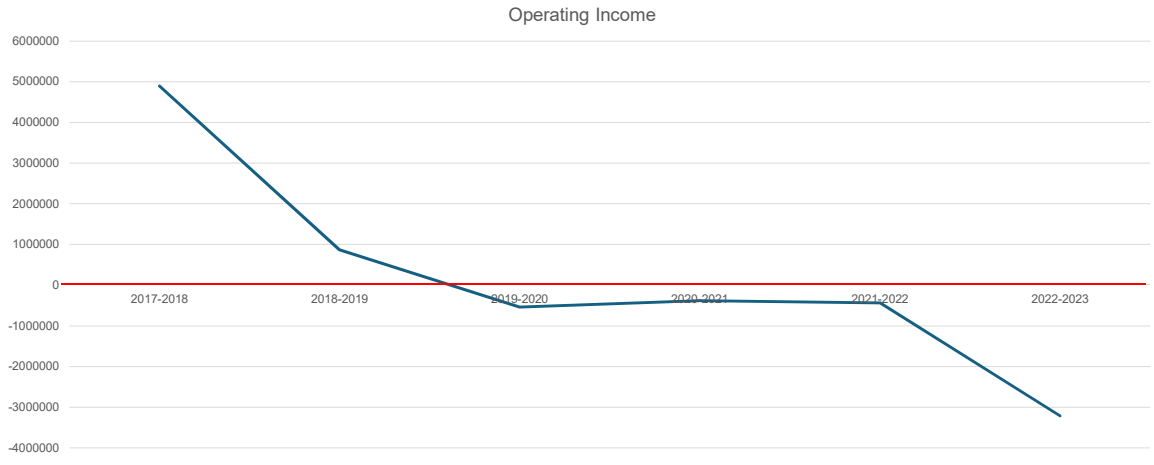
Operating Income Going Down (now negative)



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Minimize Customer Impacts – Small Increases

Residential Rate Progression and Impacts

	FY2026	FY2027	FY2028
Rates	Year 3	Year 4	Year 5
Monthly Facilities Charge:			
All Customers	$ 16.00	$ 19.00	$ 22.00
Energy Charge:			
Winter			
Winter Block 1 (0 - 250 kWh)	$ 0.1505	$ 0.1377	$ 0.1250
Winter Block 2 (251 - 1,000 kWh)	$ 0.1505	$ 0.1377	$ 0.1250
Winter Block 3 (Excess)	$ 0.1505	$ 0.1377	$ 0.1250
Summer			
Summer Block 1 (0 - 250 kWh)	$ 0.1602	$ 0.1474	$ 0.1348
Summer Block 2 (251 - 1,000 kWh)	$ 0.1602	$ 0.1474	$ 0.1348
Summer Block 3 (Excess)	$ 0.1602	$ 0.1474	$ 0.1348
Demand Charge			
All Peak Demand kW	$ 1.50	$ 3.00	$ 4.50
PCA:			
All Energy * As updated by Staff	$ -	$ -	$ -
Revenue from Rate	$ 19,207,128	$ 19,784,852	$ 20,377,746

Average Monthly Bill Impacts			
	FY2026	FY2027	FY2028
Average Monthly Bill $	$ 136.51	$ 140.62	$ 144.83
Monthly $ Change		**$ 4.11**	**$ 4.21**
Average % Change	3.0%	3.0%	3.0%
Average all in per kWh $	$ 0.1925	$ 0.1983	$ 0.2042

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Rates Design Basics are to Recover

Rates are designed to recover

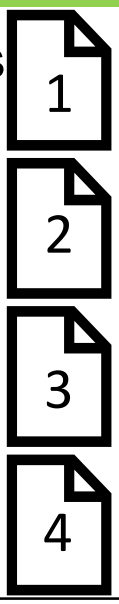
- Power Supply Costs
- Fixed Operational Costs
- Distribution Operational Costs
- Changes in Power Supply Costs

- Fixed and Distribution are total costs less power supply (all non power supply related costs)

Rate Structure Components – "rate parts"

Common Residential Rate Components

- 2-part rate typical:
  - Customer charge, Fixed monthly base fee per meter
  - kWh energy charge
- Evolve to 4-part rate:
  - kW NCP demand charge
  - PCA – Power cost adjustment kWh energy charge
- Other potential parts, 5-part+
  - CP kW demand charges
  - Fixed or ancillary power supply



Customer Charge Rate Component – "Part 1"

Fixed Operational Costs are generally what is recovered in monthly customer charge

- Stabilizes revenue
- Reduces seasonal subsidies

- Portion of the distribution system (minimum system)
- Operational costs that don't vary with customer usage:
  - Customer Service
  - Meter Reading
  - Billing, Accounting

Increasing due to higher fixed costs

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kWh Charge Rate Component – "Part 2"

If only using a 2-part rate kWh recovers

- Power supply
- All other distribution cost recovery

Too dependent on kWh markup for operational $ recovery

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Types of Basic: Residential Part 2 kWh Rates

- **Tiered Inclining block rates** increase with increased usage
- **Tiered Declining block rate** decrease with increased usage
- **Flat energy rates:** most common structure

Description	Inclining Block Rates	Declining Block Rates	Flat Energy Rates
Customer Charge	$ 15.00	$ 15.00	$ 15.00
First 500 kWhs	$ 0.0700	$ 0.1200	$ 0.0950
Excess	0.1200	0.0700	0.0950

Evolving to time of use

Significant Rate Design Evolutions

- (Time-Based Rates) Rates Mirror How Costs Are Incurred
- Demand Charges for all Customers
- Distributed Generation
- Energy Storage (batteries etc.)
- EV Charging Rates
- Increasing Loads (new and existing)

Rate Component Trends – “more & evolving parts”

- Increase monthly per meter rate for fixed cost recovery
- Reduce kWh rate to wholesale passthrough increased by losses
- Remove kWh tiers, evolving to time of use
- Introduce and evolve to monthly customer peak load charge per kW for distribution cost recovery
- PCA to balance power supply recovery per kWh, ensure that PCA has reconciliation method

Evolution of Time-Based Rates

- Seasonal (Winter, Summer) No hour differential, only over season(s)
- Time-of-Use (TOU) kWh (Often two time periods) On Peak, Off Peak (most common)
- kWh Critical peak pricing (Three time periods) adds Critical Peak
- TOU NCP kW Demand periods like TOU kWh but kW based (not common)
- Ideally CP kW Demand charges to align with power supply CP capacity and CP transmission charges (evolving with advanced metering and billing systems)

Time-of-Use Rates

- Often have two kWh time-periods, some have three periods
- Send better price signals to customers
- Good first step to more advanced rate forms (CP kWs more accurate)
- Example Rate Structure

	Summer	Winter
On Peak	0.1800	0.1700
Off Peak	0.0600	0.0600
* On Peak Hours (usually CP Hrs)	3 PM - 9 PM EST	5 AM - 10 AM EST
Number of On Peak Hours	6	5

* Need to be proactively monitor and adjusted as markets and pricing signals change, making it a challenge to retrain customers

Power Supply Costs Allocated – Not all kWh

Power Supply Costs are **Not** all kWh energy based!
Costs commonly driven by multiple billing factors:

- kWh Volumetric common
- kW Demand NCP occasionally
- kW Demand CP more common for capacity and transmission (delivery)
- Fixed, ancillary and costs that don't have a direct allocator often allocated on kWh

Power Supply Costs Allocated – Sample

Power Billing Statement

MEMBER	BILL DATE	DUE DATE	FOR SERVICE	TOTAL DUE
Removed	01/10/25	01/20/25	12/01/24 - 12/31/24	Removed

How Costs Allocated

Wholesale Power Service

DESCRIPTION	RATE	QTY	AMOUNT	
Demand Charges:				
All Demand	$22.20/kW	94,912	2,107,046.40	Monthly kW Demand CP, kW NCP
Energy Charges:				
Monthly Energy Charge	$.02514/kWh	43,618,145	1,096,560.17	Monthly kWh Volumetric

Additional Charges Monthly kWh, fixed or ancillary since not specified other than Rider 2 as noted

DESCRIPTION	RATE	QTY	AMOUNT	
True-Up Charge/(Credit)			130,894.00	
True-Up Charge/(Credit)			109,602.00	
Delivery Surcharge	$0.06/kW	94,912	5,694.72	Monthly kW Demand CP
Other Delivery Point Charges			1,508.88	
Generation Credit			(13,550.82)	
Generation Credit			(27,603.35)	
Power Agency Service (PAS) Charge			79,771.66	
Renewable Energy Portfolio Standards (REPS) Charge			18,555.43	
Debt Defeasance Support Charge			282,559.93	
Other Charges/(Credits)			95,841.00	

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Cost Drivers – Distribution System Losses

Where did the energy go?!

- Distribution system loss, transformers, wires, meters, etc.
- Free and unmetered services, city building, street lighting, etc.
- Metering, billing issues, etc.

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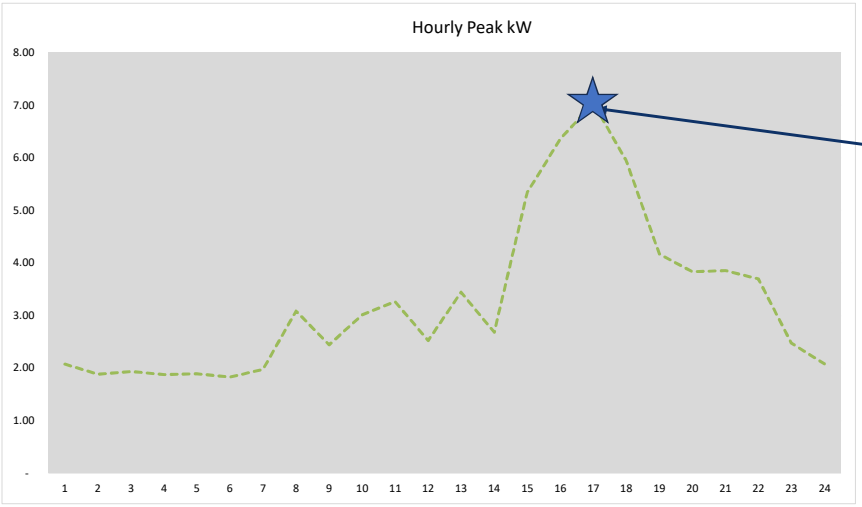
Why Demand Charges – "Part 3"?



Customer largest demand that occurs during the period (Often Month)

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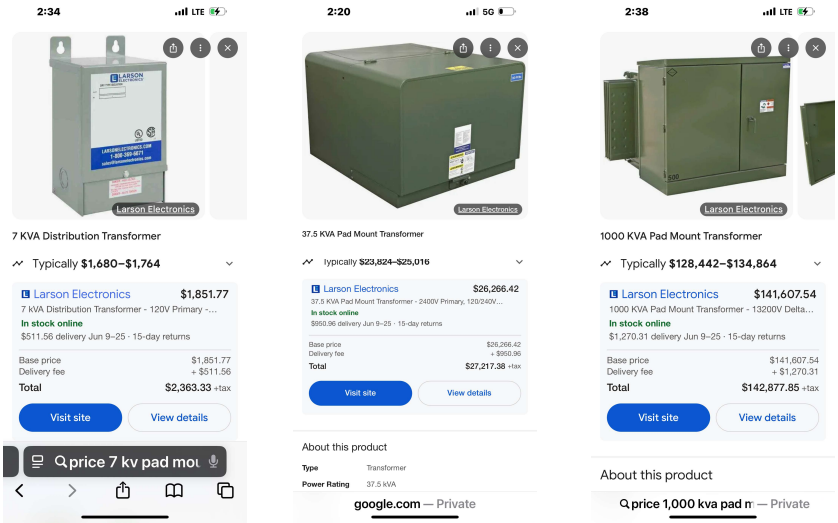
Build system to support peak usage

Loads are Increasing – Customer Peak Load



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"Back of the napkin analysis"

Loads are Varying – Customer Peak Load

Install Type and Size

=ROUND((SQRT($A3)*$B3*$C3)/1000,0)

Customer Class by common install type, size and usage characteristics – loads now greater variation within class

- Residential
- Commercial
- Industrial

A	B	C	D	E
Phase	Volts per Wire	AMP Size	UFS Combined	UFS Max Load kW @ 100% Load
1	120	100	1-120-100	12
1	120	200	1-120-200	24
3	120	200	3-120-200	42
1	120	400	1-120-400	48
1	120	600	1-120-600	72
3	120	400	3-120-400	83
3	240	200	3-240-200	83
1	120	800	1-120-800	96
3	277	200	3-277-200	96
3	120	600	3-120-600	125
3	120	800	3-120-800	166
3	240	400	3-240-400	166
3	277	400	3-277-400	192
3	120	1000	3-120-1000	208
3	240	600	3-240-600	249
3	277	600	3-277-600	288
3	240	800	3-240-800	333
3	277	800	3-277-800	384
3	240	1000	3-240-1000	416
3	277	1000	3-277-1000	480
3	277	1200	3-277-1200	576
3	277	2000	3-277-2000	960
3	277	2500	3-277-2500	1,199
3	277	3000	3-277-3000	1,439

Load Factor - Efficient Use of Infrastructure

Load Factor calculates the average percentage of total energy usage vs. peak energy usage over a given period

- LF% = Total Usage kWh / Peak Usage kW * Hours in Period
- X = 1,000 kWh in month / (5 kW * 730 hours in month)
- X = 1,000 / 3,650
- X = 0.2728 rounded to nearest 4 decimals
- Expressed as 27.28 %

Power Supply Cost Changes – "Part 4"

Power Cost Adjustment

PCA to Balance Power Supply Cost Changes

- Mechanism to fairly and smoothly charge customers for varying power costs
- Intended to recoup power costs that are more than what's being collected in retail rates
- Charged on a per kWh basis as an additional fee to keep power costs in balance *

* Common for PCA to need manual adjusted to keep in balance

Cost Drivers – PCA Basic Calculation

Costs Shown are expressed in Cost per Retail kWh Units

PCA Basic Concepts Example	
$ 0.0842	PCA base - Base Power Cost
$ 0.0892	New Power Cost (future cost)
$ 0.0050	PCA to balance old base cost with new cost

Revenue Stability for Distributed Solar *

Strive to have solar customers pay their fair share

- Should be fair for solar adopters and non-adopters alike
- Continue to review and fine-tune solar policies, metering and billing methods
  - Early systems were installed under net metering
  - Many utilities have evolved to buy-all-sell-all
  - Latest trend has been an evolution to net billing

* Applies to all distributed generation / storage, solar most common today

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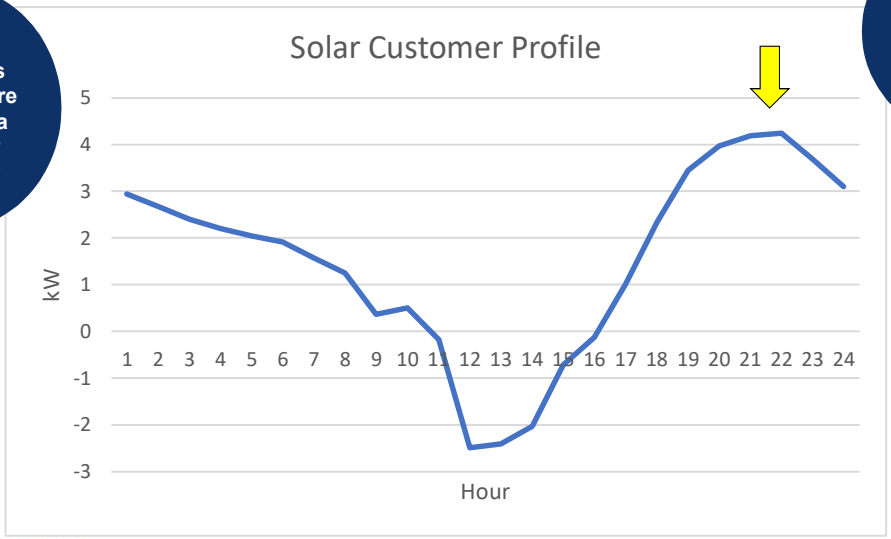
Common Solar Customer Net Usage

Solar customers demands are similar to a non-solar customer

Peak demand occurring when solar not generating



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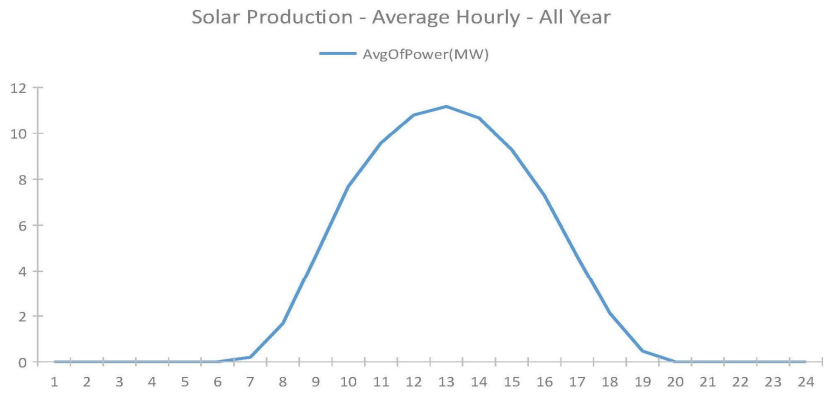
Solar Production
Perceived Solar Production Profile



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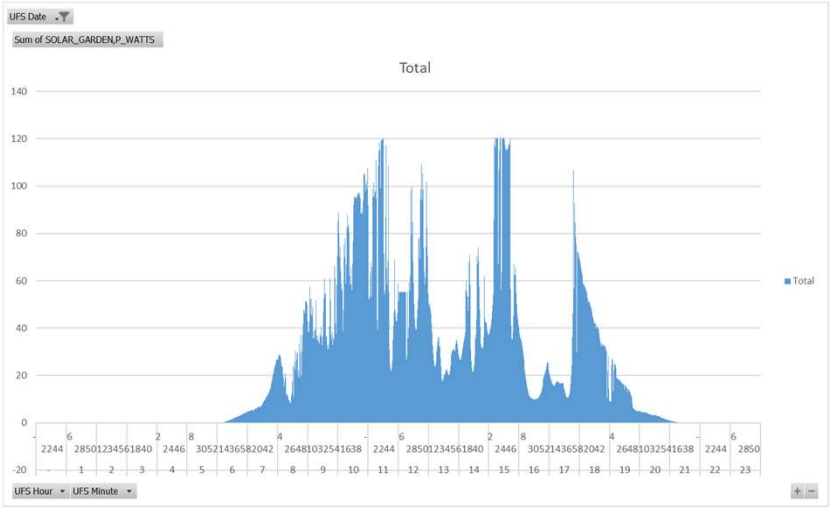
Actual Solar Production



Solar is an intermittent resources. Production changes constantly, actual 1 minute interval shown for 1 day

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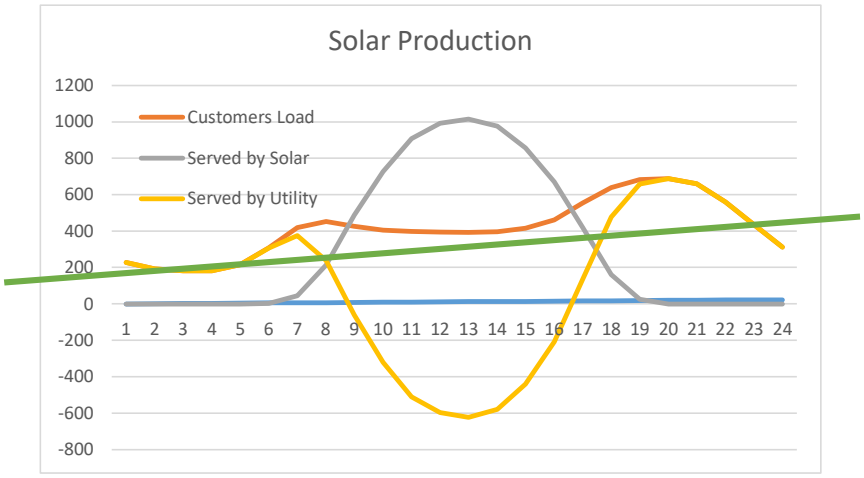
Energy Storage Can "Reshape" to Smooth Peaks and Valleys



Storage to smooth peaks and valleys

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EV Charging
Typically Have Low Load Factors, High Peak Loads *

Average C **s**

Demand Ch	ser to 60%
Energy Rate	
Load Fac	rging
	% range
	her range
	rging
	gher-than-
	h
	C Level 3
	W per port

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Commercial EV – DCFC Level 3 Example *

Commercial Electric Vehicle Charging Station - DCFC Level 3	
Customer Charge (per month)	$175.00
Coincidental Peak Demand Charge (per kW)	$27.00
Excess Demand Charge (per kW)	$6.00
Energy Charge (per kWh) Load Factor </-10%	$0.1018
Energy Charge (per kWh) 10%< Load Factor <20%	$0.0793
Energy Charge (per kWh) Load Factor >20%	$0.0568

* Utility policy restricted to no larger than 1,000 kW monthly peak load allowed

Utility Owned – DCFC Level 3 Example *

Utility Owned Electric Vehicle Charging Station - DCFC Level 3	
Active Energy Charge (per kWh) Load Factor <10%	$0.71
Active Energy Charge (per kWh) 10%< Load Factor <20%	$0.49
Active Energy Charge (per kWh) Load Factor >20%	$0.40
In Active Charging Charge (per minute)	$0.18

* Recovers power supply, utility owned stations, equipment and supporting costs (demand throttled during CP hours)

Rate Evolution Example – Time-Based Rate

		Residential Time-Based Rate Example		
		Customer monthly per (meters) rate	$	12.00
TOU	700	Off Peak 700 kWh rate	$	0.1050
kWh	300	On Peak 300 kWh rate	$	0.1850
		PCA average assumption	$	0.0050

	Existing Structure			Cost Recovery Category
Customer Charge	Customer monthly per (meters) rate	$	12.00	<- Fixed
kWh	Off Peak 700 kWh rate	$	73.50	<- Power Supply, Fixed & Distribution
kWh	On Peak 300 kWh rate	$	55.50	<- Power Supply, Fixed & Distribution
kWh	PCA average assumption	$	5.00	<- Power Supply
	Total bill for services		$ 146.00	<- Fixed, Power Supply and Distribution

All in per kWh average $ for : 1000 <- Calculated monthly utility delivered kWh $ 0.1460

27.4% <- Average Load Factor

8% <- Percent Collected Fixed
92% <- Percent Collected Power Supply, Fixed & Distribution

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Rate Evolution Example – Demand Rate

		Example Modernization / Rate Evolution: Residential Theoretical Rate Modernization (slowly over 3 to 5+ years)				
		Customer monthly per (meters) rate	$	25.00		
All	9,999,999	9999999 All kWh rate	$	0.0860		
kWh	9,999,999	9999999 All kWh rate above	$	-		
		PCA average assumption	$	0.0050	$	0.0910
		Peak monthly usage (kW distribution demand charge)	$	6.00		5.0

	Rate Modernization			Cost Recovery Category
Customer Charge	Customer monthly per (meters) rate	$	25.00	<- Fixed
kWh	9999999 All kWh rate	$	86.00	<- Power Supply
kWh	9999999 All kWh rate above	$	-	
kWh	PCA average assumption	$	5.00	<- Power Supply
kW	Peak monthly usage (kW distribution demand charge)	$	30.00	<- Distribution
	Total bill for services		$ 146.00	<- Fixed, Power Supply and Distribution

All in per kWh average $ for : 1000 <- Calculated monthly utility delivered kWh $ 0.1460

27.4% <- Average Load Factor

38% <- Percent Collected Fixed, Distribution

62% <- Percent Collected Power Supply

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Rate Evolution Example – Residential EV *

		Residential Time-Based Rate Example with Demand			
		Customer monthly per (meters) rate	$	25.00	
TOU kWh	700	Off Peak 700 kWh rate	$	0.0570	
	300	On Peak 300 kWh rate	$	0.1537	
		PCA average assumption	$	0.0050	
		Peak monthly usage (kW distribution demand charge)	$	6.00	5.0

	Existing Structure			Cost Recovery Category
Customer Charge	Customer monthly per (meters) rate	$	25.00	<- Fixed
kWh	Off Peak 700 kWh rate	$	39.90	<- Power Supply
kWh	On Peak 300 kWh rate	$	46.11	<- Power Supply
kWh	PCA average assumption	$	5.00	<- Power Supply
kW	Peak monthly usage (kW distribution demand charge)	$	30.00	<- Distribution
	Total bill for services		**$ 146.01**	<- Fixed, Power Supply and Distribution

All in per kWh average $ for : 1000 <- Calculated monthly utility delivered kWh $ 0.1460

27.4% <- Average Load Factor

38% <- Percent Collected Fixed, Distribution
62% <- Percent Collected Power Supply

* Demand and time-based rate, fair for "all" residential customers

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Rate Evolution Example – Residential Solar

		Residential Time-Based Rate Example with Demand						
		Customer monthly per (meters) rate	$	25.00		Total kWhr	169	563 Produced
TOU kWh	333	Off Peak 333 kWh rate	$	0.0570		kWhr TOU Credits		394 Consumed
	273	On Peak 273 kWh rate	$	0.1537	$	(0.0570)	142	kWhr
		PCA average assumption	$	0.0050	$	(0.1537)	27	kWhr
		Peak monthly usage (kW distribution demand charge)	$	6.00		5.0		

	Existing Structure			Cost Recovery Category
Customer Charge	Customer monthly per (meters) rate	$	25.00	<- Fixed
kWh	Off Peak 333 kWh rate	$	18.98	<- Power Supply
kWh	On Peak 273 kWh rate	$	41.96	<- Power Supply
kWh	PCA average assumption	$	3.03	<- Power Supply
kW	Peak monthly usage (kW distribution demand charge)	$	30.00	<- Distribution
	Total bill for services		**$ 118.97**	<- Fixed, Power Supply and Distribution

All in per kWh average $ for : 606 <- Calculated monthly utility delivered kWh $ 0.1762

16.6% <- Average Load Factor

52% <- Percent Collected Fixed, Distribution
48% <- Percent Collected Power Supply

* Demand and time-based rate, fair for "all" residential customers

<- Example Value of Solar (or TOU kWh Rates as kWhr Credit)

$ (12.24)

Net Billing average monthly customer bill $ **$ 106.73**

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Rate Timing & Frequency

General Strategies for rate changes

- Common at the start of each fiscal year
- Easier to plan and meet budgets projections
- Good to get Governing Body used to annual rate adjustments even if revenue neutral
- More frequent, smaller adjustments are easier to manage and lessen customer impacts
- Optionally time in shoulder months where customer's bill is normally lower to smooth impacts

Rate Evolution Review Summary

- Evolve rates to be less dependent on kWh sales
- Attempt to align rate components with how utility incurs the cost "more & evolved rate parts"
  - Fixed cost in customer charge
  - Power supply cost in kWh charge (many have distribution recovery embedded in kWh rates)
  - Distribution in NCP kW demand charge instead of kWh embedded
  - Changes in power costs in PCA kWh charge
  - Optionally break kWh in TOU kWh periods and/or CP capacity, CP transmission

RS & GS evolving to look more like "mini" GSD & Industrial

Resources for Continued Learning

- NREL (National Renewable Energy Laboratory)

The only federal laboratory dedicated to research, development, commercialization, and deployment of renewable energy and energy efficiency technologies. System Advisor Model (SAM)

Single Click link below

https://sam.nrel.gov/

Get to know your Utility:

- Audits and/or financial statements
- Power supply bills
- Customer bills
- Rate schedules, ordinances, tariffs, policies and fee schedules

Question and Answers

Chris Lund

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Thank you!