



# Hingham Municipal Lighting Plant

Electric Cost of Service Study

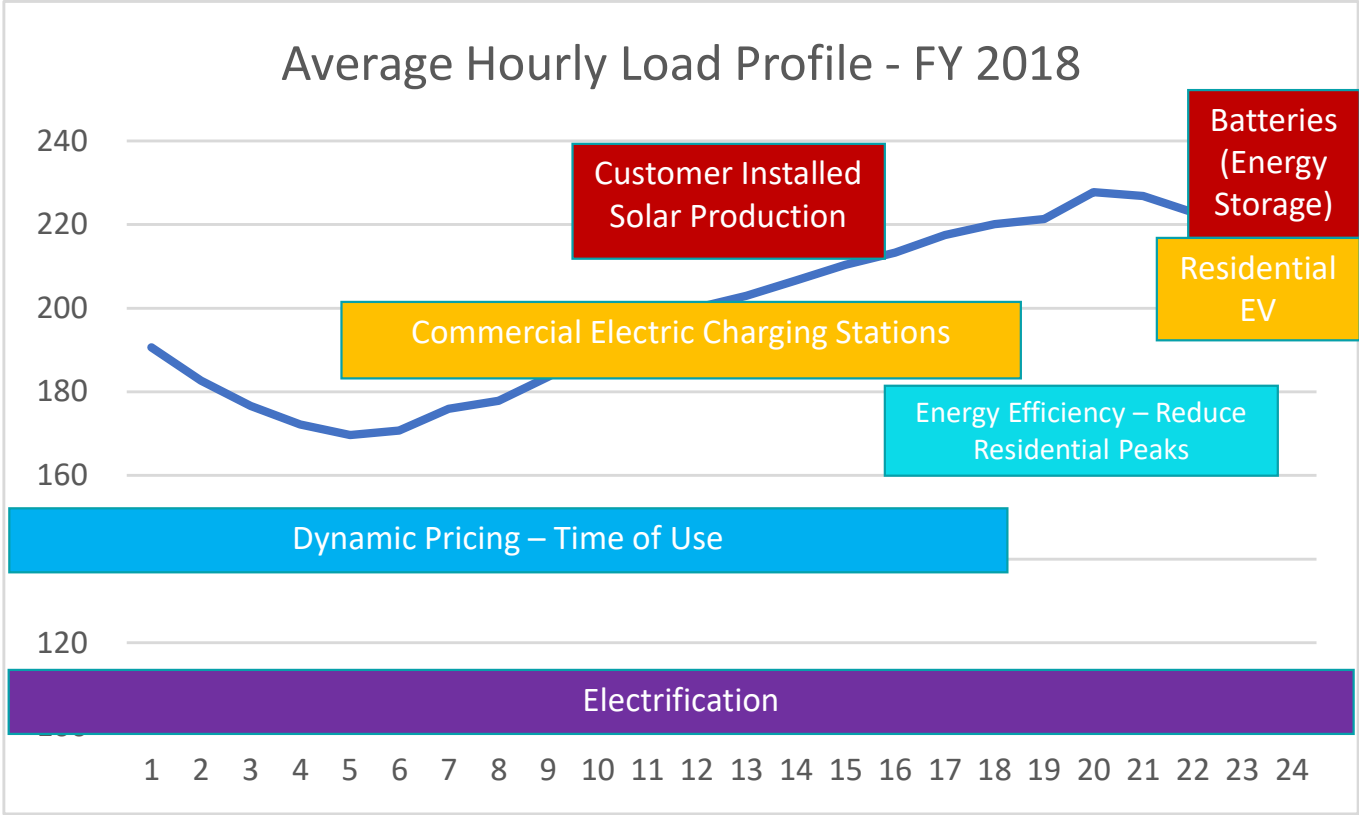
Mark Beauchamp

President, Utility Financial Solutions, LLC

# Objectives

- Review Revenue Requirement
- Review Cost of Service Results
  - Class cost results
  - Customer Charges
- Rate Adjustment Plan

# Technology Impacts on Hourly System Usages



# Historical Establishment of Rates

- Previously customers were placed into rate classes based on similar usage patterns and customer requirements
  - Customer Load factors
  - When energy was used
  - Metering requirements
  - Service levels
- Categories of Rates:
  - Residential; Commercial; Industrial

Customer usage patterns now vary substantially from class averages

# Major Rate Design Changes

**Demand Charges**  
AMI required

**Dynamic Pricing**  
(Time-Based,  
Real-Time Pricing)  
AMI required

**Commercial EV**  
**Charging Station**  
**Rates**

**Inverted block**  
**rate structures**

**Customer charges**  
**based on size of**  
**service**

**Reviewing Line**  
**Extension Policies**

**Rebate Programs**  
**for EE and Battery**  
**Storage**

**Reviewing small ,**  
**medium and large**  
**general service**  
**rates**

# Significant Assumptions

Fiscal Year	Projected	Purchase			CIP	
	Rate Adjustments	Inflation	Growth	Power Change		Depreciation Rate
2023	0.0%	5.0%		0.0%	5.0%	\$ 4,661,000
2024	0.0%	5.0%	0.5%	3.0%	5.0%	\$ 1,098,000
2025	0.0%	3.0%	0.5%	3.0%	3.0%	\$ 77,620,578
2026	0.0%	3.0%	0.5%	3.0%	3.0%	\$ 7,329,000
2027	0.0%	3.0%	0.5%	3.0%	3.0%	\$ 7,000,000

\$56M Bond Issuance 2025, 20 year, 5%

# COS Summary Financial Results

Fiscal Year	Projected Rate Adjustments	Debt Coverage Ratio	Fixed Coverage Ratio	Adjusted Operating Income	Target Operating Income	Projected Cash Balances	Recommended Minimum Cash
2023	0.0%	N/A	N/A	\$ (1,208,534)	\$ 2,313,575	\$ 35,082,786	\$ 13,826,674
2024	0.0%	N/A	N/A	\$ (2,144,190)	2,347,613	\$ 35,802,483	14,032,253
2025	0.0%	0.37	0.37	\$ (3,121,979)	4,847,002	\$ 11,345,855	17,139,077
2026	0.0%	(0.87)	(0.87)	\$ (8,772,198)	5,023,335	\$ (4,371,828)	17,977,848
2027	0.0%	(0.89)	(0.89)	\$ (9,049,090)	5,187,194	\$ (19,884,131)	18,154,466

# Debt Coverage Ratio

Description	Projected 2023	Projected 2024	Projected 2025	Projected 2026	Projected 2027
<b>Debt Coverage Ratio</b>					
Net Income	\$ (973,943)	\$ (1,968,776)	\$ (5,742,966)	\$ (11,430,790)	\$ (11,675,497)
Add Depreciation/Amortization Expense	3,350,830	3,786,473	4,600,501	4,820,371	5,030,371
Add Interest Expense	-	-	2,800,000	2,715,321	2,626,408
Cash Generated from Operations	\$ 2,376,887	\$ 1,817,697	\$ 1,657,535	\$ (3,895,098)	\$ (4,018,719)
Debt Principal and Interest	\$ -	\$ -	\$ 4,493,585	\$ 4,493,585	\$ 4,493,585
<b>Projected Debt Coverage Ratio (Covenants)</b>	<b>N/A</b>	<b>N/A</b>	<b>0.37</b>	<b>(0.87)</b>	<b>(0.89)</b>
<b>Minimum Debt Coverage Ratio</b>	<b>1.4</b>	<b>1.4</b>	<b>1.4</b>	<b>1.4</b>	<b>1.4</b>



# Minimum Cash Reserves

Description	Projected 2023	Projected 2024	Projected 2025	Projected 2026	Projected 2027
<b>Minimum Cash Reserve Allocation</b>					
Operation & Maintenance Less Depreciation Expense	12.3%	12.3%	12.3%	12.3%	12.3%
Purchase Power Expense	11.5%	11.5%	11.5%	11.5%	11.5%
Historical Rate Base	3%	3%	1%	1%	1%
Current Portion of Debt Service Payment	83%	83%	83%	83%	83%
Five Year Capital Improvements - Net of bond proceeds	20%	20%	20%	20%	20%
% Plant Depreciated	66%	70%	38%	39%	40%
<b>Calculated Minimum Cash Level</b>					
Operation & Maintenance Less Depreciation Expense	\$ 812,691	\$ 899,799	\$ 926,793	\$ 1,600,624	\$ 1,612,372
Purchase Power Expense	2,433,323	2,518,854	2,607,392	2,699,042	2,793,913
Historical Rate Base	2,238,944	2,271,884	1,533,500	1,606,790	1,676,790
Current Portion of Debt Service Reserve	-	-	3,729,675	3,729,675	3,729,675
Five Year Capital Improvements - Net of bond proceeds	8,341,716	8,341,716	8,341,716	8,341,716	8,341,716
<b>Minimum Cash Reserve Levels</b>	<b>\$ 13,826,674</b>	<b>\$ 14,032,253</b>	<b>\$ 17,139,077</b>	<b>\$ 17,977,848</b>	<b>\$ 18,154,466</b>
<b>Projected Cash Reserves</b>	<b>\$ 35,082,786</b>	<b>\$ 35,802,483</b>	<b>\$ 11,345,855</b>	<b>\$ (4,371,828)</b>	<b>\$ (19,884,131)</b>

# Target Operating Income

Description	Projected 2023	Projected 2024	Projected 2025	Projected 2026	Projected 2027
<b>Target Operating Income Determinants</b>					
Net Book Value/Working Capital	\$ 25,042,976	\$ 22,354,502	\$ 95,374,579	\$ 97,883,208	\$ 99,852,837
Outstanding Principal on Debt	-	-	54,306,415	52,528,151	50,660,974
System Equity	\$ 25,042,976	\$ 22,354,502	\$ 41,068,164	\$ 45,355,057	\$ 49,191,863
Debt:Equity Ratio	0%	0%	57%	54%	51%
<b>Target Operating Income Allocation</b>					
Interest on Debt	0.00%	0.00%	5.16%	5.17%	5.18%
System Equity	9.24%	10.50%	4.98%	5.09%	5.21%
<b>Target Operating Income</b>					
Interest on Debt	\$ -	\$ -	\$ 2,800,000	\$ 2,715,321	\$ 2,626,408
System Equity	\$ 2,313,575	\$ 2,347,613	\$ 2,047,002	\$ 2,308,014	\$ 2,560,786
<b>Target Operating Income</b>	<b>\$ 2,313,575</b>	<b>\$ 2,347,613</b>	<b>\$ 4,847,002</b>	<b>\$ 5,023,335</b>	<b>\$ 5,187,194</b>
<b>Projected Operating Income</b>	<b>\$ (1,208,534)</b>	<b>\$ (2,144,190)</b>	<b>\$ (3,121,979)</b>	<b>\$ (8,772,198)</b>	<b>\$ (9,049,090)</b>
<b>Rate of Return in %</b>	<b>9.2%</b>	<b>10.5%</b>	<b>5.1%</b>	<b>5.1%</b>	<b>5.2%</b>

# Projected Rate Track

Fiscal Year	Projected Rate Adjustments	Debt Coverage Ratio	Fixed Coverage Ratio	Adjusted Operating Income	Target Operating Income	Projected Cash Balances	Recommended Minimum Cash
2023	6.0%	N/A	N/A	\$ 618,160	\$ 2,313,575	\$ 36,909,480	\$ 13,826,674
2024	6.0%	N/A	N/A	\$ 1,637,616	2,347,613	\$ 41,420,117	14,032,253
2025	6.0%	1.68	1.68	\$ 2,756,385	4,847,002	\$ 22,869,941	17,139,077
2026	6.0%	0.95	0.95	\$ (651,123)	5,023,335	\$ 15,330,954	17,977,848
2027	6.0%	1.46	1.46	\$ 1,470,440	5,187,194	\$ 10,414,836	18,154,466

# COS Summary Results

Customer Class	Cost of Service	Projected Revenues	% Change
Residential - R1	\$ 17,200,147	\$ 15,098,366	13.9%
Off-Peak (Water Heating)	150,664	181,116	-16.8%
Small General Service	3,523,485	3,070,298	14.8%
Small Farm G-1B	12,336	10,361	19.1%
General Service Heat Commercial	545,434	482,698	13.0%
General Service Demand	6,536,213	6,174,441	5.9%
Large General Service	3,811,425	3,533,775	7.9%
Municipal	1,492,181	1,379,744	8.1%
General Service Heat Residential	388,780	315,950	23.1%
<b>Total</b>	<b>\$ 33,967,019</b>	<b>\$ 30,444,909</b>	<b>11.6%</b>

# What is a Customer Charge?

**Recovers cost for connection to grid at zero kWh consumption**

- Meter operation, maintenance and replacement costs
- Meter reading costs or AMR installation costs
- Billing costs
- Customer service department
- Service into customers facilities
- **Portion of distribution system**
  - Cost to get a wire from the substation system to customer transformer
  - Based on minimum sizing (If all customers only used a single kWh)

## Why is a Customer Charge Needed?

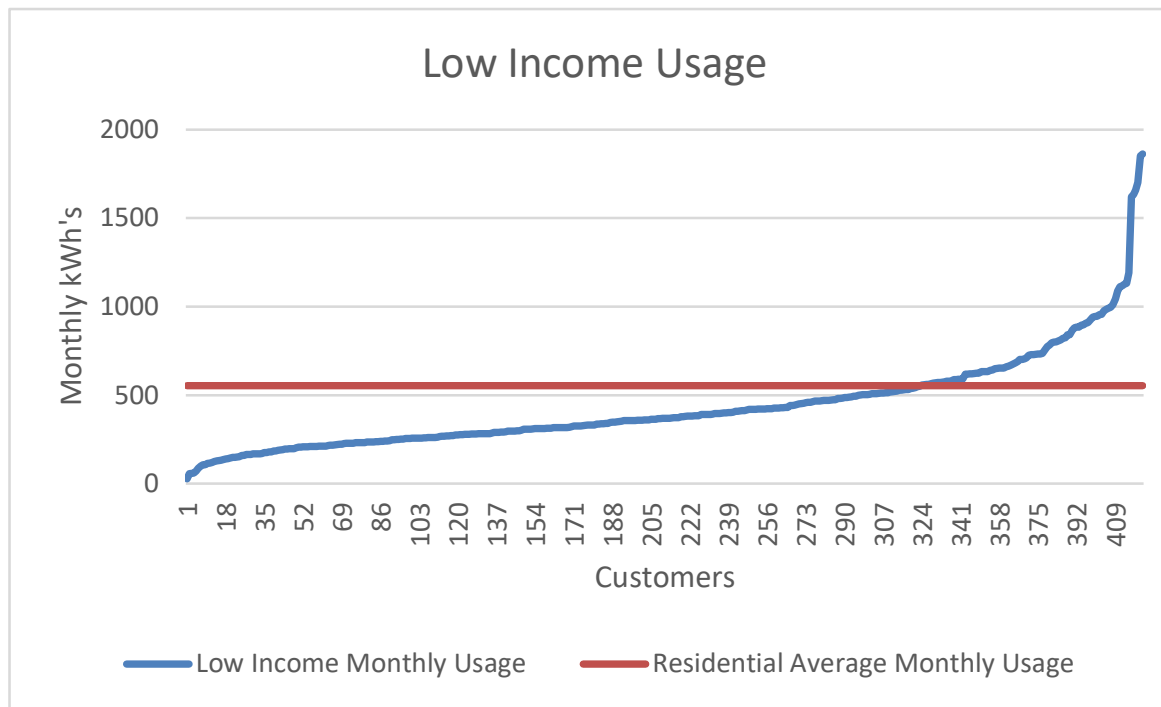
**Stabilizes revenue**

**Reduces seasonal subsidies**

**May impact low-use customers**

**Low income may not be low use**

# Average Residential Usage Compared with Low-Income



# Monthly Customer Charges

Customer Class	COS Customer Charge	Current Average Customer Charge
Residential - R1	\$ 26.89	\$ 8.86
Off-Peak (Water Heating)	4.75	8.30
Small General Service	41.97	10.94
Small Farm G-1B	26.90	9.84
General Service Heat Commercial	41.98	11.53
General Service Demand	100.63	36.86
Large General Service	610.46	389.78
Municipal	64.44	20.43
General Service Heat Residential	26.90	11.53



# Next Steps

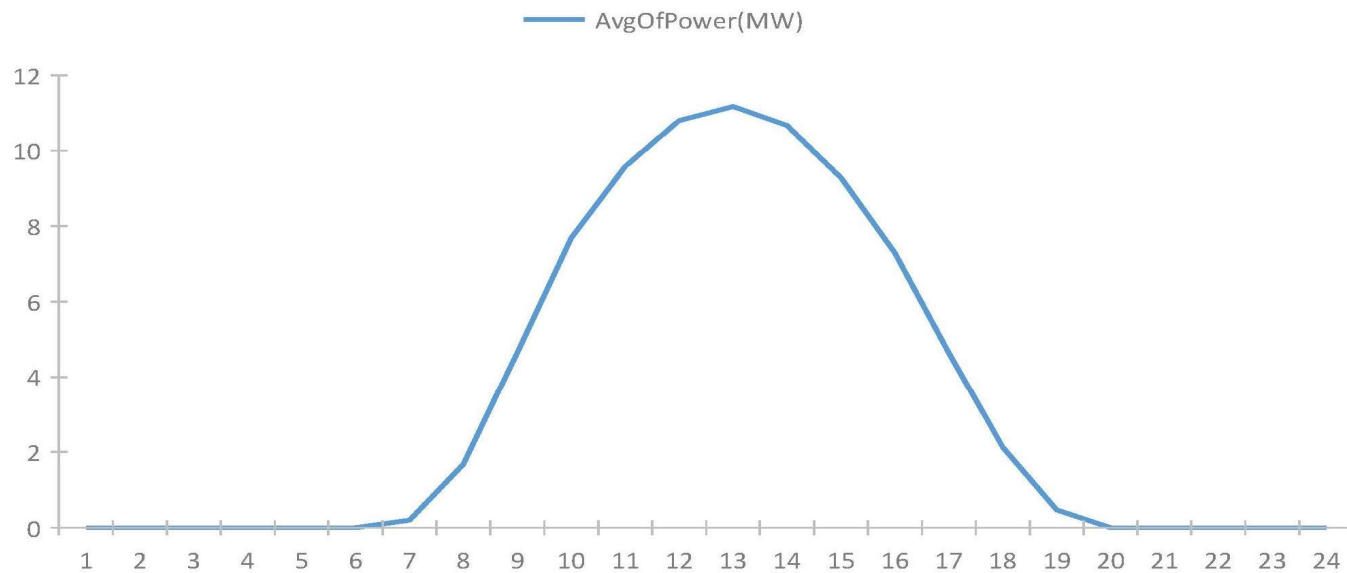
## Meeting Objectives

- Develop Bandwidth Rates (Rate Adjustment Plan)
  - Plus or Minus 1.5%, Increase vary between 7.5% - 4.5%
- Overall Rate Increase
  - Planned 6% Annually
  - Implementation of low income discount
- Customer Charges
  - Move toward Cost of Service \$2.00 increase in residential customer charge
- Develop a three year rate plan
- Residential All electric rate

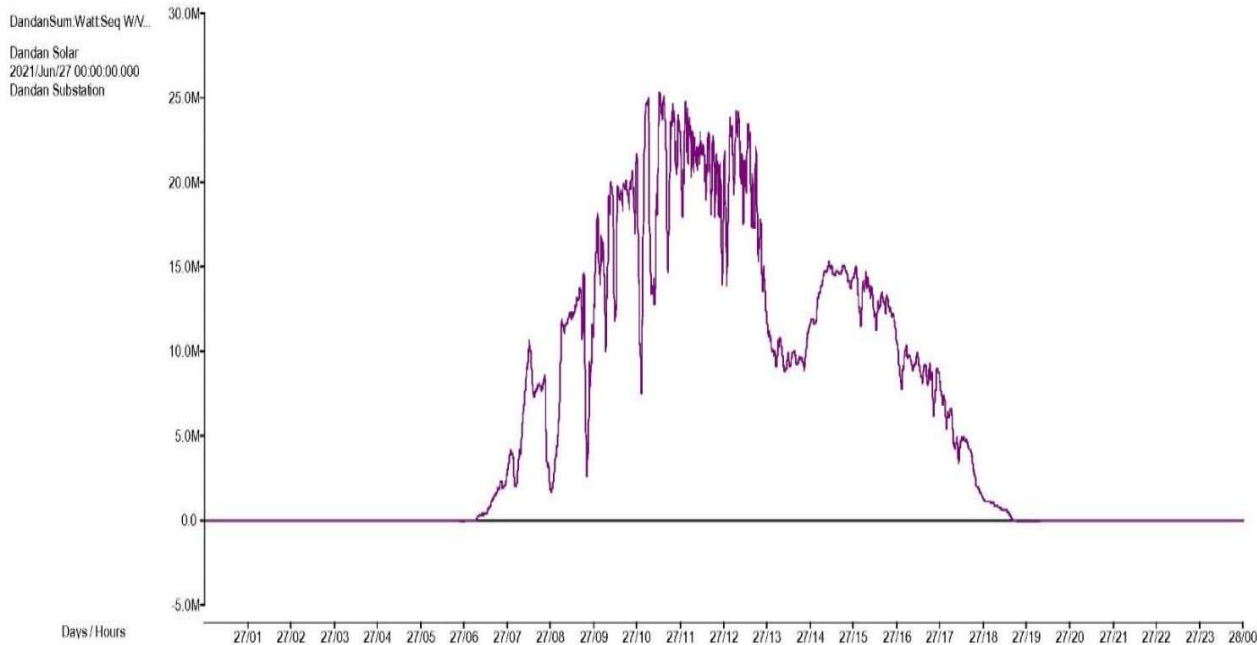
# Solar Rates and Issues

# Solar Production – Perceived Solar Production Profile

Solar Production - Average Hourly - All Year



# Actual Solar Production



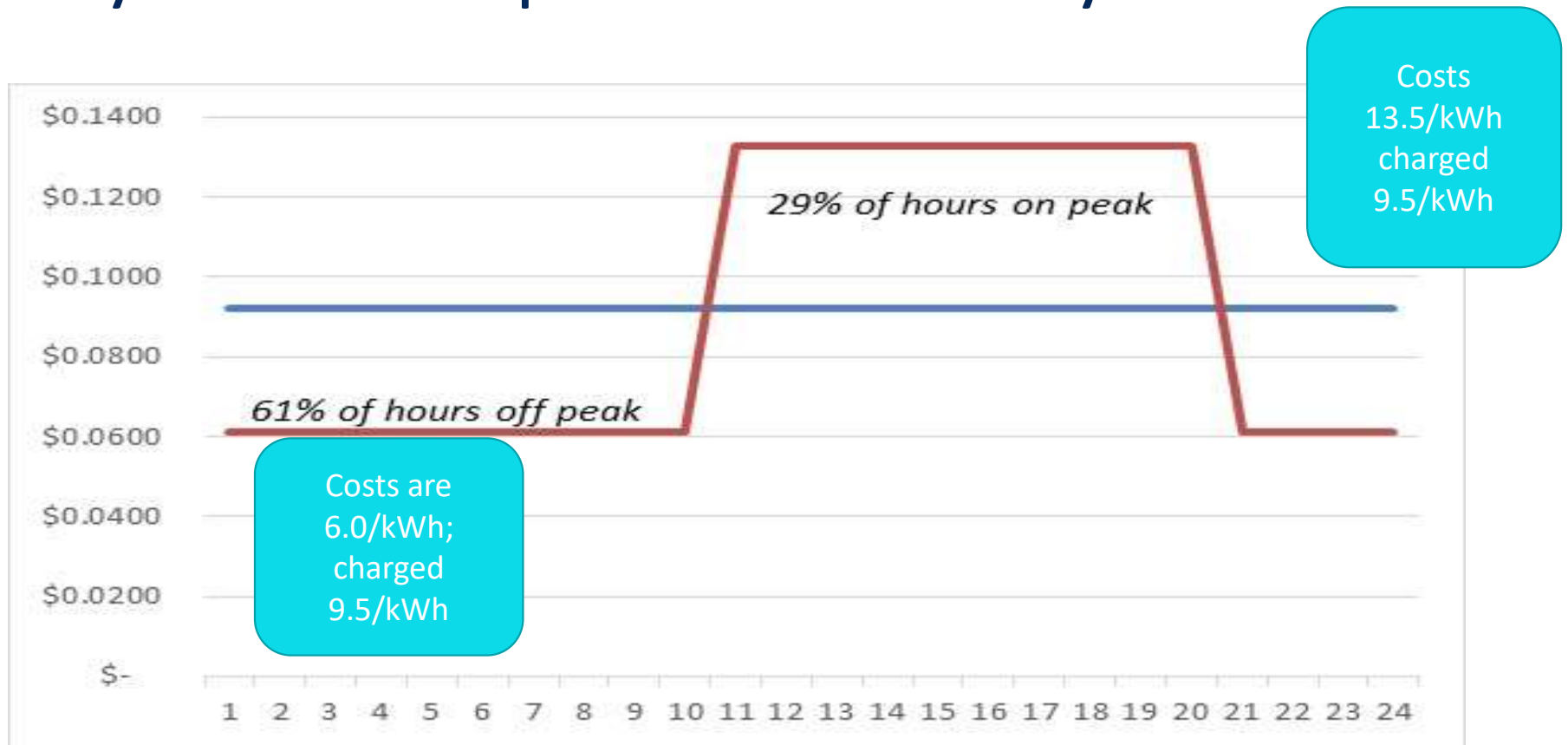
- There is a strong outage correlation between outages due to UFLS when feeders exceed solar concentrations of 30% of the feeders minimum daytime loadings
- Solar is an intermittent resources with production changing on a minute to minute basis

# Time of Use

# Benefits of Time Differentiated Pricing

- Lowers usage during peak demand hours
- Increases usage during low cost hours
  - Electric vehicles
  - Heating/cooling
- Tends to lower customers overall electric usage
- Allows customers control over electric bill
- Lowers Green House Gas Emissions

# Utility Costs Compared with Utility Rates



# Enabling Devices

## Devices to lower or shift usage

- LED Lights
- Motion Sensors for Lighting Systems
- Solar Lights
- Solar Water Heaters
- Smart programmable thermostats
- Energy star devices
- Air curtains
- Mini Fans
- Evaporative Humidifiers
- Water saving shower heads and faucet aerator



## Rebate programs

Description

- Residential Central Air Conditioning
- Clothes Dryer (Capacity  $\leq 4.3$  cu-ft)
- Clothes Dryer (Capacity  $> 4.3$  cu-ft)
- Clothes Washer (Top Load)
- Clothes Washer (Front Load)
- Variable Refrigerant Flow A/C
- Water Heater (18 - 51 gallons)
- Water Heater (greater than 75 gallons)
- Water Heater (High)
- Water (Heat Pump)
- Aquanta



# Time of Use (TOU)

- Cost Allocation/Rate Development

Costs	Energy-Off	Energy-On	Transmission	Capacity
S	\$ 4,274,539.18	\$ 1,846,894.30	\$ 2,121,530.04	\$ 751,546.66
W	\$ 5,593,082.62	\$ 3,926,074.29	\$ 2,642,717.58	\$ -

Units	Energy-Off	Energy-On
S	61,387,596	18,475,403
W	74,436,028	49,253,823

Rate	Off-Peak	On-Peak
S	\$ 0.0696	\$ 0.2555
W	\$ 0.0751	\$ 0.1334

# Time of Use (TOU)

- Oct-May
  - Energy
  - Applicable Transmission
- Jun-Sep
  - Energy
  - Applicable Transmission
  - Capacity

# TOU Identified Time Periods

Period	On Peak	Off Peak
Oct-May	8A-8P	8P-8A
June-Sept	1P-7P	7P-1P
Exceptions:		
Weekends		12A-12P
Holidays		12A-12P
Memorial Day		
Independence		
Labor Day		
Thanksgiving		
Christmas		
New Year's		

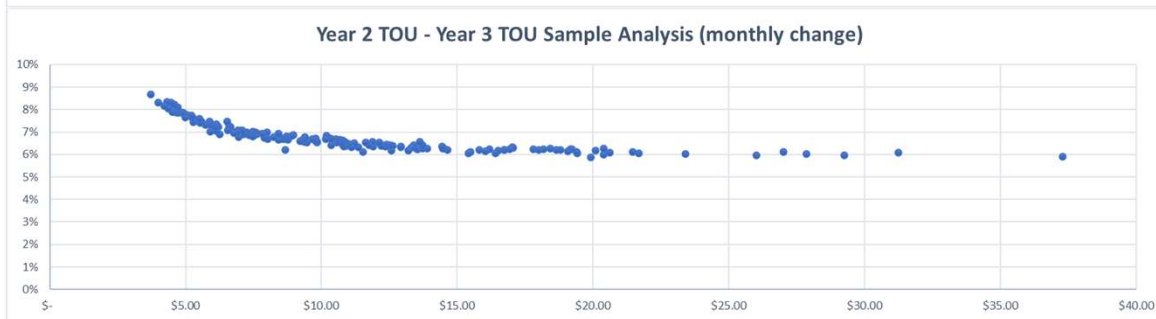
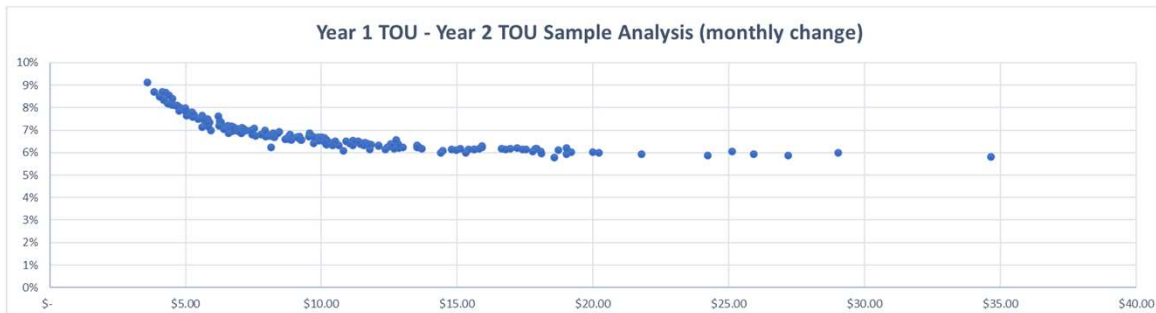
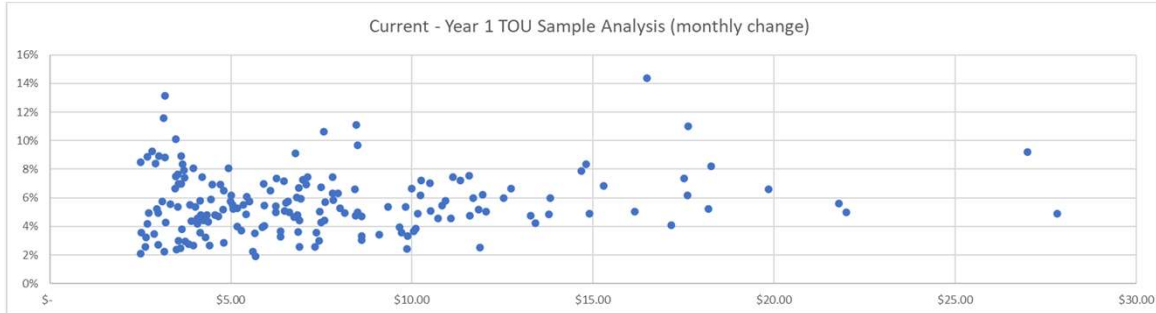
History:  
Summer System Peaks Occur  
between 3P and 5P  
Winter System Peaks Occur  
between 9A and 8P  
Transmission Peaks Occur  
between 12P and 7P

# Residential Rate Track

Rates	Current	Year 1	Year 2	Year 3
Monthly Facilities Charge:				
Facilities Charge	\$ 8.86	\$ 10.86	\$ 12.86	\$ 14.86
Energy Charge:				
Capacity, Transmission and Distribution Charge	\$ 0.10756	\$ 0.08233	\$ 0.08733	\$ 0.09273
Energy Charge	\$ 0.05000	\$ 0.08191	\$ 0.08690	\$ 0.09230
Total Energy	\$ 0.15756	\$ 0.16424	\$ 0.17423	\$ 0.18503
Power Cost Adjustment:				
All Energy	\$ 0.01095	\$ 0.01095	\$ 0.01095	\$ 0.01095
Revenue Change (Excl. Pasny/discounts)		5.0%	6.5%	6.5%

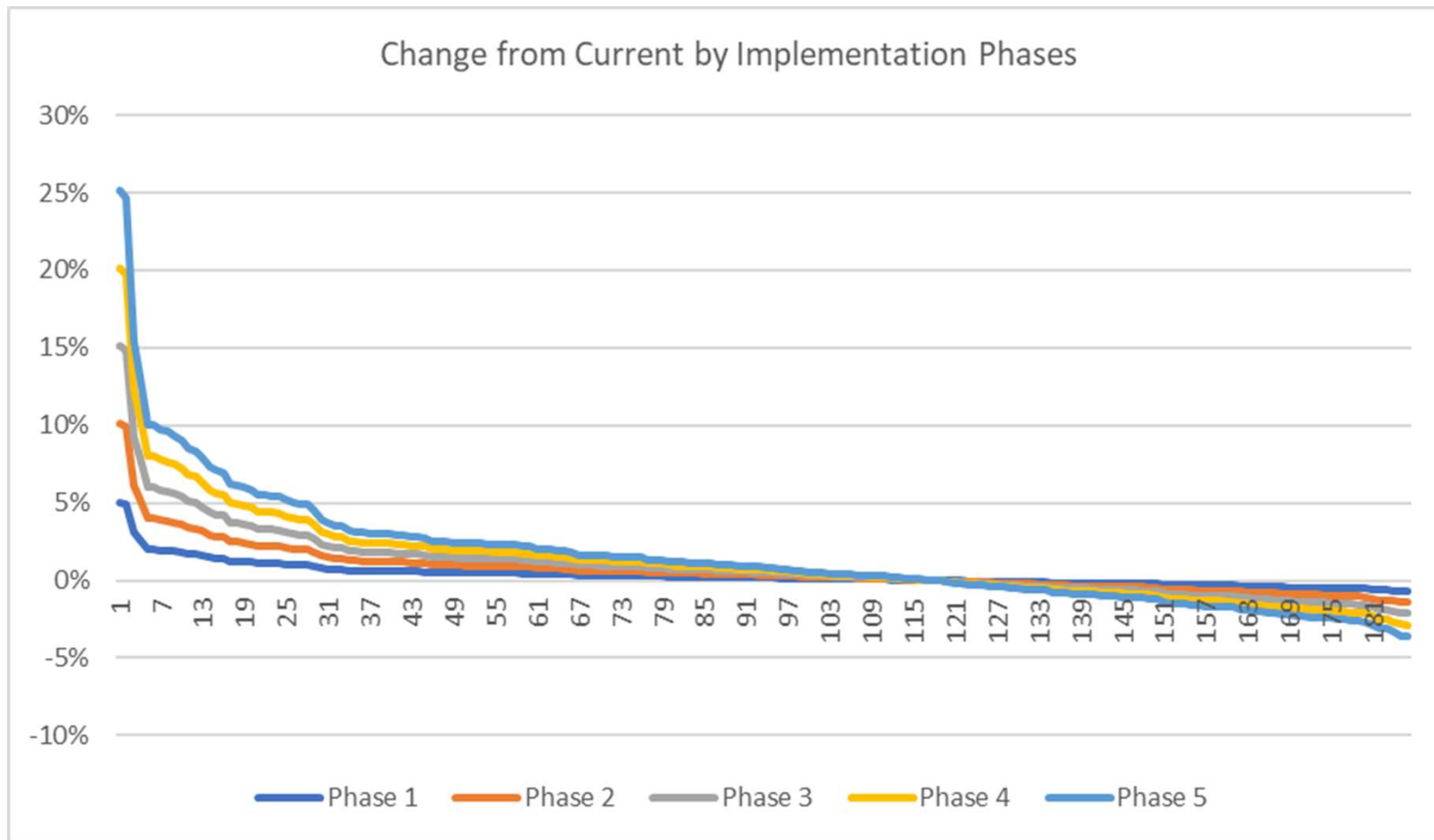
Rates	Current	TOU Year 1	TOU Year 2	TOU Year 3
Monthly Facilities Charge:				
All Customers	\$ 8.86	\$ 10.86	\$ 12.86	\$ 14.86
Capacity, Transmission and Distribution Charge:				
Winter On-Peak	\$ 0.1076	\$ 0.1181	\$ 0.1229	\$ 0.1281
Winter Off-Peak	\$ 0.1076	\$ 0.0599	\$ 0.0647	\$ 0.0699
Summer On-Peak	\$ 0.1076	\$ 0.2402	\$ 0.2450	\$ 0.2502
Summer Off-Peak	\$ 0.1076	\$ 0.0544	\$ 0.0592	\$ 0.0644
Energy Charge:				
All Energy	\$ 0.0500	\$ 0.0819	\$ 0.0869	\$ 0.0923
Power Cost Adjustment:				
All Energy	\$ 0.01095	\$ 0.01095	\$ 0.01095	\$ 0.01095
Revenue Change (Excl. Pasny/discounts)		5.0%	6.5%	6.5%

# Residential TOU Effect (With Rate Track)



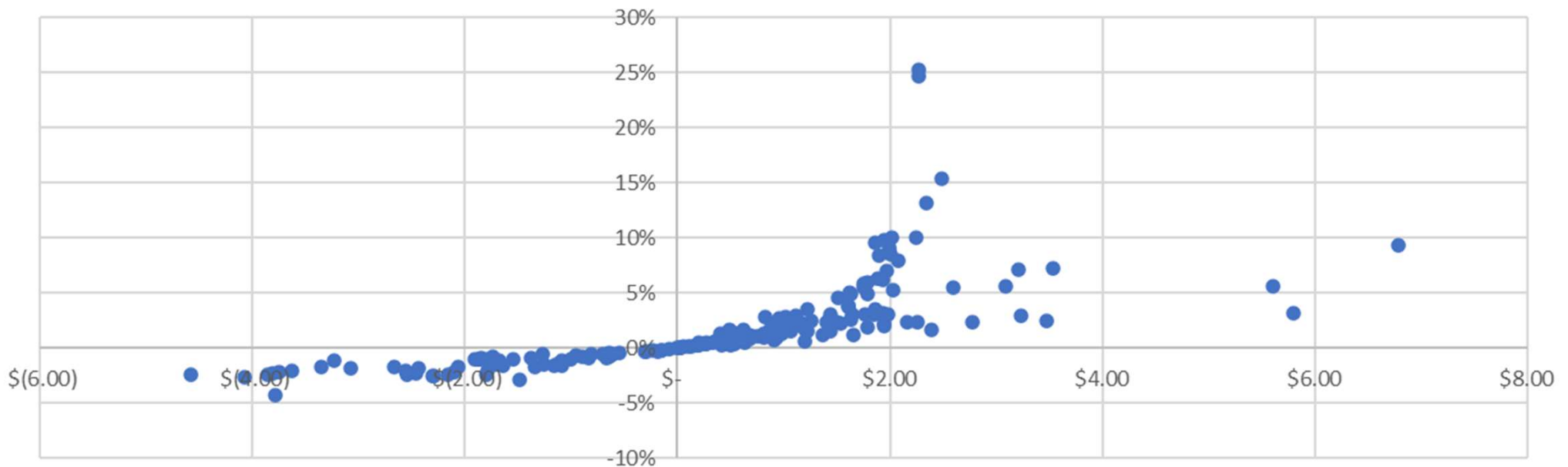


# Residential TOU Consumer Analysis (by implementation) excluding rate changes after Oct. 2023



# Monthly Residential Sample Analysis

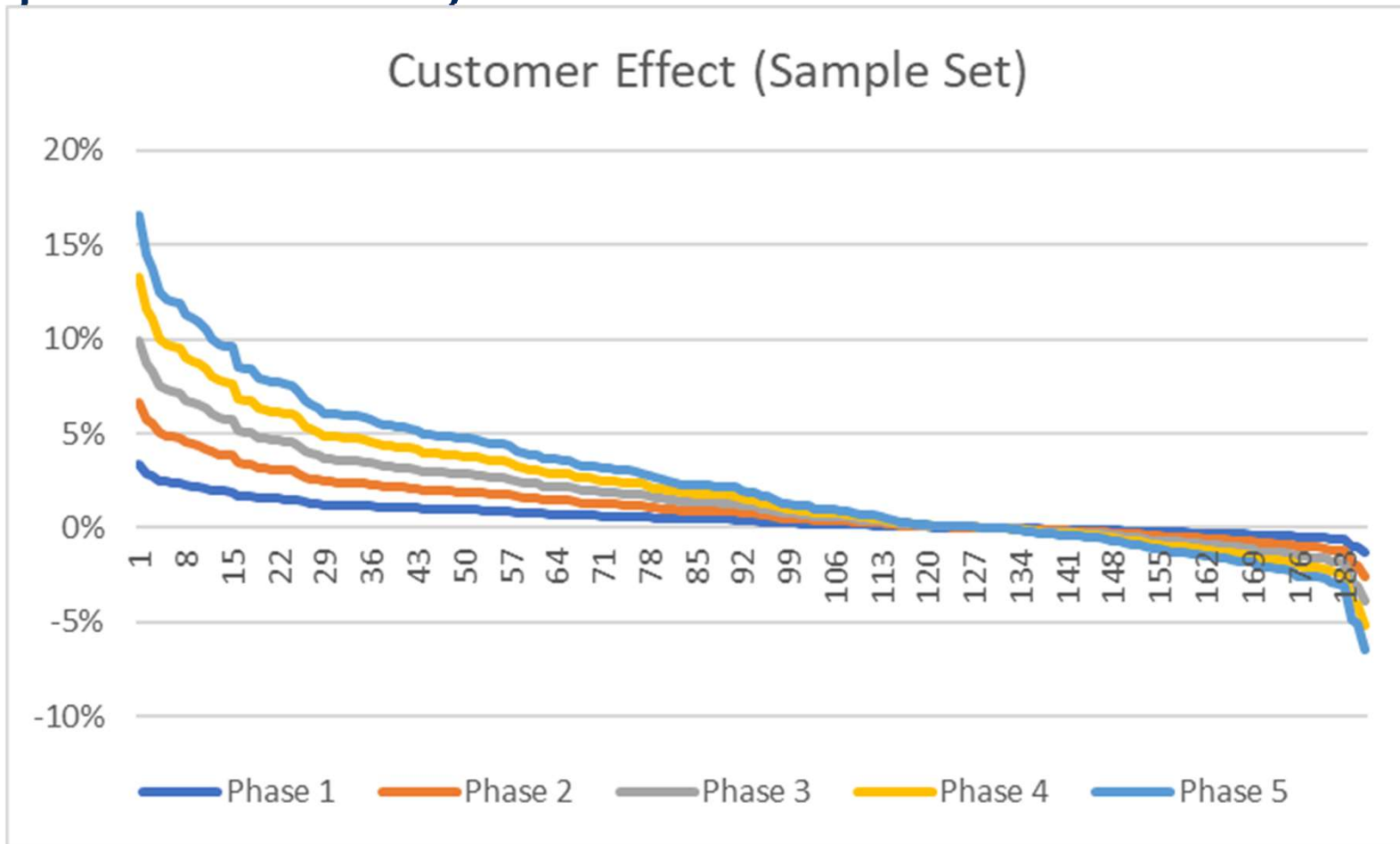
Full TOU Sample Analysis (monthly)





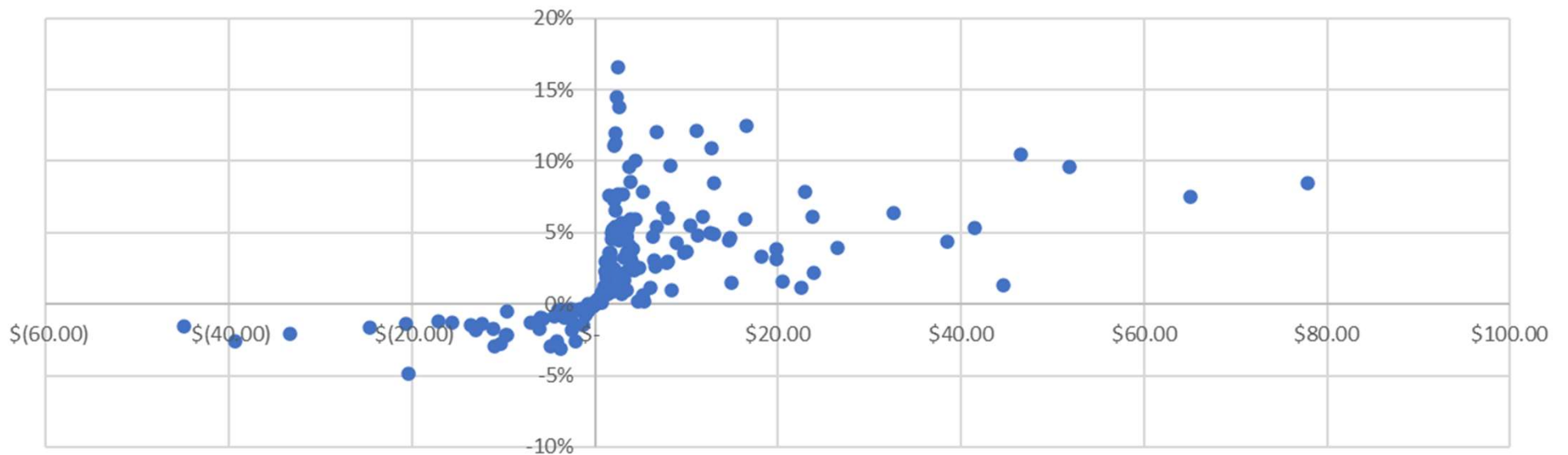


# Commercial TOU Consumer Analysis (by implementation)



# Commercial Residential Sample Analysis

Residential Full TOU Sample Analysis (monthly)



# Time-Based Rates

## Utility Rate Design Objectives for Utility

- 1) Align customer savings with savings for Utility ✓
- 2) Supported strategic electrification ✓
- 3) Protect low-income customers ?
- 4) Support energy efficiency & solar ✓
- 5) Ensure revenue sufficiency & stability ✓
- 6) Provide for easy implementation X

# Questions?



# Projection without Transmission Upgrades

Fiscal Year	Projected Rate Adjustments	Adjusted Operating Income	Target Operating Income	Projected Cash Balances	Recommended Minimum Cash
2023	0.0%	\$ (1,362,039)	\$ 2,344,575	\$ 33,962,639	\$ 11,092,541
2024	0.0%	\$ (2,102,388)	2,378,613	\$ 34,768,537	11,313,966
2025	0.0%	\$ (1,002,618)	2,584,267	\$ 29,806,666	11,617,016
2026	0.0%	\$ (1,403,445)	2,811,466	\$ 23,944,028	11,944,038
2027	0.0%	\$ (1,800,960)	3,028,466	\$ 18,193,563	12,264,404

# Rate Track without Transmission Upgrades

Fiscal Year	Projected Rate Adjustments	Adjusted Operating Income	Target Operating Income	Projected Cash Balances	Recommended Minimum Cash
2023	2.0%	\$ (795,088)	\$ 2,344,575	\$ 34,529,589	\$ 11,092,541
2024	2.0%	\$ (951,422)	2,378,613	\$ 36,489,288	11,313,966
2025	2.0%	\$ 755,425	2,584,267	\$ 33,294,063	11,617,016
2026	0.0%	\$ 363,388	2,811,466	\$ 29,215,696	11,944,038
2027	2.0%	\$ 594,204	3,028,466	\$ 25,886,752	12,264,404

# Solar Rate

- Currently for solar systems whose design capacity is greater than 20kW (AC) the per kWh rate is 0.0527. For solar systems whose design capacity is equal to or less than 20kW (AC) the per kWh rate is \$0.1014
- Less than 20kW
  - Avoided Cost 11.4 Cents
  - 5Yr Average 7.1 Cents, 3 Year average 7.7 Cents
- 20kW or greater
  - Avoided Cost 9.0 Cents
  - 5Yr Average 4.8 Cents, 3 Year average 5.1 Cents
- Discuss direction



# What is a Power Cost Adjustment?

- A mechanism to help ensure power costs are recovered from customers
- PCA reduces Utility risk and exposure to changes in power supply costs
- Mitigates over/under recovery of power supply costs from customers

# Historical Monthly Power Cost (this is an example numbers are NOT Hingham)

- Historically, average costs were close to base cost (PCA close to \$0)
- Power cost have been volatile and increasing, driving up the PCA
  - PCA is forecasted to be \$0.0589 in the test year FY 2024

