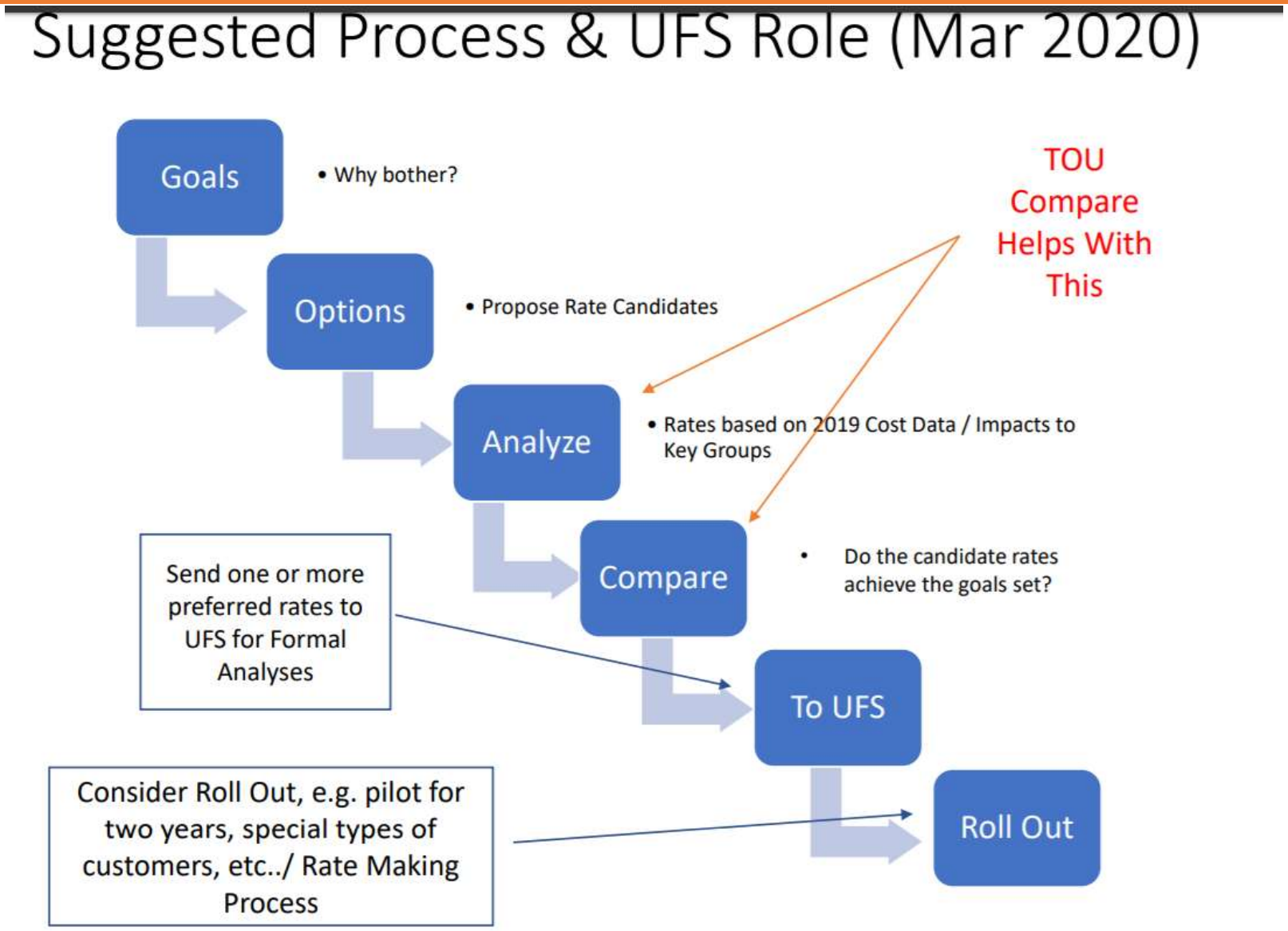
TOU Customer Impact Comparison Model

8/19/20 LBAC Meeting

Presentation Overview

- Model Description
- Current Rate Scenarios
- Comparison – No Change in Consumption Patterns
- Comparison – With Change in Consumption Patters
- Comparison – With Alternate Distribution Approach
- Final Thoughts

Model Description



TOU Compare Model

Examines potential annual bill impacts of different TOU schemes for specified customer groups:

- All Residential Customers
- Low-Income Rate
- Top 10% Highest Consumers
- Top 25% Highest Consumers
- Customers with Heat Pumps
- Customers with EVs
- Customers with Solar
- Customers with EV and Solar
- Pending: Customers w. EV & HP

→ **Preliminary vetting to inform formal UFS analysis**

Recent Model Updates

- Typos / Formula Errors Addressed
- Added ability for Critical Peak assignment
- Loser match to 2019 rate
- Future Plans
  - Individual version
  - Better tracking of Payback for solar
  - Solar – HP user

Current Rate Scenarios

Name	Description
Baseline	Rate Structure for Power Supply, BL Distribution and Other Costs in place in calendar year 2019
Virtual Peaker	Rate Structure Based on a Concord resident's TOU Proposal with Virtual Peaker Element. Crit Peak serves as VP call hours. Peak 5-9 PM includes weekends
UFS-9hr	UFS - 9hr Proposal. All year, excludes weekends. Crit Peak: 2 - 7, Peak 12-2, 7-9.
Summer Peaker	Peak defined as 1 pm to 7 pm for June - September. Includes weekends and holidays.

Previously modeled scenarios: “12-Hour Peaker”, “Clean Peak Standard”

TOU Scenario 1. UFS 9-Hour

Critical Peak

- 2 – 7 PM
- To match UFS-9hr, 2/3 of Capacity cost included

Peak

- 12 – 2 PM
- 7 – 9 PM
- To match UFS-9hr, 1/3 of Capacity cost included

All year, excludes weekends and holidays in peaks

TOU Scenario 2. Virtual Peaker

- **Rate scenario based on:**
  - Presentation by Brian Foulds', 3/13/19, *Time-of-Use Rate: How it can save money and increase in-town renewable generation* [for Concord Light consideration]
  - BL Virtual Peaker scenario for potential ISO-NE Peak Events
    - 2/3 of Capacity and 100% Transmission costs at peak ISO-NE available for customer savings
      - Currently, BL keeps 100% of any Capacity & Transmission savings
      - Assumes 31 hours of calls and calculates a $/kWh rate – around $4/kWh
      - For lower call hours (e.g. 10 hours) rate would be proportionally higher (e.g. $12 / hour)
- **Assumes "motivated" customers can reduce load by 75% during a call**
    - E.g. turning off central air conditioners or setting thermostats a few degrees higher
    - For average Residential as modeled, savings = $130 / year,
    - Heavy 'summer' users (Top 10%), savings = $360 / year

Rate Component	Concord Proposal	Translation to BL Scenario
Energy	• No TOU. Annual flat rate	• Energy rolled in with Off-Peak, Peak and Critical Peak times.
Transmission	• Peak: 5 – 9 PM (shift hours seasonally), weekends and holidays included	• Peak: 5 – 9 PM, (no seasonal shift), weekends and holidays included. • Energy costs in these hours rolled in. • Does not include Transmission at ISO-NE peak.

Capacity	• **Peak: 12 – 10 PM (June – Sept), Weekdays**
	• **Critical Peak: (Calls – up to 10 events/year, 3 hours/event, ($0.50 / kWh)**
		• **Virtual Peaker scenario:**
		  • **Critical Peak: 31 hours of calls**
		  • **2/3 of Capacity cost and 100% Transmission cost at ISO-NE peak (about $4/kWh)**

Distribution	• $30 / month fixed, $0.0062 variable	• Base scenario: 2019 BL Distribution: $10.60 fixed, $0.07795 /kWh variable • Alternate Distribution scenario: $30 / month fixed, $0.041/kWh variable

TOU Scenario 3. Summer Peaker

- **Same rate structure as presented in last round of examples**
  - Peak
    - 1 – 7 PM (June – Sept)
    - Includes Weekends and Holidays
  - Off-Peak
    - All other hours in the year
- **Peak includes costs for:**
  - Capacity
  - Summer Transmission
    - 38% of annual cost (2019)
  - Energy during Peak hours
- **Why 1 – 7 PM?**
  - Imperative not to have the ISO-NE Peak occur in rate off-peak
  - ISO-NE Peak Hour over last 5 years
    - Earliest : 2 - 3 PM
    - Latest: 5 - 6 PM
    - Add one hour each side: 1 PM – 7 PM
- **Why Include Weekends & Holidays?**
  - ISO-NE Peak close to occurring on a Sunday in 2019

Rates (Residential – A) With 2019 Distribution

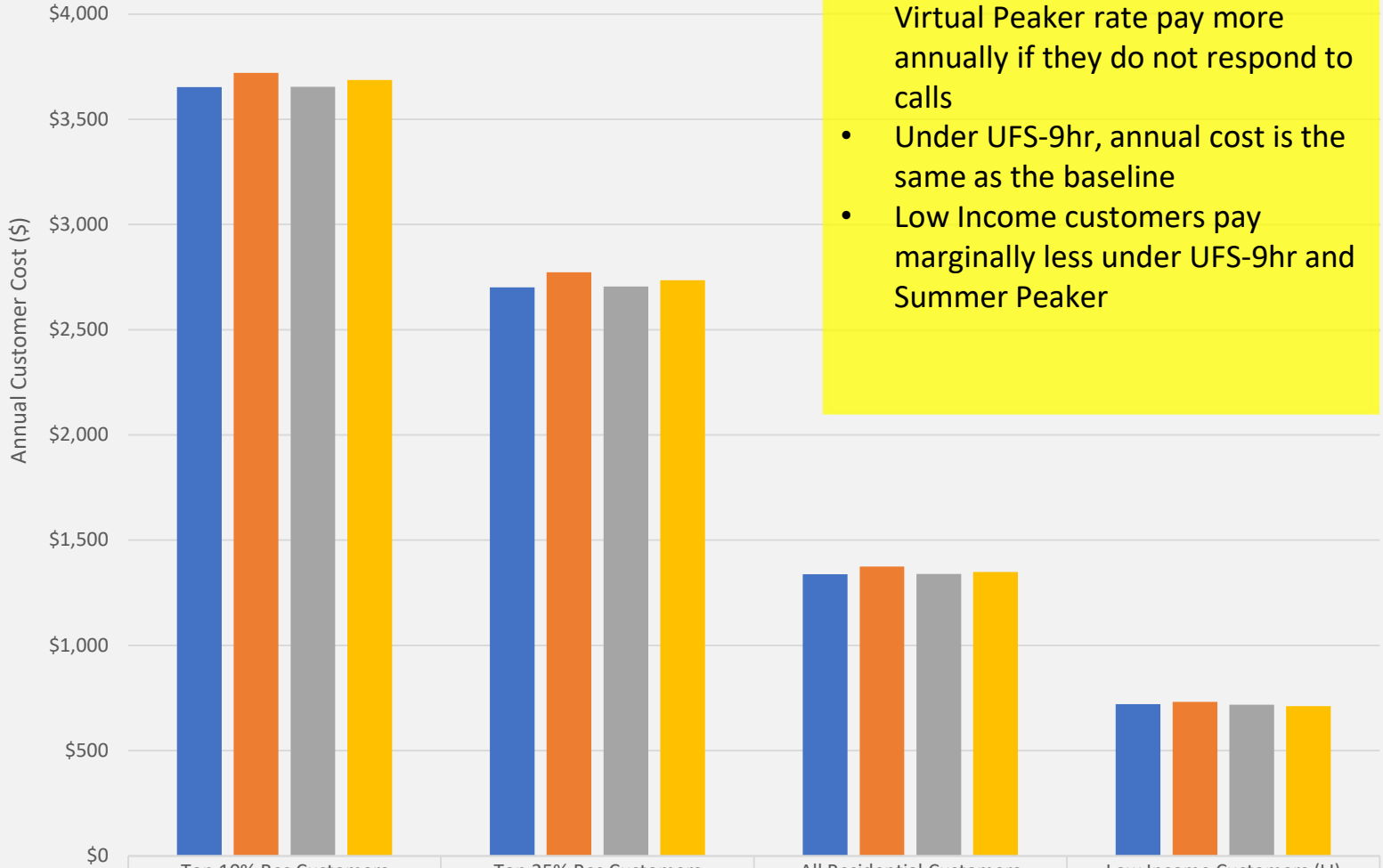
Note: for equivalent Solar Buyback rate, subtract $0.078 from rate shown. E.g. UFS-9hr Critical Peak: $0.360 - $0.078 = $0.282

RATE Name	DESCRIPTION	RATES ($/kWh)
Baseline	• Rate based on BL 2019 Costs. Fixed through the year.	$0.191 *{Actual Rate Paid: $0.193}*
UFS – 9 Hour	• Peak: 12 -2 PM, 7 – 9 PM • Critical Peak: 2 – 7 PM • All Year, Weekends & Holidays Excluded	Peak: $0.242 (+27%) {UFS: $0.243} Critical Peak: $0.360 (+88%) {UFS: $0.380} Off Peak: $0.141 (-26%) {UFS: $0.134}
Virtual Peaker	• Peak: 5 – 9 PM • Critical Peak: 31 hours of calls on potential ISO peak hours • All Year, Weekends & Holidays Included	Peak: $0.221 (+16%) Critical Peak: $4.078 Off Peak: $0.137 (-18%)
Summer Peaker	• Peak: June – Sept only (1 – 7 PM), Weekends & Holidays Included	Peak: $0.494 (+158%) Off Peak: $0.137 (-19%)

Results: No Change In Consumption

- No Change in Consumption Patterns
  - Represents “unmotivated” participants
    - Do not reduce load during Virtual Peak calls
- Distribution Follows Current Rate Structure & Costs

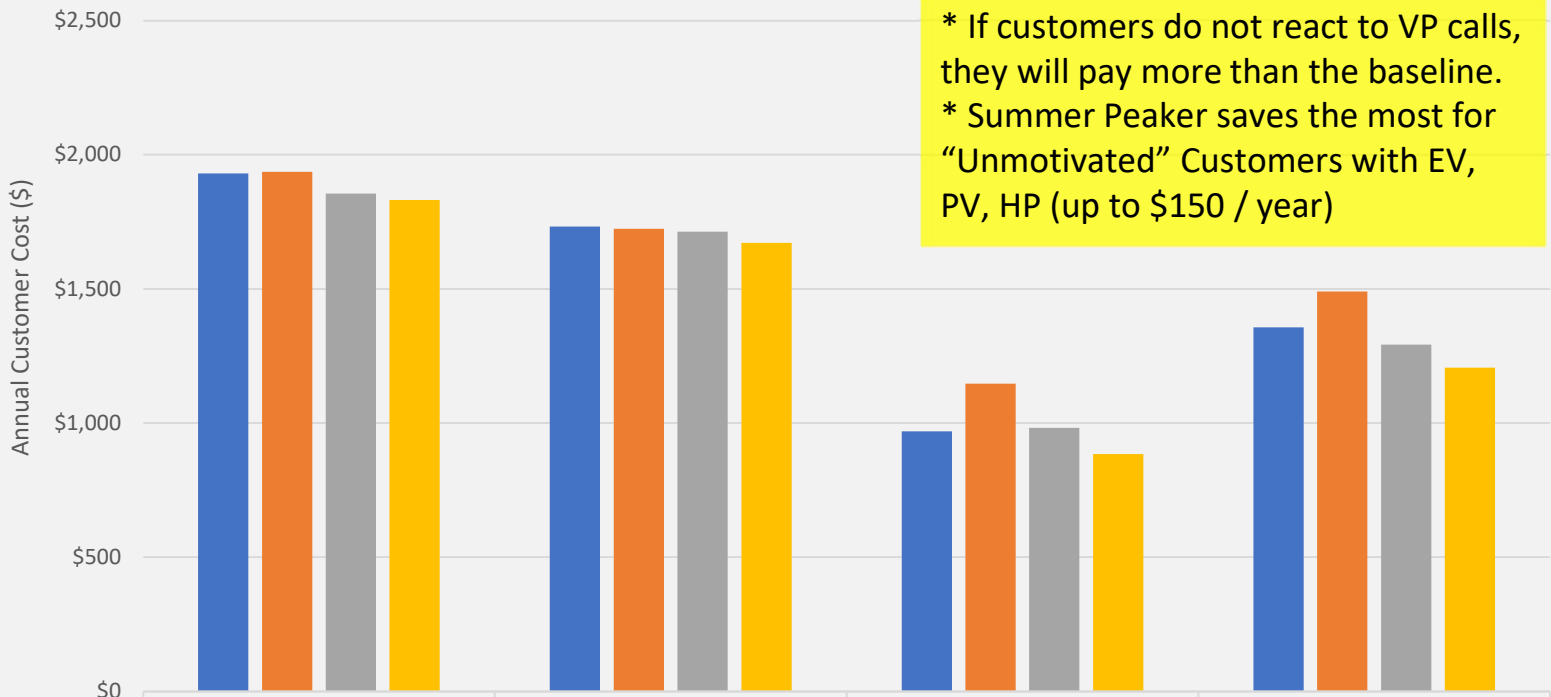
Residential Cost Comparison: No Change In Consumption



	Top 10% Res Customers	Top 25% Res Customers	All Residential Customers	Low Income Customers (LI)
Baseline	$3,653	$2,701	$1,339	$720
Virtual Peaker	$3,720	$2,773	$1,375	$732
UFS-9hr	$3,654	$2,705	$1,339	$717
Summer Peaker	$3,687	$2,735	$1,349	$711

- "Unmotivated" customers on Virtual Peaker rate pay more annually if they do not respond to calls
- Under UFS-9hr, annual cost is the same as the baseline
- Low Income customers pay marginally less under UFS-9hr and Summer Peaker

Residential Cost Comparison: No Change In Consumption (EV, HP, PV)



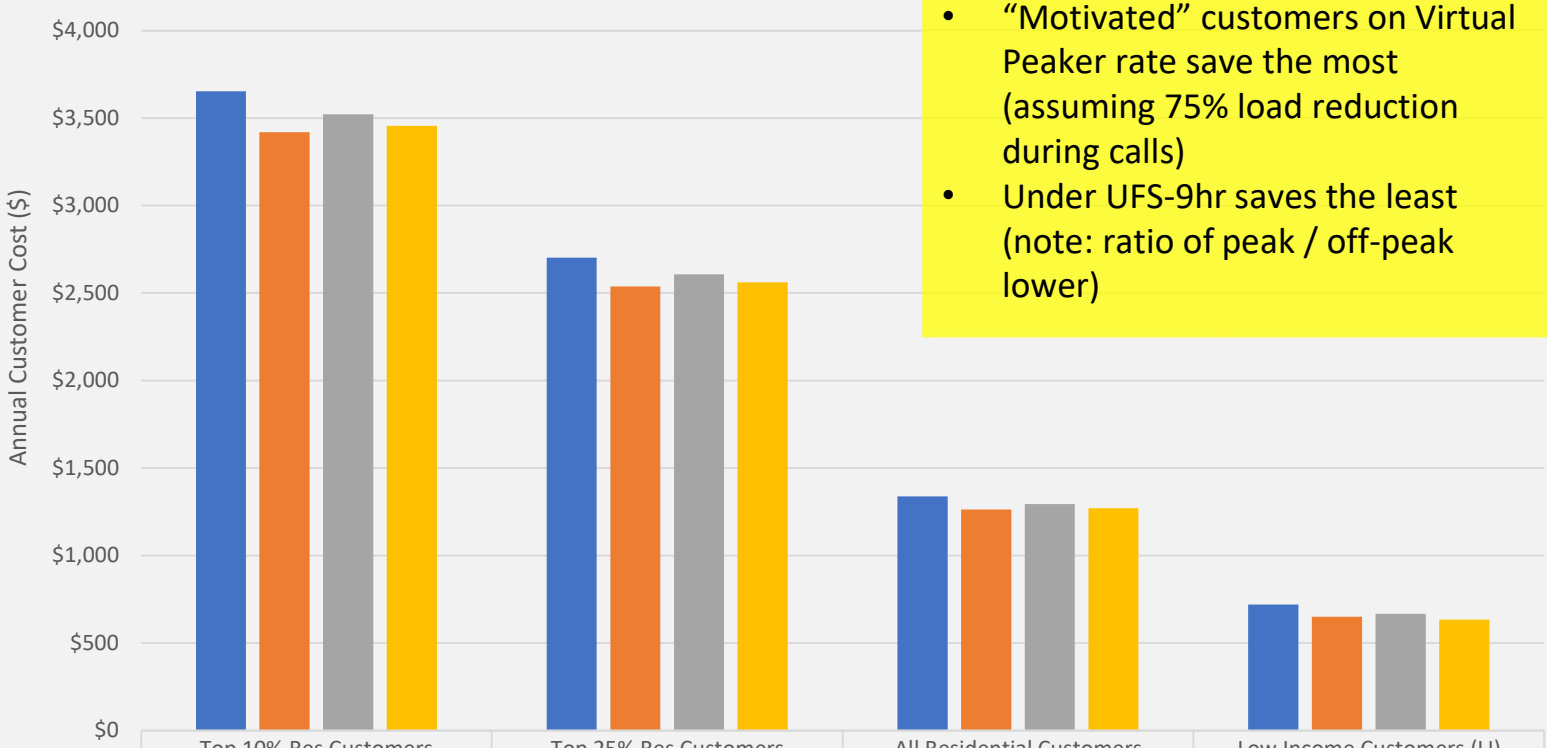
* If customers do not react to VP calls, they will pay more than the baseline.
* Summer Peaker saves the most for "Unmotivated" Customers with EV, PV, HP (up to $150 / year)

	Customers With EV	Customers With Heat Pumps (HP)	Customers With PV (PV)	Customers With EV & PV
Baseline	$1,930	$1,732	$969	$1,356
Virtual Peaker	$1,936	$1,724	$1,146	$1,490
UFS-9hr	$1,855	$1,713	$982	$1,292
Summer Peaker	$1,832	$1,672	$884	$1,206

Results: With Change In Consumption

- With Change in Consumption: Elasticity = 0.2
  - E.g. for every 10% of change in electricity rate, kWh consumption will change by 2%
  - May represent “motivated” participants
    - With larger electric loads that can be shifted
    - Have smart thermostats, solar, EV, HP
    - E.g. Colorado TOU pilot
      - “Customers with solar achieve nearly a 30% reduction in summer on-peak consumption and a 13% reduction in annual electric bills compared to a matched control group.” (pg. x)
      - Fn 7. “ Sampled customers with solar generally live in larger homes (66% in homes greater than 2,000 square feet) with large electric loads that can be shifted (23% own electric vehicles and 87% have smart thermostats connected to central air conditioning).”
      - Source: Residential Energy Time-of-Use (RE-TOU) Trial Evaluation Report 2 Findings from October 2018 to July 2019, Prepared for: Public Service Company of Colorado, Submitted by: Navigant, a Guidehouse Company.
      - www.xcelenergy.com/staticfiles/xe-responsive/Company/Rates%20&%20Regulations/Regulatory%20Filings/TOU/19AL-XXXXE_Attachment%20BAT-3_RE-TOU%20Evaluation%20Report%202%20Final_November%202019.pdf

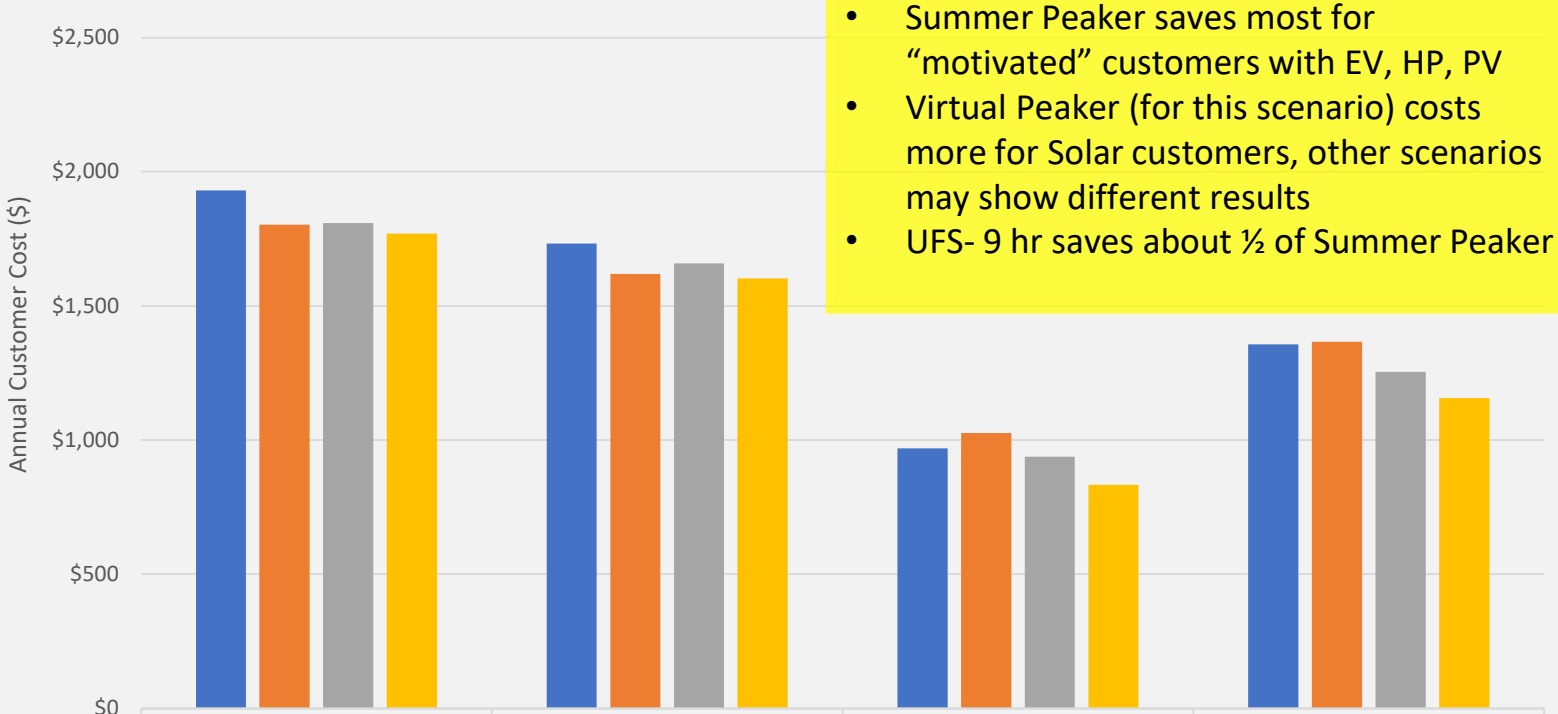
Residential Cost Comparison: With Change In Consumption



- "Motivated" customers on Virtual Peaker rate save the most (assuming 75% load reduction during calls)
- Under UFS-9hr saves the least (note: ratio of peak / off-peak lower)

	Top 10% Res Customers	Top 25% Res Customers	All Residential Customers	Low Income Customers (LI)
Baseline	$3,653	$2,701	$1,339	$720
Virtual Peaker	$3,418	$2,538	$1,264	$651
UFS-9hr	$3,521	$2,607	$1,293	$667
Summer Peaker	$3,455	$2,562	$1,270	$633

Residential Cost Comparison: With Change In Consumption (EV, HP, PV)



- Summer Peaker saves most for "motivated" customers with EV, HP, PV
- Virtual Peaker (for this scenario) costs more for Solar customers, other scenarios may show different results
- UFS- 9 hr saves about ½ of Summer Peaker

	Customers With EV	Customers With Heat Pumps (HP)	Customers With PV (PV)	Customers With EV & PV
Baseline	$1,930	$1,732	$969	$1,356
Virtual Peaker	$1,802	$1,619	$1,026	$1,366
UFS-9hr	$1,809	$1,658	$938	$1,254
Summer Peaker	$1,769	$1,603	$832	$1,156

Example Monthly Bill Impacts

Monthly Bill Impacts- No Change in Consumption, 2019 Distribution Charges										
Rate Scenario	All Residential Customers (ARC)		Low Income Customers (LI)		Customers with EV (EV)		Customers With Heat Pumps (HP)		Customers With PV (PV)	
	Cost	$ Change	Cost	$ Change	Cost	$ Change	Cost	$ Change	Cost	$ Change
Baseline	$111.54		$60.01		$160.84		$144.34		$80.77	
Virtual Peaker	$114.58	$3.04	$60.99	$0.98	$161.32	$0.48	$143.67	-$0.66	$95.52	$14.75
UFS-9hr	$111.61	$0.07	$59.79	-$0.23	$154.59	-$6.25	$142.74	-$1.59	$81.87	$1.10
Summer Peaker	$112.44	$0.89	$59.25	-$0.76	$152.63	-$8.21	$139.30	-$5.03	$73.67	-$7.10

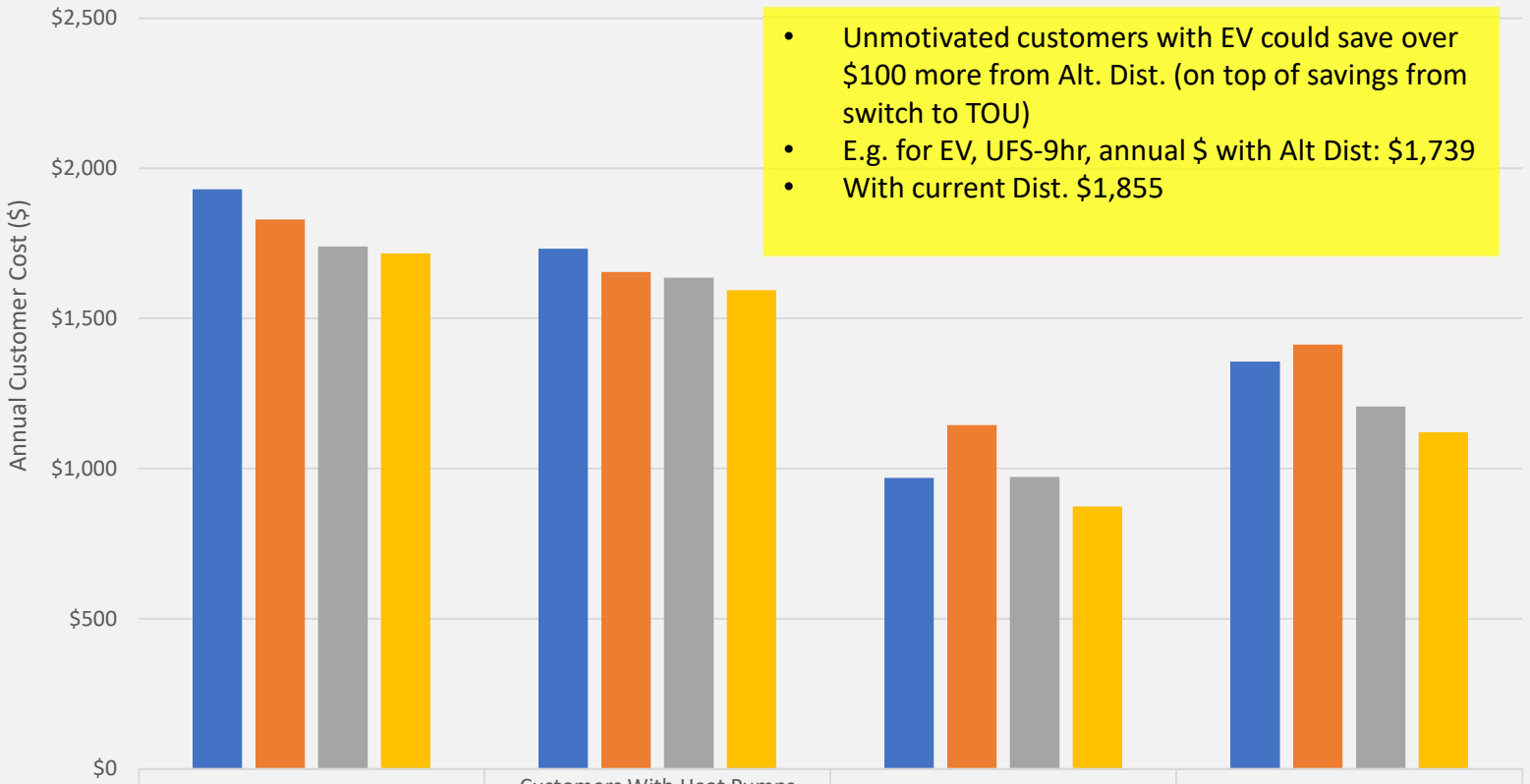
Monthly Bill Impacts- With Change in Consumption, 2019 Distribution Charges										
Rate Scenario	All Residential Customers (ARC)		Low Income Customers (LI)		Customers With EV(EV)		Customers With Heat Pumps (HP)		Customers With PV (PV)	
	Cost	$ Change	Cost	$ Change	Cost	$ Change	Cost	$ Change	Cost	$ Change
Baseline	$111.54		$60.01		$160.84		$144.34		$80.77	
Virtual Peaker	$105.30	-$6.24	$54.27	-$5.74	$150.18	-$10.66	$134.90	-$9.44	$85.49	$4.72
UFS-9hr	$107.79	-$3.76	$55.57	-$4.44	$150.72	-$10.12	$138.16	-$6.17	$78.14	-$2.63
Summer Peaker	$105.85	-$5.69	$52.77	-$7.24	$147.39	-$13.45	$133.55	-$10.79	$69.37	-$11.40

Results: Alternate Distribution

- Do some customers, e,g. HP, overpay for distribution services?
- Fixed versus variable distribution costs?
  - On a per customer basis how much cost is fixed?
  - Hard to answer – as a start, using $30 from the Concord proposal
  - Regulatory Assistance Project published a 270 page manual, “Electric Cost Allocation for a New Era,”
    - https://www.raponline.org/knowledge-center/electric-cost-allocation-new-era/

- With $30 fixed monthly customer fee, back calculated variable charge of $0.041/kWh ($0.037/kWh less)
  - BL distribution revenue for the average residential customer is break-even
  - Customers that use more than average kWh, save money
  - Customers that use less than average kWh, pay more

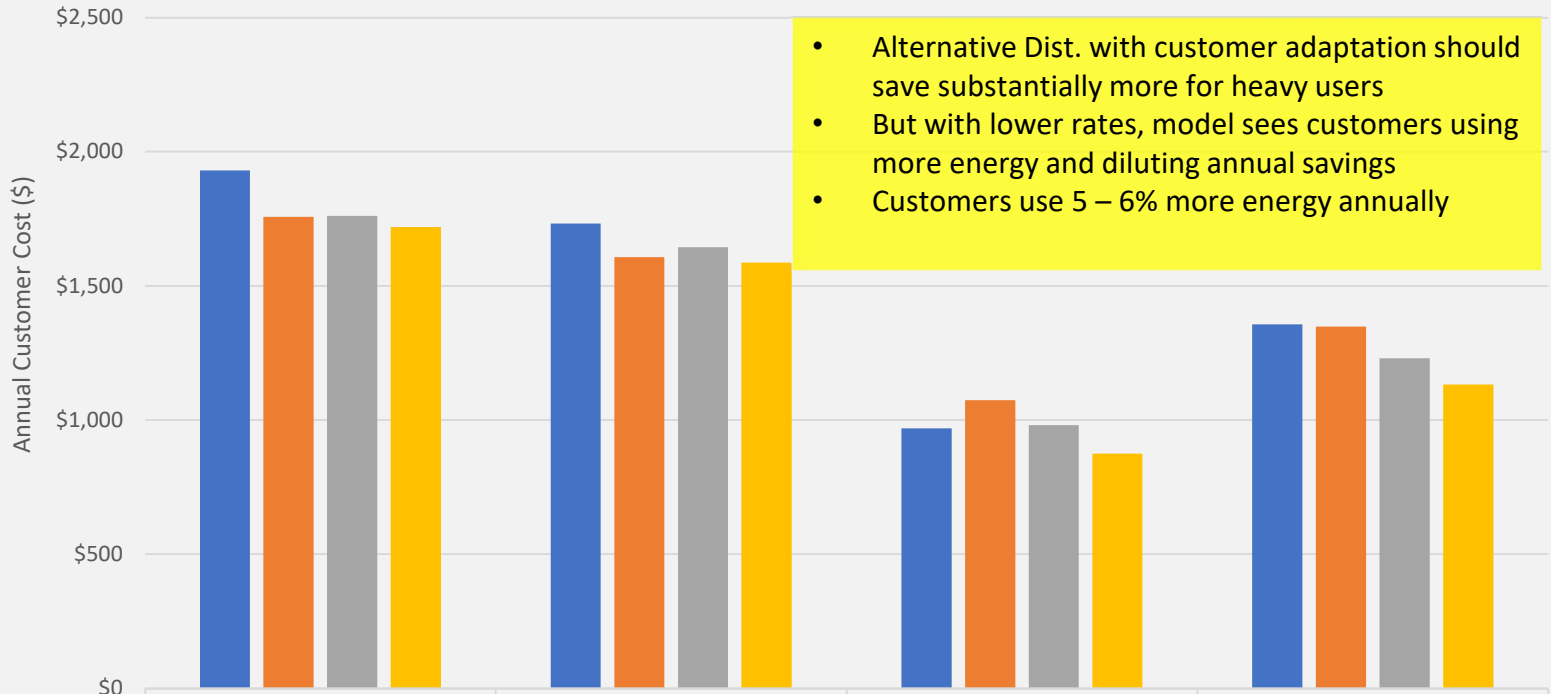
Alternative Distribution Cost Comparison: No Change In Consumption (EV, HP, PV)



- Unmotivated customers with EV could save over $100 more from Alt. Dist. (on top of savings from switch to TOU)
- E.g. for EV, UFS-9hr, annual $ with Alt Dist: $1,739
- With current Dist. $1,855

	Customers With EV	Customers With Heat Pumps (HP)	Customers With PV (PV)	Customers With EV & PV
Baseline	$1,930	$1,732	$969	$1,356
Virtual Peaker	$1,829	$1,654	$1,145	$1,412
UFS-9hr	$1,739	$1,635	$972	$1,207
Summer Peaker	$1,716	$1,594	$874	$1,120

Alternative Distribution Cost Comparison: With Change In Consumption (EV, HP, PV)



- Alternative Dist. with customer adaptation should save substantially more for heavy users
- But with lower rates, model sees customers using more energy and diluting annual savings
- Customers use 5 – 6% more energy annually

	Customers With EV	Customers With Heat Pumps (HP)	Customers With PV (PV)	Customers With EV & PV
Baseline	$1,930	$1,732	$969	$1,356
Virtual Peaker	$1,757	$1,606	$1,074	$1,347
UFS-9hr	$1,760	$1,644	$980	$1,230
Summer Peaker	$1,719	$1,587	$874	$1,132

Observations

- UFS- 9hrs is the most conservative – no projected aggregate annual impact on unmotivated customers.
  - Question: will week-day only fully capture Capacity and Transmission events?
- Virtual Peaker – users need to be motivated to save.
  - Question: Any issues with equitable access? Renters, Low-Income
- Solar Peaker may be best rate for EV, PV, HP, Solar customers
- For all scenarios: Total kWh doesn't change substantially, instead, load is shifted
- Distribution Revenues
  - Not impacted substantially when using current distribution rate
  - Alternative Distribution rate would reduce revenue from those customers
- *Distribution System Support?*
  - *Which of these rates would have helped reduce the recent high distribution load? (34 MW)*