	Business Agenda
	Second Reading
	Consent Agenda
	Info Only/Possible Action
x	*Info Only*

COMMISSION MEETING AGENDA ITEM

Subject:	Strategic Session: Demand Response	
Agenda Item No:	3	
Meeting Date:	October 11, 2022	
Presented by:	Blake Scherer	*Staff Presenting Item*
Approved by (dept):	Chris Johnson	*Director/Manager*
Approved for Commission review:	Rick Dunn	*General Manager/Asst GM*

Motion for Commission Consideration:

None.

Recommendation/Background

As part of planned Strategic Planning updates, staff will provide the Commission with a presentation on the development of a cost-effective, reliable, and feasible demand response program.

The presentation will address the following topics:

1. STATUS – Is the District planning for demand response?
2. NORTHWEST – Is the Northwest Planning for demand response?
3. DRIVERS – Why is the District considering demand response?
4. POTENTIAL – What is the District's demand response potential?
5. STRATEGY – What should the District's strategy be for demand response?
6. TIMELINE – When should the District develop a demand response program?

Summary

Staff will present information on the District's demand response strategy.

Fiscal Impact
None.

DEMAND RESPONSE

Developing a *cost-effective*, *reliable* *and* *feasible* demand response program

DATE: 10/11/22

Agenda

#1
Status

#2
Northwest

#3
Drivers

#4
Potential

#5
Strategy

#6
Timeline

#1 - STATUS

Is the District planning for demand response?

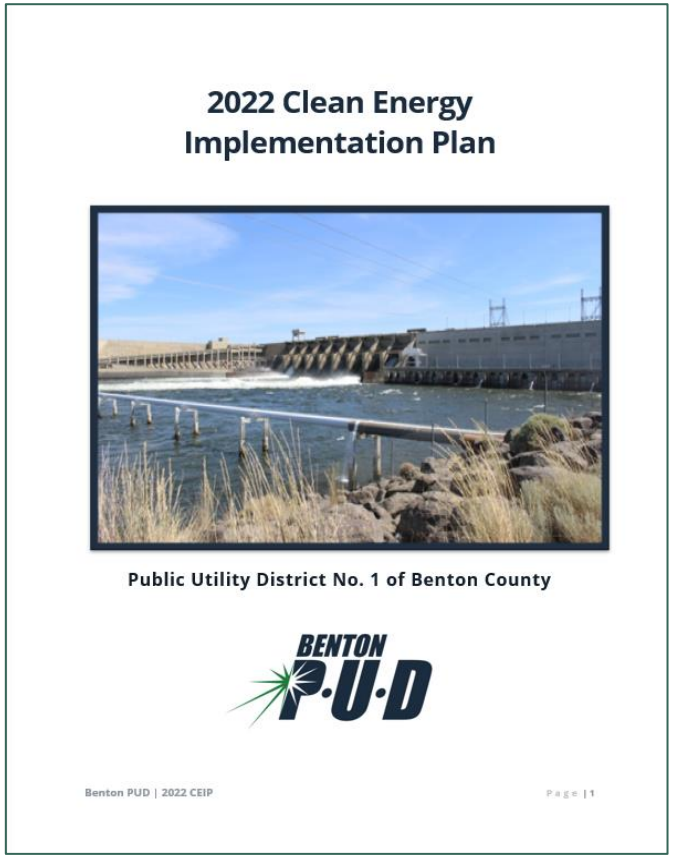
2019 Strategic Planning Session – Demand Response (DR)

- **Date:** October 8, 2019
- **Title:** *What about Demand Response? As a capacity resource*
- **Question:** Should the District consider demand response as a capacity resource?
- **Takeaways:**
  - **DR should be considered** as a potential capacity resource
  - DR program development is **complex**
  - District is **well positioned**, especially due to our **enabling technology**, to develop a program
- **Key recommendations:**
  1. **Proceed with evaluating DR programs, including rate-based options**, for **cost-effectiveness, reliability and feasibility**, consistent with the requirements of the Clean Energy Transformation Act (RCW 19.405).
  2. Move towards an IRP process that evaluates the economic potential of DR as a capacity resource.
  3. Presented a preliminary timeline of a path forward for DR program implementation planning.

See District website for the meeting presentation (pages 65-108),
https://www.bentonpud.org/getattachment/Board-Meetings/2019/2019-10-08/Commission-Handouts-2019-10-08-website.pdf.aspx?lang=en-US&ext=.pdf

DR in the Clean Energy Implementation Plan (CEIP)

DR Target was 0 MW for 2022-2025



Resolution No. 2585 - Nov 9, 2021

From the 2022-2026 CEIP:

1. "The District expects to complete its first ever **demand response potential assessment (DRPA)** in the Fall of 2021."
2. "The District plans to utilize the DRPA results and subsequent analysis as an **input to its next full IRP update in 2024**."
3. "After first determining the potential DR measures that are both cost-effective and achievable, the District would then **require time to plan for implementation and customer engagement**."
4. "**Final development** of any DR programs that are cost-effective, reliable, and feasible are unlikely to occur until the end of the interim period at the earliest."
5. "It is expected that DR resources will be **further assessed in the next interim performance period 2026-2029** as the District continues researching DR programs."

DR Target may stay at 0 MW for the 2026 CEIP

#2 - NORTHWEST

Is the Northwest Planning for Demand Response?

Northwest Power and Conservation Council (NWPCC)

2021 Power Plan

March 2022

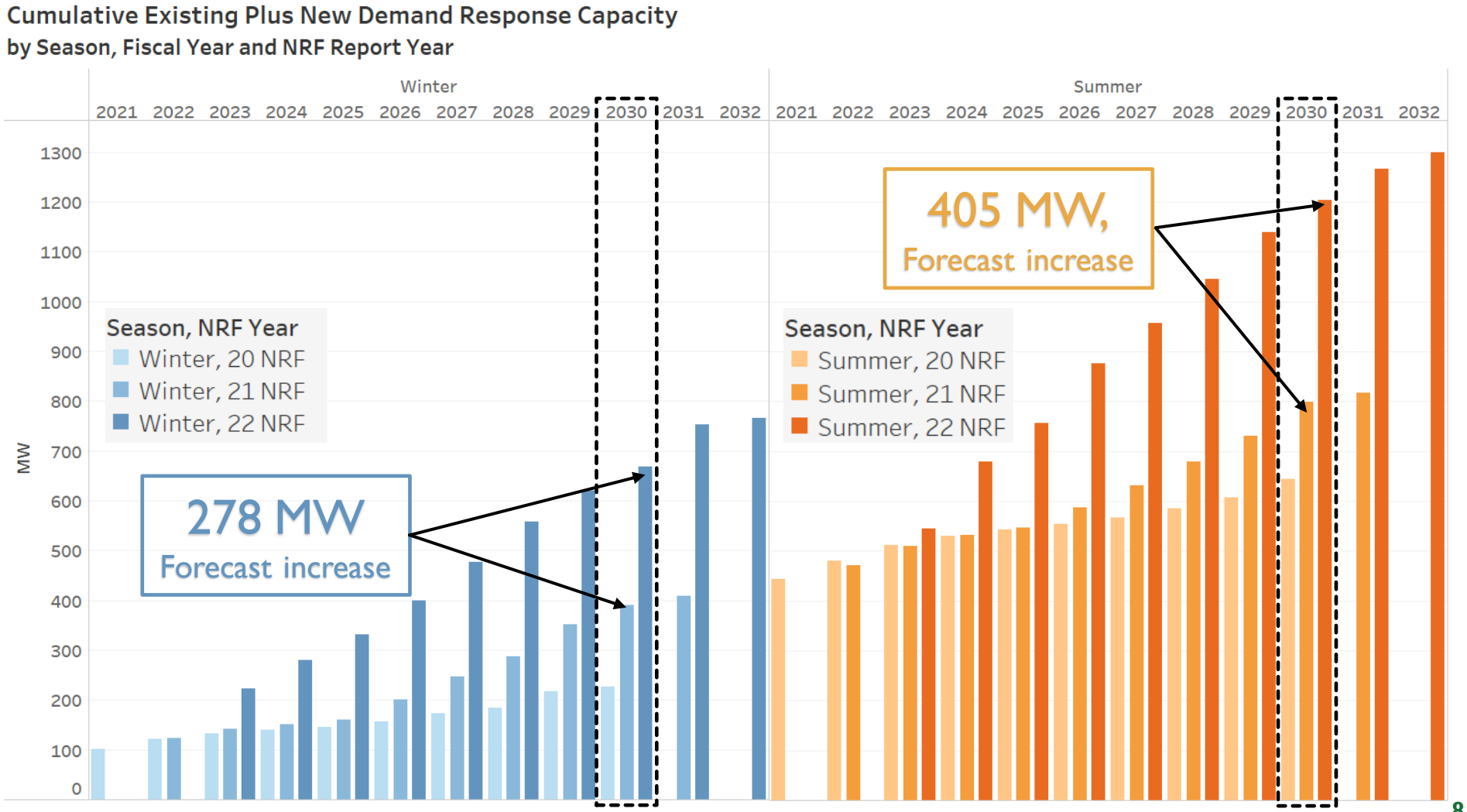
- Council recommends DR types that are **"frequently deployable, low cost, and with minimal customer impact"**
- Council recommends utilities examine two types of DR:
  - **1) Residential Time-of-Use (TOU) Rates**
    - *Plan target is 200 MW by 2027*
  - **2) Demand Voltage Regulation (DVR)**
    - *Plan target is 520 MW by 2027*

***"Bonneville should work to enable and encourage its customer utilities to pursue these** and other low-cost and high-value demand response measures in an equitable manner."*

Pacific Northwest Utility Conference Committee (PNUCC) – 1 of 2

2022 Northwest Regional Forecast
(Apr 2022)

"This year's report contains a ***notable increase in projected demand response*** *over time."*

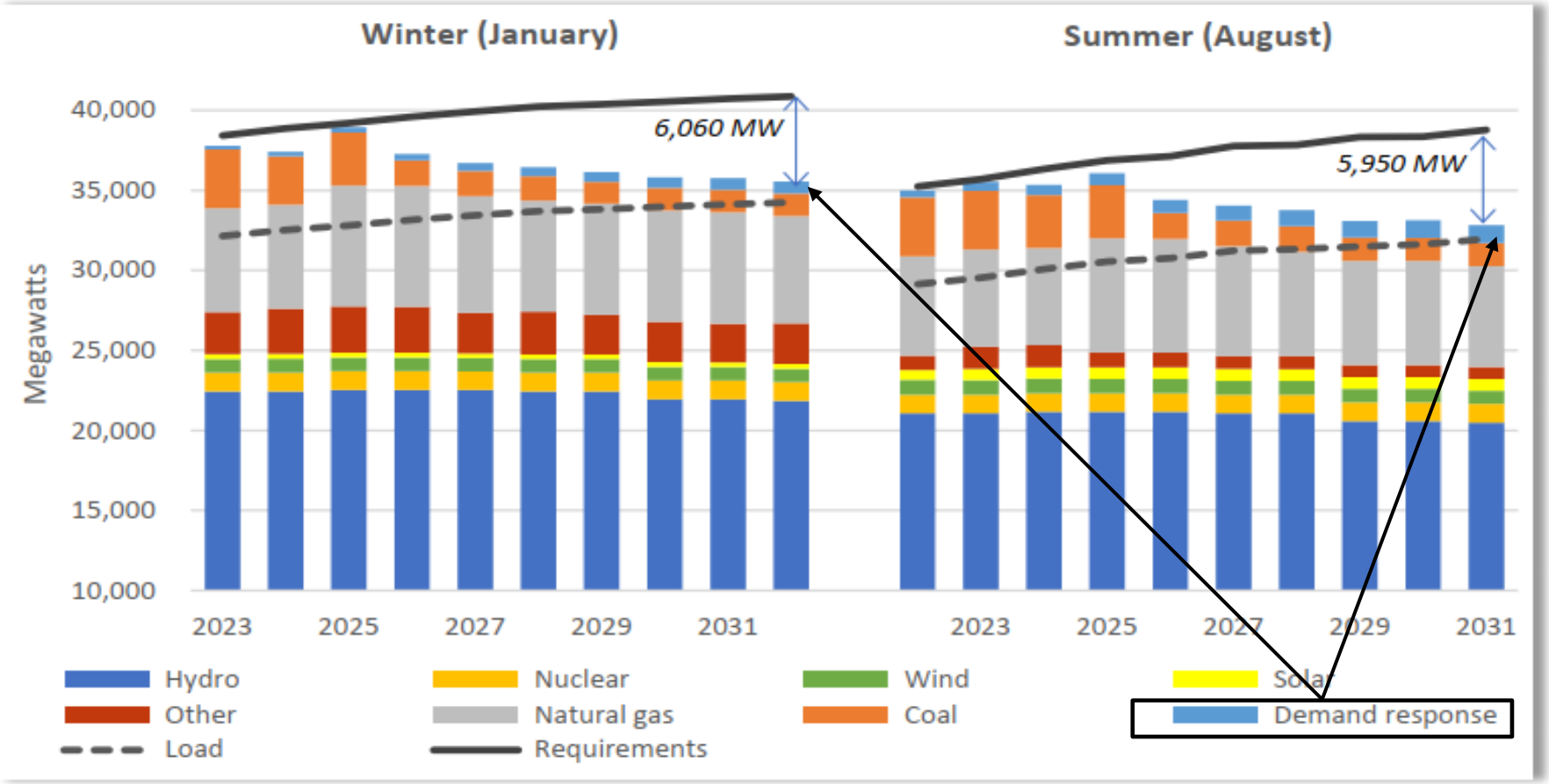


Data is from Table 7 of the 2020, 2021 and 2022 PNUCC Northwest Regional Forecast (NRF).

Pacific Northwest Utility Conference Committee (PNUCC) – 2 of 2

Although growing, DR remains a **very small portion (~2% - 4%) of the region's total** planned resources

Figure 5. **Peak Capacity Load/Resource Picture**



Data is from Figure 5 of the 2022 PNUCC Northwest Regional Forecast.

Bonneville Power Administration (BPA)

2022 Resource Program *(Preliminary)*

- DR is part of the **least-cost** resource strategy, **for the first time**
  - 436 MW Summer, 283 MW Winter **by 2027**
- DR **products selected**:
  - Critical Peak Pricing (CPP)
  - Demand Voltage Regulation (DVR)
- Based on BPA's **Dec. 2021 DRPA**

*"DR shows up as a **regularly deployed, low impact, low cost** energy related load management product" – 6/28/22 BPA Presentation*

*"**It will take some time** for BPA managers to internally discuss next steps related to the Demand Response selected in the Resource Program." – 8/18/22 BPA Staff*

BPA 20-Year (2022-2043) DR Potential - 1 of 2

Figure 4. 20-Year Summer Achievable Potential Supply Curve with Levelized Cost (2016$)

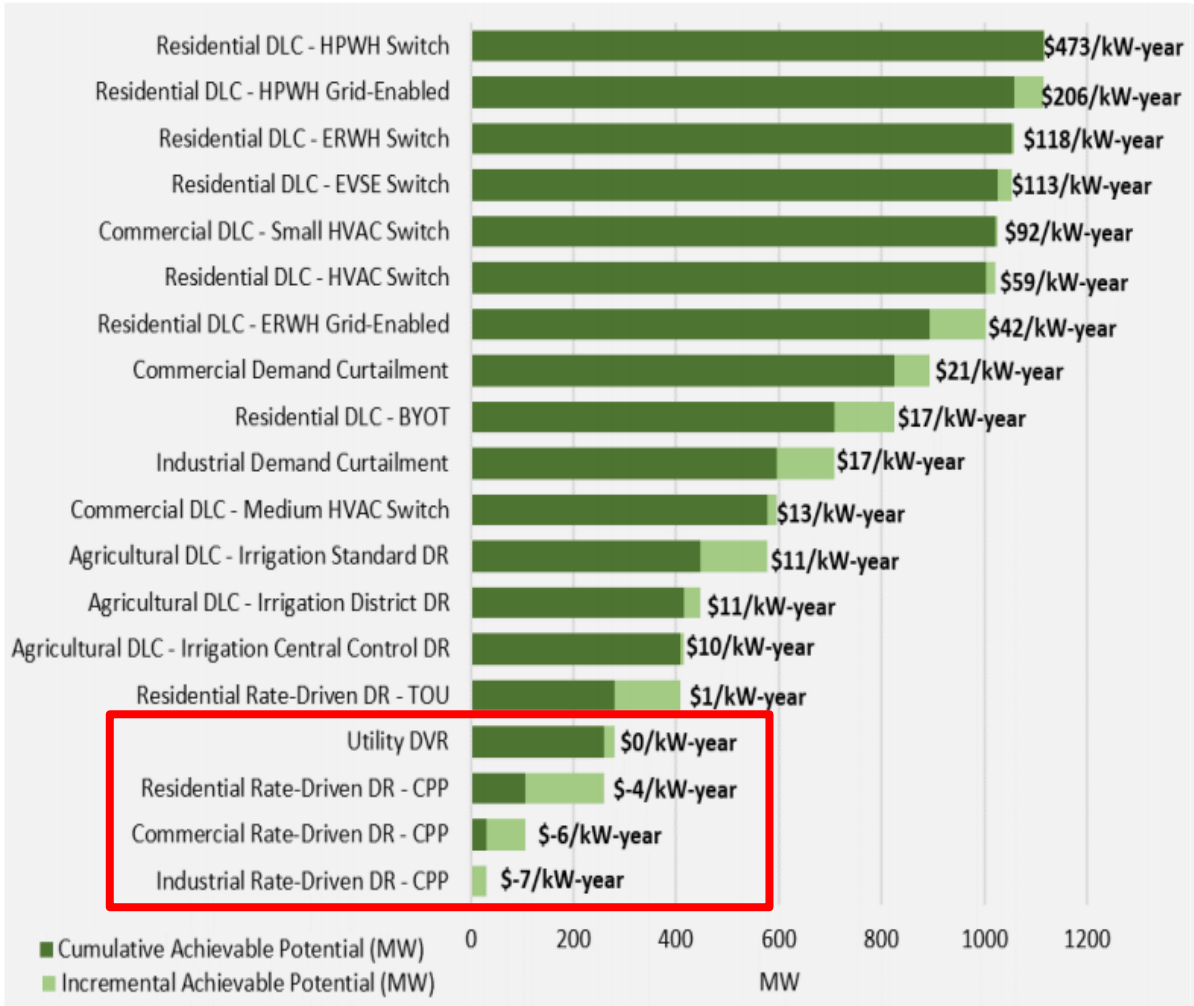
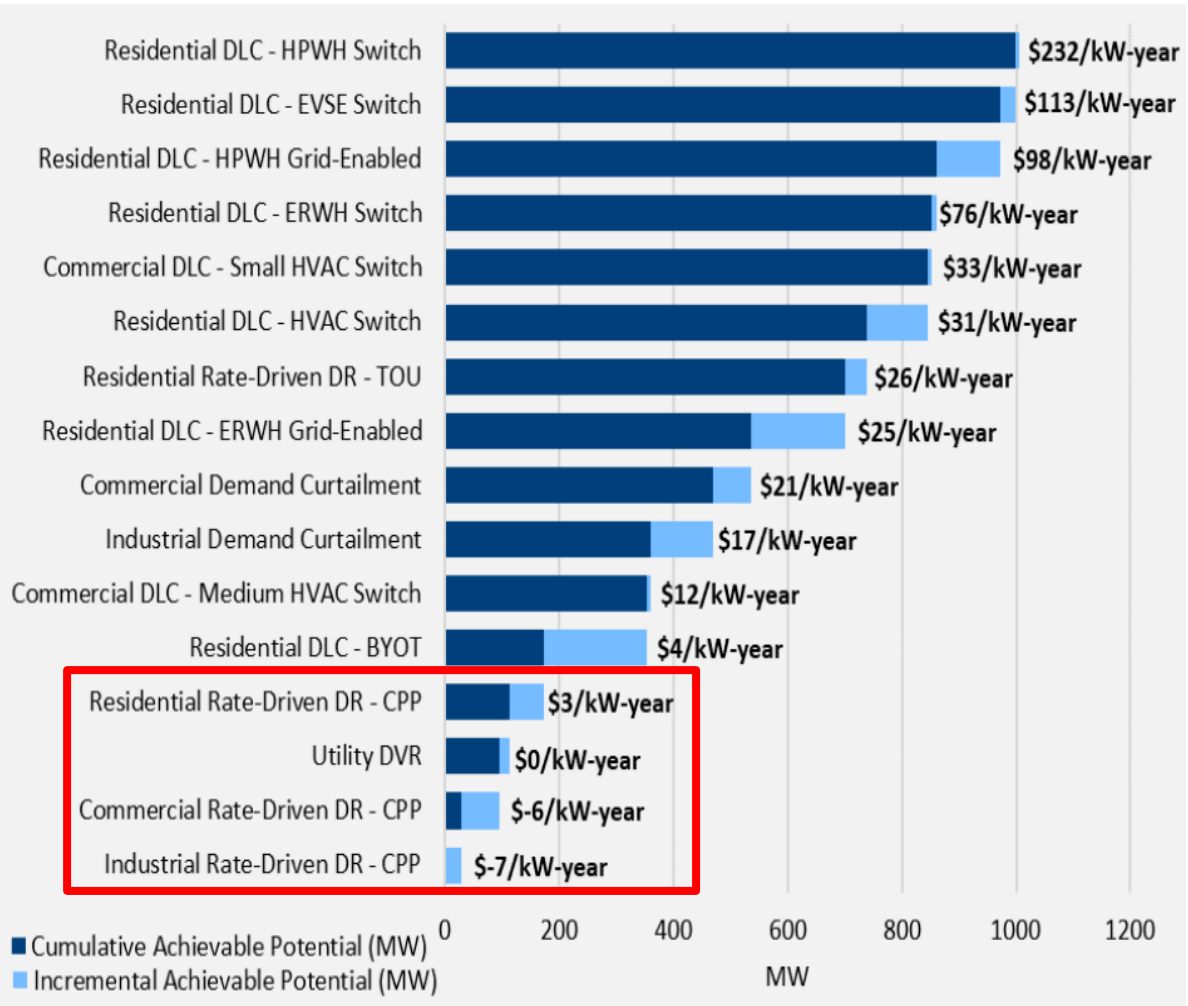


Figure 5. 20-Year Winter Achievable Potential Supply Curve with Levelized Cost (2016$)



Figures are from BPA's December 2021 Demand Response Potential Assessment.

BPA 20-Year (2022-2043) DR Potential - 2 of 2

Figure 12. Typical Operations Annual Summer Achievable Potential Forecast

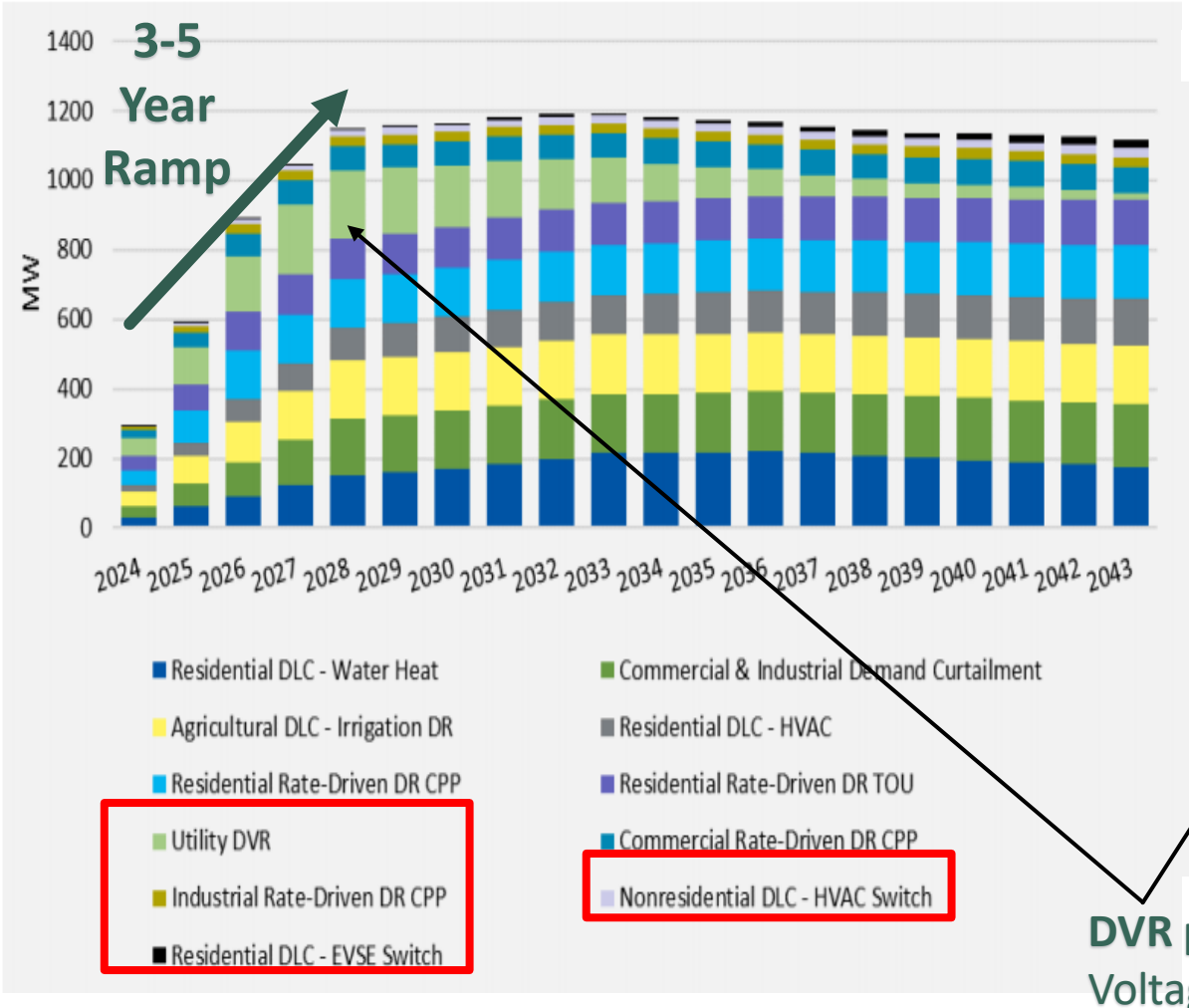
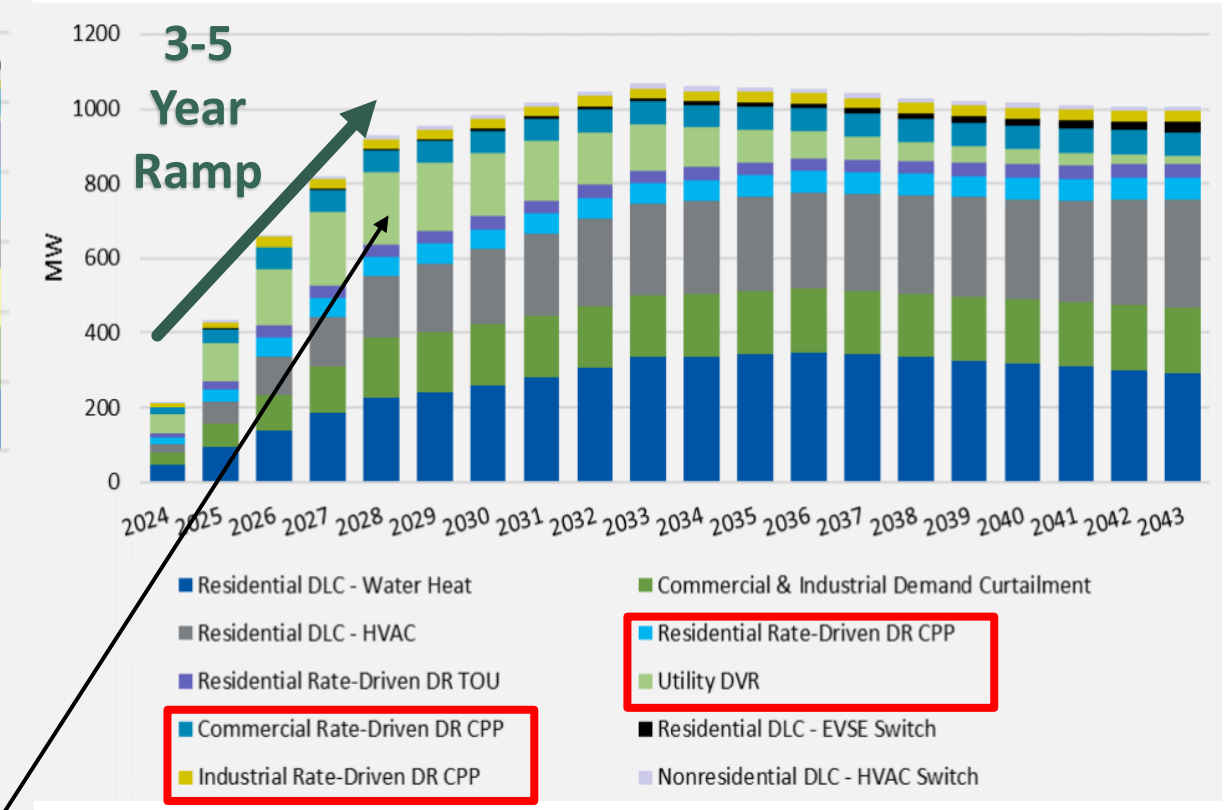


Figure 13. Typical Operations Annual Winter Achievable Potential Forecast



DVR potential decreases over time due to growth of Voltage Optimization/Conservation Voltage Reduction (CVR)

Figures are from BPA's December 2021 Demand Response Potential Assessment.

DR at Seattle City Light

- 2022-2025 CEIP, **DR Target = 0 MW**
- 2022 IRP includes new DR:

*"The 2022 IRP is the **first to recommend a portfolio that endorses demand response programs**, as they not only manage climate- or electrification-related extremes, but also generally reduce customers' energy burden." – SCL 2022 IRP*

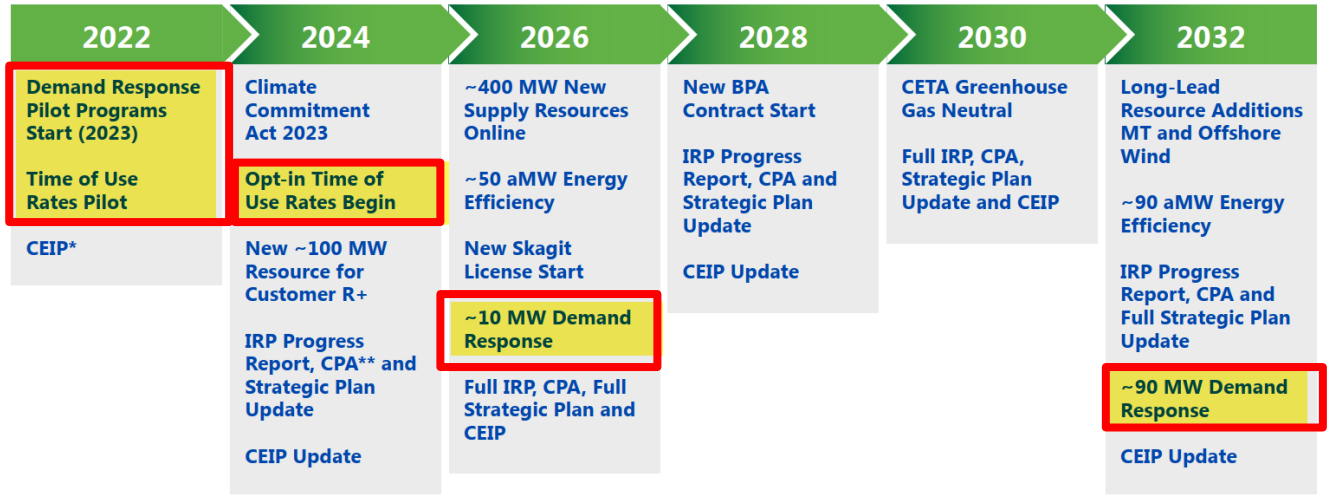
NEW RESOURCE ADDITIONS BY TIME PERIOD	2022–2031	2032–2041	TOTAL
Solar (MW)	175	0	175
Wind (MW)	225	50	275
Energy Efficiency (aMW)	85	31	116
Customer Solar Programs (MW)	24	28	52
Summer Demand Response (MW)	47	31	78
Winter Demand Response (MW)	79	43	122

2022 IRP Recommended Top Portfolio Plan

Table 8 Demand Response Program Size Over Time

Program	Summer			Winter		
	2025	2030	2040	2025	2030	2040
Commercial/Industrial Curtail	2	11	11	2	8	9
Thermostat	1	7	12	3	36	51
Resistance Water Heating	6	40	65	7	43	70
Heat Pump Water Heating	0	2	3	1	5	7

2022 IRP Ten Year Important Milestones



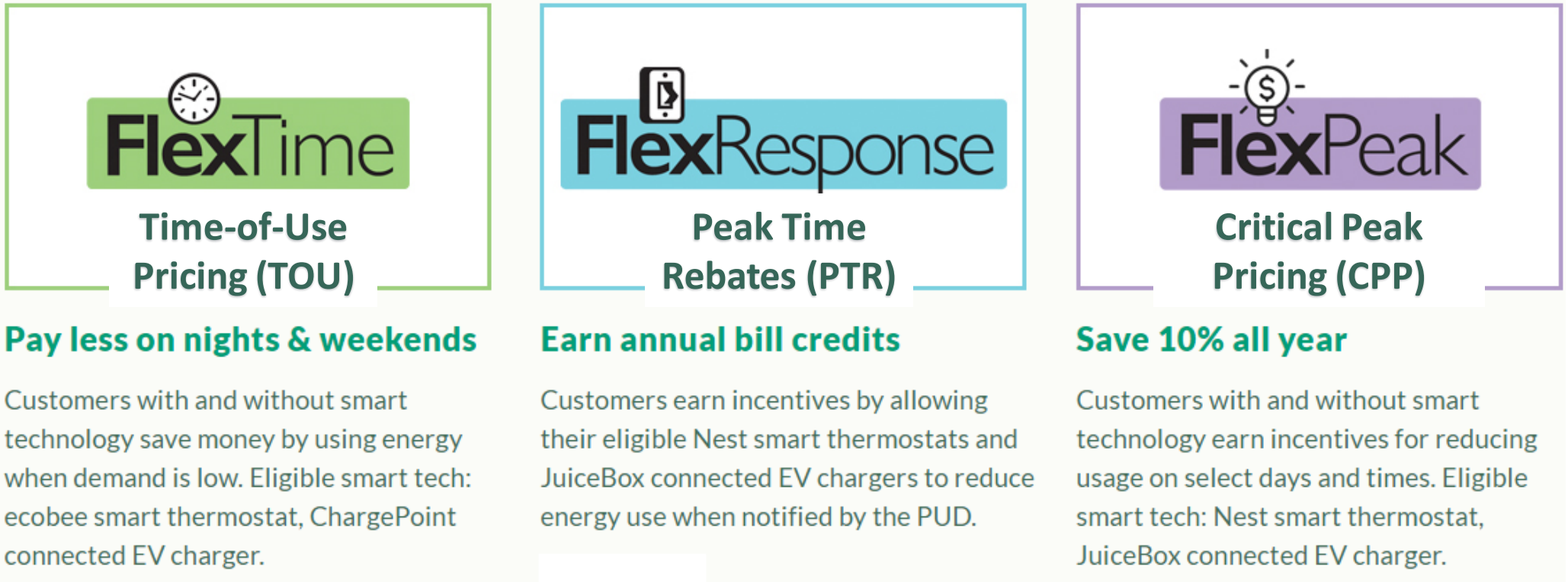
*CEIP – Clean Energy Implementation Plan a requirement of the Clean Energy Transformation Act.
**CPA – Conservation Potential Assessment.

Seattle City Light 2022 IRP: https://www.seattle.gov/documents/Departments/CityLight/2022IntegratedResourcePlan.pdf

DR at Snohomish PUD – 1 of 2

- 2022-2025 CEIP, **DR Target = 5.6 MW** by 2025
- Residential "FlexEnergy" Pilots (Oct 2021 – Mar 2023):

Also known as:



Graphic is from Snohomish PUD's FlexEnergy website: https://www.snopud.com/save-energy/residential/flexenergy/

DR at Snohomish PUD – 2 of 2

Avoided Costs

Avoided market power purchases

- During peak events, market power purchase prices were typically 54% higher ($62.32 per MWh) than in other hours (average $40.44 per MWh).
- On Dec. 20, the PUD called an event when prices were $126.26 per MWh or 312% higher than average.

Costs avoided thanks to shifting energy use off-peak

with a natural gas generator:*
$7,876

with utility battery storage:
$14,177

What would that mean scaled up?

If 10,000 customers had been part of FlexEnergy, it would have avoided costs of:

Natural gas generator: $144,514
Utility battery storage: $260,128

If 100,000 customers had been part of FlexEnergy, it would have avoided costs of:

Natural gas generator: $1,445,138
Utility battery storage: $2,601,284

Graphics are from Snohomish PUD's FlexEnergy Year 1 Winter Summary Report: https://www.snopud.com/wp-content/uploads/2022/07/FlexEnergyWinterSummary.pdf

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#3 - DRIVERS (PART 1 OF 2)

Why is the District considering demand response?

Steve Wright's Perspective on DR

APRIL 1, 2022 - CLEARING UP QUESTION?

"Volumetric rates work in a system focused on energy costs, but they're increasingly out of step with a renewable resource-heavy system with a growing need for capacity. **Where do you see rate structures headed?**"

STEVE WRIGHT'S RESPONSE:

"**We're headed toward dynamic rates** for a bunch of really clear reasons that make a lot of sense. **We need consumers to be more involved** on their side of the meter to help balance the system.

I am not optimistic, I will admit, about the **reliability** components right now. I've been very concerned about **resource adequacy** going back to 2017, 2018 when we first started doing these studies showing what would happen if we went to 80 percent or higher clean energy standards in the Northwest.

The time frame that we're looking at with some legislation—particularly Washington's Clean Energy Transformation Act—and the time frame to develop resources don't seem to match up very well. **I think that means we're going to have a lot more demand response…"**

https://www.newsdata.com/clearing_up/opinion_and_perspectives/utilities-strive-to-keep-up-as-pace-of-change-accelerates/article_539cdd54-b215-11ec-b01a-a3d827585602.html

Example of a DR Event in California

California consumers respond to appeals for electricity conservation during heat wave

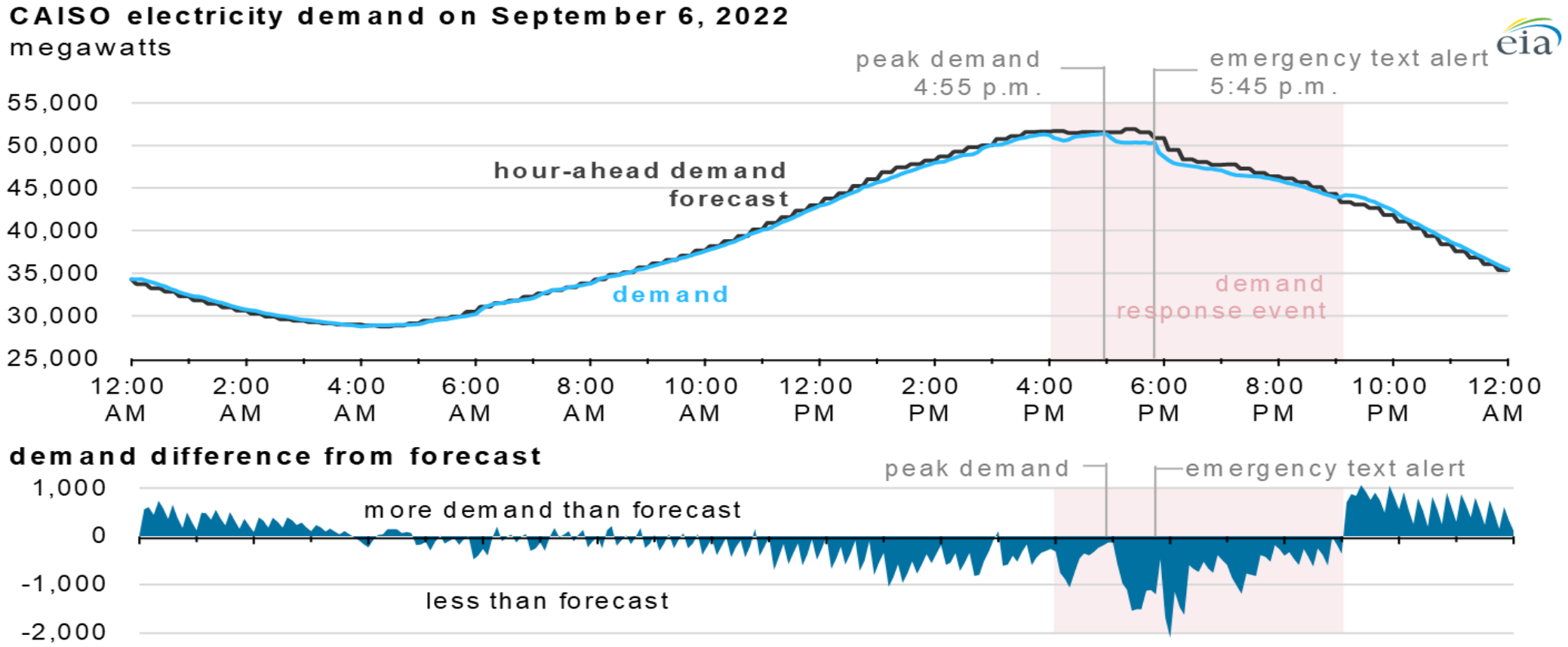
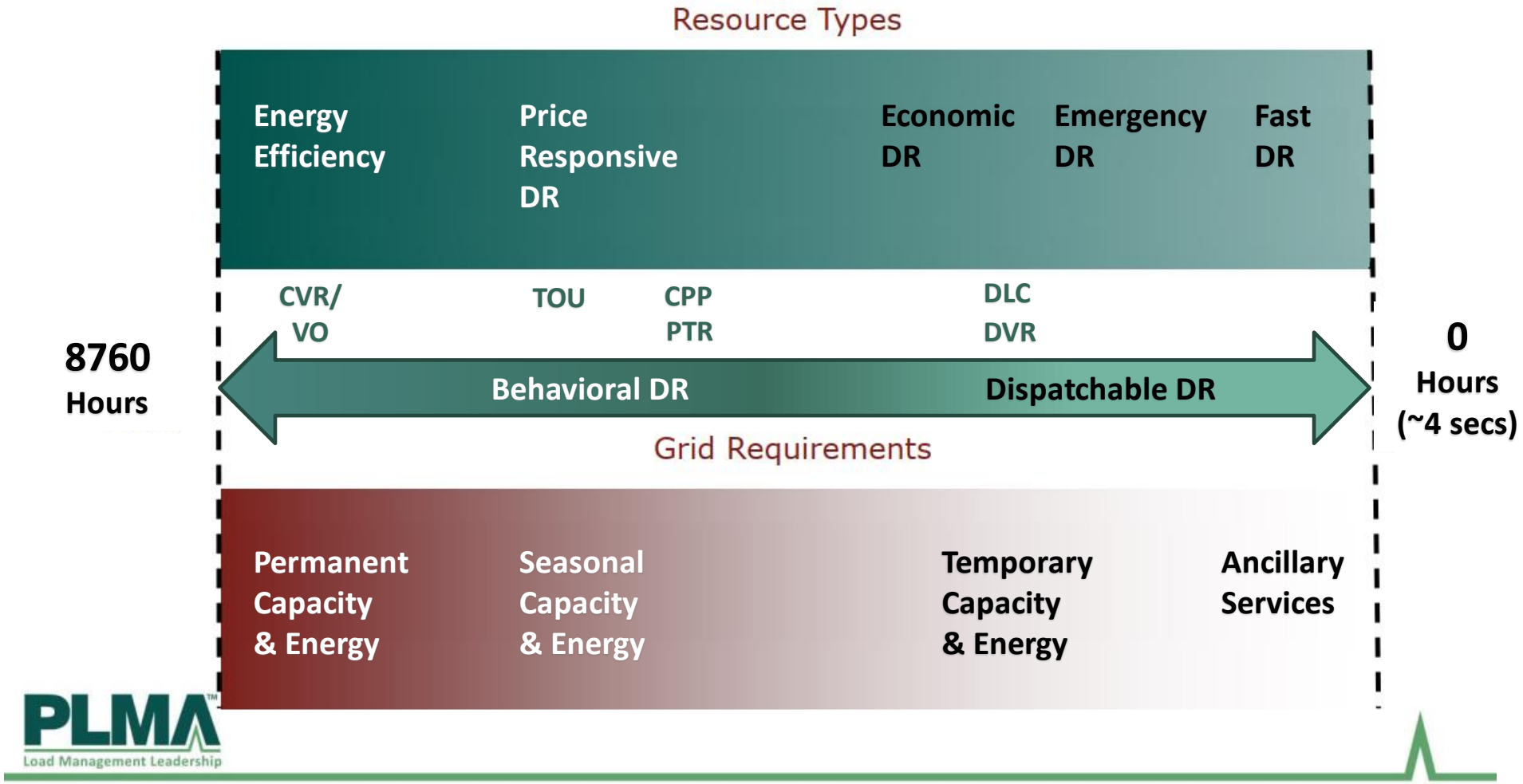


Image is from a 9/28/22 article by the U.S. Energy Information Administration (EIA): https://www.eia.gov/todayinenergy/detail.php?id=54039

Spectrum of Grid Needs and DR Types



DLC	Direct Load Control
DVR	Demand Voltage Reduction/Regulation
CVR	Conservation Voltage Reduction/Regulation
VO	Voltage Optimization
TOU	Time-of-Use
CPP	Critical Peak Pricing
PTR	Peak Time Rebate

Slide adapted from Peak Load Management Association's (PLMA) Demand Response Training Series - "Program Design & Implementation" (9/22/20).

The District's Primary Driver for DR

- **AS-IS** (Slice/Block BPA Contract)

  From the District's "DR Program Development" project agreement (6/12/20):

  Desired Results

  Consistent with the District's 2020-2021 Strategic Plan and 2020 Integrated Resource Plan action plan, this project agreement is to develop a comprehensive demand response program that addresses the District's seasonal power supply deficits, reduces market exposure as market volatility increases with the retirement of dispatchable resources, and supports the District's compliance with Washington State's Clean Energy Transformation Act (CETA). The demand response program developed and implemented must be beneficial to Benton PUD customers by reducing power supply cost increases and/or risk and must be consistent with the District's Rate Strategy and the associated cost-causation principles included in the District's cost of service analysis.

- **TO-BE** (Load Following BPA Contract) *Effective Oct 1, 2023*
  - BPA power bill **demand charges**
  - CETA compliance remains a driver of **DR evaluation**

Washington's Clean Energy Implementation Plan Rules

WAC 194.40.200(3)(b) – Demand response resources.

The CEIP must specify a target for the amount, expressed in megawatts, of demand response resources to be acquired during the period. The demand response target must comply with WAC 194-40-330(2).

Existing target 0 MW, specified in **2021**

Next target to be specified in **2025**

WAC 194.40.330(2) – Demand response resources.

(a) Assessment of potential. Each utility must assess the amount of demand response resource that is cost-effective, reliable, and feasible.

DRPA

(b) Target. The demand response target for any compliance period must be sufficient to meet the utility's obligation under RCW 19.405.040(6) and must be consistent with the utility's integrated resource plan or resource plan and any distributed energy resource plan adopted under RCW 19.280.100.

CETA Greenhouse gas neutral by 2030

District expects to meet CETA RCW **without DR**

(c) Measurement and verification. Each utility must maintain and apply measurement and verification protocols to determine the amount of capacity resulting from demand response resources and to verify the acquisition or installation of the demand response resources being recorded or claimed. The utility must document the methodologies, assumptions, and factual inputs used in its measurement and verification of demand response resources."

Targets **require** measurement & verification

Other Drivers for DR

- **Other BPA charges**
  - BPA coincident peak demand (Network transmission bill)
  - Load shaping (Load Following power bill)
  - Avoided Tier 2 power purchases
- **T&D Planning & Operations**
  - Deferring system upgrades
  - Accommodating electrification/decarbonization
  - Accommodating distributed energy resources
- **Emergency Load Reduction**
  - BPA energy or transmission emergency
  - District transmission or distribution emergency
- **Plus, one more CRITICAL driver of program design…**

THE 2021 NORTHWEST POWER PLAN

*"We identified that demand voltage regulation (DVR) and time-of-use (TOU) rates **can help substantially in ramping and peak periods**. Additional value may also be obtained to **relieve transmission constraints and defer transmission and distribution system upgrades**."*

Customer Needs – Trusted Energy Partner

- **How do I…**
  - save **money**?
  - help the **grid**?
  - use new **technology**?
  - support **clean energy**?
  - support the **community**?
  - use energy more **efficiently**?

DR program design should identify opportunities for meeting customer needs.

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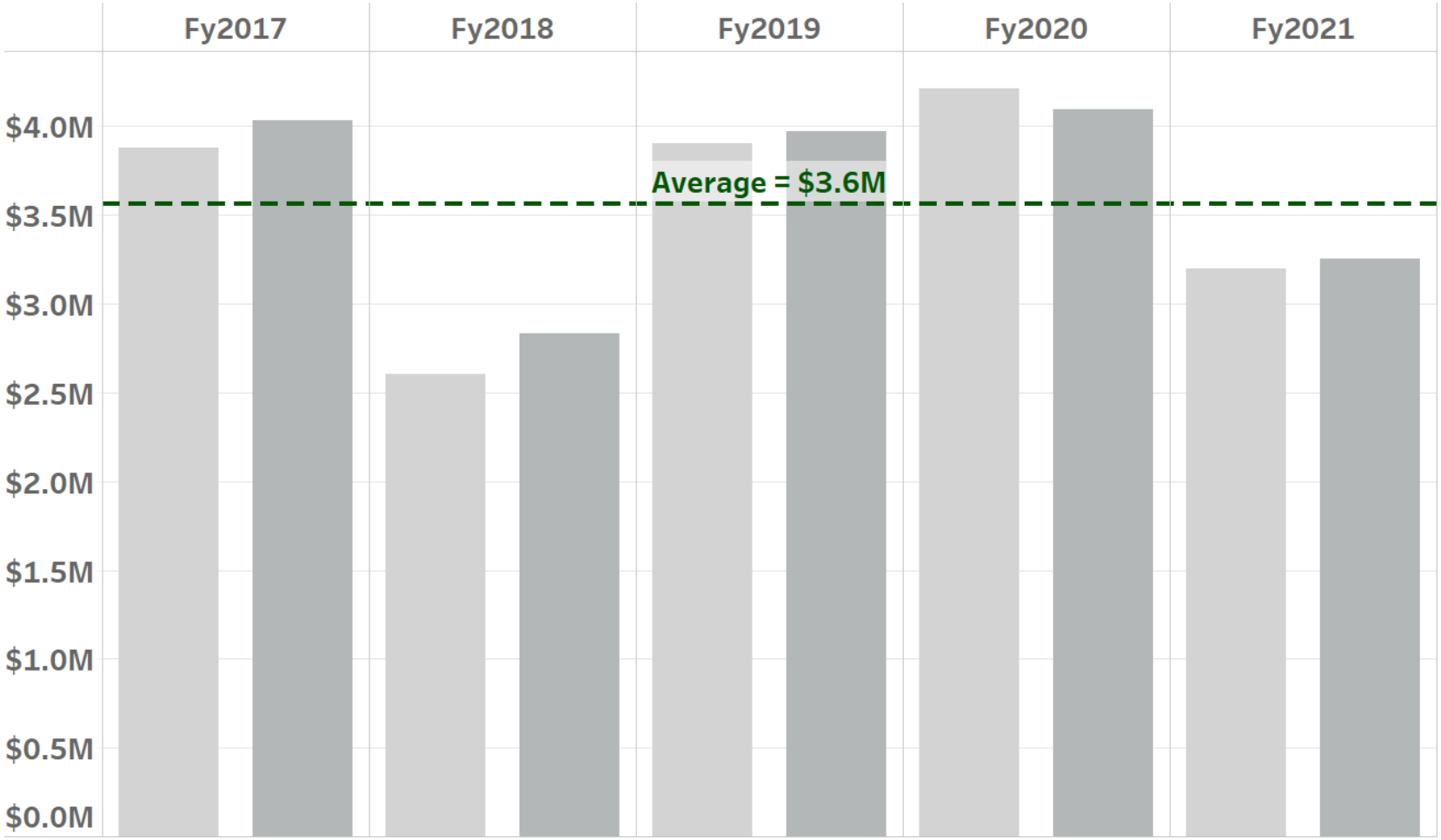
#3 - DRIVERS (PART 2 OF 2)

What are BPA's Demand Charges?

Annual Cost of BPA Demand Charges



About
$3.6M per year,

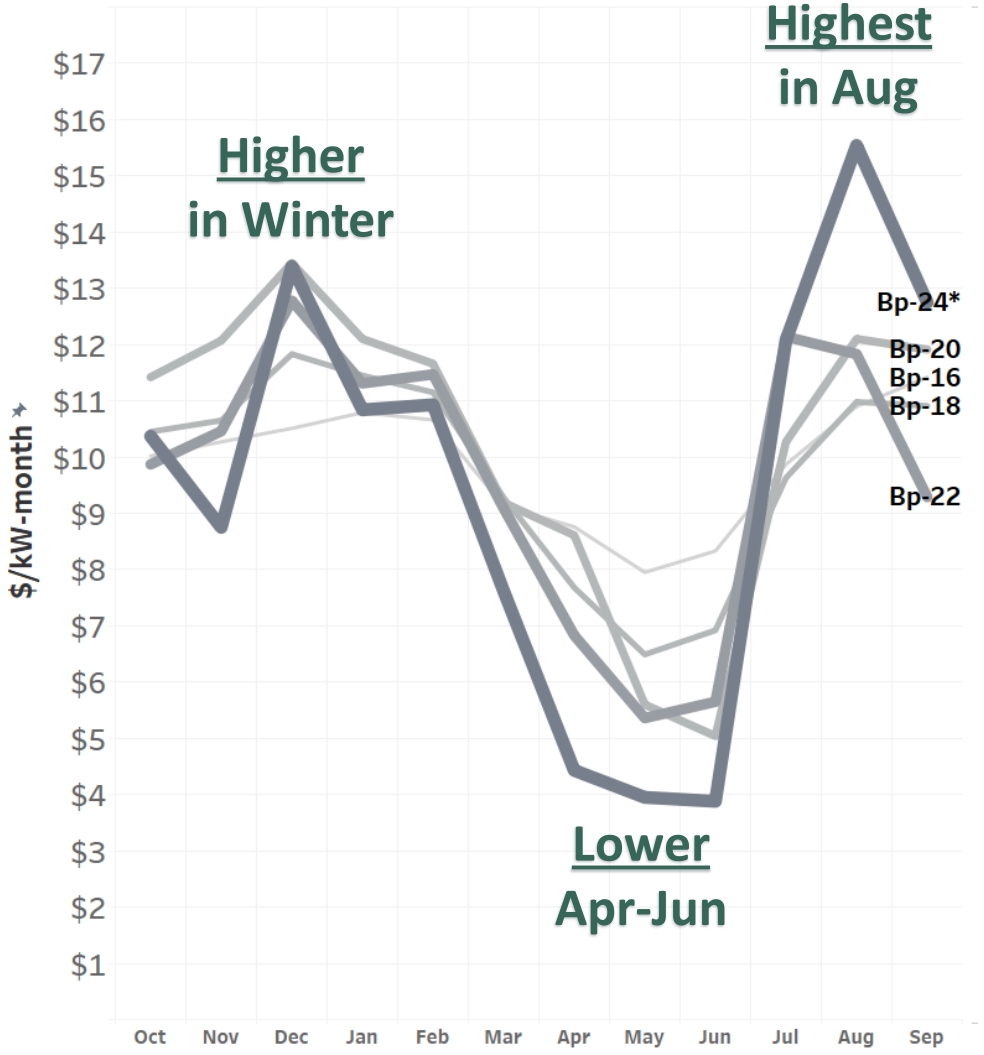
if the District had been Load Following

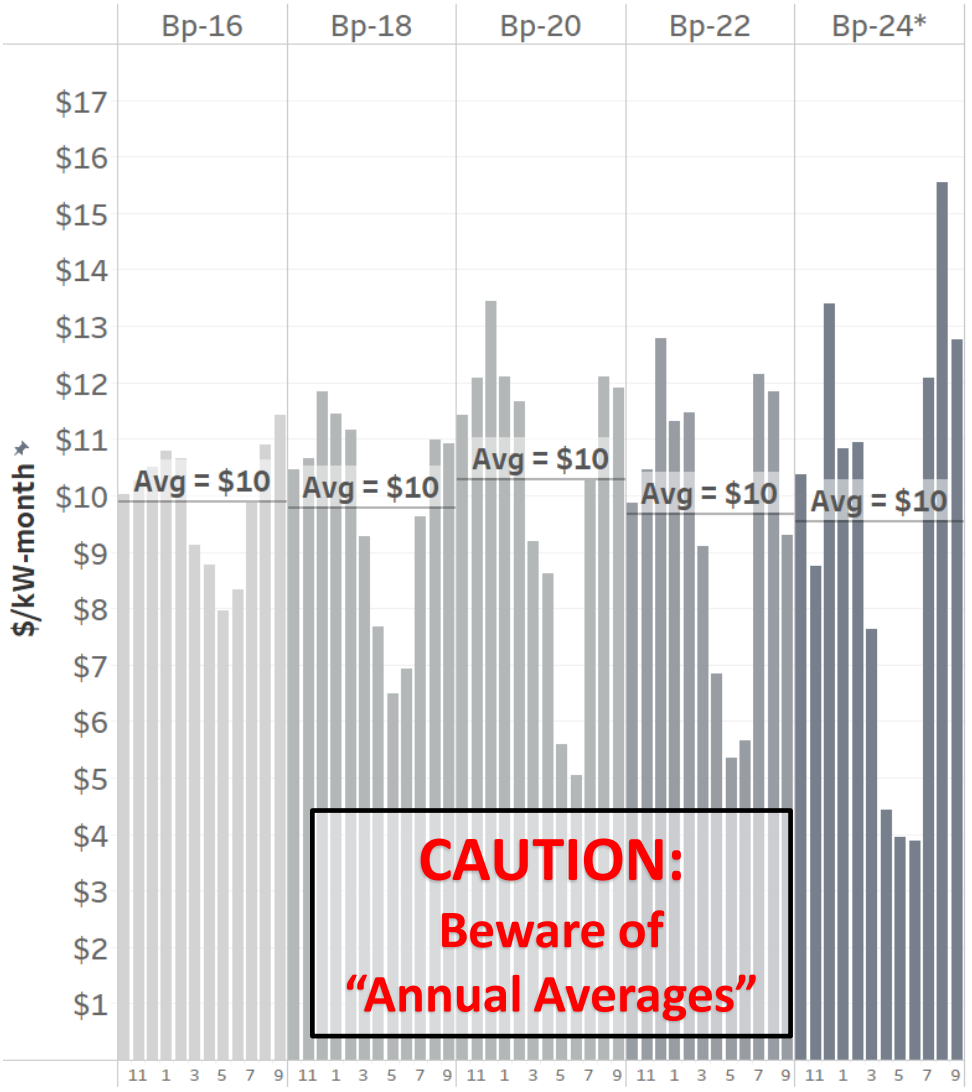
Scenario Description
- Historical Rates w/CDQ
- BP-24* Rates w/CDQ

CDQ to be explained later

Estimated fiscal year demand charges using BPA's Rate Impact Model (RIM), assuming historical actual load with historical demand rates and historical load with (*) BP-24 proposed demand rates .

BPA's Monthly Demand Rates



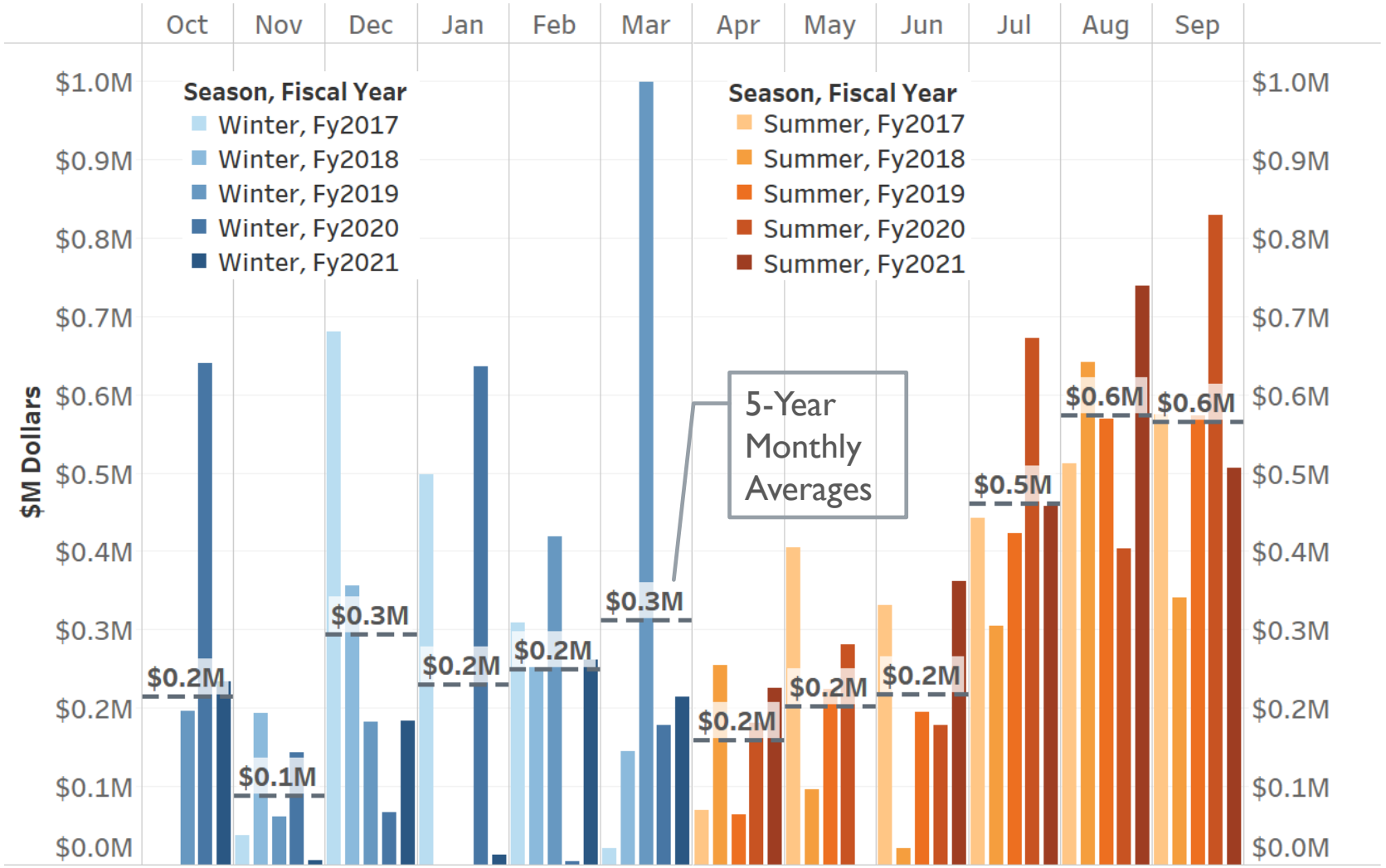


Demand Rates:

1. **Rates** represent marginal cost of new capacity
2. **Vary** by month
3. **Change** over time

* BP-24 proposed demand rates

Monthly Cost of Demand Charges

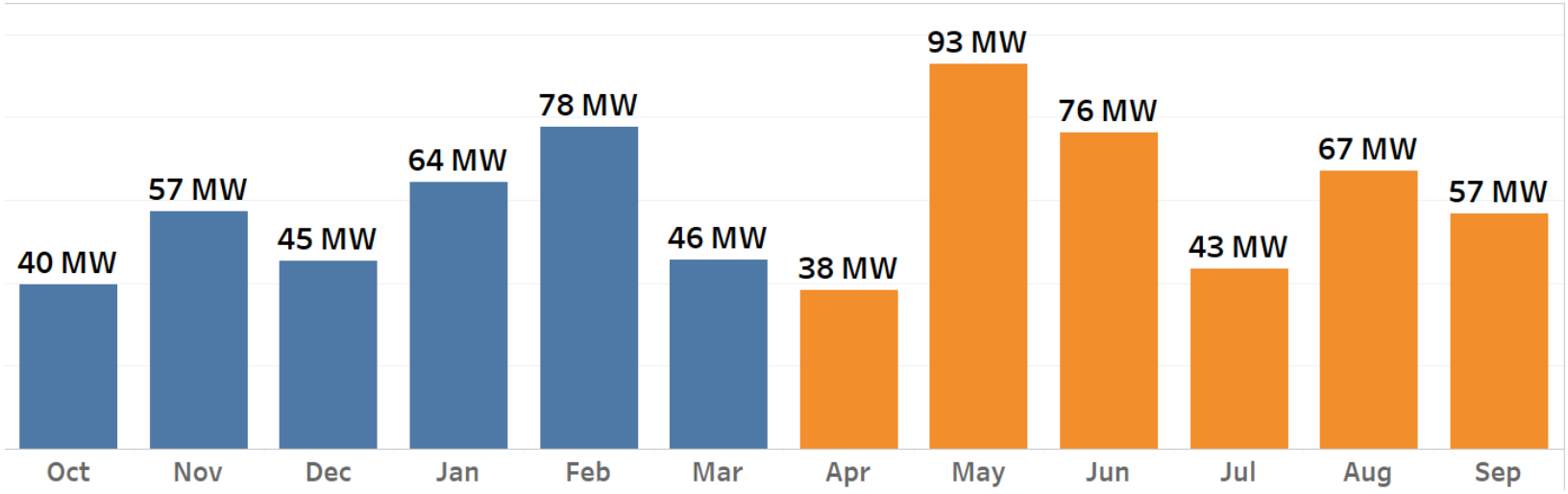


Demand Charges:

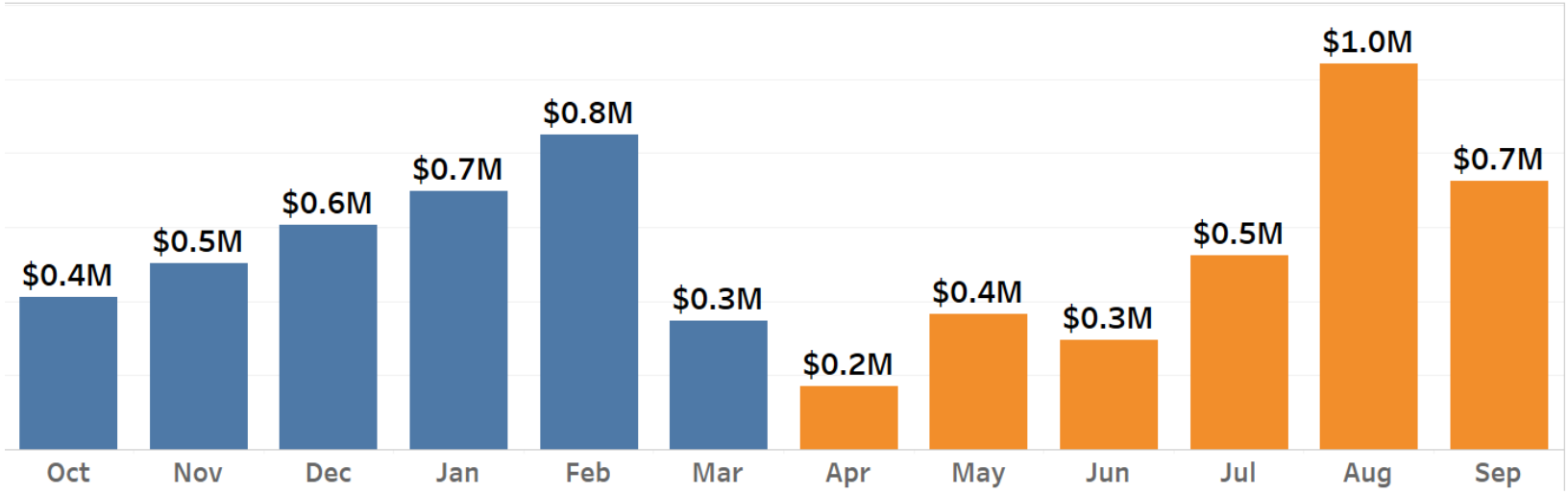
1. **Vary by month <u>from $0-$1M</u>**
2. Vary due to peak & average load
3. **Vary over time,** due to BPA rate changes
4. **Reduced** by Contract Demand Quantity (CDQ)

Estimated monthly demand charges using BPA's Rate Impact Model (RIM), assuming historical actual load with historical demand rates.

Contract Demand Quantity (CDQ)

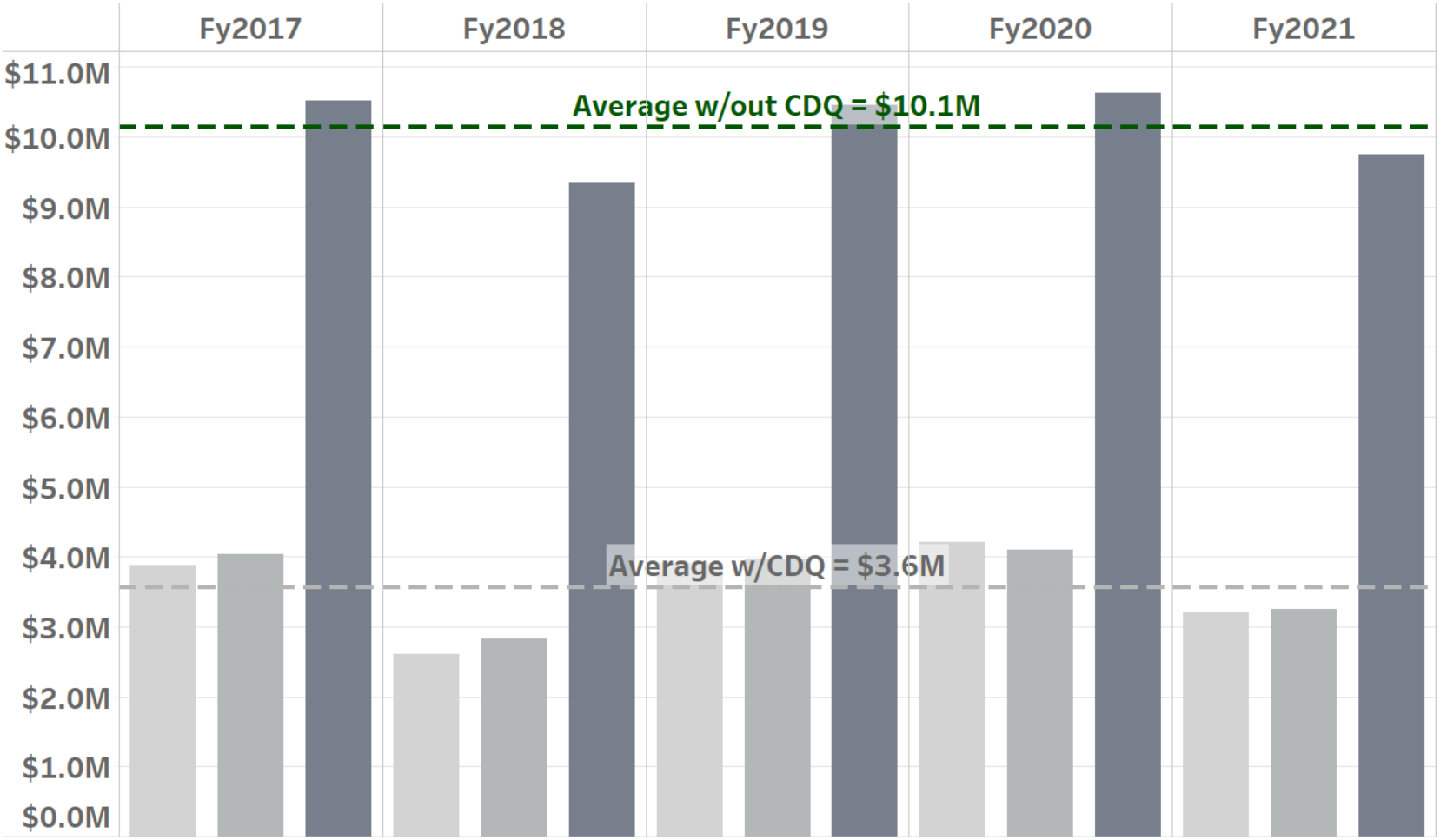


Monthly CDQ values in Megawatts (MW)



Monthly CDQ savings in Millions of dollars ($M), based on BP-24 Proposed Rates

Annual Cost of BPA Demand Charges without CDQ



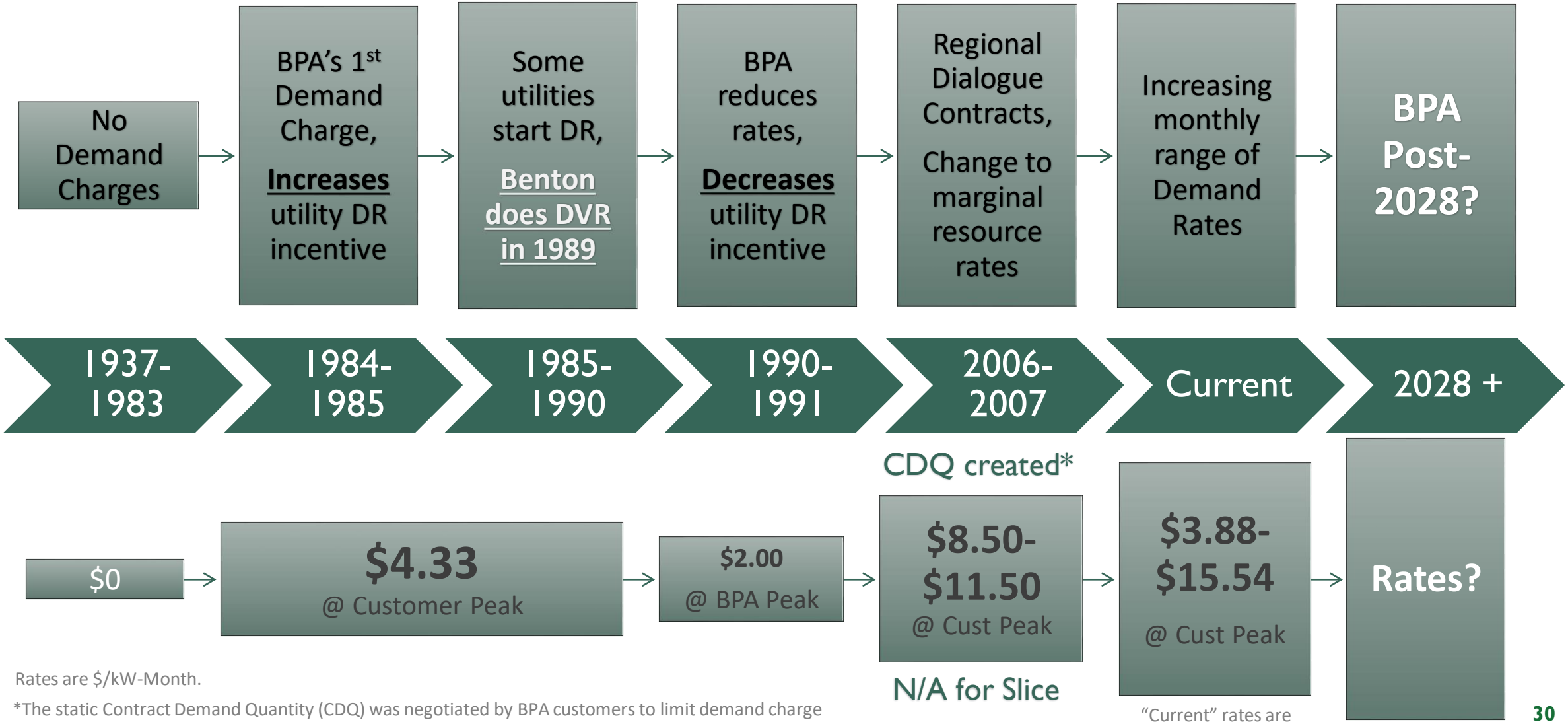
Annual cost
increases by $6.5M

*"With regard to Contract Demand Quantity (CDQ), **Bonneville does not intend to use these values** in the rate design applicable during the Provider of Choice contract period." - **BPA Post-2028 Concept Paper***

Scenario Description
- Historical Rates w/CDQ
- BP-24* Rates w/CDQ
- BP-24* Rates w/out CDQ

Estimated fiscal year demand charges using BPA's Rate Impact Model (RIM), assuming historical actual load, (*) BP-24 proposed rates, and without the existing Contract Demand Quantity (CDQ).

History of BPA Demand Charges



Rates are $/kW-Month.

*The static Contract Demand Quantity (CDQ) was negotiated by BPA customers to limit demand charge cost increases by "grandfathering" a portion of the utility's 2006 peak demand, reducing their billed kW.

"Current" rates are BP-24 proposed.

#4 - POTENTIAL

What is the District's demand response potential?

Demand Response Potential Assessment (DRPA)

What is DR Potential?

- Estimates how many MWs of load reduction (or other load modification) are feasible over time
- Represents what could be achieved given certain conditions are met (e.g., customers accept the program, cost effectiveness, etc.)

Why is it Important?

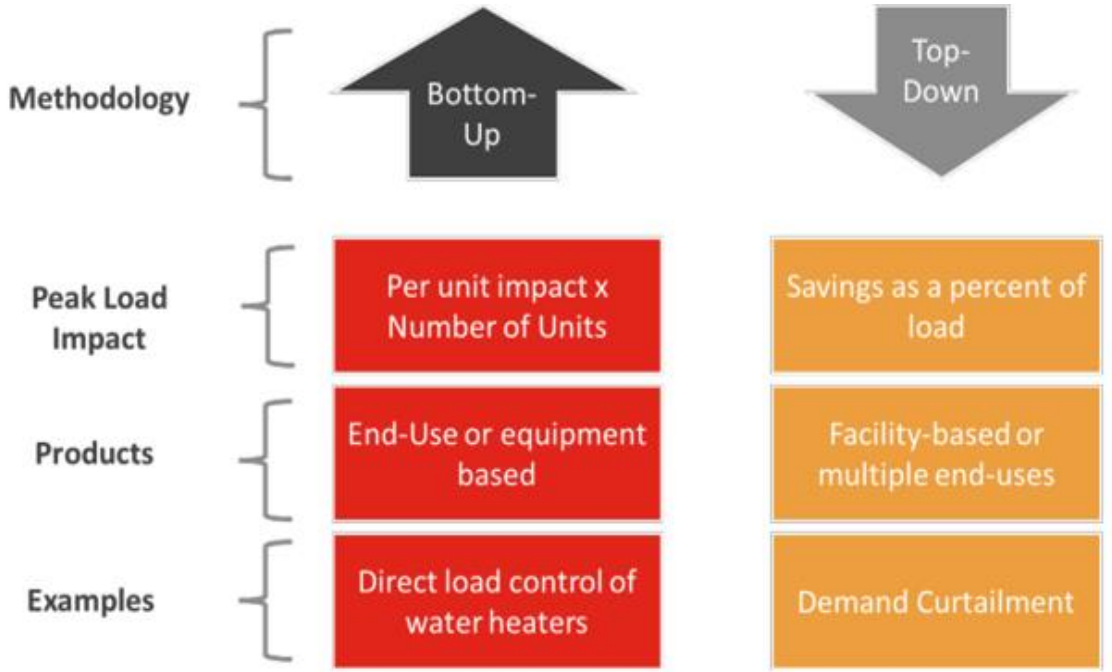
- Helps to prioritize program focus and design efforts
  - Important caveat – DR potential studies are not program designs
- Serves as regulatory and business due diligence tool
- A tool in the IRP process
- Can identify the "game changer" large customers

PLMA™
Load Management Leadership

DRPA Assumptions and Modeling

Key Variables	Description	
Participation Rates	• Percentage of eligible customers enrolled in DR programs • Participation and ramp	
Unit Impacts	• kW reduction per device • Percent of enrolled load	
Costs	• Program development (One-time fixed costs) • Marketing, installation, technology enablement (One-time variable costs) • Annual program admin. costs, customer incentives, O&M, etc.(Recurring fixed and variable costs)	
Global Parameters	• Avoided Costs • Inflation Rate • Line Losses	• Program Lifetime • Discount Rate

Modeling Methods:



Other Assumptions:

Profile = Calendar Year 2018
Seasons = Summer (Jun, Jul, Aug), Winter (Dec, Jan, Feb)
Events = 4-hour event duration, 20-hour season maximum (5 events)

DR Products Considered in the District's DRPA

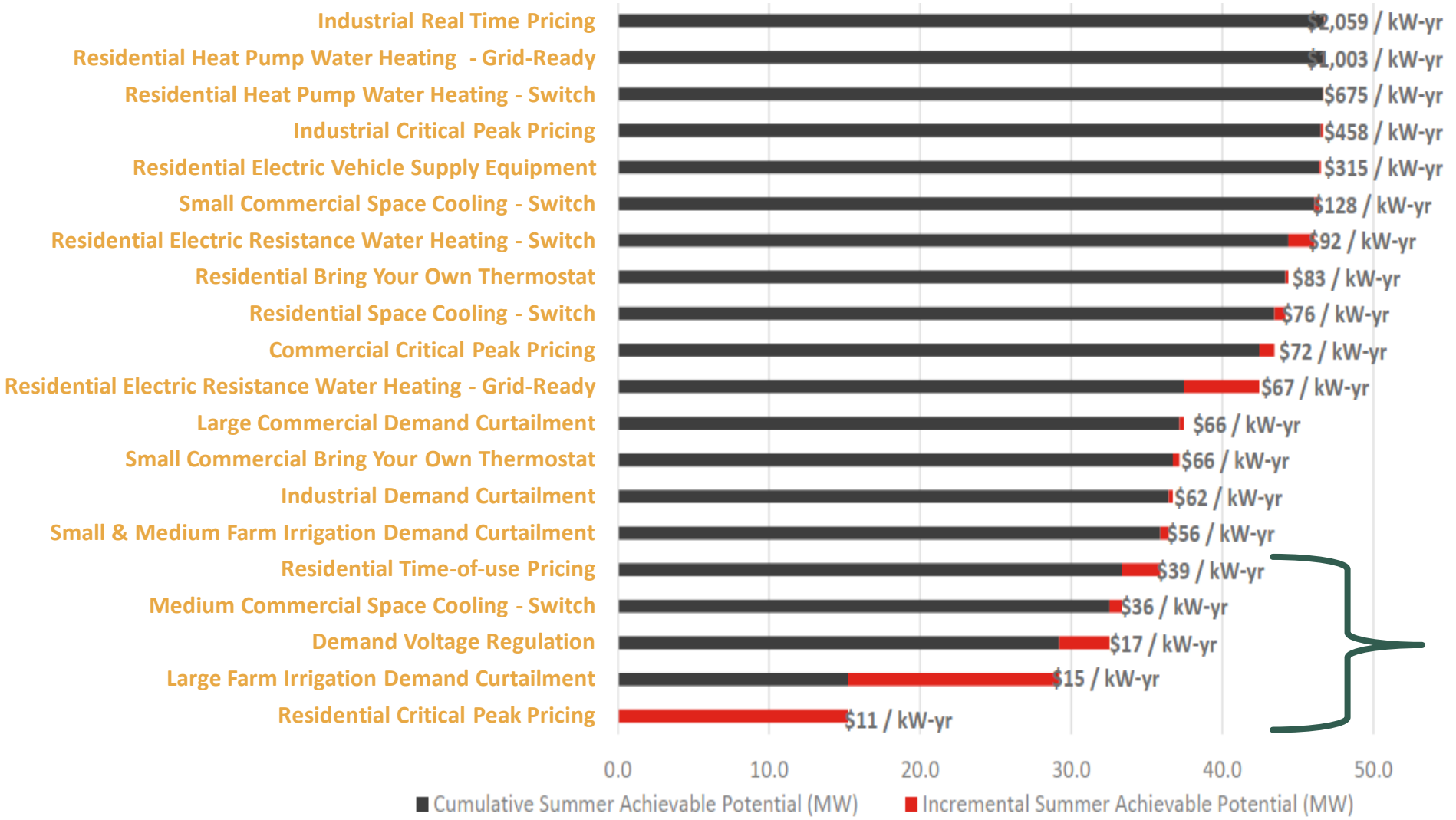
Type	Category	Product Description	Seasonality: Summer	Seasonality: Winter
Firm/ Controlled	Demand Curtailment	Large Farm Irrigation Demand Curtailment	↓	
		Small & Medium Farm Irrigation Demand Curtailment	↓	
		Industrial Demand Curtailment	↓	↓
		Large Commercial Demand Curtailment	↓	↓
	Space Cooling	Medium Commercial Space Cooling - Switch	↑	
		Small Commercial Space Cooling - Switch	↑	
		Residential Space Cooling - Switch	↑	
	Space Heating	Medium Commercial Space Heating - Switch		↑
		Small Commercial Space Heating - Switch		↑
		Residential Space Heating - Switch		↑
	Bring Your Own Thermostat	Small Commercial Bring Your Own Thermostat	↑	↑
		Residential Bring Your Own Thermostat	↑	↑
	Water Heating	Residential Electric Resistance Water Heating - Switch	↑	↑
		Residential Electric Resistance Water Heating - Grid-Ready	↑	↑
		Residential Heat Pump Water Heating - Switch	↑	↑
		Residential Heat Pump Water Heating - Grid-Ready	↑	↑
	Electric Vehicle	Residential Electric Vehicle Supply Equipment	↑	↑
	Utility System	Demand Voltage Regulation	↓	↓
Non-Firm/ Price Based	Rates	Industrial Critical Peak Pricing	↓	↓
		Industrial Real Time Pricing	↓	↓
		Commercial Critical Peak Pricing	↓	↓
		Residential Time-of-use Pricing	↓	↓
		Residential Critical Peak Pricing	↓	↓

Modeling	Seasonality: Summer	Seasonality: Winter
Top-Down	↓	↓
Bottom-Up	↑	↑

DR Products:

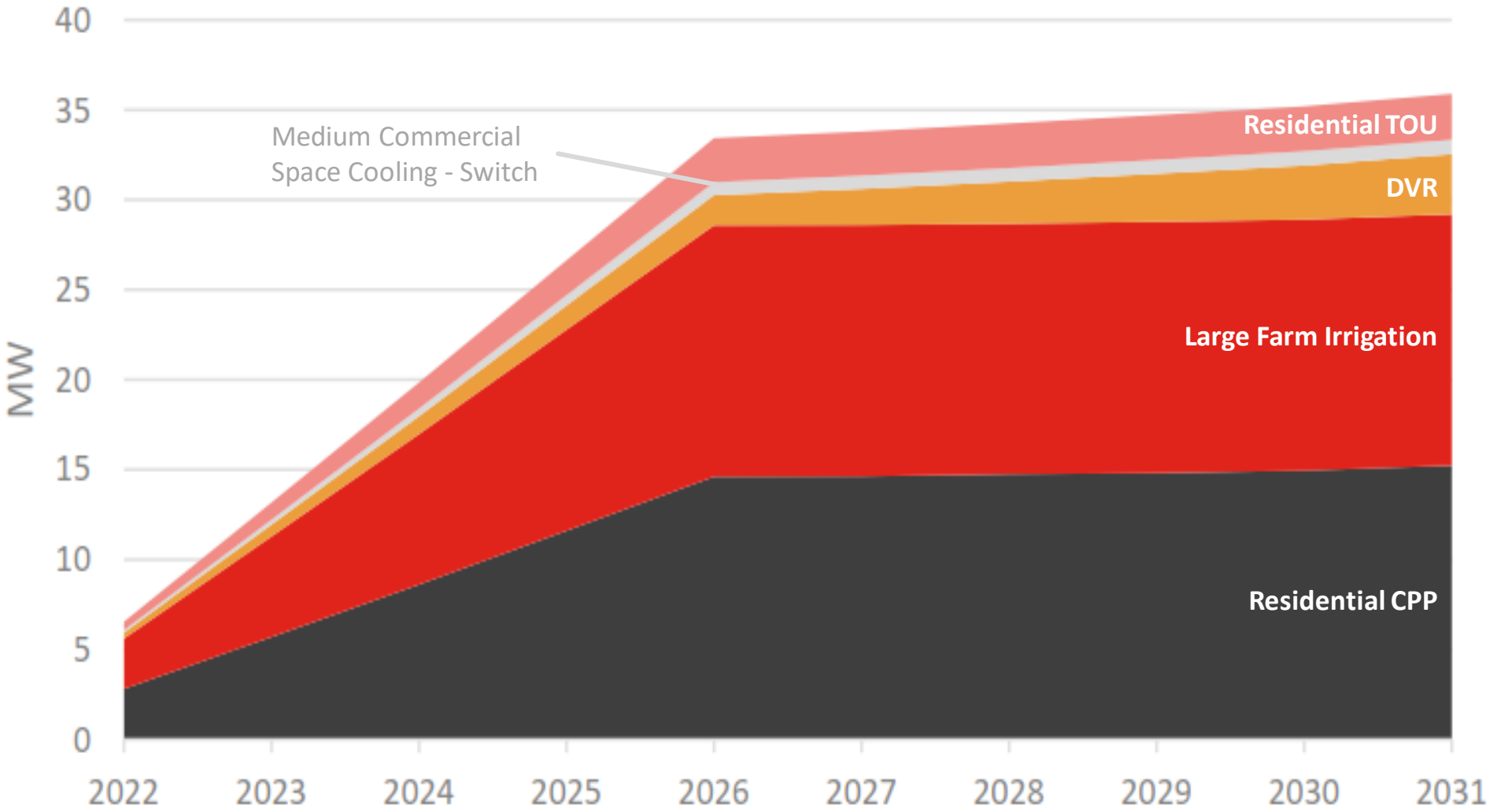
- Same products and assumptions as NWPCC's 2021 Power Plan
- 23 Products
  - 20 Summer
  - 18 Winter

10-Year Achievable Potential & Levelized Cost - Summer



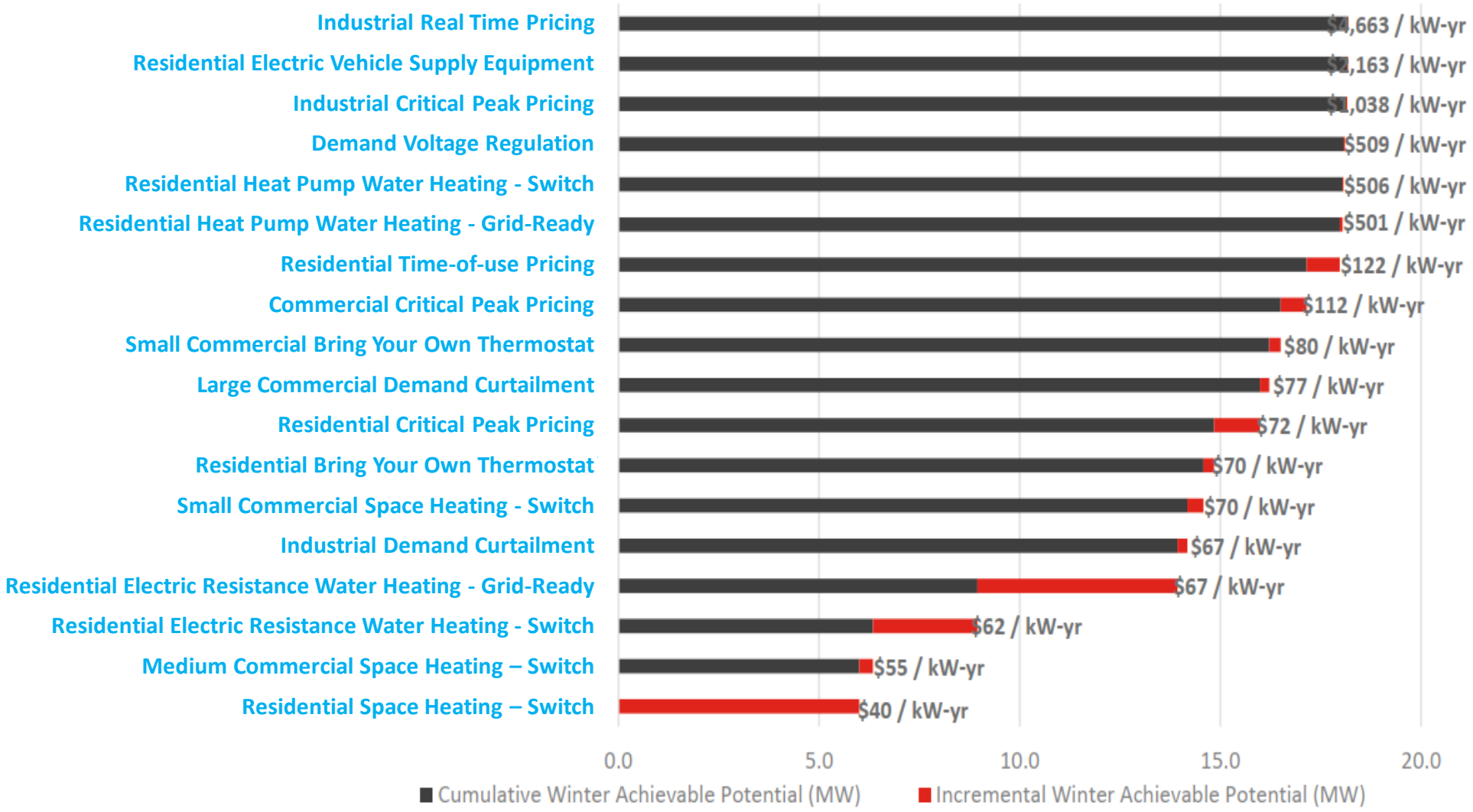
The most cost-effective products are less than $40/kW-Year

10-Year Cost-Effective Potential - Summer



- 10-Year potential is **36 MW**
- **5-Year ramp** is assumed
- Showing programs deployed in parallel

10-Year Achievable Potential & Levelized Cost - Winter



- Winter potential is less and more costly in this DRPA;
- However, the 2018 load shape was a very mild winter

DRPA Requires Continuous Refinement

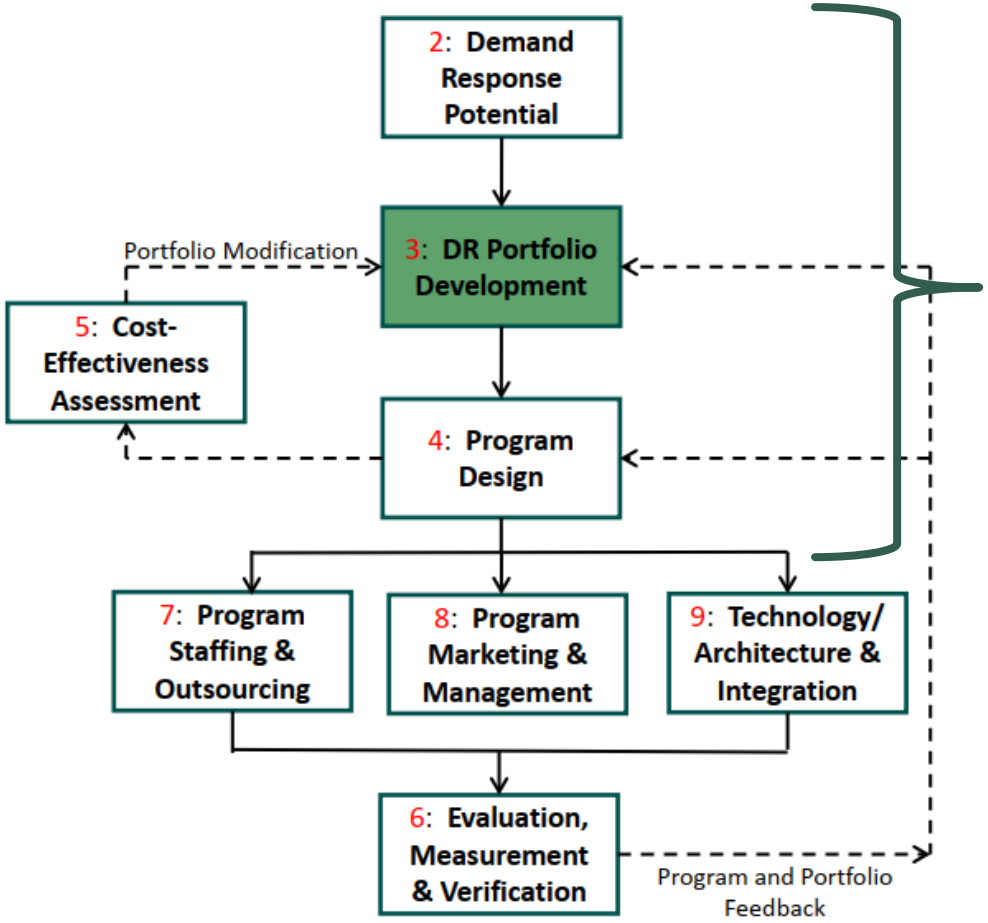
- **Improve** annual load shapes and seasons
- **Update** with BPA's 2021 DRPA Product Assumptions
- **Improve** the benefit-cost analysis
  - Refine the value of demand charges and other drivers
- **Complete** detailed review of segment applicability,
  - For example, need to ensure irrigation excluded from DVR results
- **Consider** more detailed analysis of DVR and irrigation
- **Consider** how to estimate time-of-day residential demand

#5 - STRATEGY

What should the District's strategy be for demand response?

The DR Program Development Process

- Understand DR drivers and needs
- Map needs to DR program attributes
- Develop program concepts and portfolios
- Understand diverse applications of DR with EE and DERs more broadly



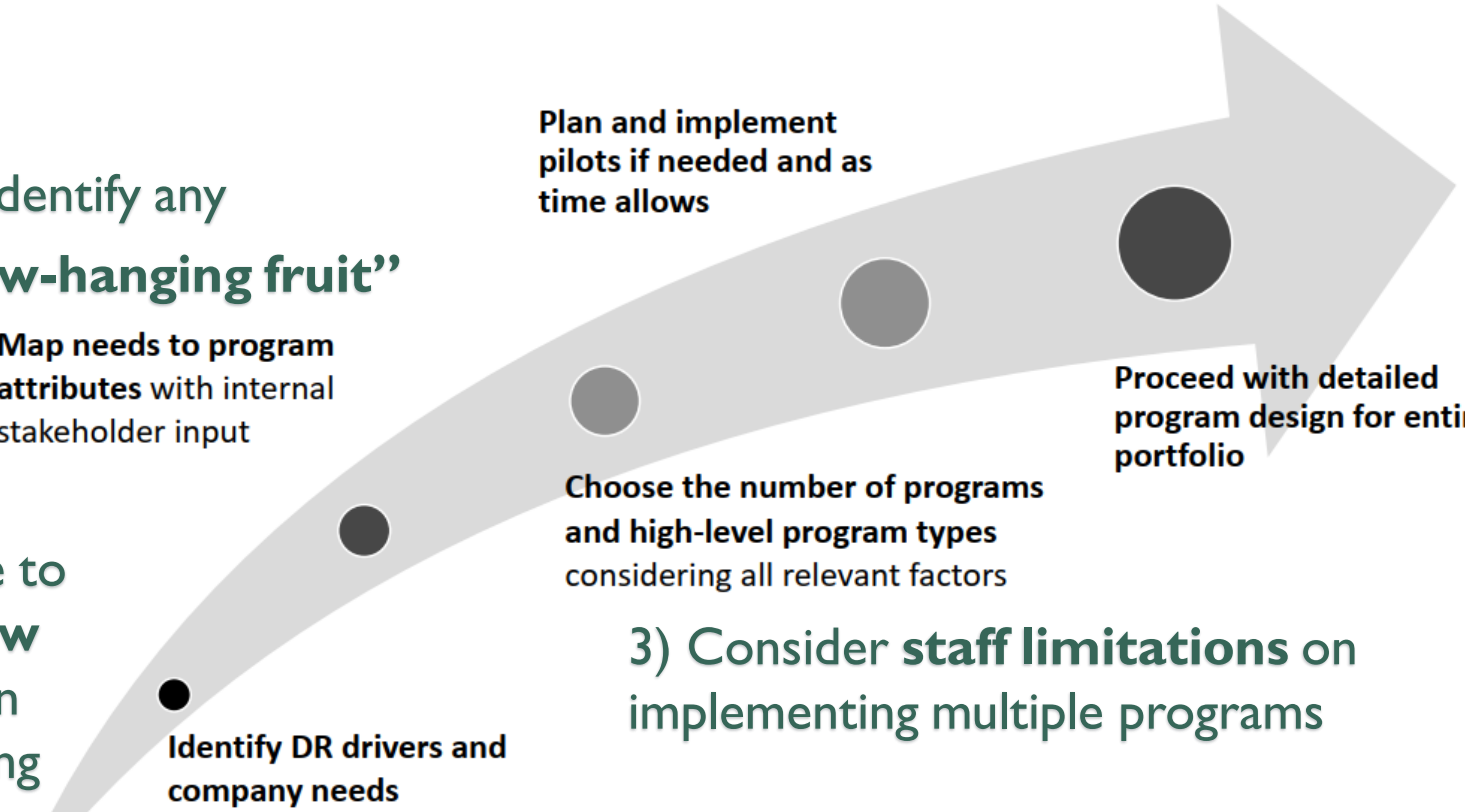
We are at the beginning.

Need time to iterate through this portion.

PLMA™ Load Management Leadership

Slide adapted from Peak Load Management Association's (PLMA) Demand Response Training Series - "Program Design & Implementation" (9/22/20).

Trajectory of a DR Portfolio Design



1) Need time to **evaluate new drivers,** given Load Following switch.

2) Identify any **"low-hanging fruit"**

3) Consider **staff limitations** on implementing multiple programs

When are programs needed?

Consider BPA Post-2028 Contract Timing

PLMA™ Load Management Leadership

Source: Guidehouse (formerly Navigant)

Slide adapted from Peak Load Management Association's (PLMA) Demand Response Training Series - "Program Design & Implementation" (9/22/20).

Demand Response Portfolio & Strategy

Residential	Commercial	Industrial	Irrigation	Utility
• Pursue time-of-day demand charges	• No programs identified at this time	• No programs identified at this time	• Consider developing a pilot program	• Pursue Voltage Optimization • Consider pursuing DVR

Energy Efficiency

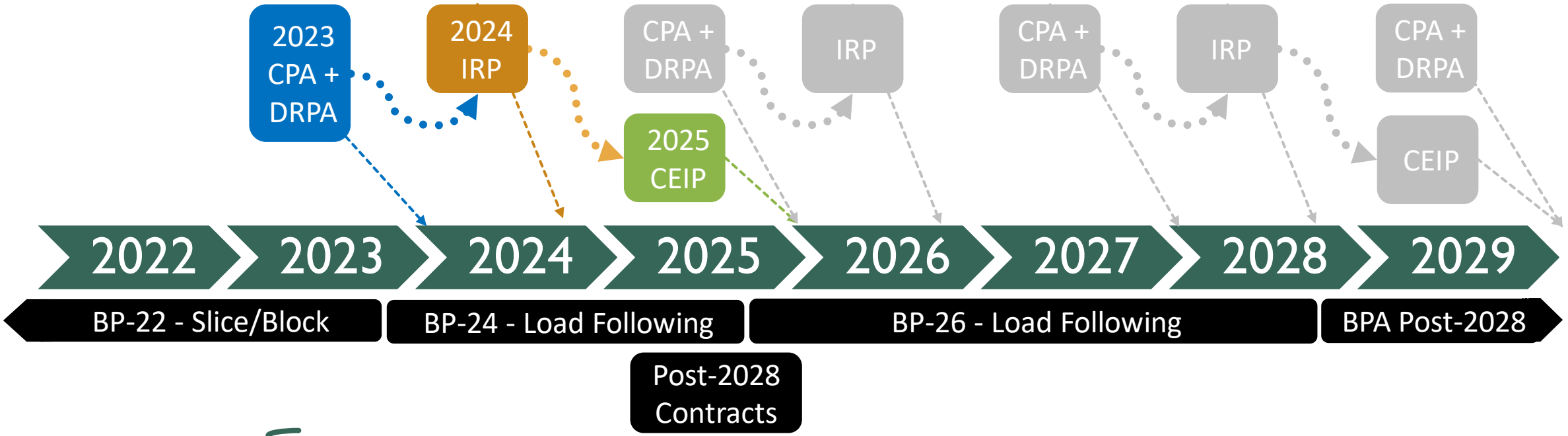
Employee and Customer Education

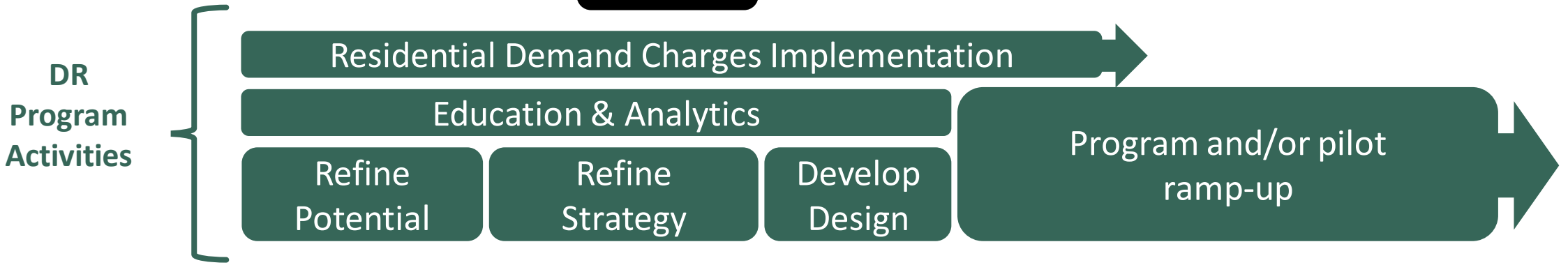
Load Segmentation Analytics

#6 - TIMELINE

When should the District develop a demand response program?

Demand Response Activity Timeline





Note: BP-##=BPA Rate Period, BPA=Bonneville Power Administration, CEIP=Clean Energy Implementation Plan, CPA=Conservation Potential Assessment, DR=Demand Response, DRPA=DR Potential Assessment, IRP=Integrated Resource Plan. ***Timeline is preliminary for facilitating planning discussions.***