x	*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:	6e	
Meeting Date:	October 8, 2019	
Presented by:	Blake Scherer	*Staff Presenting Item*
Approved by (dept):	Rick Dunn	*Director/Manager*
Approved for Commission review:	Chad Bartram	*General Manager/Asst GM*

Motion for Commission Consideration:

None.

Recommendation/Background

The Commission will be presented material about demand response and its consideration as a capacity resource. Information will be presented by District staff. Presentation material will be available at the Commission meeting.

Summary

This session is part of the strategic planning process completed by the District in preparation to develop the 2020-2021 Strategic Plan.

Fiscal Impact

None.

AGENDA

Demand Response Strategic Planning

Benton PUD Commission Session

October 8, 2019

Commission Welcome and Open	Commissioner Jeff Hall
Introduction	Chad Bartram Rick Dunn
Regional Perspective	Kevin White
District's Load Profile	Blake Scherer
Overview of Demand Response	Blake Scherer
Rate Based Demand Response	Blake Scherer
BPA's Tri-Cities Potential	Blake Scherer
Challenges & Opportunities	Blake Scherer
Clean Energy Transformation Act	Kevin White
A Path Forward	Kevin White
Questions	

WHAT ABOUT DEMAND RESPONSE?

AS A CAPACITY RESOURCE

BENTON P·U·D

OCTOBER 8, 2019

Should the District consider demand response as a capacity resource?

Hint:
The Clean Energy Transformation Act **requires** electric utilities to pursue all energy efficiency and **demand response** that meets **3 criteria**.

- Agenda
  - Regional Perspective
  - District's Load Profile
  - Overview of Demand Response
  - Rate Based Demand Response
  - BPA's Tri-Cities Potential
  - Challenges & Opportunities
  - Clean Energy Transformation Act
  - A Path Forward

REGIONAL PERSPECTIVE

DEMAND RESPONSE FOR RESOURCE ADEQUACY

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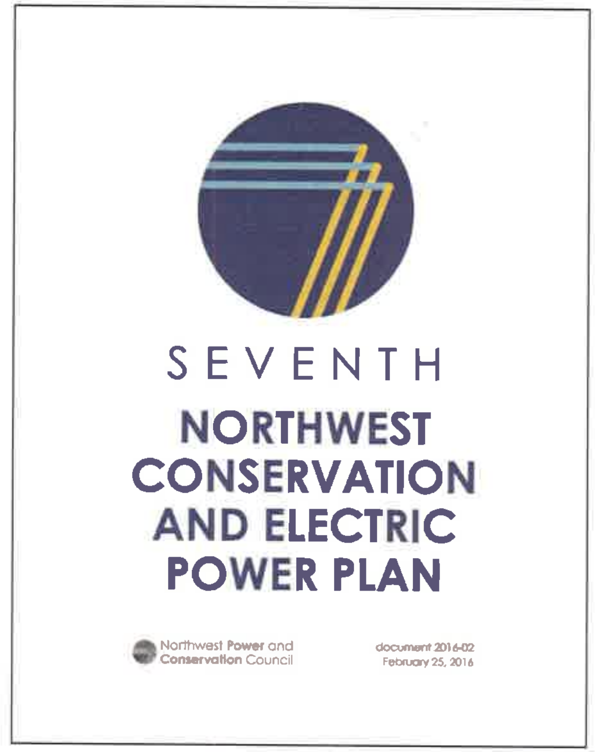
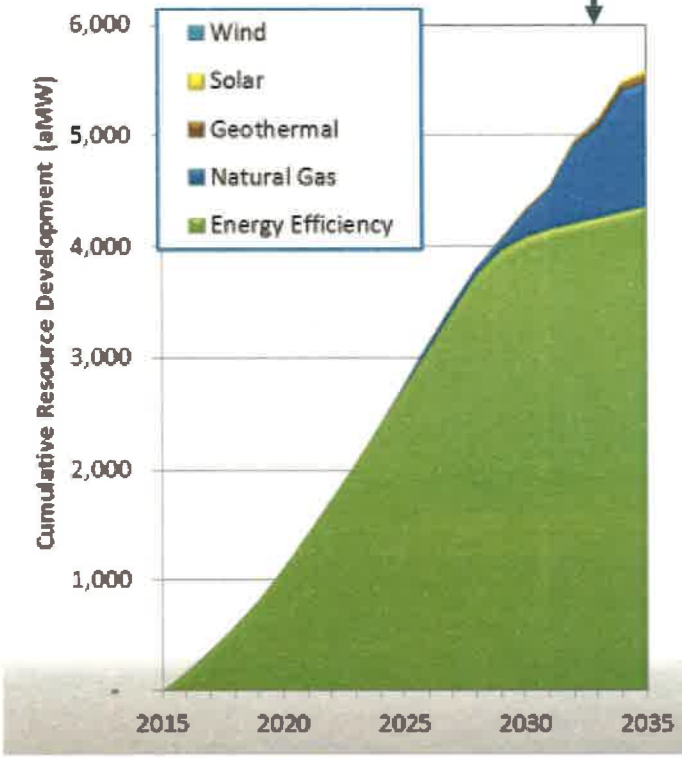
Northwest Power & Conservation Council (NWPCC)

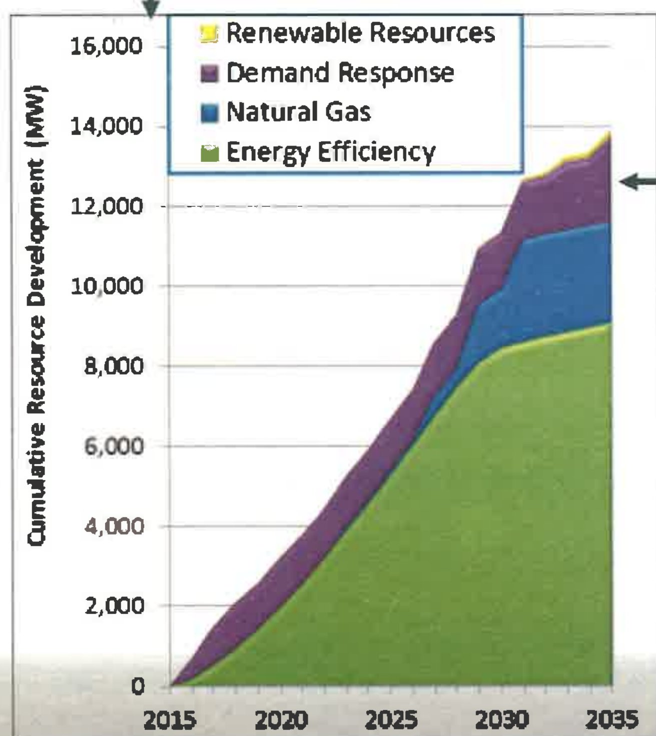
- Seventh Power Plan **<u>key finding</u>**:
  - To satisfy regional **resource adequacy** standards, the region should be prepared to develop significant demand response resources by 2021 to meet system **capacity needs** under critical water and weather conditions.



Feb. 2016

Seventh Power Plan Least Cost Resource Strategies for Meeting Forecast $\boxed{\text{Energy}}$ and $\boxed{\text{Capacity}}$ Needs





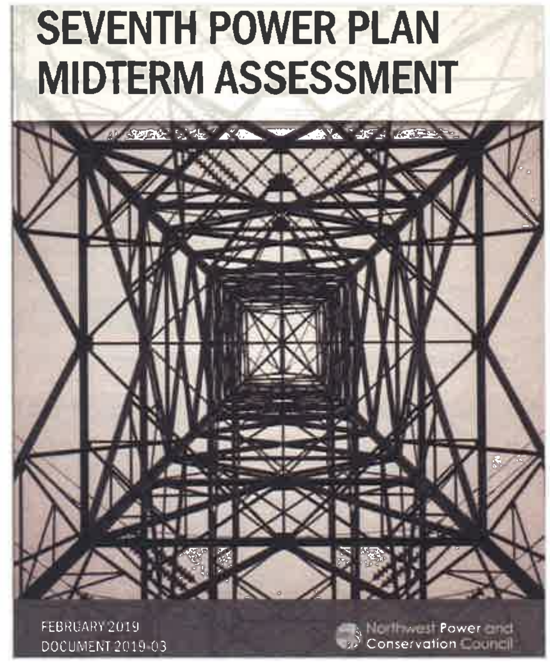
Demand response identified as a **least cost capacity resource** with development needed early in the plan's forecast.

Seventh Power Plan's DR Action Plan

- Region's utilities and BPA should develop and implement methods to **evaluate least-cost resources to maintain resource adequacy**, including assessments of acquiring additional conservation and DR.
- BPA should **identify DR potential** for its needs and the **barriers**.
- Region's utilities and BPA should further develop DR infrastructure, installing a **minimum of 600 MW of DR**, prior to coal retirements.
- Region should form a Demand Response Advisory Committee (DRAC).
- Region should support regional market transformation for DR.

Seventh Power Plan Midterm Assessment of DR

- Seventh Plan's recommended resource strategy **still produces a least-cost and reliable system.**
- All Investor Owned utilities have released Integrated Resource Plans that show a **new or continuing DR need**.
- BPA's 2018 Resource Program **adds DR as a summer capacity resource**.
- Substantial progress has been made to identify **barriers** to developing DR and the regional DR **potential**.
- Region has **yet to make substantial progress** on the recommended 600 MW of incremental DR.



Feb. 2019

Seventh Plan Midterm Assessment – Summary of Planned DR

Utility	Amount DR (MW)	Start Date
BPA	131 (summer)*	2020
Puget Sound Energy	103 (winter)	2023
Portland General	69 (summer), 77 (winter)	2021
PacifiCorp	500 (summer)	Continuing
Avista	44 (winter)	2025
Idaho Power	390 (summer)	Continuing
Northwestern Energy	TBD – winter	TBD

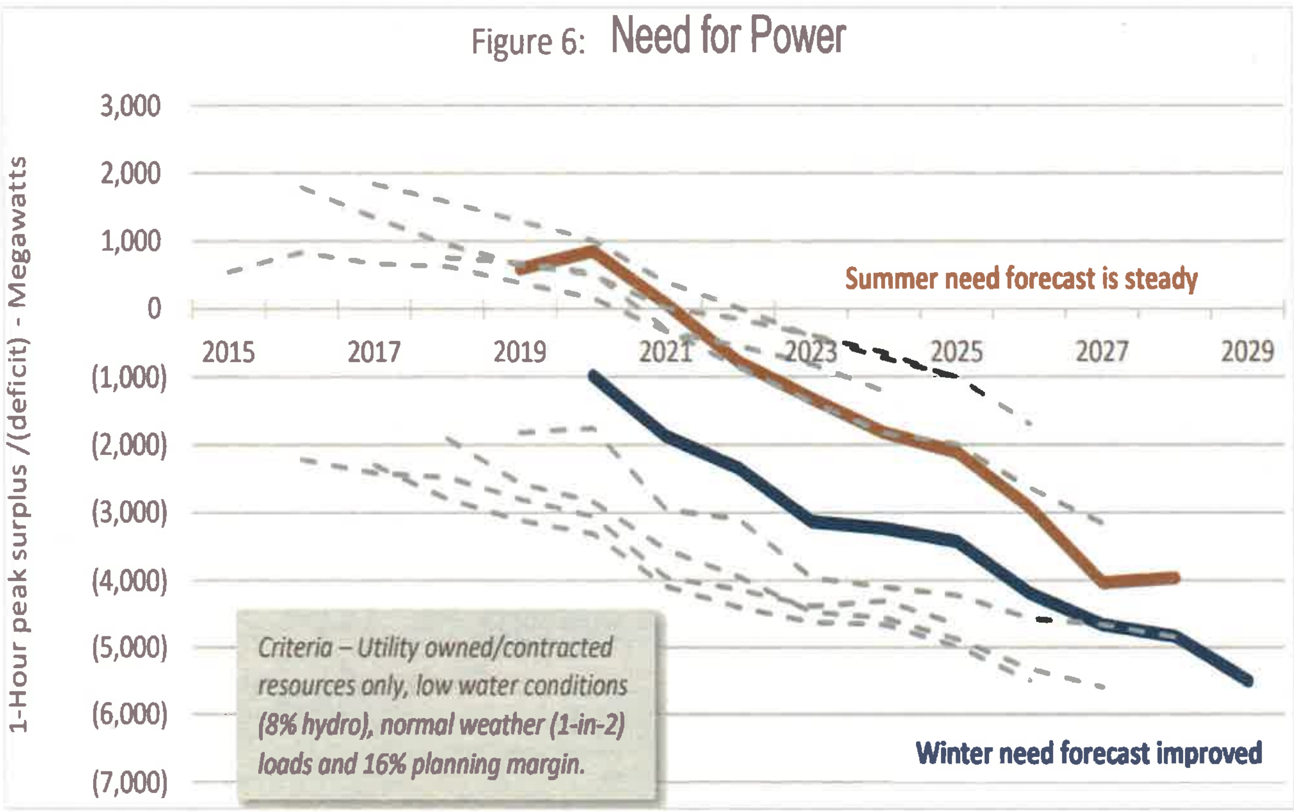
* Portfolios 2 and 3

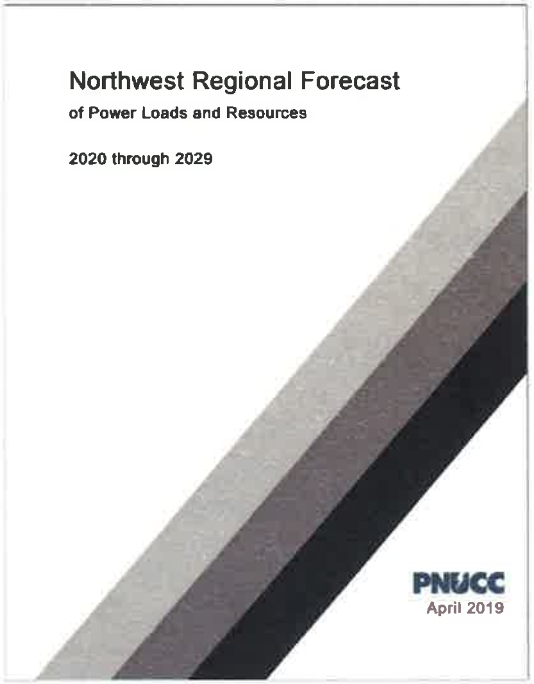
IOU Amounts from their **2017 IRP's**

Puget Sound Energy issued an **RFP for DR** in Jun. 2018

Table Source: NWPCC Seventh Power Plan Midterm Assessment (Feb. 2019), Page 2-4;
https://www.nwcouncil.org/sites/default/files/7th Plan Midterm Assessment Final Cncl Doc %232019-3.pdf

PNUCC's Northwest Regional Forecast





Apr. 2019

2024 UPDATE – PRELIMINARY DRAFT

2021-24 RESOURCE ADEQUACY ASSESSMENTS

- 2021 LOLP = 7 to 8%
  1,619 MW Retired Capacity (Hardin, Colstrip 1 and 2, Boardman, Centralia 1)
- 2022 LOLP = 7 to 8%
  127 MW Retired Capacity (N Valmy 1)
- 2023 LOLP = 7 to 8%
  No coal retirements

- 2024 LOLP = 8.2% - with mostly winter shortfalls
  No coal retirements in reference case
- 2024 LOLP = 33% - with both winter and summer shortfalls
  1,853 MW Early retirement case (Centralia 2, Bridger 1 and 2, N Valmy 2)

DISTRICT LOAD PROFILE

HISTORICAL PEAKS AND SUMMER LOAD SHAPE

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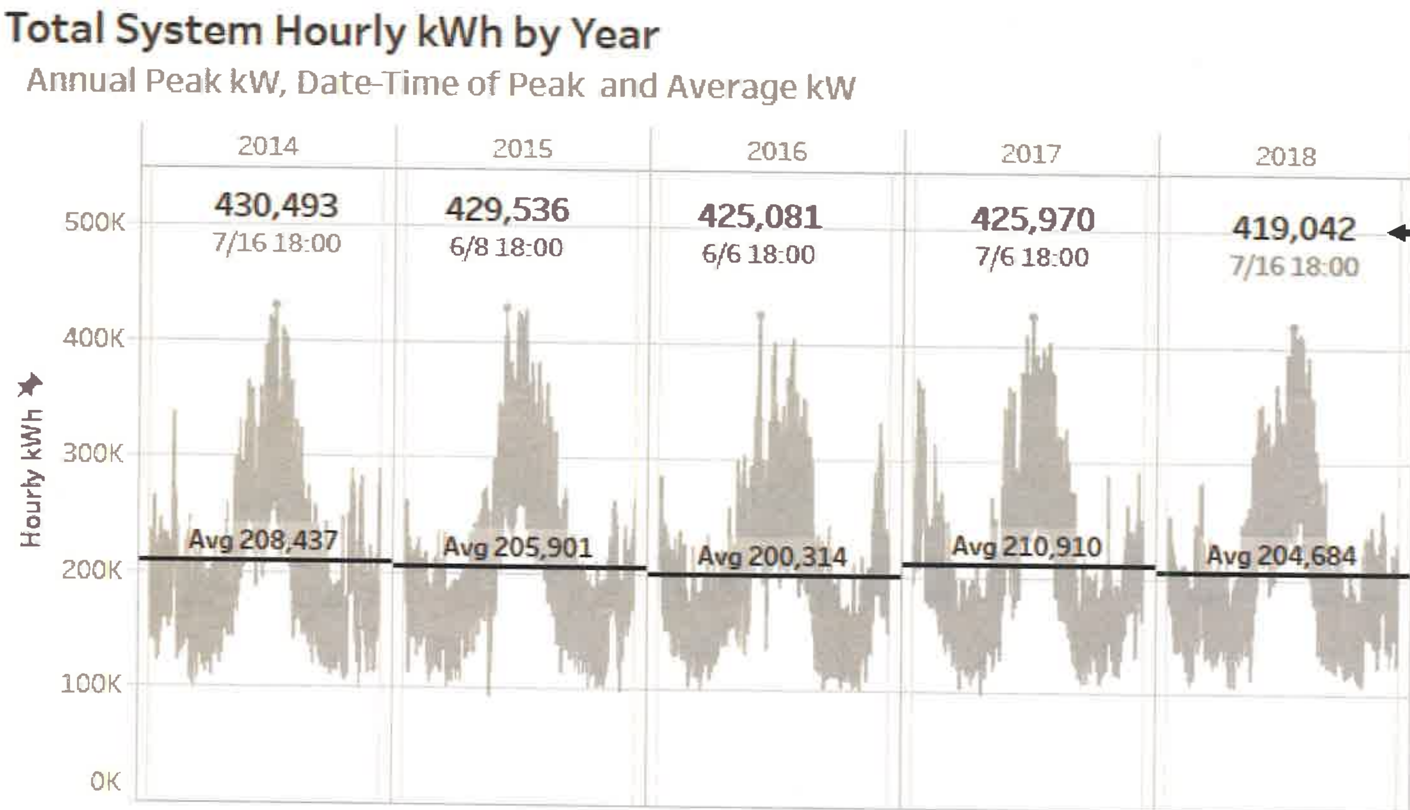
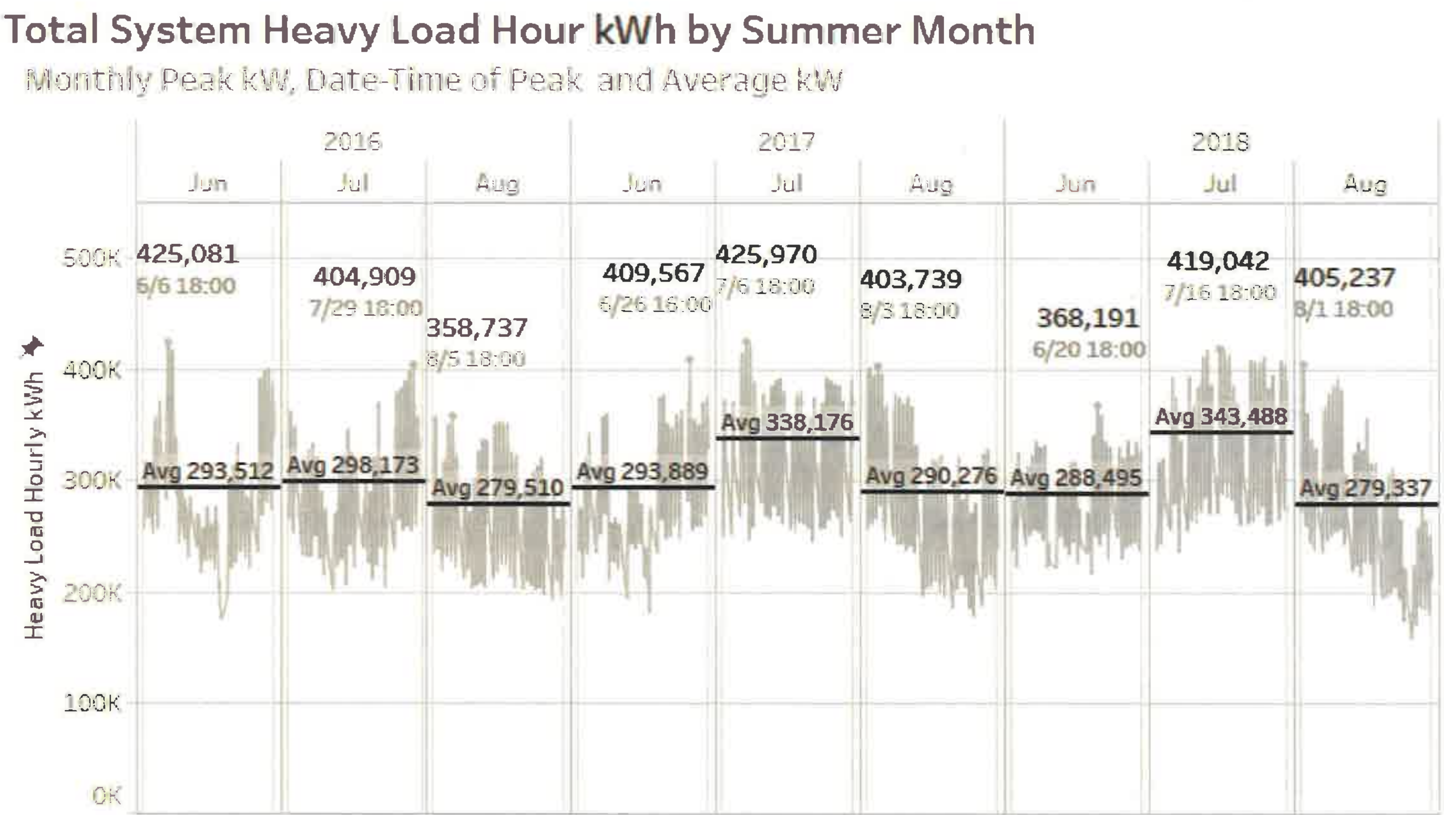
Annual System Peak History



System peak of **419–430 MW** in Jun. or Jul., hour ending **18:00 (5-6p)**

Note: Hourly data is the District's total system load including losses, from BPA's MDMR2 system.

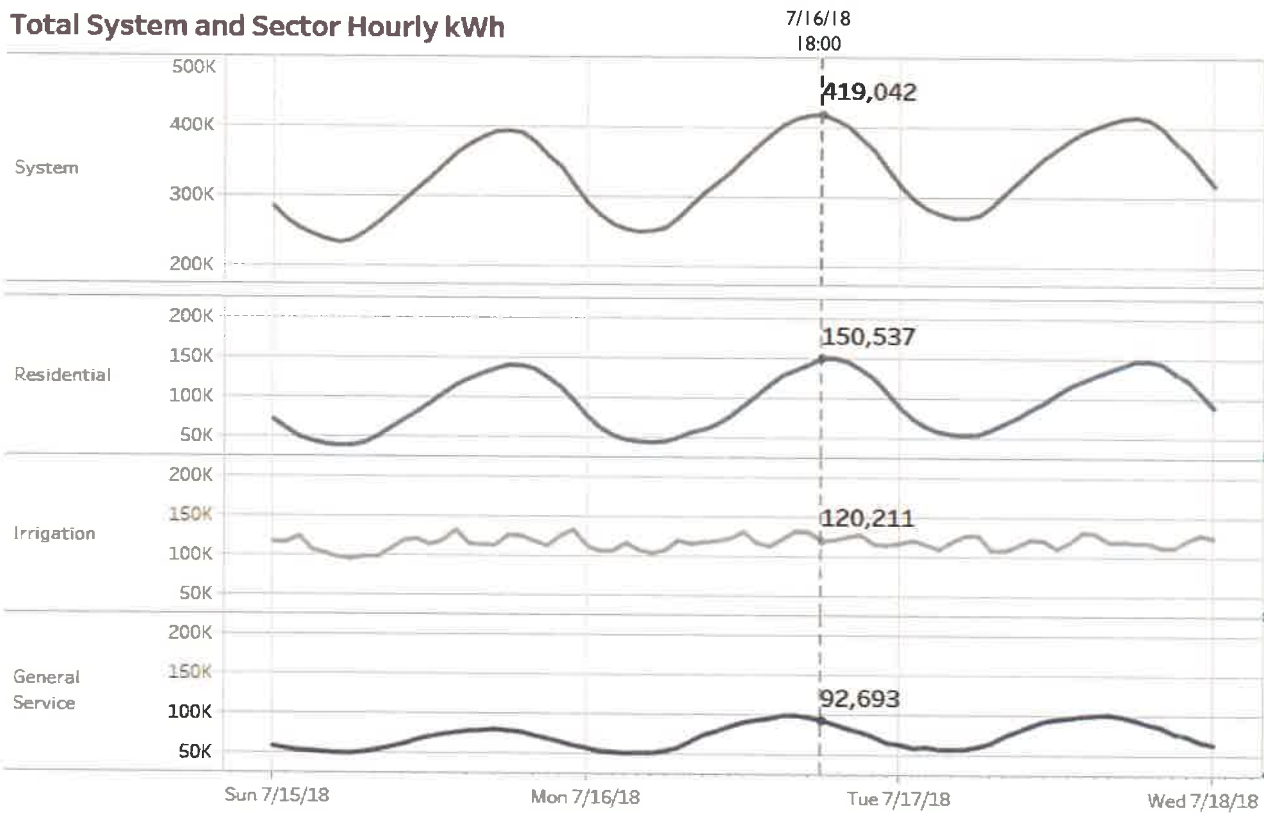
Monthly Summer System Peak



Significant gaps from peaks to averages presents a **resource planning challenge**

Note: Hourly data is the District's total system load including losses, from BPA's MDMR2 system. Heavy Load Hours means the 16 hours ending 0700 through 2200 hours, Monday through Saturday, excluding holidays (July 4th).

Summer Peak 2018 - Load Profile by Sector



Predictable load shape, **driven by residential;** daily variance of **170 MW**

Large daily variance of **100 MW**, but predictable

Hourly variance of up to <u>20 MW</u>

Daily variance of **50 MW**, but predictable

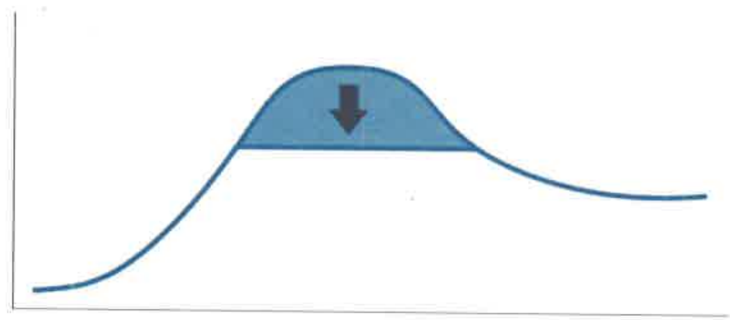
Note: Hourly data is the District's total system load including losses, from BPA's MDMR2 system. Sector data is a virtual meter aggregation from the District's MDM system. Total of sectors will be less than the system for a few reasons: 1) no data available for industrial sector, 2) system includes unmetered load, and 3) system includes losses.

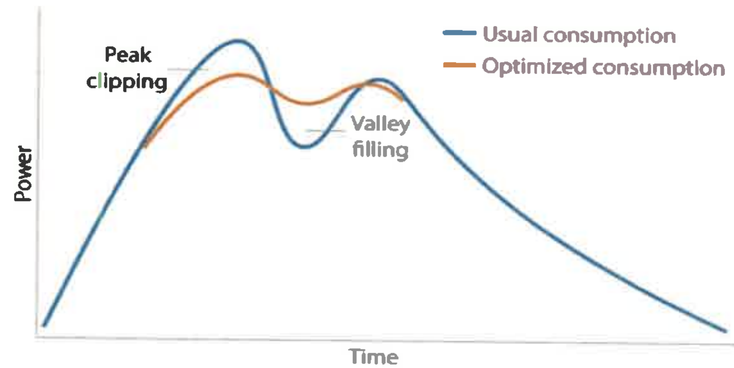
OVERVIEW OF DEMAND RESPONSE

DEFINITION, CHARACTERISTICS AND NATIONAL PERSPECTIVE

Definition of DR

- ***What?*** - DR is voluntary and temporary reduction in consumers' use of electricity ***When*** the power system is **stressed**.
- ***How?*** – Reduction or shift in consumer's **end-use loads** in response to financial incentives offered by the utility.
- **Why?** – DR can lower the system peak, shift load to off-peak periods and can be **dispatched** during times of need; **lowering the utility's costs.**

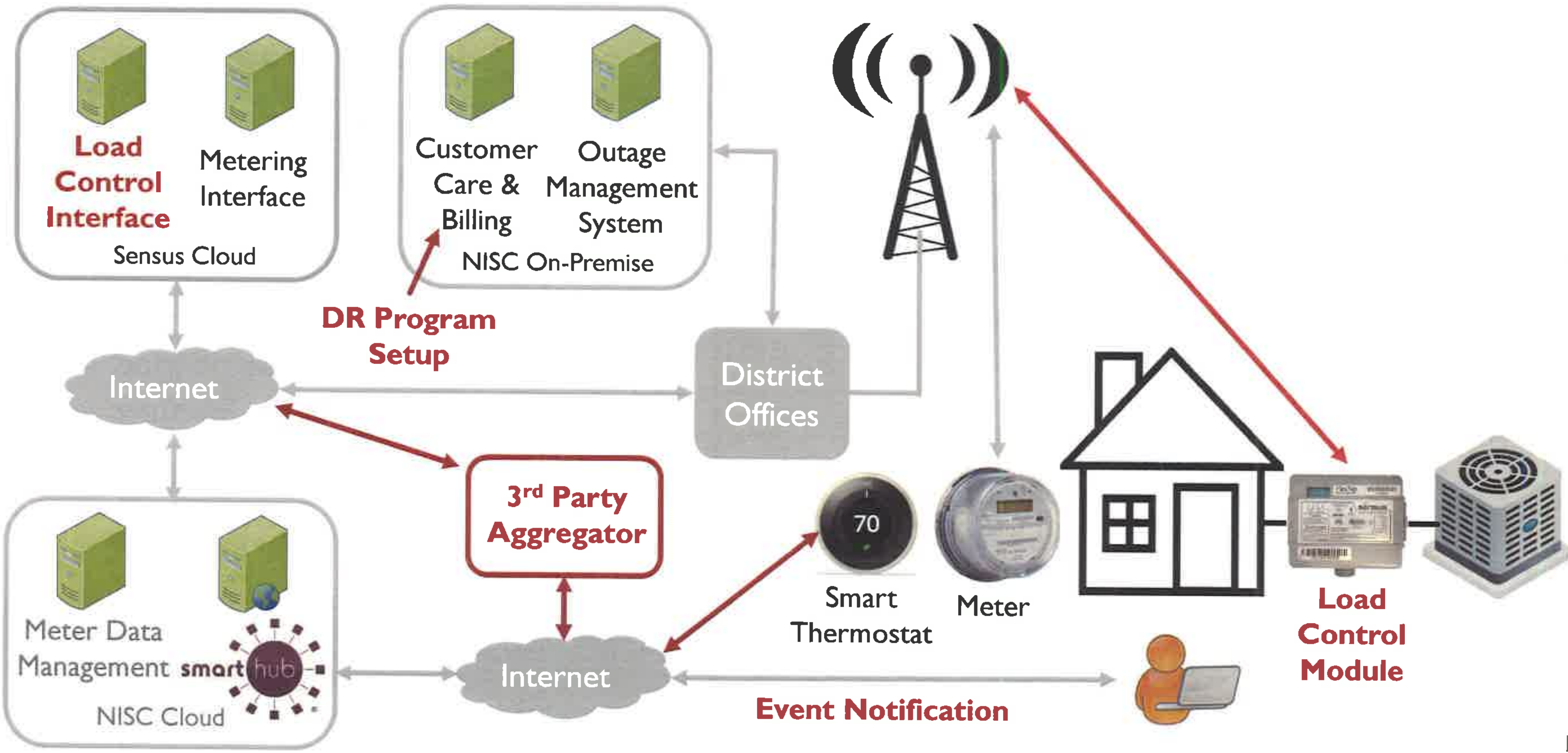




DR Programs have many characteristics and variety

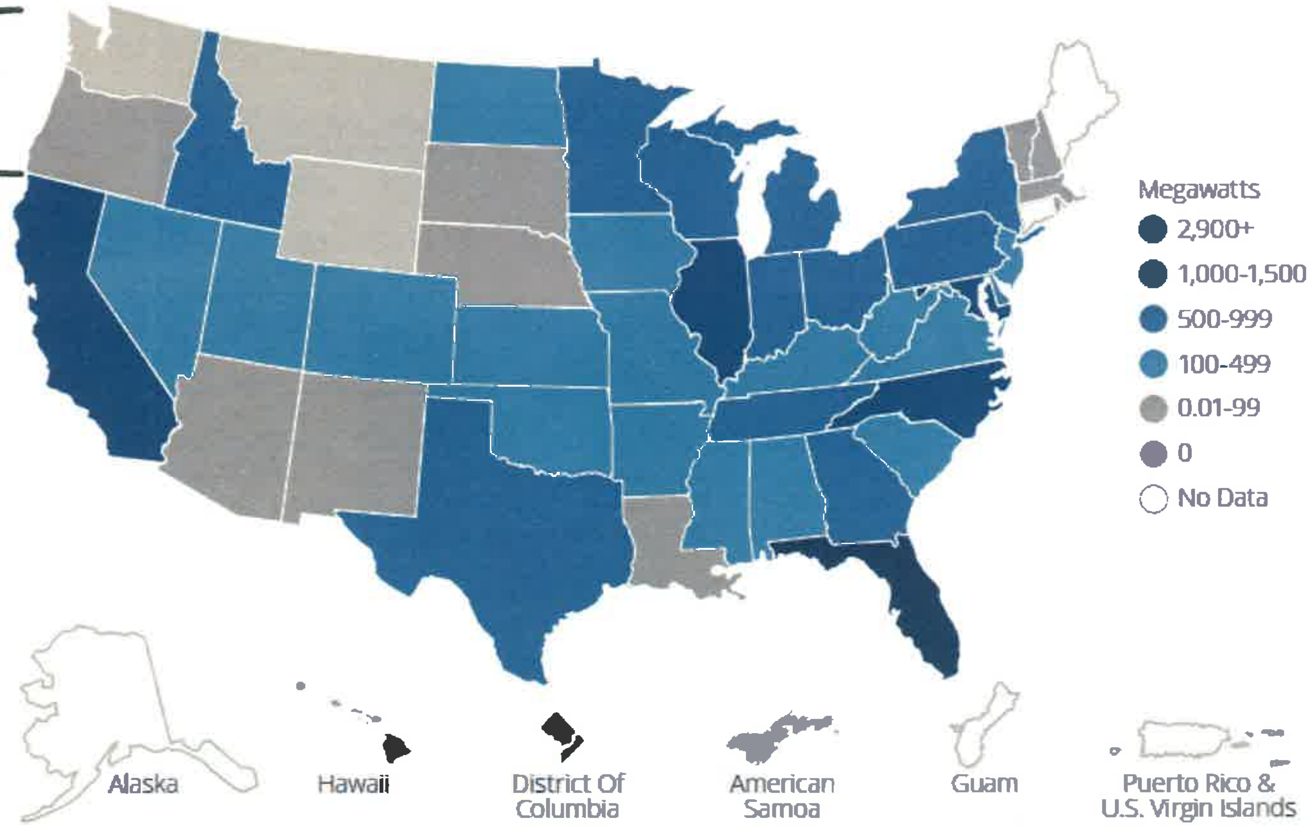
- **Seasonality** – different end-use devices
  - Winter – space heating
  - Summer – space cooling, irrigation, pool pumps
  - Year-round - lighting, water heating, curtailable/interruptible tariffs
- **Sectors** - diverse characteristics and different methods of acquisition
  - Residential
  - Commercial & Industrial
  - Agricultural
- **Firmness**
  - Firm – DR resources directly controlled by the utility or scheduled ahead of time
  - Non-Firm – DR resources outside of utility's direct control; driven by modified customer behavior
- **Incentive/Penalty Structure**
  - Fixed and/or variable incentives
  - Penalties for non-compliance, or not
- **Frequency of Events**
  - Typically limited number and duration per season, e.g. 10 - 4 hour events per season

Examples of DR Infrastructure & Communication



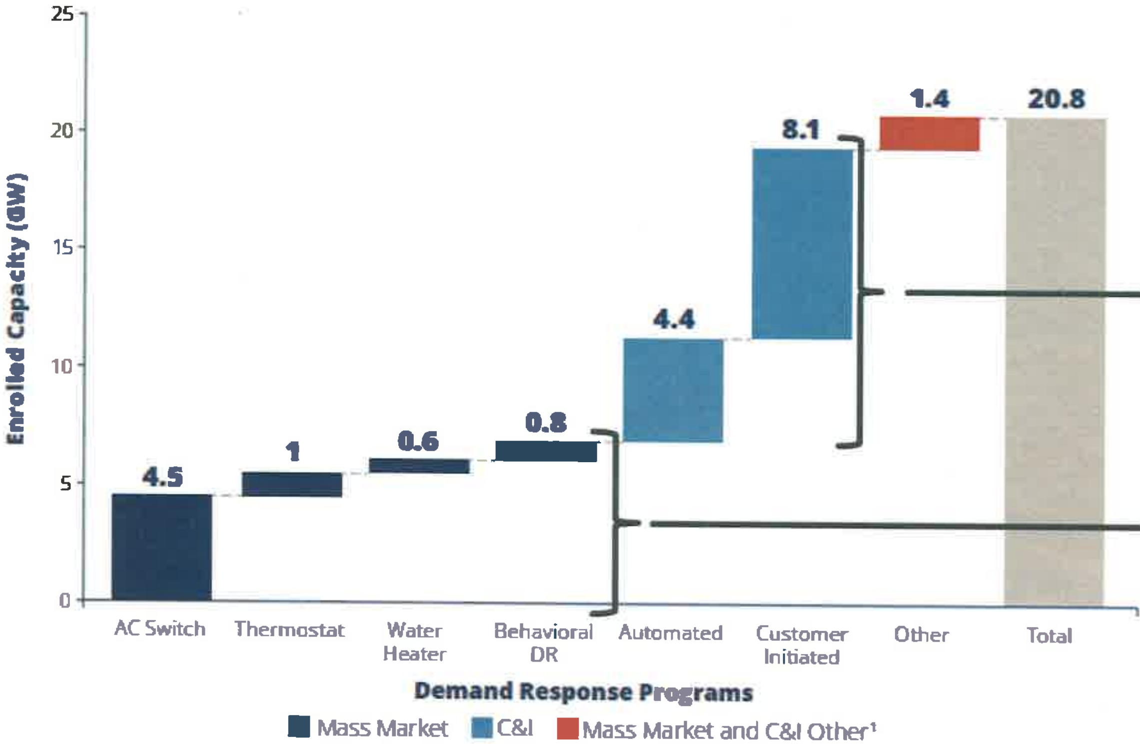
2018 National Enrolled DR Capacity by State

Low DR
in the Pacific
Northwest,
except for
Idaho.



Source: Smart Electric Power Alliance (SEPA), 2019 Utility Demand Response Market Snapshot. N=190 Utility Survey participants.

2018 National Enrolled DR Capacity by Program Type



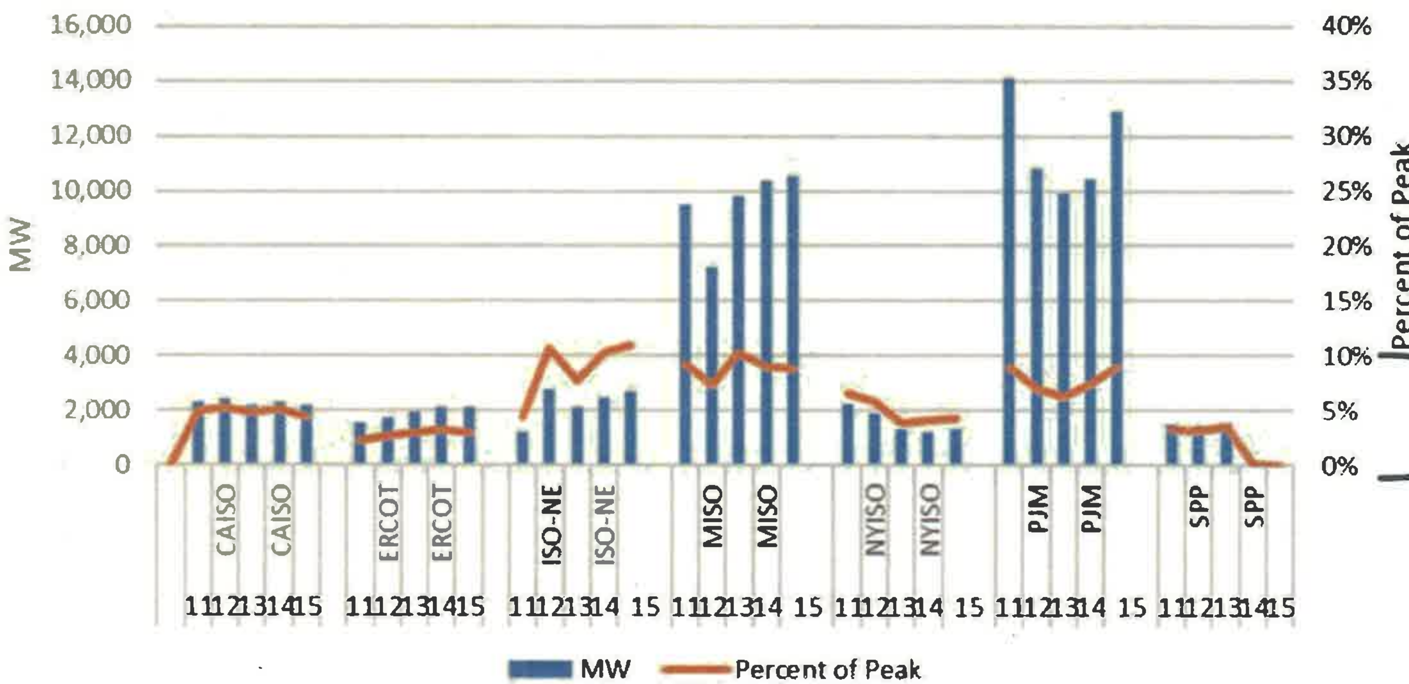
"C&I" is medium and large commercial & industrial **(12.5 GW)**

"Mass Market" is residential and small commercial **(6.9 GW)**

Footnote 1: Other includes mass market other programs (e.g. pool pumps) and C&I other programs (e.g. irrigation control).
Source: Smart Electric Power Alliance (SEPA), 2019 Utility Demand Response Market Snapshot. N=190 Utility Survey participants.

DR Resources in Wholesale Markets

Figure 7. DR Resources in Wholesale Markets of RTOs/Independent System Operators and Associated Peak Load Reduction



Typically **<u>less than 10%</u>** of the system peak.

Source: Demand Response Potential in BPA's Public Utility Service Area (Mar. 2018)

RATE BASED DEMAND RESPONSE

TIME VARYING RATES AND DEMAND CHARGES

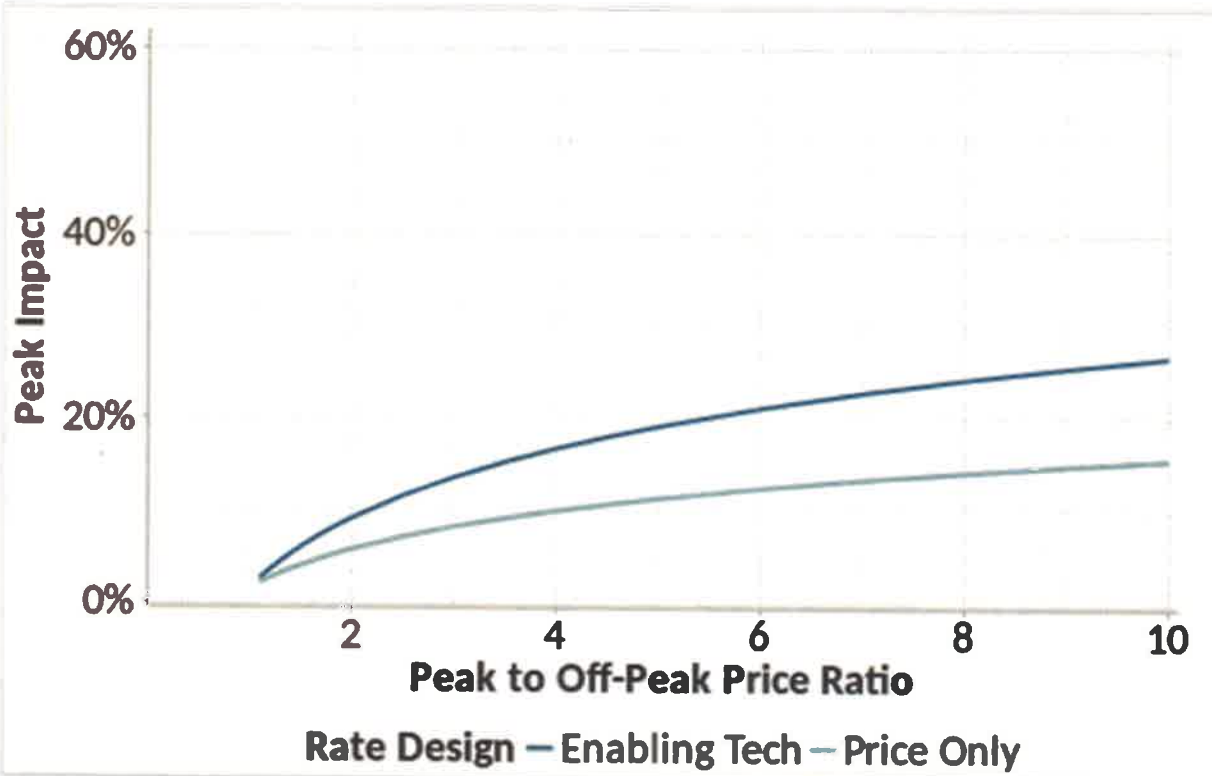
BENTON P·U·D

Research indicates customers do respond to time varying rates

Potential for **significant <u>customer peak</u> reductions,** <u>especially with technology</u>.

The Brattle Group Presentation, June 12, 2019: <u>A Meta Analysis of Time-Varying Rates</u>: The Arcturus Database. Ahmad Faruqui and Cecile Bourbonnais. Arcturus is a database containing the results of 349 experimental and non-experimental pricing treatments from over 60 pilots.

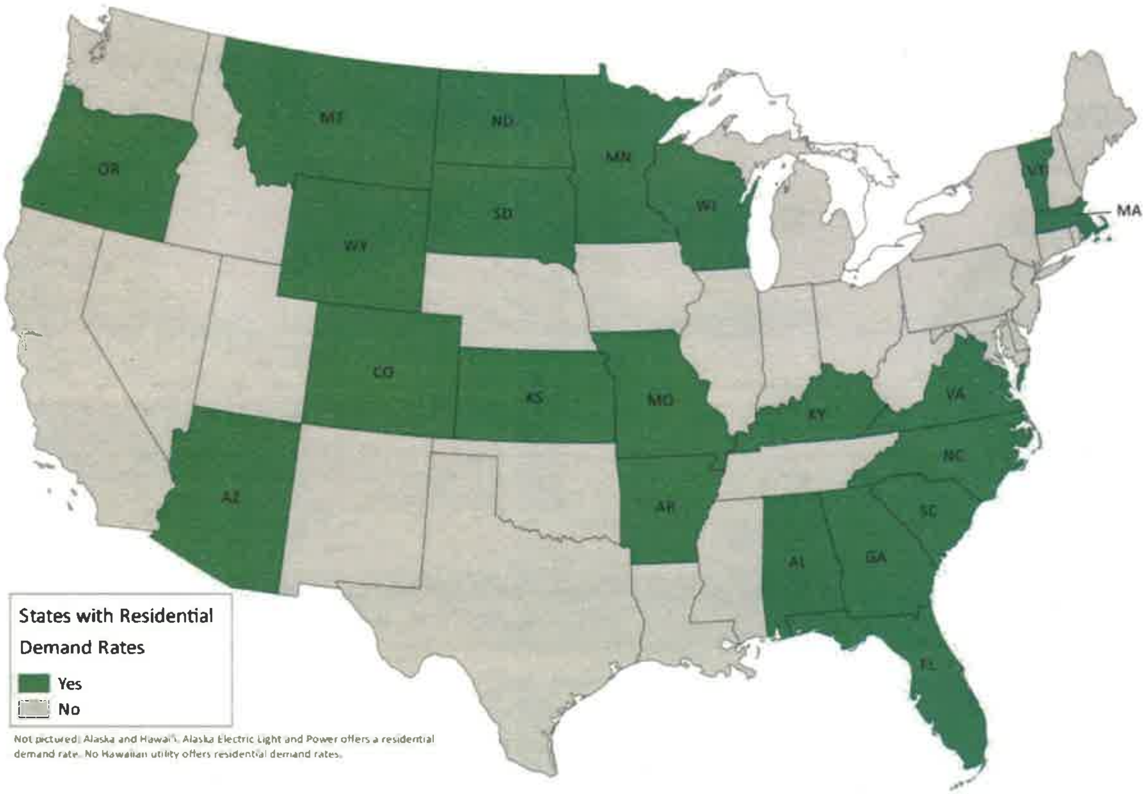
Higher peak prices drive higher customer response



Higher ratio results in a **higher <u>customer peak</u> impact %,** <u>especially with technology</u>.

The Brattle Group Presentation, June 12, 2019: <u>A Meta Analysis of Time-Varying Rates</u>: The Arcturus Database, Ahmad Faruqui and Cecile Bourbonnais. Arcturus is a database containing the results of 349 experimental and non-experimental pricing treatments from over 60 pilots.

Residential demand charges are being offered in 22 states



Demand charges <u>historically used for C&I customers</u>, but **beginning to appear for residential** customers.

Staggering the use of a few key appliances reduces demand

Avg. Demand Over 30-min

Appliance	Avg. Demand (kW)
Dryer	4.0
Oven	2.0
Stove	1.0
Hand iron	0.5
Misc. plug loads	0.2
Lighting	0.3
Refrigerator	0.5
Total	**8.5**

$\left.\begin{array}{l}\text{Dryer} \\ \text{Oven} \\ \text{Stove} \\ \text{Hand iron}\end{array}\right\}$ **Flexible Load (7.5 kW)**

$\left.\begin{array}{l}\text{Misc. plug loads} \\ \text{Lighting} \\ \text{Refrigerator}\end{array}\right\}$ **Inflexible Load (1 kW)**

Comments

- Use of some of the appliances is inflexible (1 kW)
- Use of other appliances could be easily staggered to reduce demand
- Simply delaying use of the dryer until after the oven, stove, and hand iron had been turned off would reduce the customer's maximum demand by 3.5 kW
- This would bring the customer's maximum demand down to 5 kW, a **roughly 40% reduction in demand**

Source: The Brattle Group Presentation, May 2015. Rolling Out Residential Demand Charges. Presented to EUCI Residential Demand Charges Summit. Presented by Ryan Hledik.

Model of residential customer response to demand charges

Average Change in Residential Load Profile Due to Price Response

	Without Tech	With Tech
Customer max demand	-5.3%	**-22.0%**
Class peak demand	-1.7%	**-3.1%**
System peak-coincident demand	-1.5%	**-3.0%**
Annual consumption	0.2%	**0.2%**

System level % peak reduction is **lower than a single customer**

With technology,
% peak reduction **is much higher.**

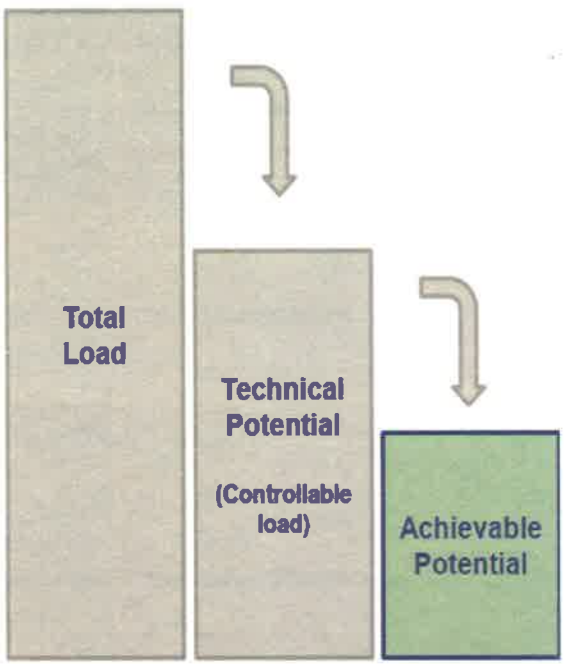
Source: The Brattle Group Presentation, May 2015 Rolling Out Residential Demand Charges, Presented to EUCI Residential Demand Charges Summit, Presented by Ryan Hledik. Data is from a model developed by the Brattle Group to simulate customer response to demand charges.

DEMAND RESPONSE POTENTIAL

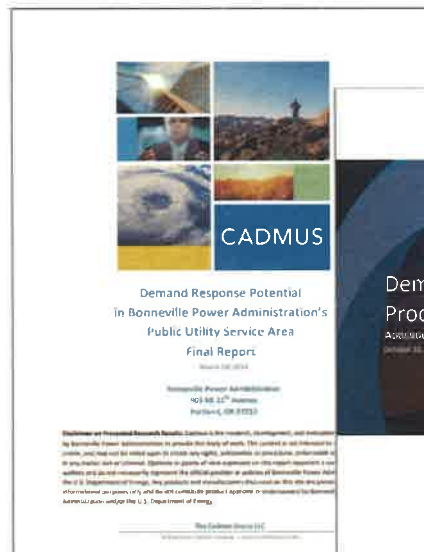
BPA'S POTENTIAL ASSESSMENT FOR THE TRI-CITIES

BENTON P·U·D

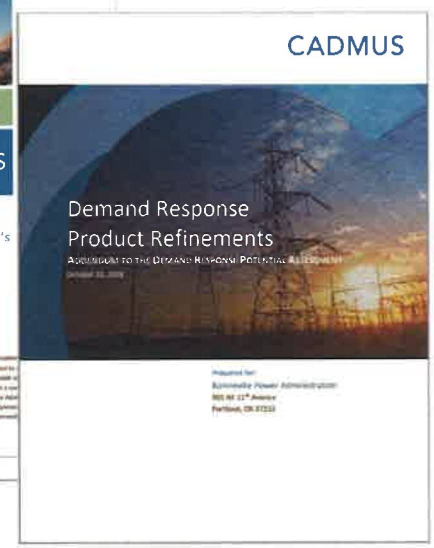
BPA Completes DR Study in 2018



- Demand Response Potential in BPA's Public Utility Service Area
- Demand Response Product Refinements – *Addendum to the Demand Response Potential Assessment*

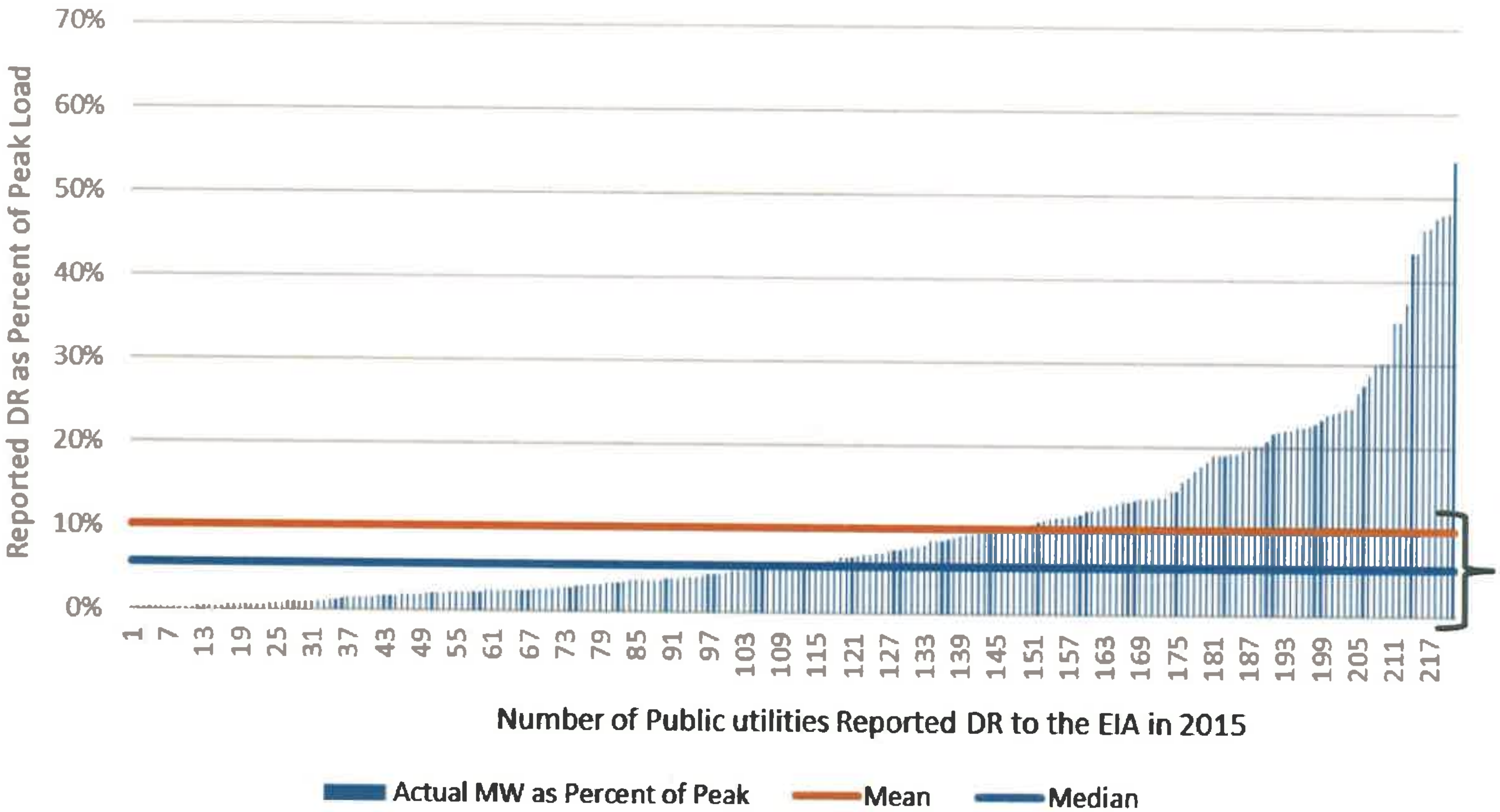


Mar. 2018



Oct. 2018

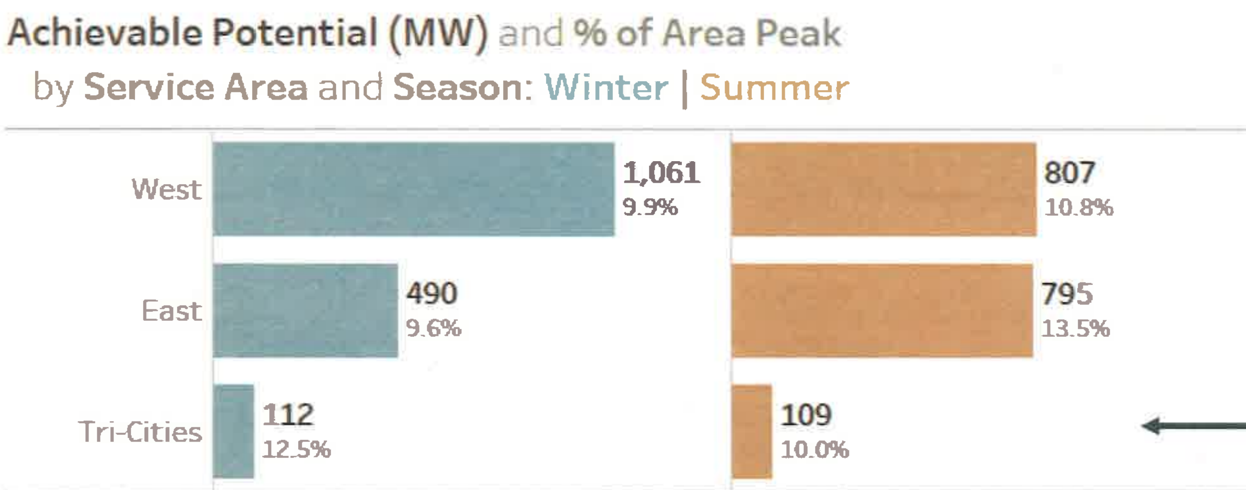
Figure 8. Utility DR Capability as Percent of Peak—Public Utilities (2015)



Average is 10%, but over half are less than 10%.

Source: Demand Response Potential in BPA's Public Utility Service Area (Mar. 2018). Data from 222 public utilities reporting to EIA.

BPA's System and Tri-Cities DR Potential



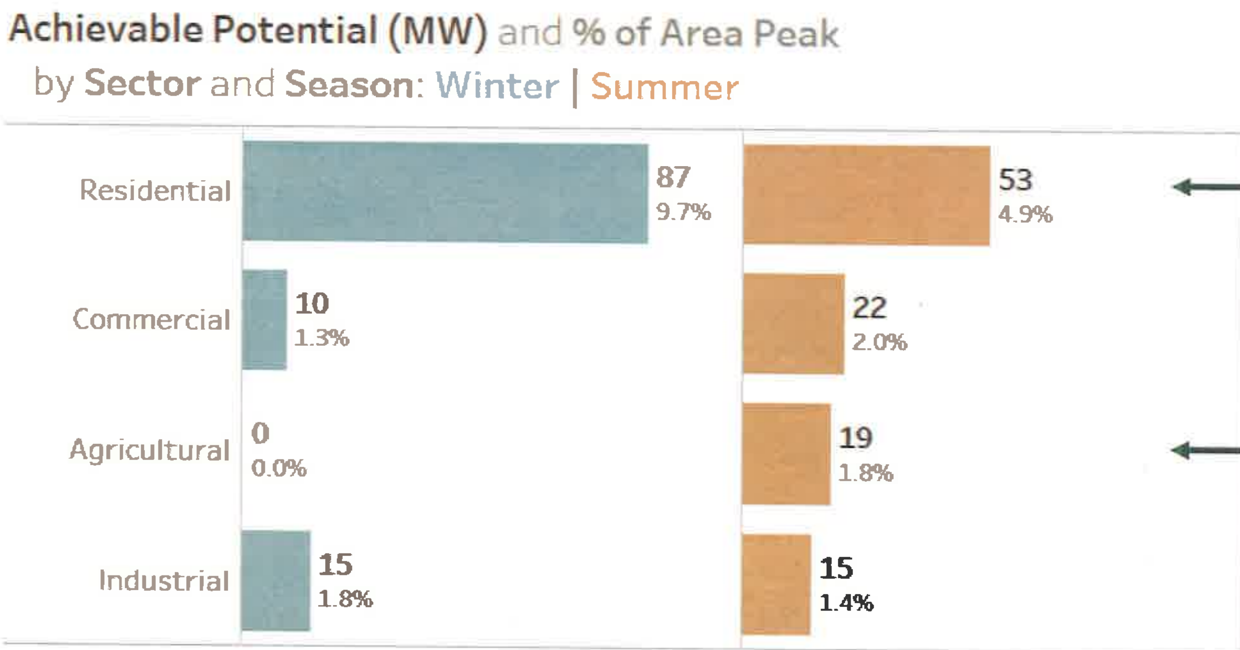
Potential is all of Tri-Cities, District's potential is less.

Assuming 40% of total, District total potential is:

- Winter = **45 MW**
- Summer = **44 MW**

Source: Demand Response Potential in BPA's Public Utility Service Area (Mar. 2018)

BPA's Tri-Cities DR Potential by Sector



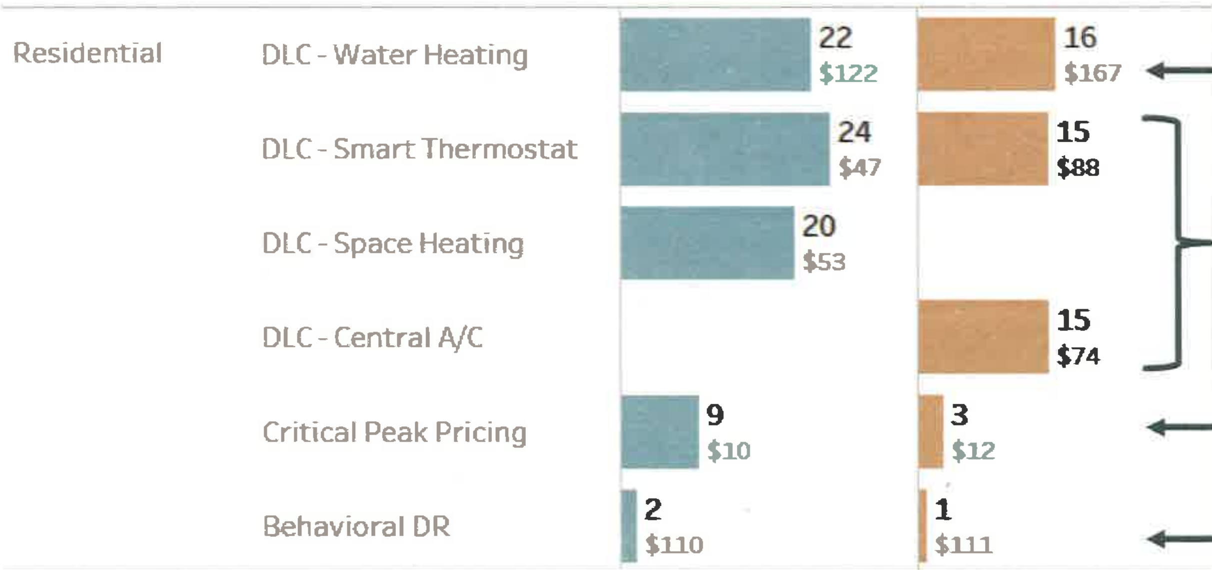
Highest potential, especially winter

District potential is estimated to be **5-10 MW**

Source: Demand Response Potential in BPA's Public Utility Service Area (Mar. 2018).

BPA's Tri-Cities DR Potential by Sector and Program Type

Achievable Potential (MW) and **20-Year Levelized Cost ($)/kW-yr**
by **Sector**, **Program Type** and **Season**: Winter | Summer



High potential, highest cost

Programs with
High potential and lower costs

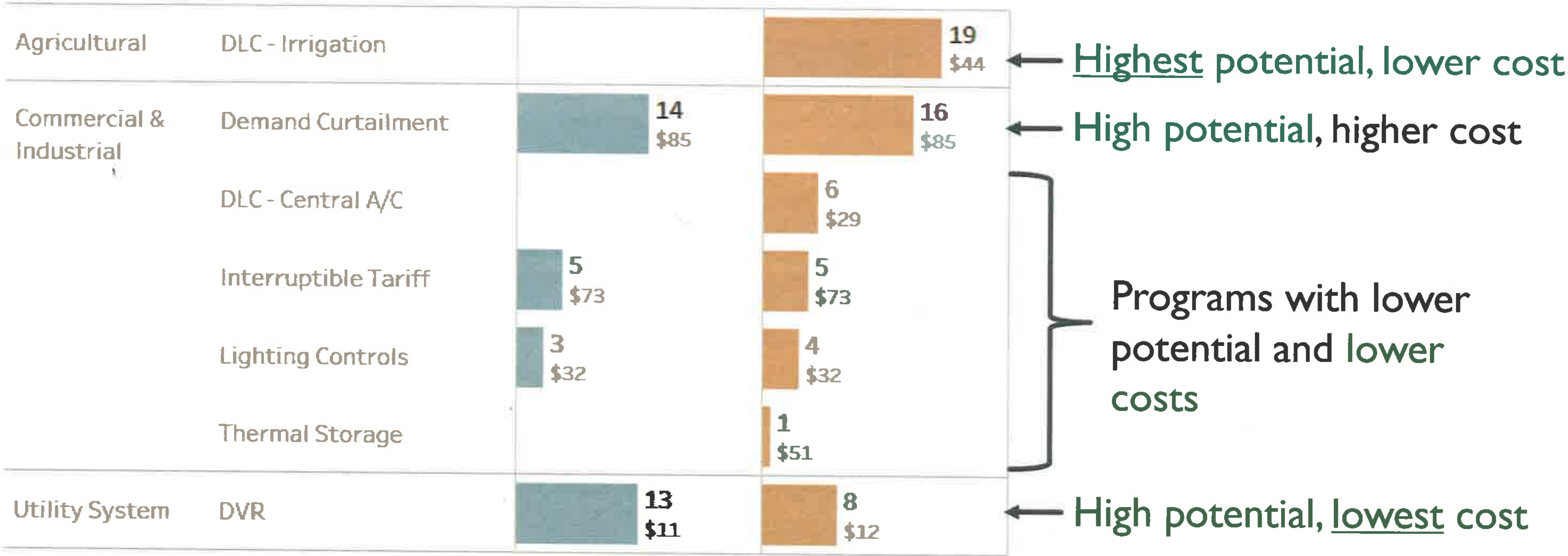
Low potential, lowest cost

Lowest potential, high cost

Note: DLC = Direct Load Control, Central A/C = Central Air Conditioning. Critical Peak Pricing is assumed incremental potential for an existing Time-of-Use rate.
Source: Demand Response Potential in BPA's Public Utility Service Area (Mar. 2018). Excluding Industrial Real Time Pricing (<1MW).

BPA's Tri-Cities DR Potential by Sector and Program Type (cont.)

Achievable Potential (MW) and **20-Year Levelized Cost ($)/kW-yr**
by **Sector**, **Program Type** and **Season**: Winter | Summer



Note: DLC = Direct Load Control, Central A/C = Central Air Conditioning, DVR = Dynamic Voltage Reduction
Source: Demand Response Potential in BPA's Public Utility Service Area (Mar. 2018). Excluding industrial Real Time Pricing (<1MW).

CHALLENGES & OPPORTUNITIES

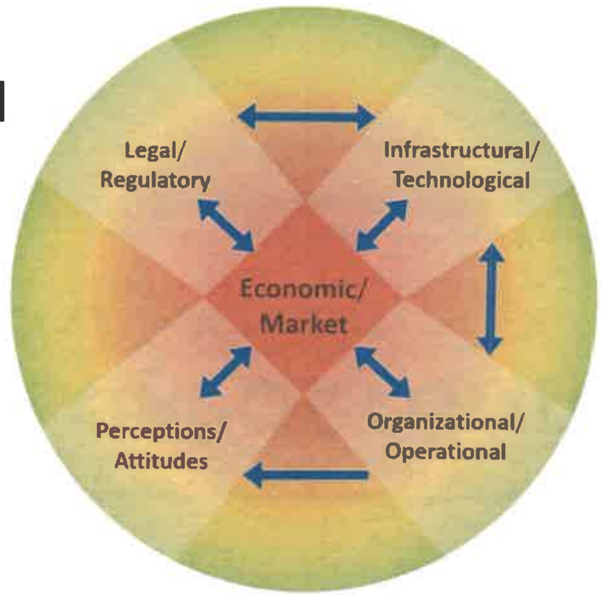
BPA'S SURVEY AND THE DISTRICT'S ENVIRONMENT

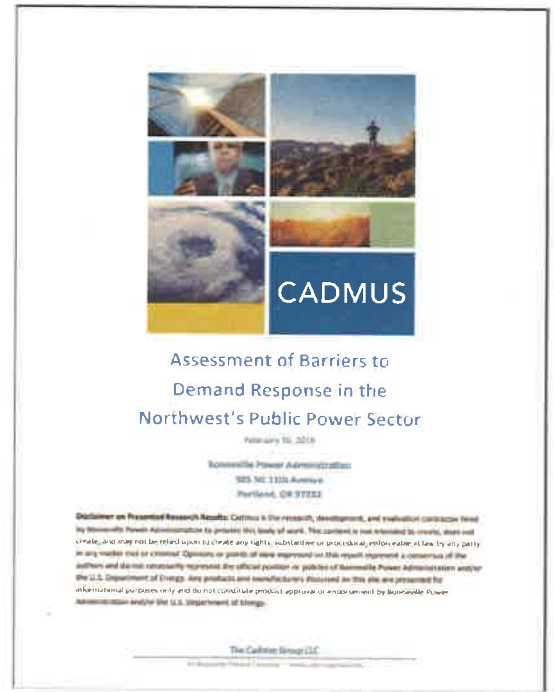
BPA's Assessment of Barriers to DR in the Northwest

454 end user surveys
68 interviews
69 barriers surveys
30+ barriers identified

BPA has begun taking steps to **mitigate the barriers** identified by the assessment.

Figure 2. Barrier Criticality and Relationships





Feb. 2018

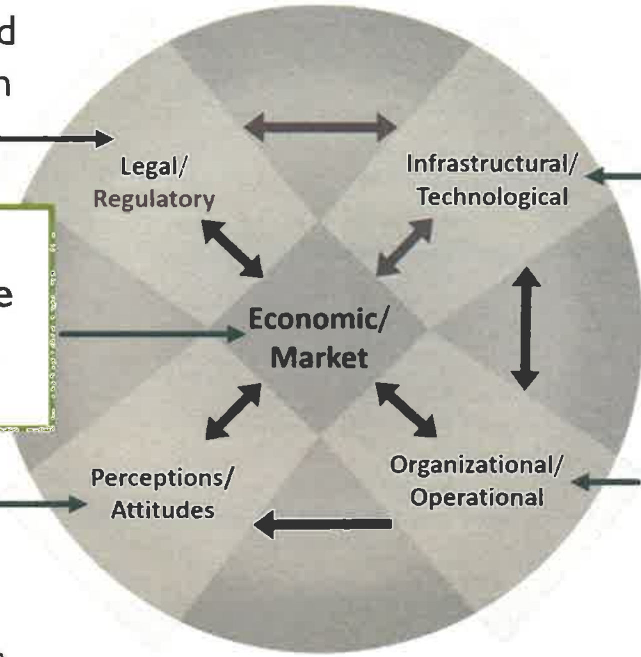
Assessing the District's Environment for DR

District subject to Integrated Resource Planning **(IRP)** and Clean Energy Transformation Act **(CETA)** requirements

District should move towards an **IRP process that evaluates the economic potential of DR** as a capacity resource.

District **areas of concern**:

- Initial startup costs
- Implementation complexity
- Workforce impact/resources
- Unknown customer perceptions



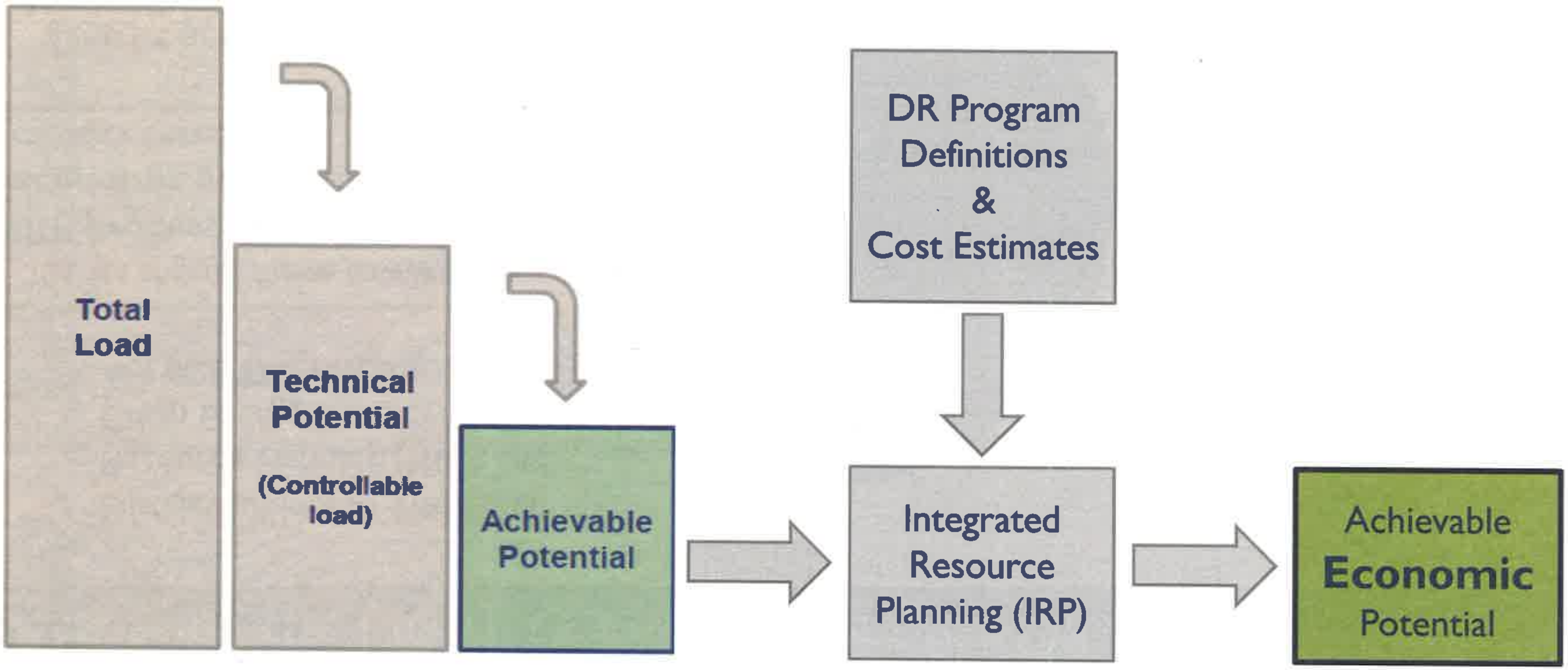
District's **enabling technology**:

- AMI infrastructure
- Meter Data Management
- Customer Information System
- SmartHub Customer Portal

District **areas of strength**:

- Conservation team
- Customer engagement strategy
- Technology project success
- Highly collaborative departments

Achievable Economic Potential



CLEAN ENERGY TRANSFORMATION ACT

REQUIREMENT FOR UTILITIES TO PURSUE DEMAND RESPONSE

Clean Energy Transformation Act (CETA)

- **RCW 19.405.030 – Eliminate coal by 12/31/2025**
- **RCW 19.405.040 – Greenhouse gas neutral by 1/1/2030:**
  - "(6)(a) In meeting the standard under subsection (1) of this section, an electric utility **must**, consistent with the requirements of RCW 19.285.040, if applicable, **pursue all cost-effective, reliable, and feasible** conservation and efficiency resources, and **demand response**…"
- **RCW 19.405.050 – 100% clean energy resources by 1/1/2045:**
  - "(3) In planning to meet projected demand consistent with the requirements of subsection (2) of this section and RCW 19.285.040, if applicable, an electric utility **must pursue all cost-effective, reliable, and feasible** conservation and efficiency resources, and **demand response**…"
- **RCW 19.405.060** – Develop 4-year clean energy implementation plan by 1/1/2022
- **RCW 19.280.030** – Develop 10-year clean energy action plan within IRP

A PATH FORWARD

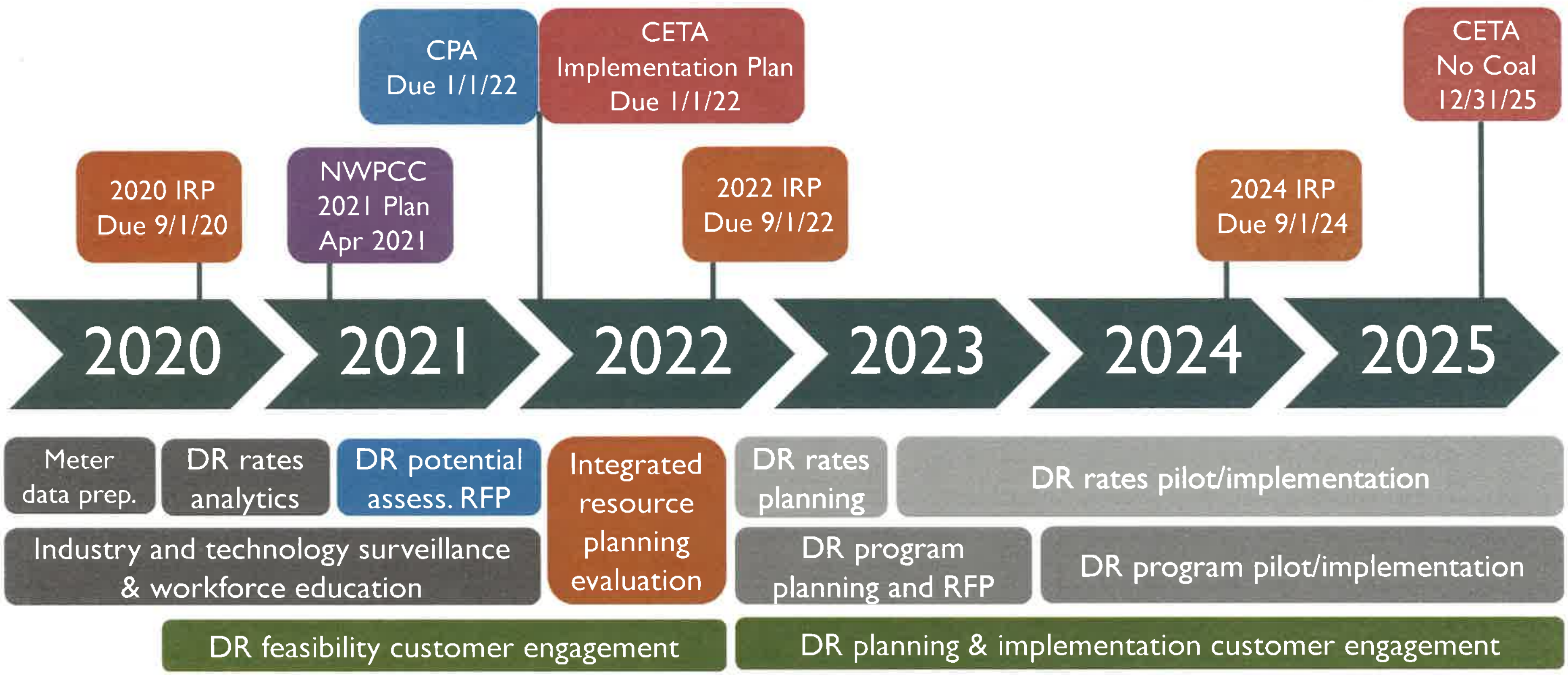
RECOMMENDED STRATEGIC ACTIONS

Should the District consider demand response as a capacity resource?

YES

Recommend the District evaluate demand response programs, including rate based options, for **cost effectiveness, reliability and feasibility** as a capacity resource.

Timeline of a Path Forward for Demand Response



Note: CETA = Clean Energy Transformation Act, CPA = Conservation Potential Assessment, DR = Demand Response, IRP = Integrated Resource Plan, NWPCC = Northwest Power and Conservation Council, RFP = Request for Proposal. ** TIMELINE IS PRELIMINARY FOR FACILITATING ADDITIONAL PLANNING DISCUSSION **