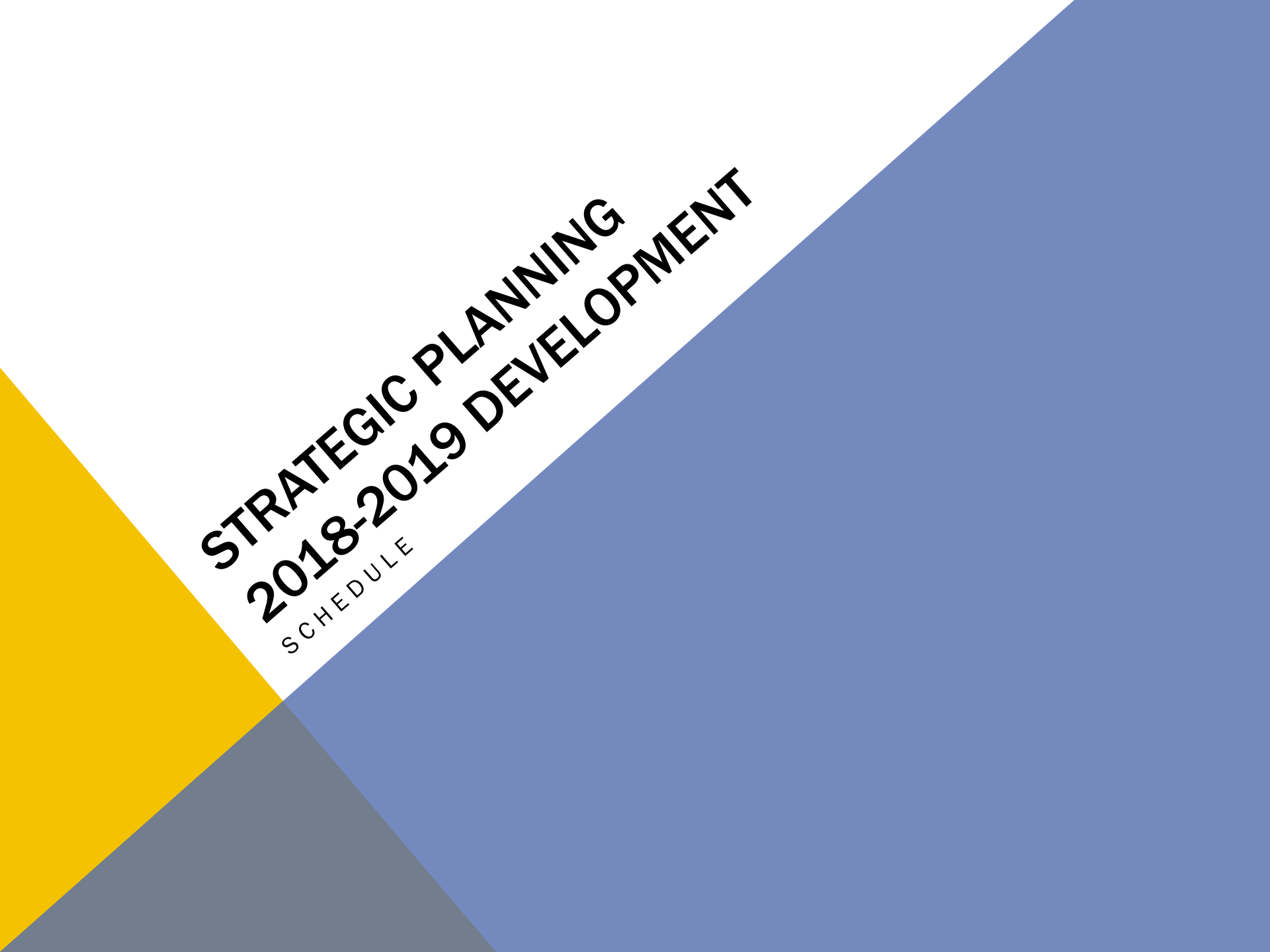




STRATEGIC PLANNING 2018-2019 DEVELOPMENT

SCHEDULE

STRATEGIC PLANNING - 2017

May 2

Completed

- Broadband

May 23

Completed

- Key Power Supply Issues
- Finance & Rates

June 13

Completed

- Customer Engagement
- Emerging Technologies
- Capital Planning

July 11

Recap & Potential Action Items for Discussion

Today

MEETING SCHEDULE – DUE DATES

- Aug 15th: Plug Into Your Future: Rates
- Aug 30th: Plug Into Your Future: Utility 2.0
- Sept 20th: Plug Into Your Future: Broadband
- Sept 26th: Commission: First Draft: Strategic Environment and Actions
- Sept 27th: Plug Into Your Future: Emerging Technologies
- Oct 24th: Commission: Final Draft: Strategic Environment and Actions
- Dec 12th: Commission: Strategic Plan (and Budget) Approval

1

Utility 2.0: Legacy, Uncertainty, Opportunity

July 11, 2017

Greatest Engineering Achievement of the 20th Century¹

2



“.....the workhorse of the modern world.”

¹National Academy of Engineering

Utility Industry: Regulated Monopoly

3



Natural Monopoly

- Large capital investments
- Economies of scale

Reliability

Safety

Price Stability

- Customer protection
- Financial viability

Essential service for society's well-being

Utility 2.0

4

**Technology Change
+ Customer Expectations
+ Regulatory¹ Change**

**Unprecedented Change to
the Utility Business Model**

¹ Includes legislative, initiative, exec. order



Fundamental Concepts

- ❑ **All Megawatts are Not Equal**
- ❑ **All U.S. Electric Regions are Not Equal**
- ❑ **All Northwest Utilities are Not Equal**

All Megawatts are Not Equal

6

1. Energy Value

- ▣ Average megawatts produced over the year

2. Peak Capacity Value

- ▣ Ability to “ramp-up” to meet peak power loads

3. Flexibility Value

- ▣ Ability to match resource to loads, instantaneously
- ▣ Storage solutions may be coming, but not here yet

4. Transmission Support Value

- ▣ Voltage stability to the transmission grid

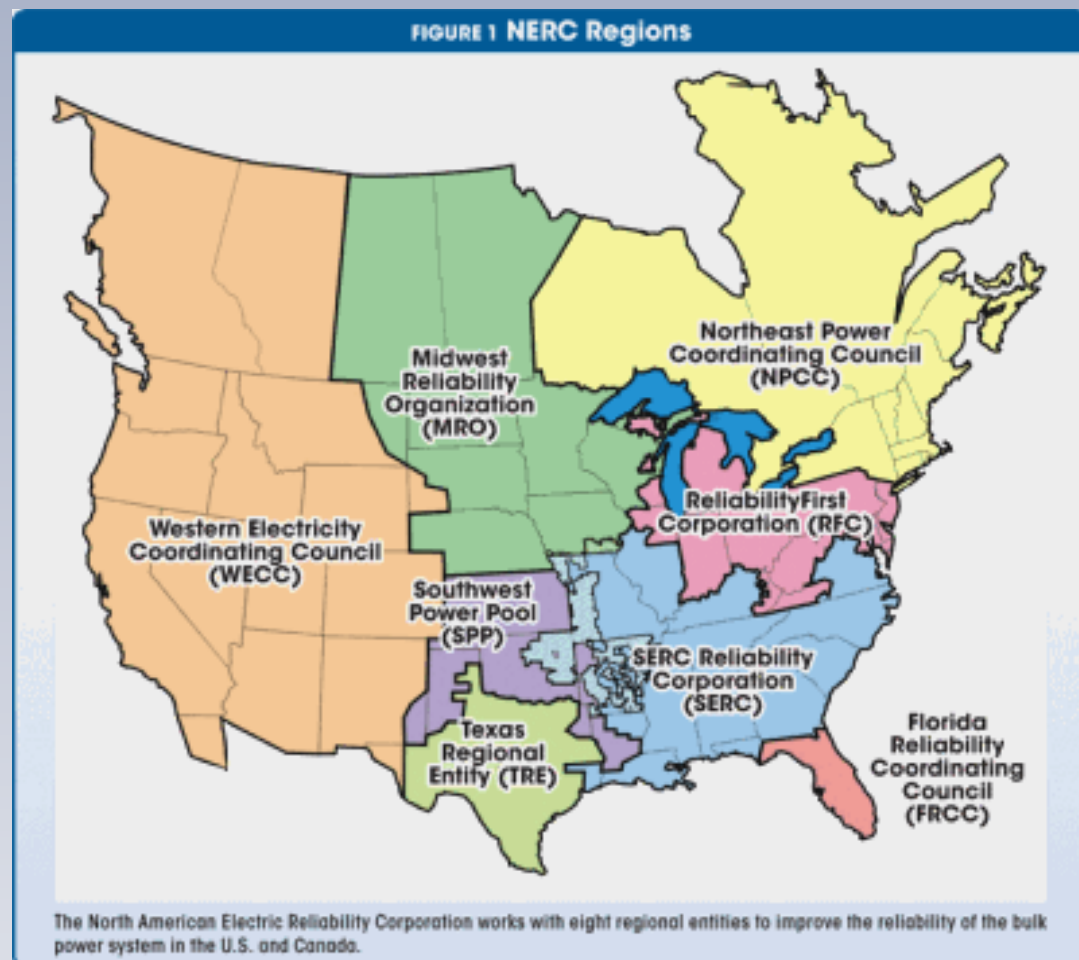
All Electric Regions are Not Equal

7

**North American Electric
Reliability Corporation
(NERC)**

**Last Line of Defense for
Electric Reliability**

- **8 reliability regions**
- **8 governance structures**
- **Fuel source dependencies**
- **Transmission constraints**



All Northwest Utilities are Not Equal

8

1. Primary fuel source may be different
 - ▣ Hydro, nuclear, natural gas, coal, wind
2. Governance structure may be different
 - ▣ For profit (investor-owned)
 - ▣ Not-for-profit (consumer-owned)
3. Consumer-owned utilities may be different
 - ▣ Dam ownership: Chelan, Grant, Douglas
 - ▣ BPA¹ contracts: which may also be different

¹ Bonneville Power Administration

So What's Changing?

- ☐ **Technology**
- ☐ **Customer Expectations**
- ☐ **Regulatory**

Technological Landscape

10



Technology is a good thing, but can be extremely disruptive!

Shale hydraulic fracturing

Smart grid integration

Solar efficiency and price

Energy efficiency

Somewhere on the horizon, but coming fast:

Battery storage



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Regulatory Policy

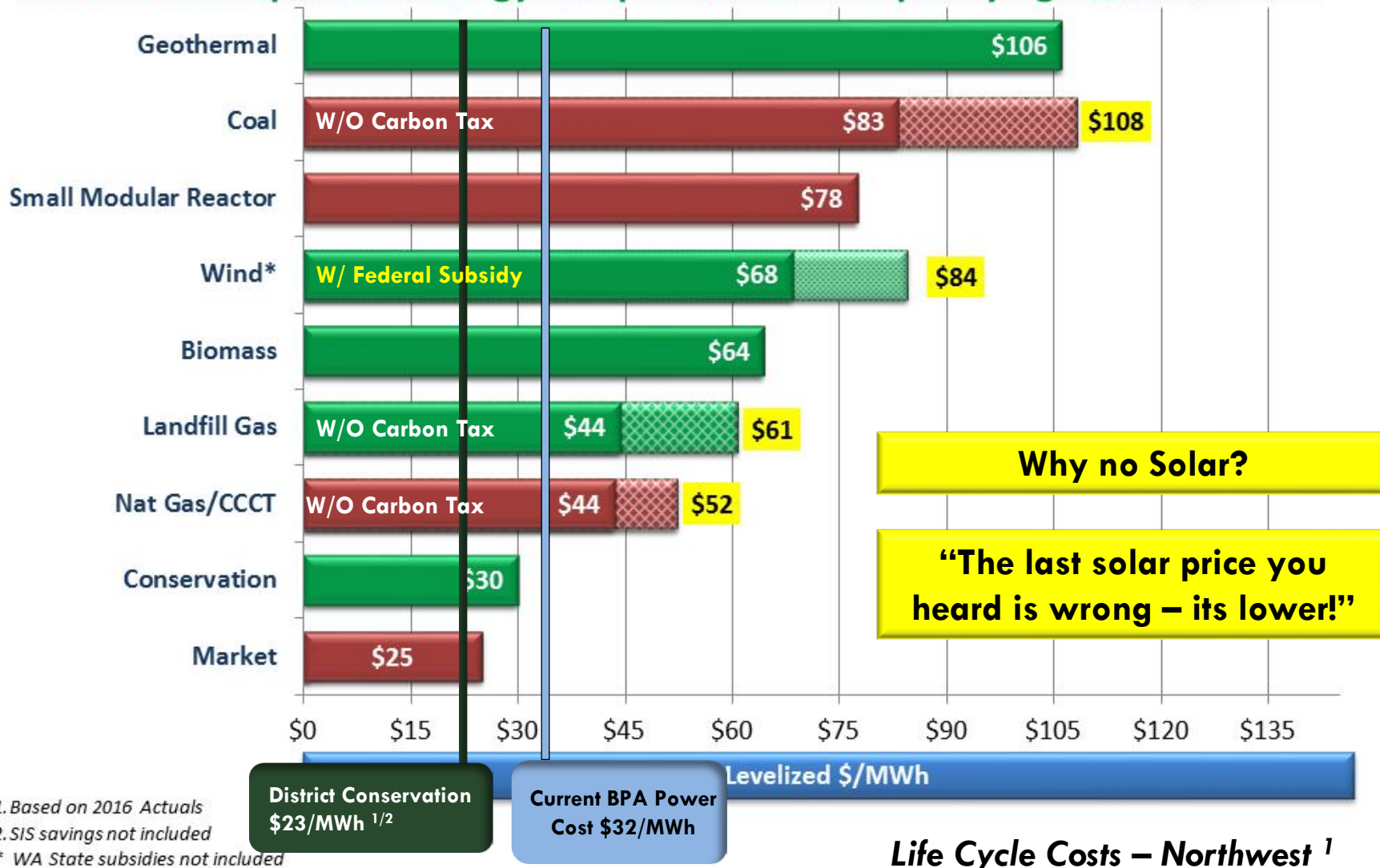
- Energy efficiency
- Renewable Portfolio Standards
- Carbon abatement
- Net metering (primarily rooftop solar)
 - ▣ Sell excess generation to utility
 - ▣ Reimbursement at full retail rate
- Incentives/tax credits
 - ▣ Important disclaimer! Costs can change quickly



Regulatory Impacts on Resource Costs

12

Green bars represent Energy Independence Act "qualifying resources"



1. Based on 2016 Actuals

2. SIS savings not included

* WA State subsidies not included

1 – Based on Northwest Utility 2016 Integrated Resource Plans

Note: Costs can vary considerably in other regions and change significantly in one year

Unprecedented Change

13

Change Drivers

- Technology
- Customer expectations
- Regulatory Policy

Impacts

More wind/solar

Non-utility entrants

Expanded customer choice

Flat/declining utility loads

Devalued infrastructure

??????????

??????????

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- Seeing absolutely dramatic changes in the industry
- Caused by rooftop solar units, community choice aggregation efforts, battery storage and direct access service for commercial and industrial customers
- As much as 25 percent of retail load formerly provided by investor-owned utilities, or IOUs, will be served by non-IOU sources later this year
- **No central strategy or coherent plan** for dealing with all this change

Michael Picker, President
California Public Utilities Commission
May 19, 2017

As reported in Public Power Daily May 23, 2017 DRAFT REV 0

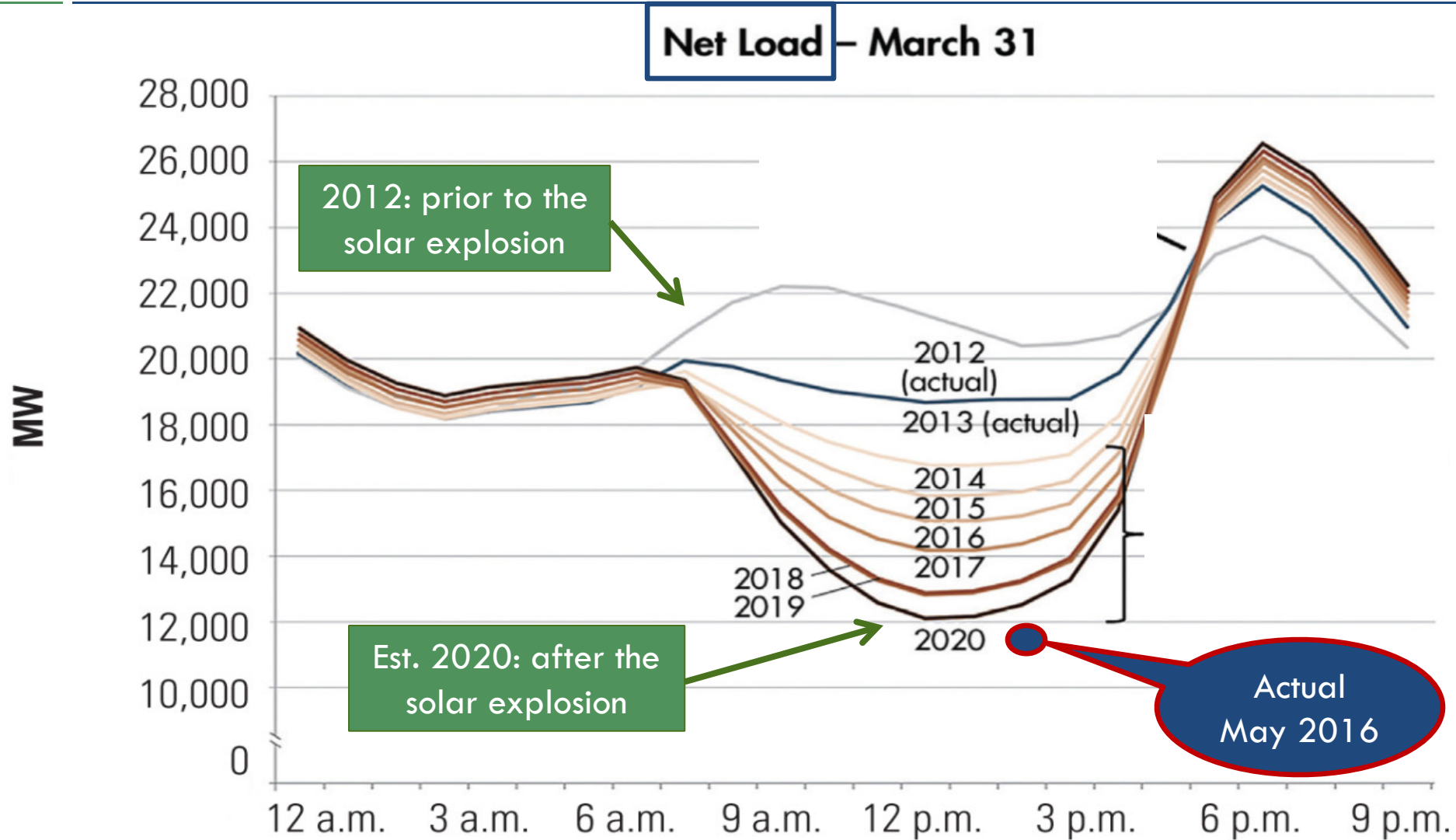
California Solar Explosion

15

- Both rooftop & utility-scale solar
- Driven by:
 - ▣ Plentiful sun
 - ▣ High retail rates
 - ▣ Renewable portfolio standards – **50%** by 2030
 - 100% by 2045?
 - ▣ Liberal net metering policies
 - ▣ End result: shortened payback period
- Significant concerns pertaining to reliability impacts

Regulatory Impact

California Duck Curve (2014 forecast)



Net Load: Served by traditional dispatchable generation, such as natural gas and nuclear.

Implications of the Duck Curve On the Northwest

17



Can the Northwest adapt to CA?

Northwest Power Picture

2007

18

- **Stable electricity supply**
- **Low carbon electric sector**
- **Relatively low electric rates**

What happened?

2017

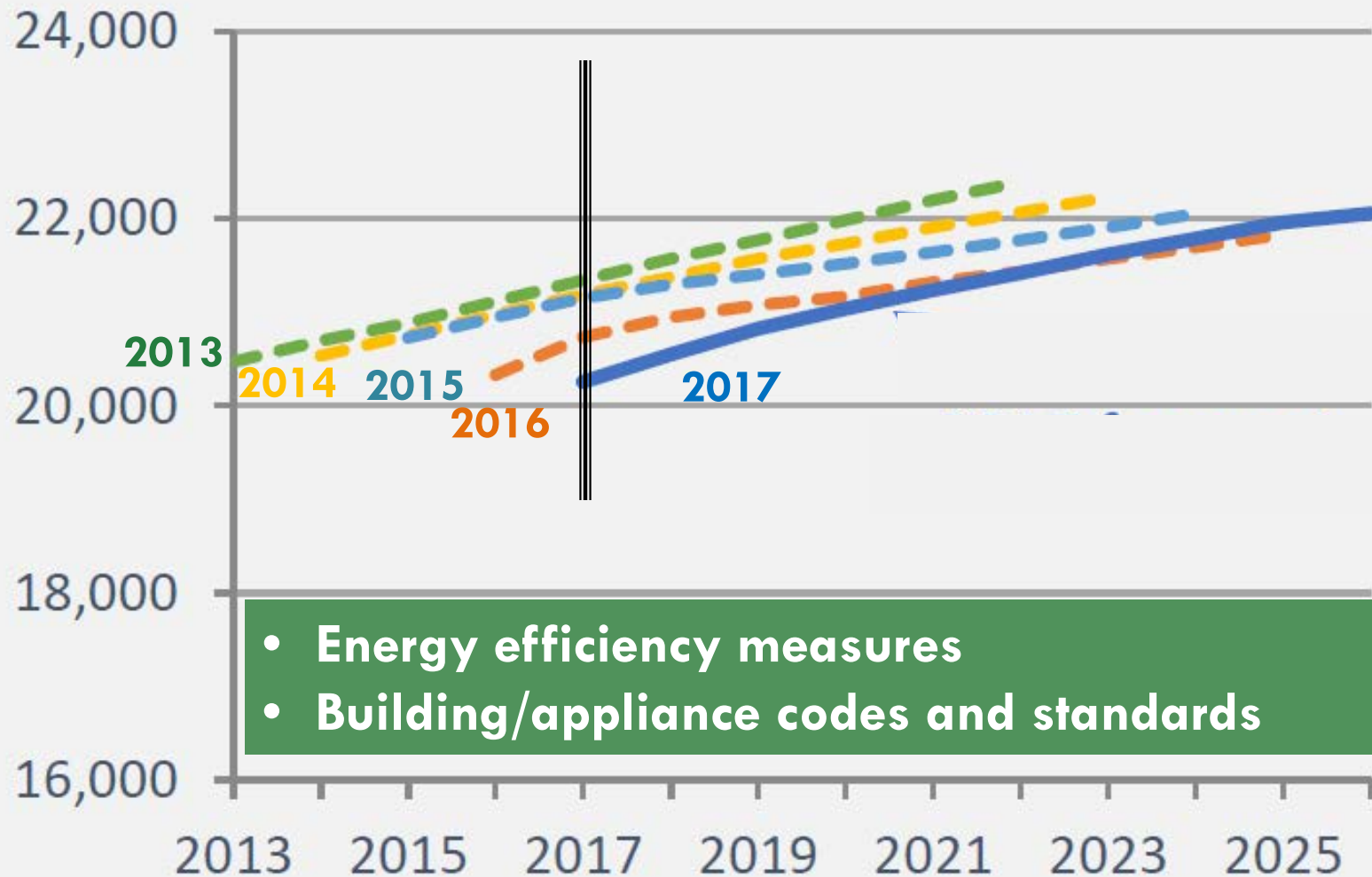
- **Surplus energy**
- **Winter peak problem**
- **Lower carbon**
- **Rising electric rates**



Load Forecast Slips Again

forecast years 2013 - 2017

ANNUAL ENERGY - MWh



- Energy efficiency measures
- Building/appliance codes and standards

WIND GENERATION CAPACITY IN THE BPA BALANCING AUTHORITY AREA

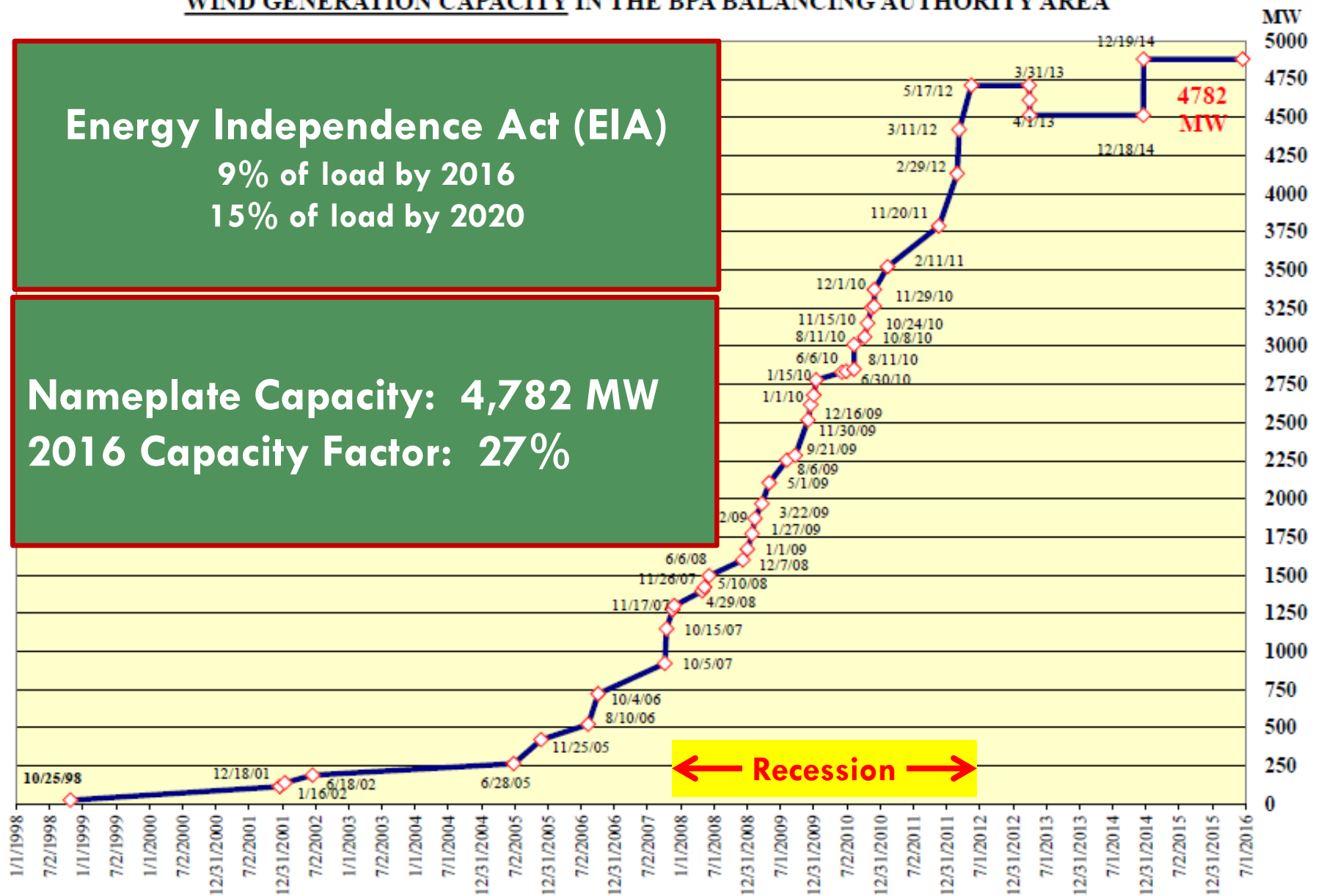
Energy Independence Act (EIA)

9% of load by 2016

15% of load by 2020

Nameplate Capacity: 4,782 MW

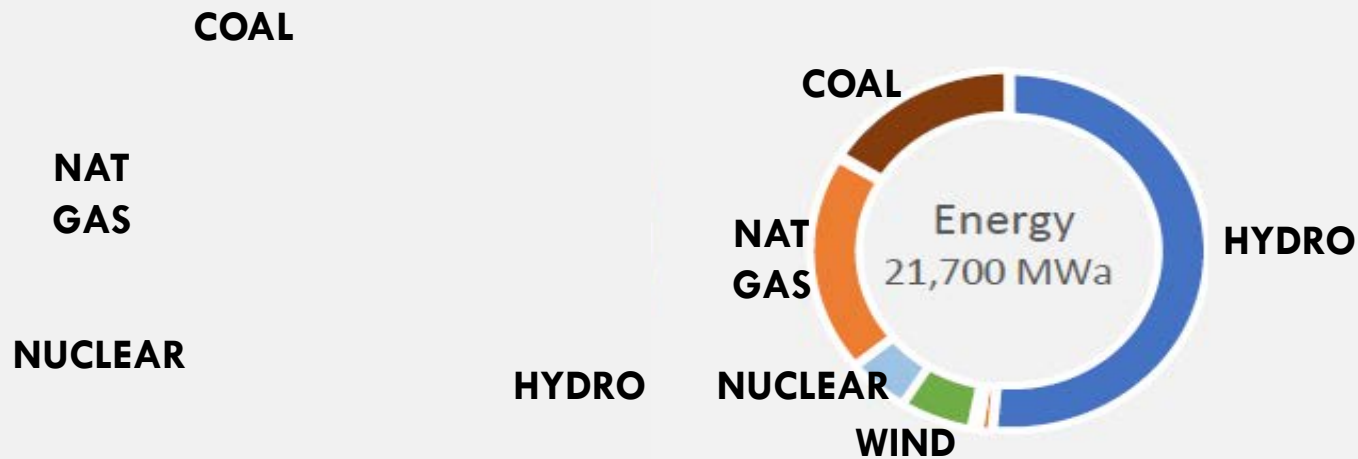
2016 Capacity Factor: 27%



Energy Value vs. Winter Peak Capacity Value

21

Make Up of Existing Generation Pacific Northwest

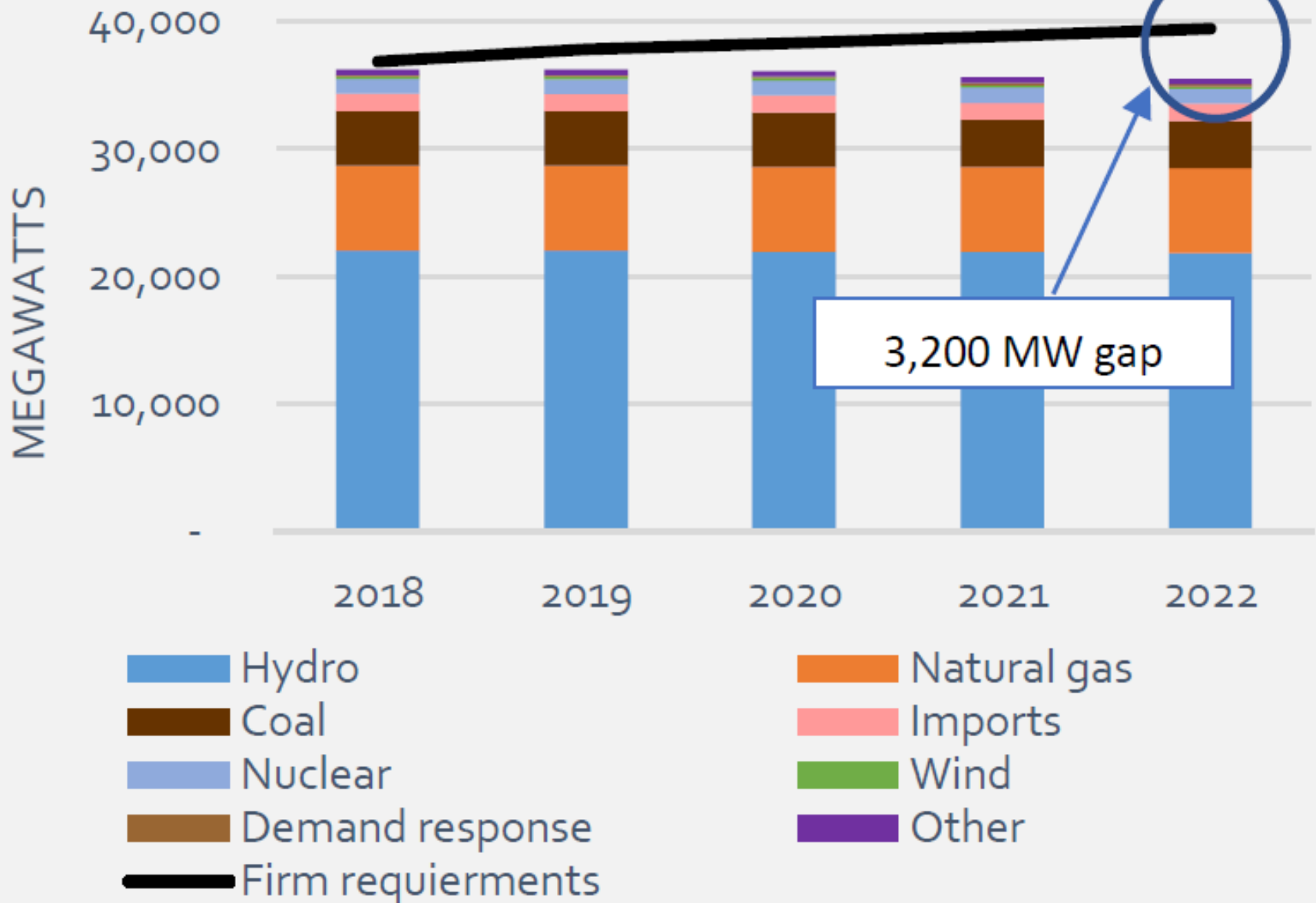


■ Hydro
■ Wind
■ Natural Gas

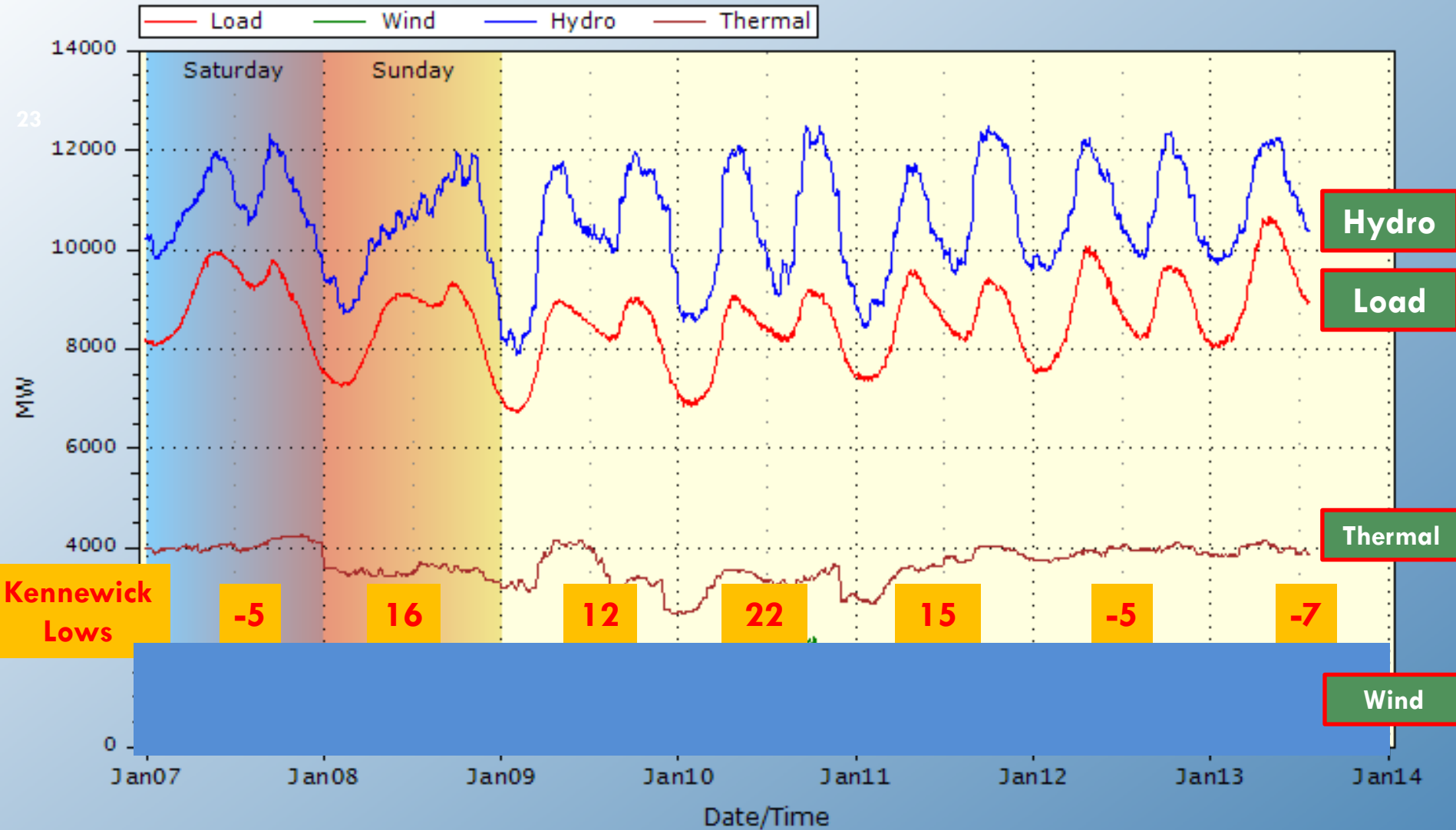
■ Renewables-Other
■ Nuclear
■ Cogeneration

■ Solar
■ Small Thermal & Miscellaneous
■ Coal

Focus on Winter Peak



BPA Balancing Authority Load & Total Wind, Hydro, and Thermal Generation, Last 7 days
 07Jan2017 - 14Jan2017 (last updated 13Jan2017 13:21:01)



Replace Snake River Dams with Wind?

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Unprecedented Change

24

Change Drivers

- Regulatory Policy
- Technology
- Customer expectations

Impacts

More wind/solar

Non-utility entrants

Expanded customer choice

Flat/declining utility loads

Devalued infrastructure

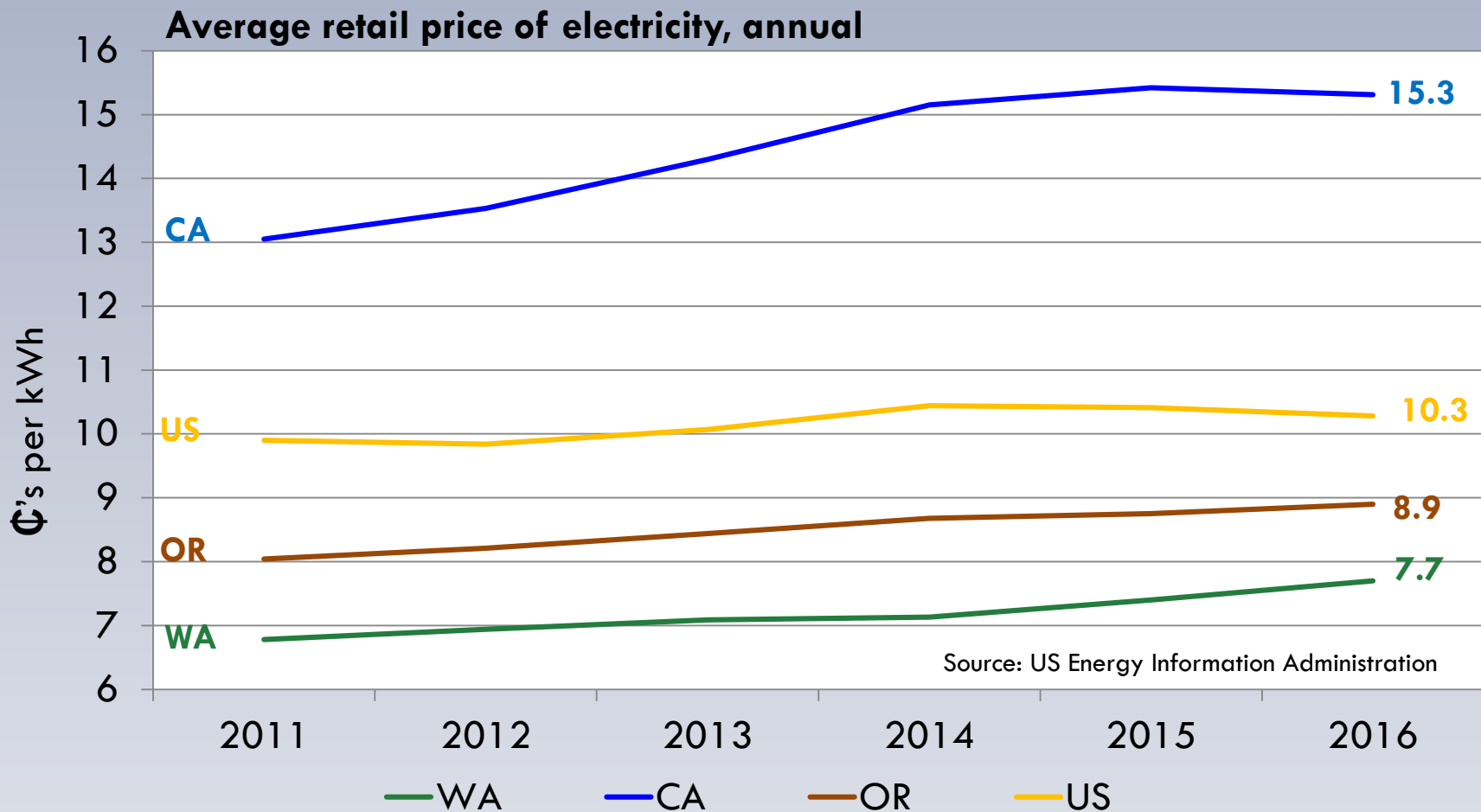
Lower energy prices

Higher retail rates

Huh???

Lower Energy Prices but Higher Rates?

25

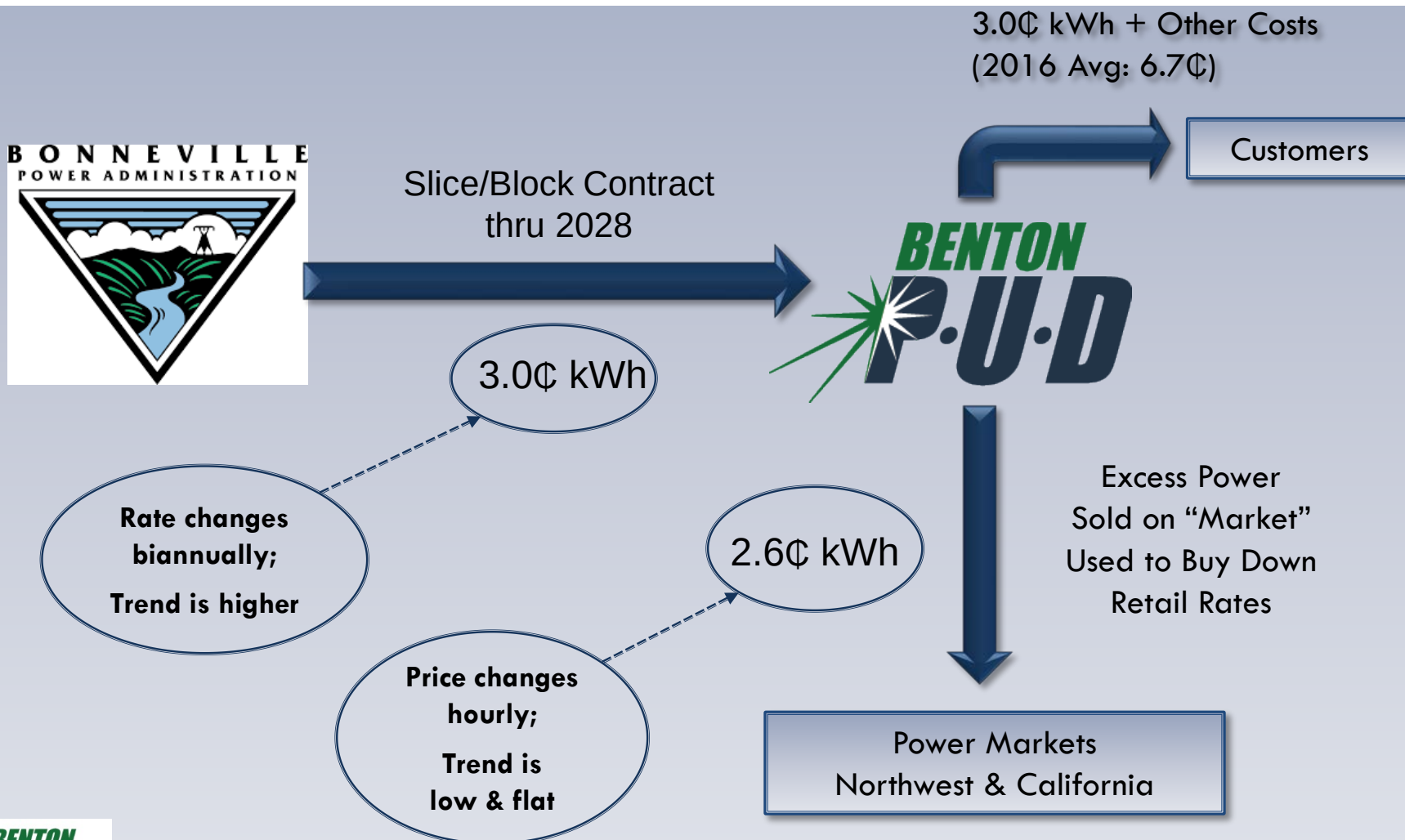


How “Surplus” Power Sales Work

Simplified Example

Many NW utilities have surplus sales – particularly BPA

26



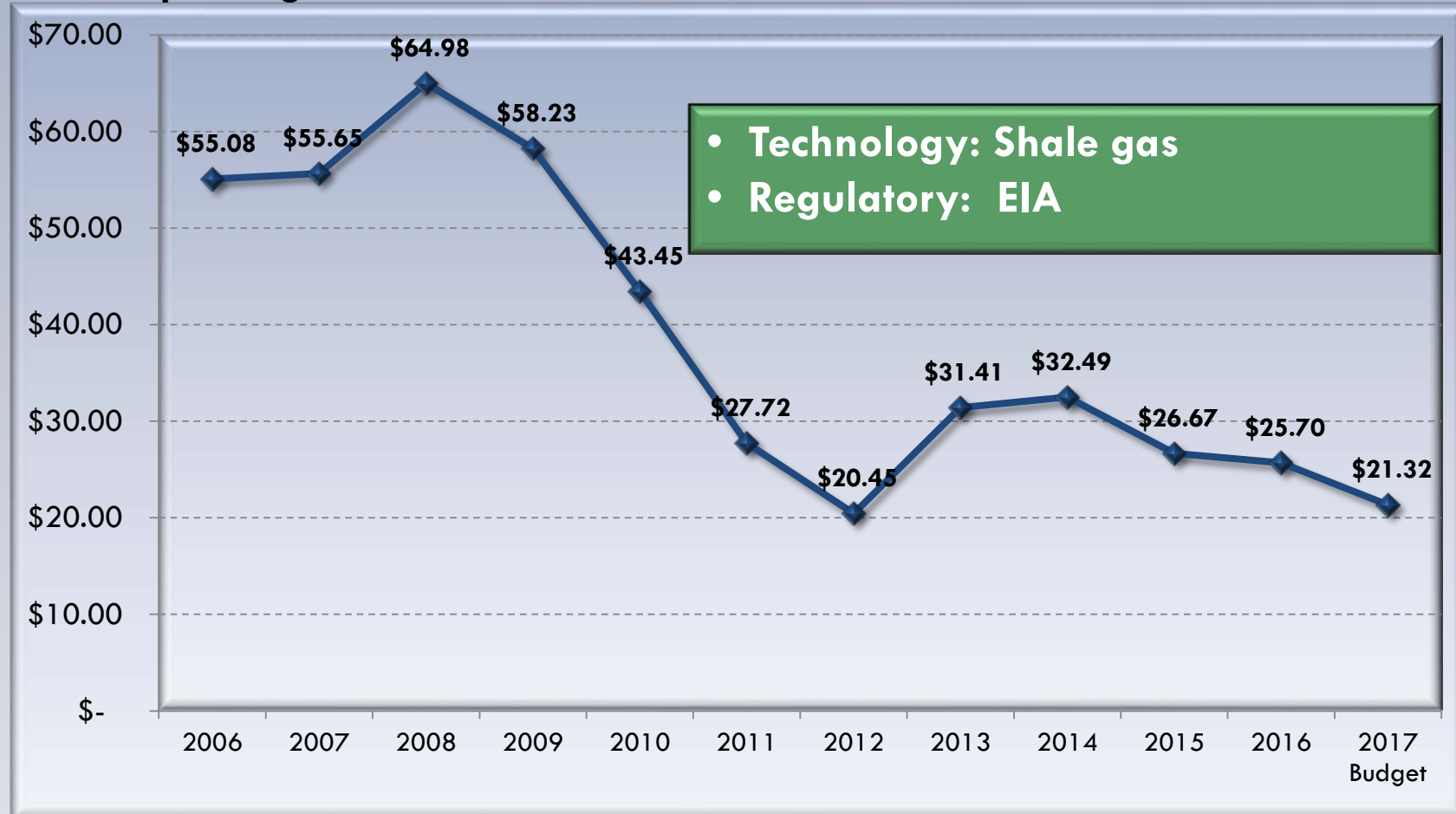
DRAFT REV 0

Benton PUD Surplus Sales

Historical Market Price of Power

27

Dollars per Megawatt-hour



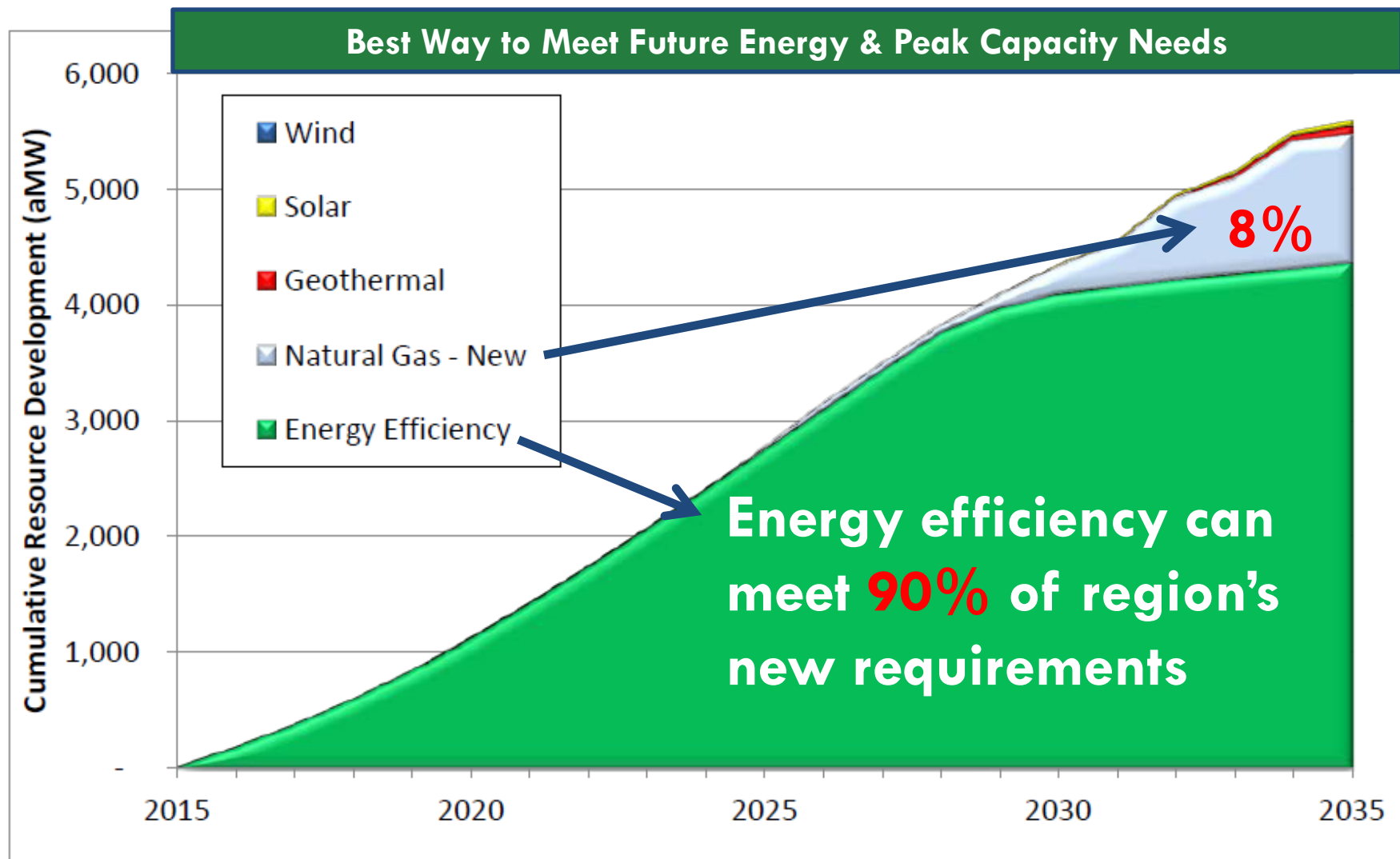
28

Looking Ahead

Northwest Power & Conservation Council

7th Power Plan

29



Change is Happening.....

But Which Way Do We Go?

30

Northwest Markets

BPA wholesale cost trends?

California Duck Curve?

Snake River Dams?

Technology

Solar Prices?

Battery Storage?

Electric Vehicles?

Smart Grid Technology?



Regulation

Higher RPS in Washington?

Washington Carbon Tax?

Higher RPS in California?

Natural Gas Prices Stay Low?

Nuclear/Coal Plant Closings?

Small Modular Reactors?

National Markets

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Northwest Utility Strategic Positioning

Likely Actions

31

- ❑ Large, long-term projects, intensely scrutinized
- ❑ Coal-based utilities likely looking for renewables
 - ❑ Corporations with sustainability goals also looking
- ❑ Be more nimble and responsive to customers
 - ❑ Protect those customers unable to participate in change
- ❑ Focus on load preservation/new loads
- ❑ Adapt to technology
- ❑ Educate customers and legislators

Average Revenue per kWh

APPA¹ 2015 Report on Average Revenue (Cents per kWh)

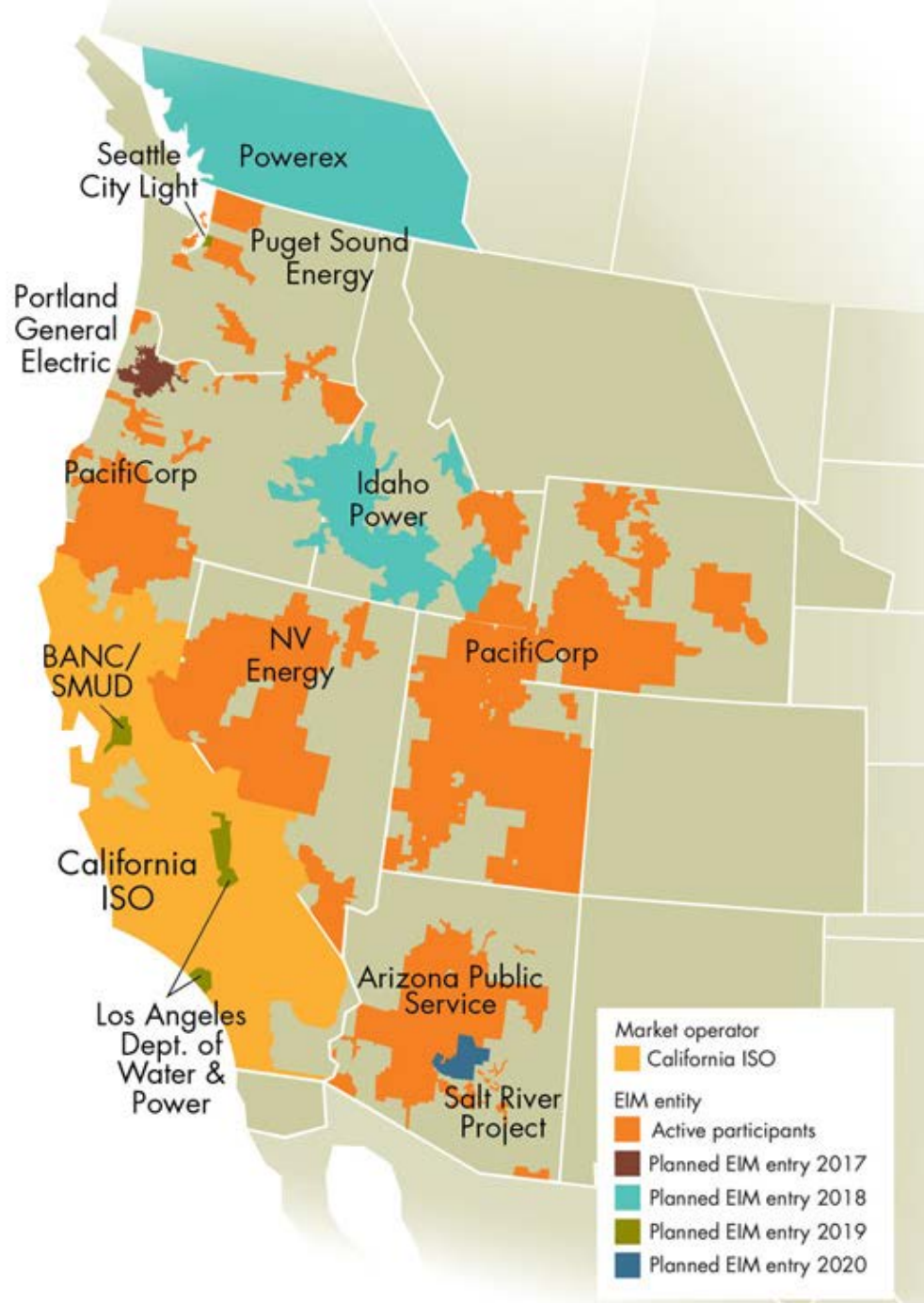
32

	Residential	Commercial	Industrial	Total
Benton PUD	7.7	6.4	4.7	6.4
WA Publicly Owned	8.4	7.3	4.7	6.8
WA Investor Owned	10.1	9.6	7.6	9.6
WA Cooperatives	8.7	7.6	6.0	7.8
National Average	12.7	10.6	6.9	10.4
California	16.2	15.6	12.3	15.1

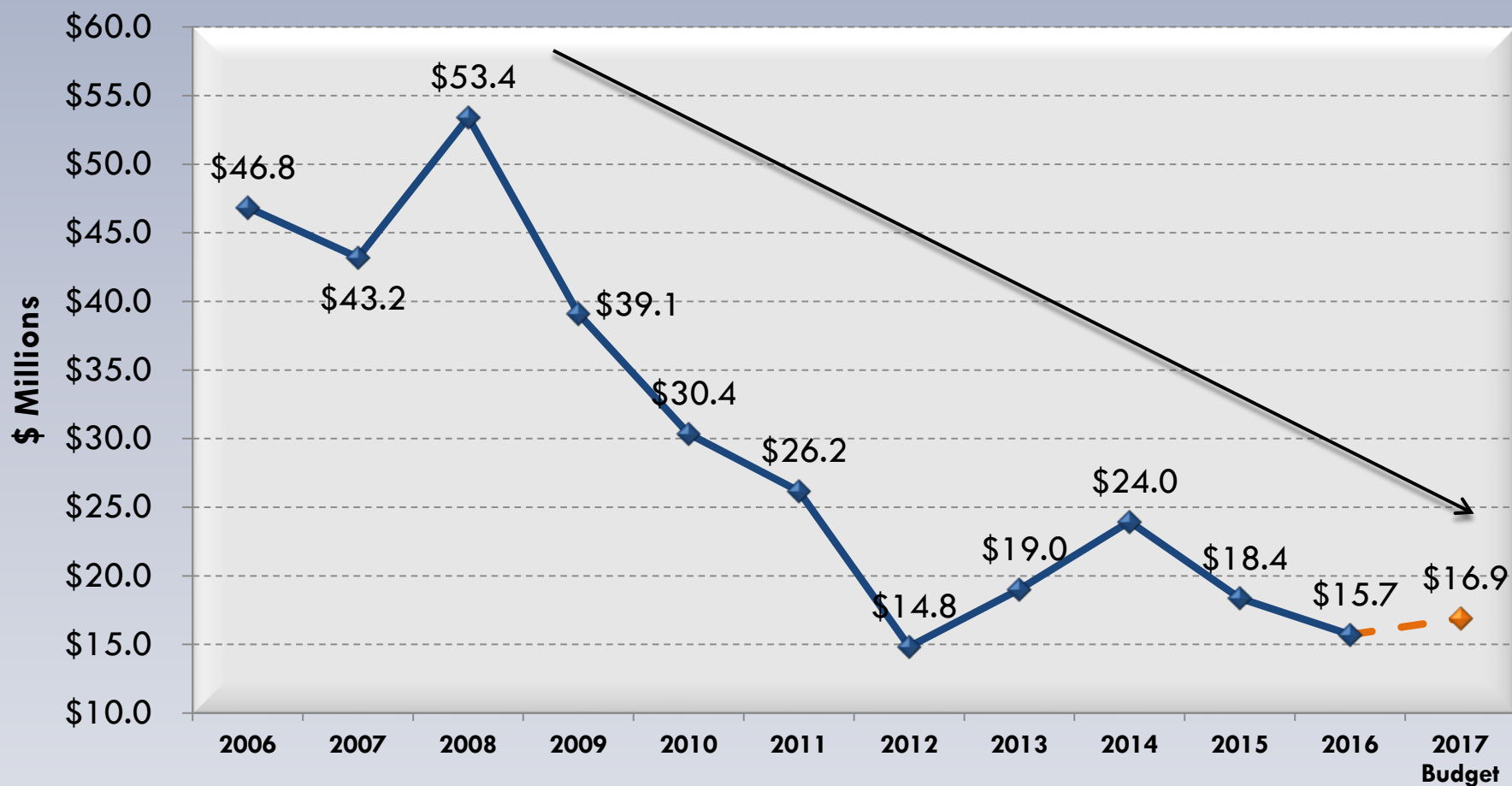
¹American Public Power Association

33

Questions / Comments?



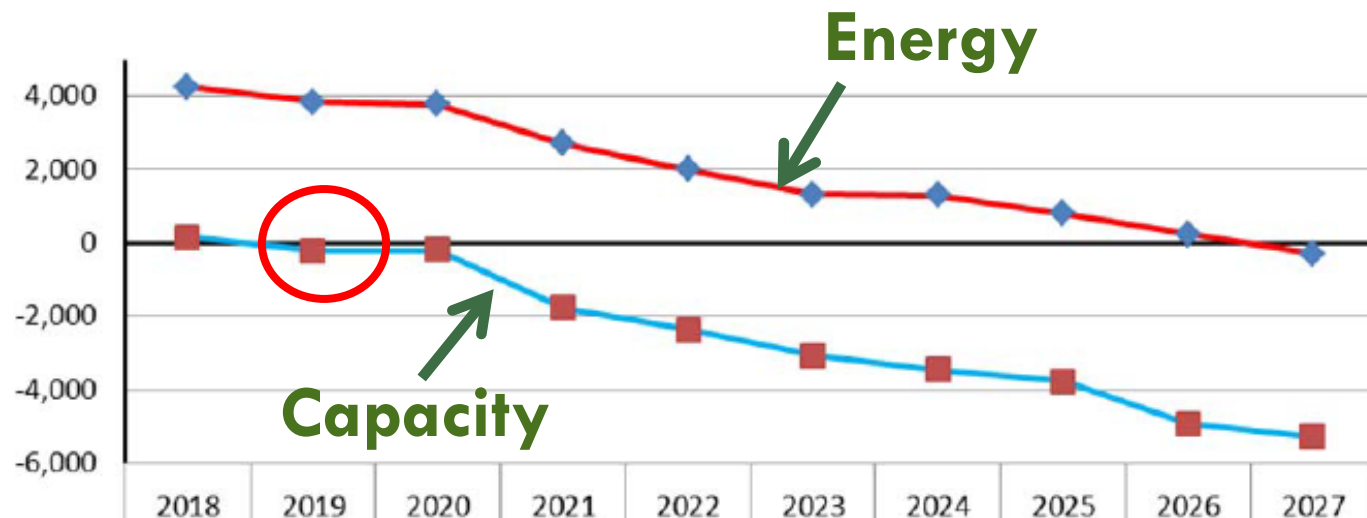
Benton PUD Surplus Sales by Year



Energy Surplus, Capacity Deficit

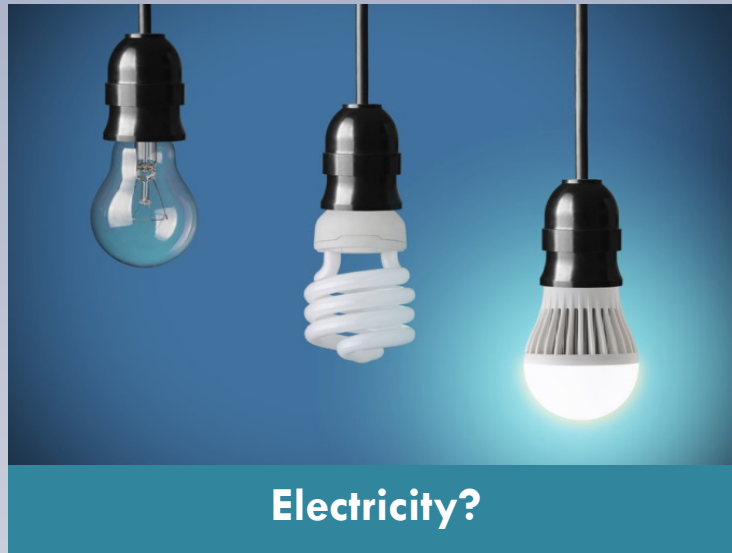
36

PNW Region
Annual Energy and January 120-Hour Capacity Surplus/Deficit
OY 2018 through 2027
1937-Critical Water Conditions



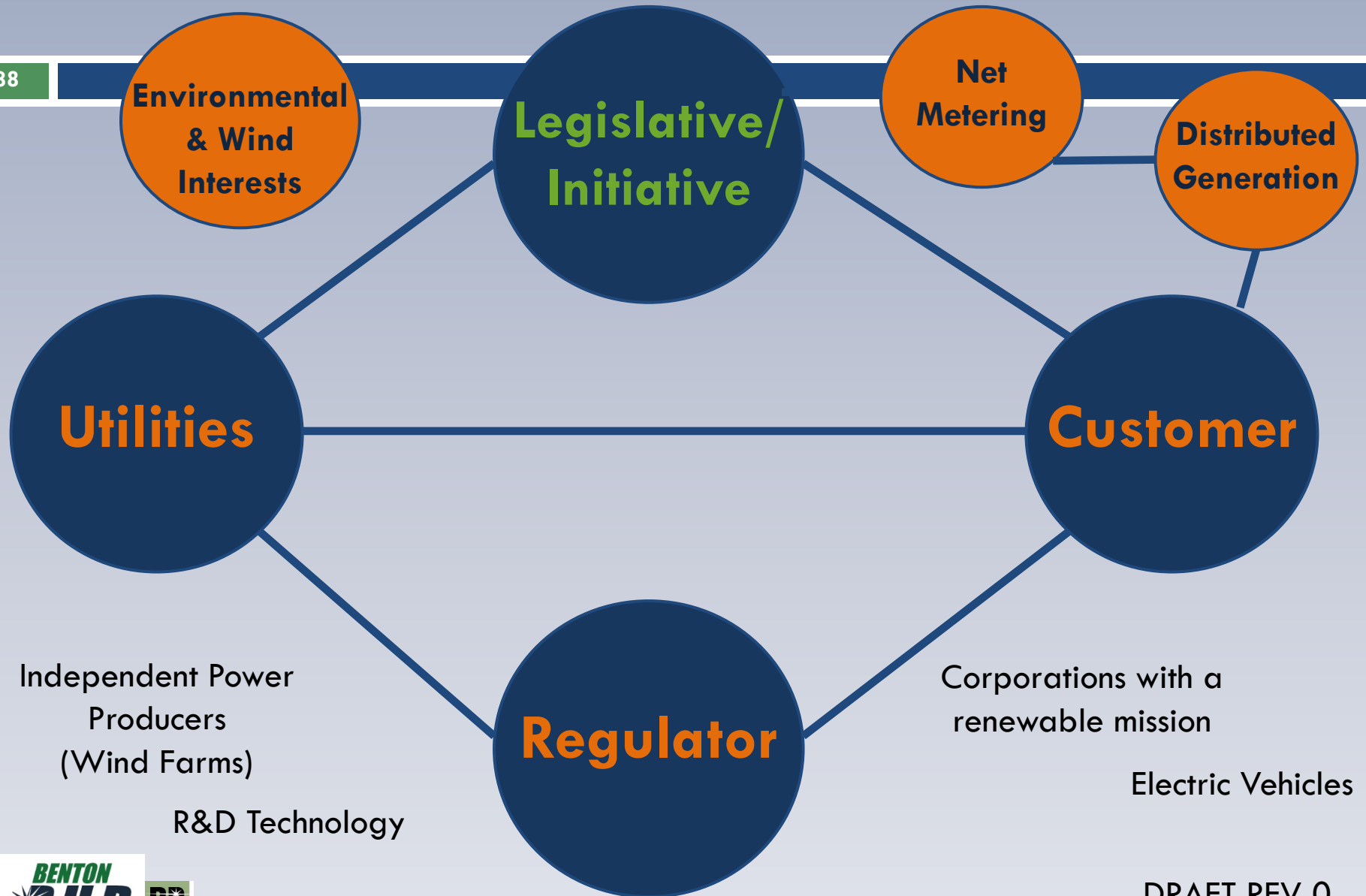
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Energy (aMW)	4,258	3,839	3,782	2,707	2,009	1,323	1,312	798	240	-293
January 120 Hour Cap (MW)	160	-198	-189	-1,755	-2,349	-3,054	-3,436	-3,754	-4,907	-5,255

120-Hour Capacity is calculated by averaging the generation forecasts from the 6 highest heavy load hours per day, 5 days per week, for 4 weeks per a month

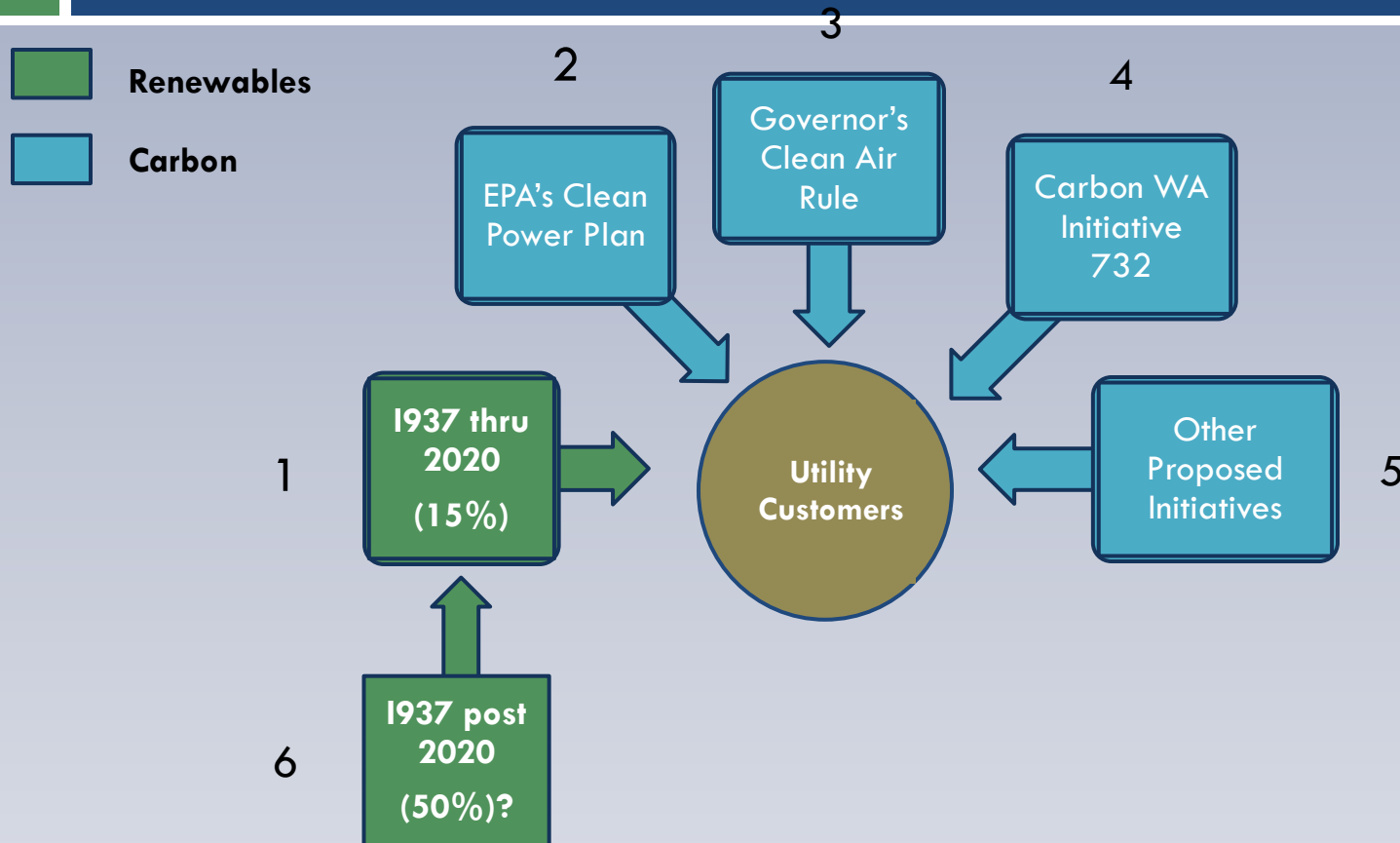


Electric Industry – Many Players

38



Carbon & Renewables Regulation



Northwest Power & Conservation Council

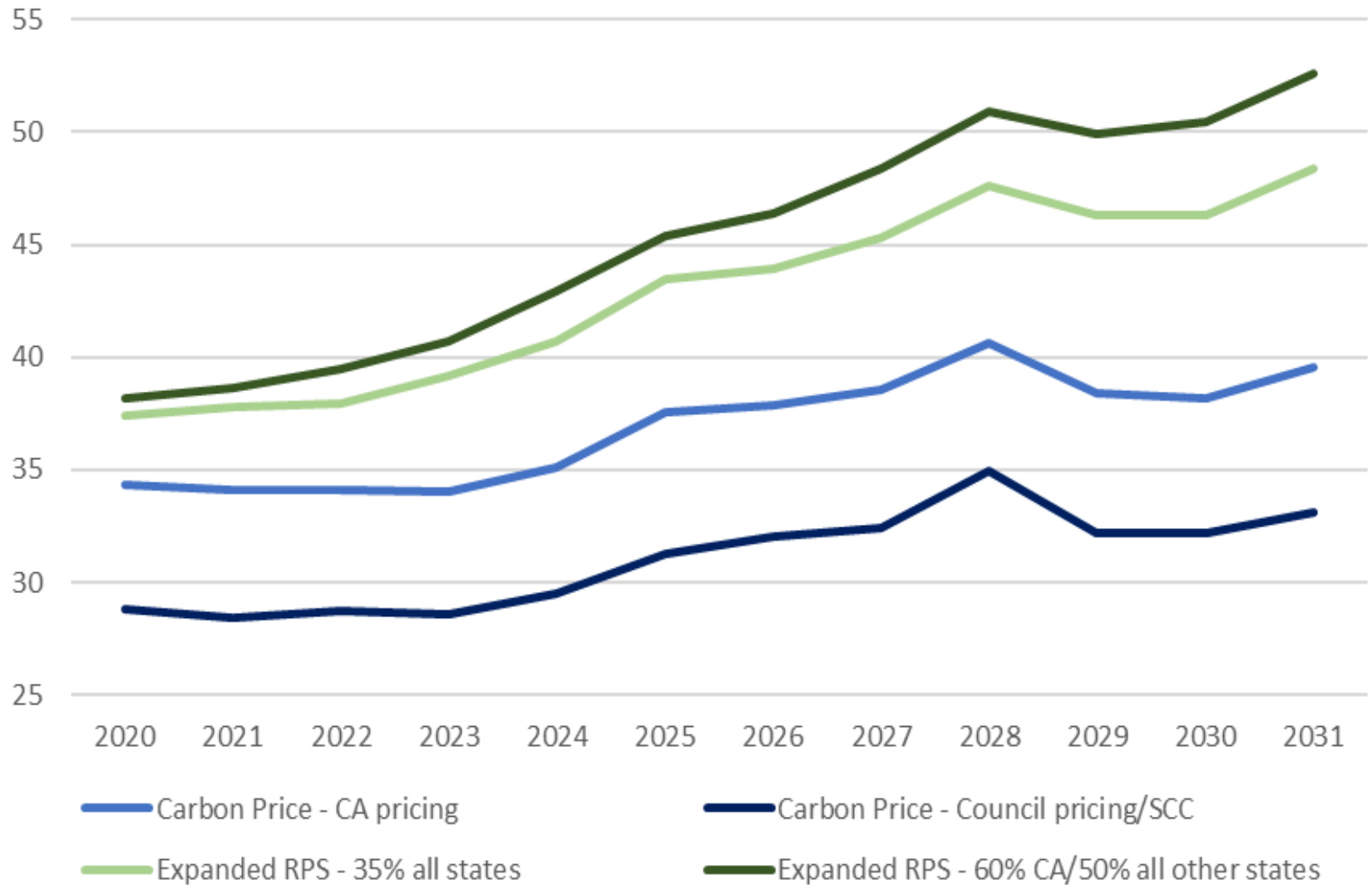
7th Power Plan

40

- Analyzed many scenarios
- Increasing Renewable Portfolio Standards produces the smallest CO₂ emissions reductions and it is the highest-cost emissions reduction resource strategy



BPA Sensitivity Analysis Estimated PF Rates



Topics

42

- Utility Industry Past & Present
- Industry Change
 - ▣ Technological
 - ▣ Regulatory
 - ▣ Western markets
- Uncertainty: Which Way Do We Go?
- Utility Perspective: Thoughts About MCEI Initiatives

Average Revenue per kWh

APPA¹ 2015 Report on Average Revenue (¢ per kWh)

43

	Residential	Commercial	Industrial	Total
Benton PUD	7.7	6.4	4.7	6.4
WA Publicly Owned	8.4	7.3	4.7	6.8
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National Average	12.7	10.6	6.9	10.4
California	16.2	15.6	12.3	15.1
Texas (REPs)	12.2	7.7	5.3	8.6
Texas Publicly Owned	10.7	9.2	7.1	9.5
Texas Investor Owned	10.1	7.9	5.0	7.3

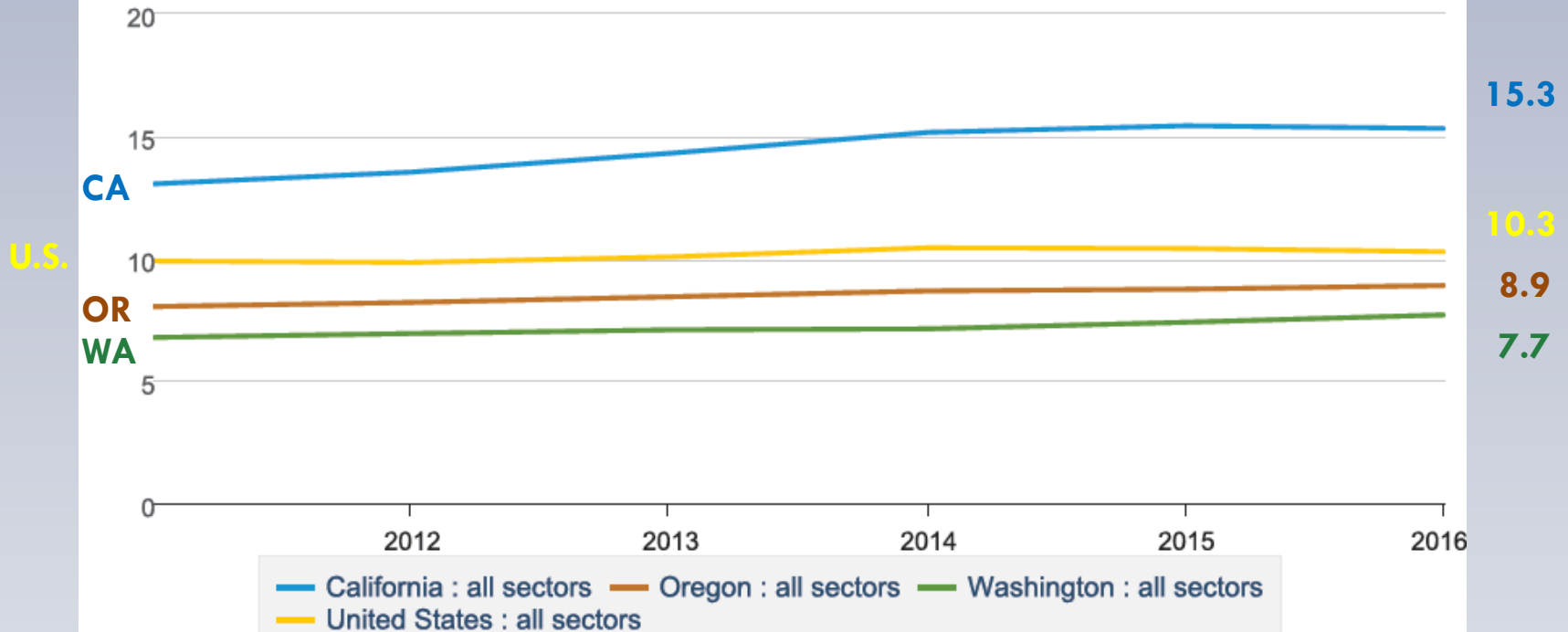
¹American Public Power Association

What's Happening in the West?

44

Average retail price of electricity, annual

cents per kilowatthour



Data source: U.S. Energy Information Administration

WASHINGTON IS LOWEST IN THE NATION!

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45



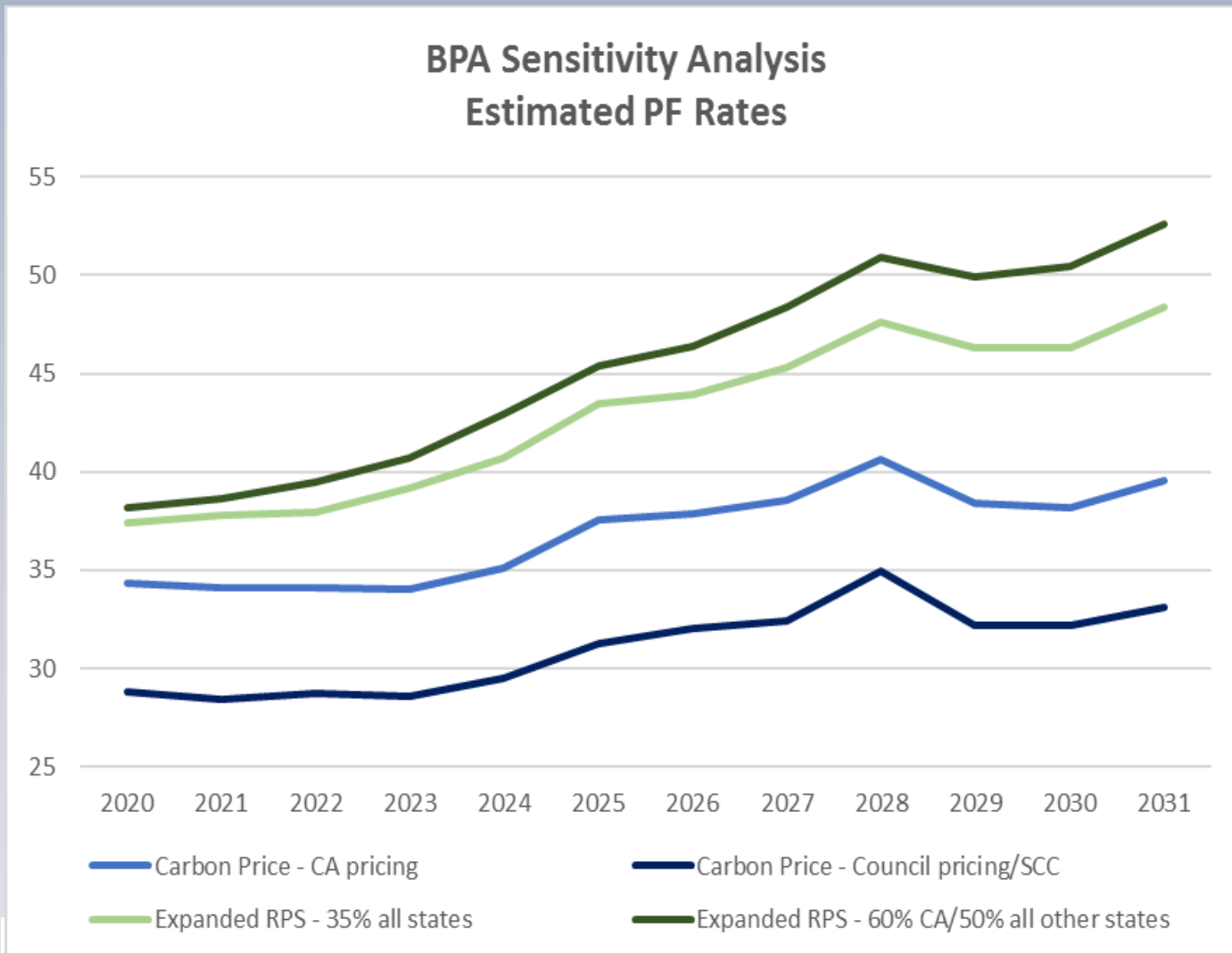
DRAFT REV 0

Between rooftop solar units, community choice aggregation efforts, battery storage and direct access service for commercial and industrial customers, as much as 25 percent of retail load formerly provided by investor-owned utilities, or IOUs, will be served by non-IOU sources later this year, Picker said.

“We don’t have a central strategy,” or coherent plan, for dealing with all this change



Regulatory Policy Matters



REV 0

Logical Reaction to all of THIS

48



Captain James T. Kirk

Strange planet

Things would get really weird (like now)

Transporter having problems

Chief Engineer Montgomery Scott - Scotty

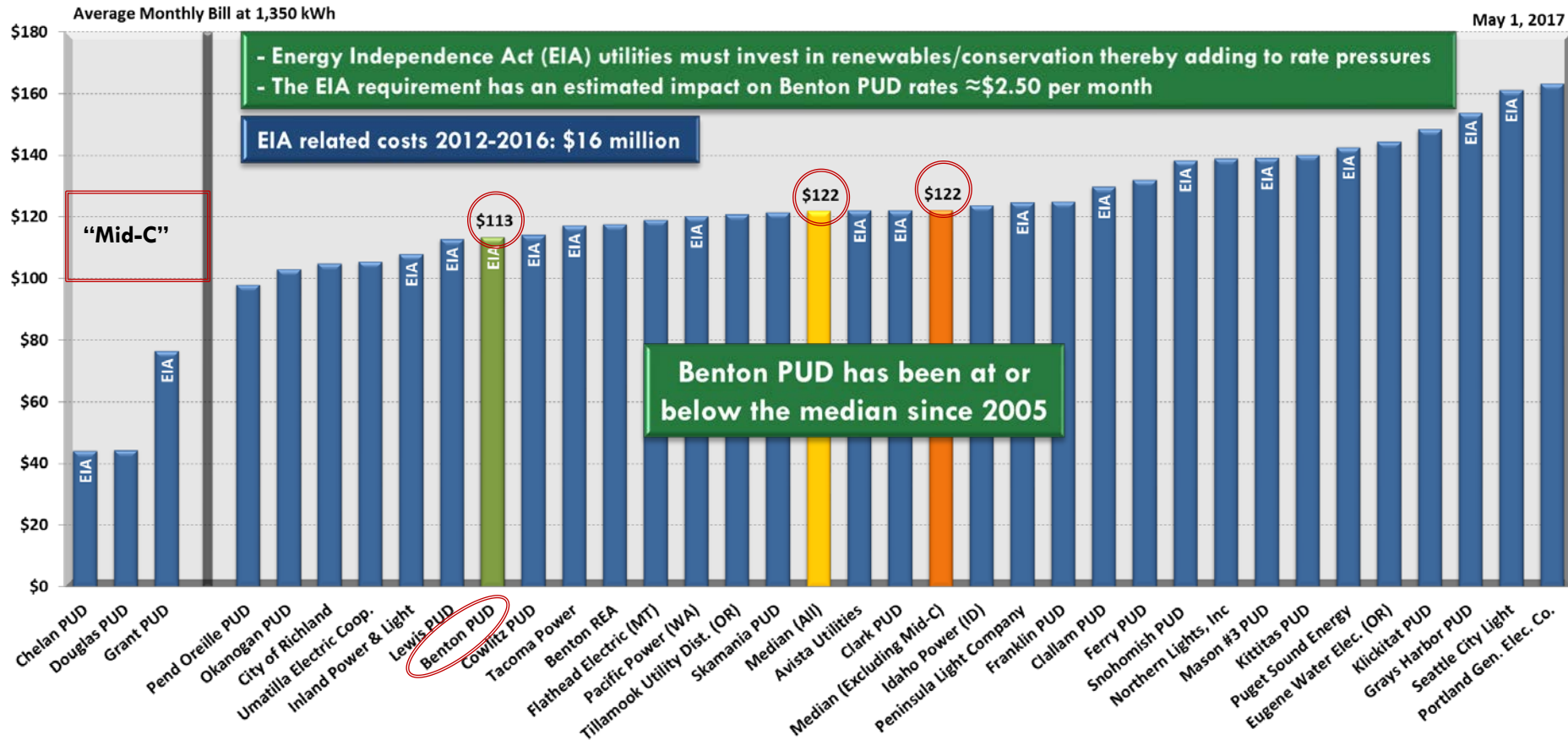
“Beam Me Up Scotty!”

Monthly Bill Comparison

Residential

49

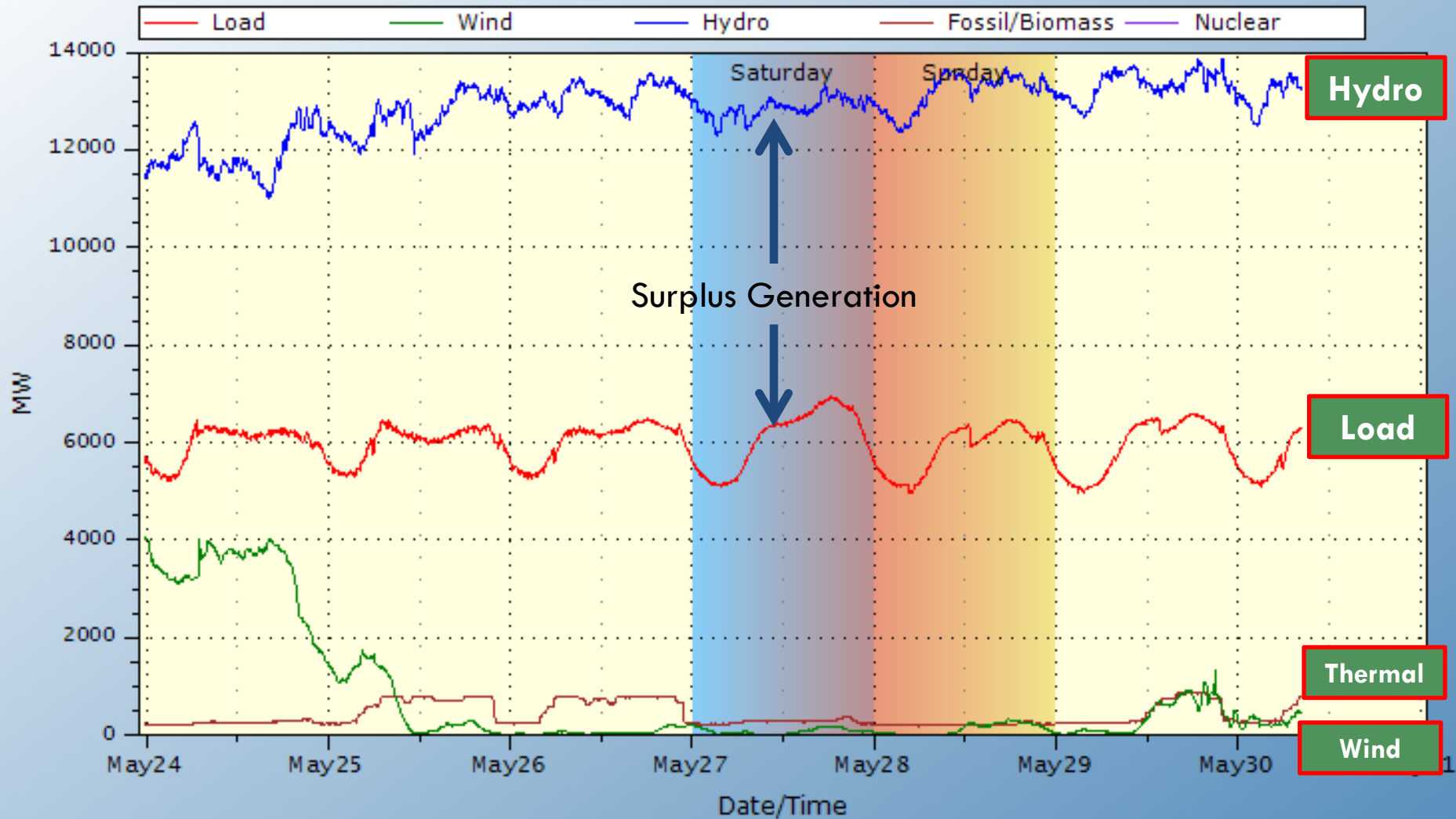
Residential Average Monthly Bill Comparison



Average bill information has been calculated by Benton PUD staff from other utilities' publicly available websites.
Calculation is Benton PUD's best effort to provide comparable information.

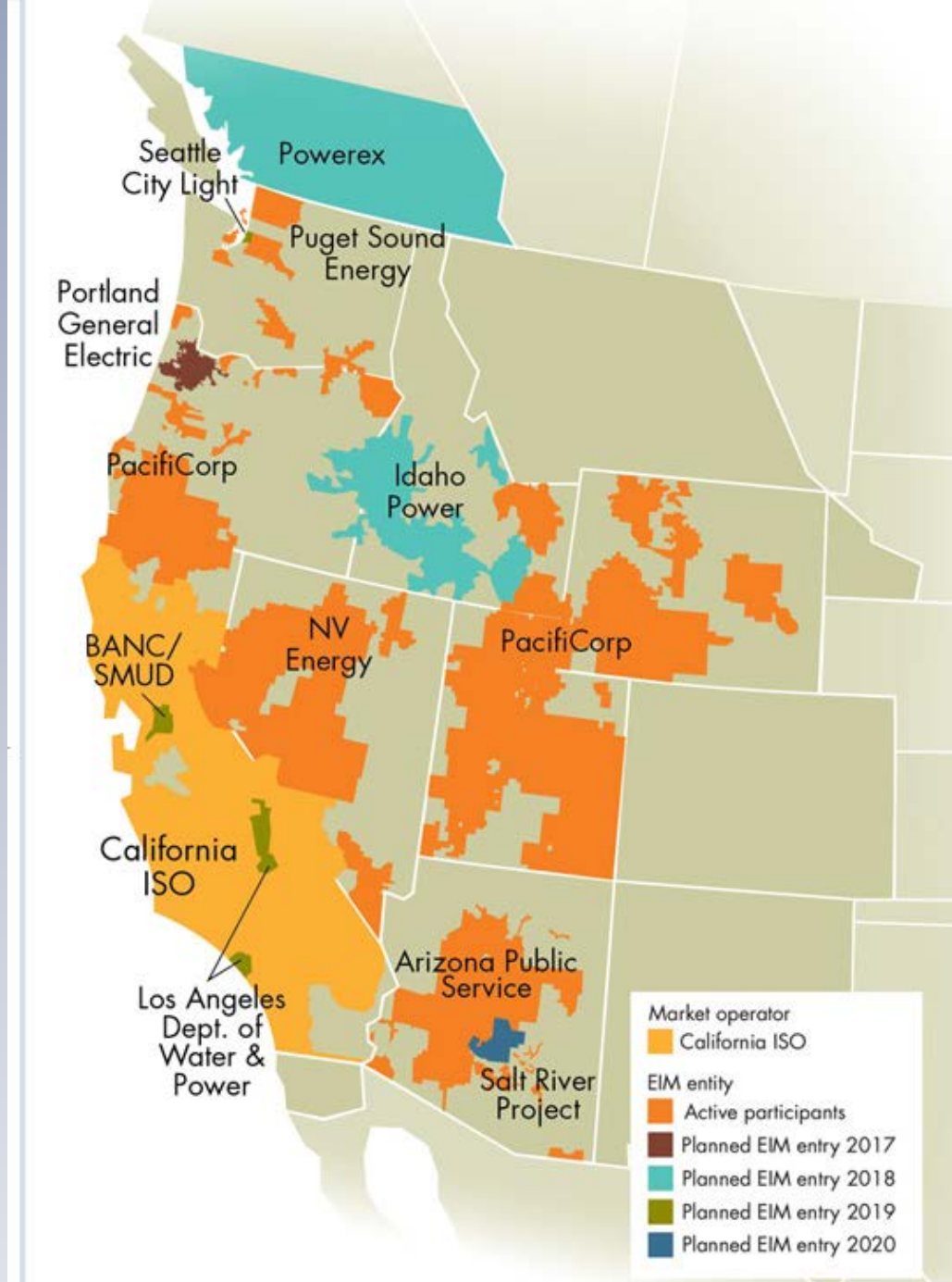
DRAFT REV 0

BPA Balancing Authority Load & Total Wind, Hydro, Fossil/Biomass, and Nuclear Generation, Last 7 days
24May2017 - 31May2017 (last updated 30May2017 08:30:49)



Thermal shut down to due oversupply/outages

DRAFT REV 0



2018-2019 Strategic Planning

CHALLENGES/UNCERTAINTY ¹					
Power Supply	Customer Engagement	Emerging Technologies	Finance & Rates	Capital Planning	Broadband
- Flattening loads	- Higher customer expectations	- Disruptive technology	- Power Supply cost impacts	- Transmission reliability	- Continued positive cash flow
- Conservation/Solar impacts	- Changing demographics			- Aging infrastructure	- Removing barriers to SMBs
	- Technology needs by age group	- Electric vehicle loads	- Fixed cost recovery		- Maximizing community benefit
- Low market prices		- EV charging stations		- Customer growth	
- Rising BPA power costs	- Customer education		- New Large Load rate schedule	- New large load requests	- 5G & pole attachments
- BiOp/Snake River Dams?	- Utility analytics for key accounts	- Solar prices even lower?	- Renewable rate schedule?		- "Fiber to the premise" interest
		- New state solar incentives			
- Duck curve California?	- Social media communications	- Community solar interest?	- Low income assistance		
- Higher RPS California?		- Corporate sustainability?			
	- Customer knowledge of SmartHub				
- Higher RPS Washington?	- Staff learning curve NISC	- Battery technology impacts			
- Carbon tax Washington?	- Customer service metrics	- Grid scale			
- Pancaking legislation?		- Customer scale			
- Capacity post Frederickson?					

¹ Some challenges/uncertainties pertain to multiple categories!

2018-2019 Strategic Planning

While facing significant uncertainty, we are well-positioned:

Facts & Figures

- RP3 Diamond Utility
- Rates below the median of benchmark utilities
- Strong customer satisfaction ratings
- Solid financial reserves
- Relatively low debt to equity ratio, with drop in debt service beginning in 2021
- Positive O&M cost benchmark comparisons and positive customers/employee trends

Distinctive Competencies relative to our peers:

- Advanced metering infrastructure in place, unlike many peer utilities
- AMI hourly data combined with SmartHub delivery platform
- Utility analytics
- World class broadband

Intangibles

- Highly skilled, adaptable workforce

2018-2019 Strategic Planning

OPPORTUNITIES & ACTIONS (2017/2018/2019) ²					
Power Supply	Customer Engagement	Emerging Technologies	Finance & Rates	Capital/Infrastructure	Broadband
- BPA Focus 2028	- Maximize SmartHub value	- EV Charging Stations	- Base charge pace of increase	- Sunset Road to Reata	- Access Internet Pilot
- Capacity value for hydro	- Online outage management	- Community solar	- Establish gradualism bands	- Spaw to Phillips	- Explore 5G for our community
- 15% RPS Standard	- Achieve customer service metrics	- Battery storage	- Joint procurement initiative	- New load readiness	- "Smart Cities" interest?
	- Utility analytics/key accounts	- Legislation: EV incentives	- Net metering policy post cap	- Coordinate with TRIDEC/Cities/Ports	
- PGP Carbon/RPS Study			- Substation readiness	- Streamline BPA interconnection	
- Carbon vs RPS legislation	- Enhanced customer surveys	- Cyber security best practices	- New Large Load rate schedule	- Distribution automation/regulators	
- John Francisco discussion	- Customer focus groups		- Customer rate choices		
- 2018 IRP	- Customer education - videos		- Maintain financial viability		
- post 2021 plan	- Quarterly education program		- Rates below the median		
	- Education in our schools		- Low income support programs		

² General topics - need to further define the specific action as to whether to support, evaluate, plan, or do.

2018-2019 Strategic Planning

SKILLED WORKFORCE AND SAFETY - CHALLENGES/UNCERTAINTY

Employee engagement in industry transformation

- Shifting skill set demands*
- Maintaining a customer-focused culture*

Recruiting and retaining talent

- Low unemployment - fewer candidates to choose from - increased competition for talent*
- Changing employee demographics - reduced tenure for employees entering the workforce*
- Lack of desire for leadership roles*
- Resource adequacy for new strategic initiatives?*

Rising healthcare costs

- Continuous effort to avoid safety complacency**
- Increased safety regulations/compliance**

SKILLED WORKFORCE AND SAFETY - OPPORTUNITIES/ACTIONS

Focus on business process efficiencies

- Provide good technology solutions for performing jobs in and out of the field (i-Pads, etc.)*
- Maintain customer service metrics*

Continue to promote and provide learning and development

- E-learning*
- Job shadowing, mentoring, career coaching, and networking opportunities*
- Strategic plan communications*
- Leadership training*

Develop new approaches to recruitment and hiring (on-boarding) recognizing the dynamics of a new workforce

- Additional benefit offerings and work-life balance programs (i.e. telecommuting, flexible schedules, etc.)*
- Educate younger generations on the value of a career in public service*

Explore emerging healthcare strategies to contain costs for the employer/employee(e.g. near-site clinics)

Continue to strengthen our safety culture

- Leverage safety analytics in decision making processes (leading indicators, performance measurements, safety incentive programs, training, etc.)*