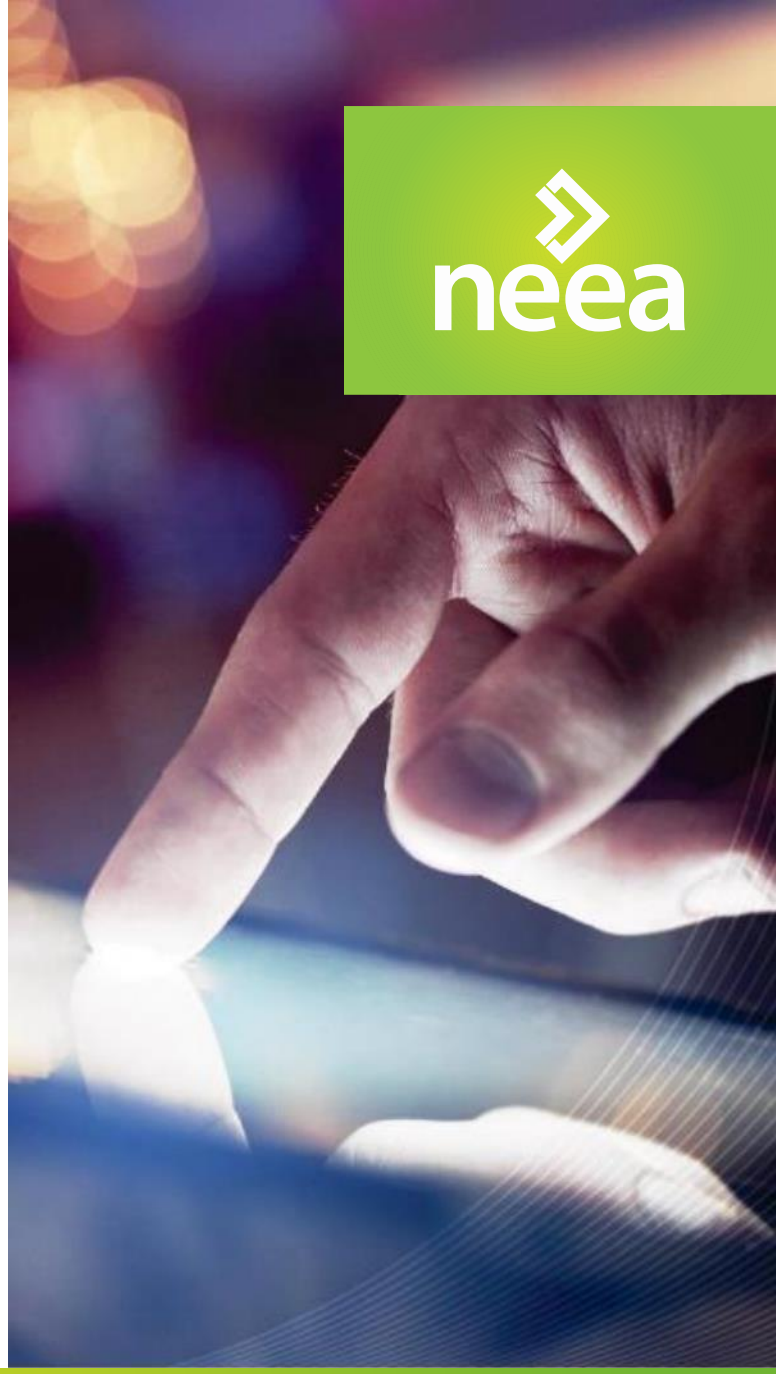
April 18, 2018

Commercial Advisory Committee



- **Name, Organization, and…**

Agenda

- Introductions, Housekeeping, Announcements
- High Performance HVAC – Very High Efficiency Dedicated Outside Air Systems (VHE DOAS) - IS Milestone
- CAC Member Share Out/Round Robin
- *Lunch!*
- C & I Lighting Regional Strategic Marketing Plan (RSMP)
- CAC Panel Discussion : Pay for Performance
- *Break!*
- Market Opportunities
- Adjourn

Informational Updates

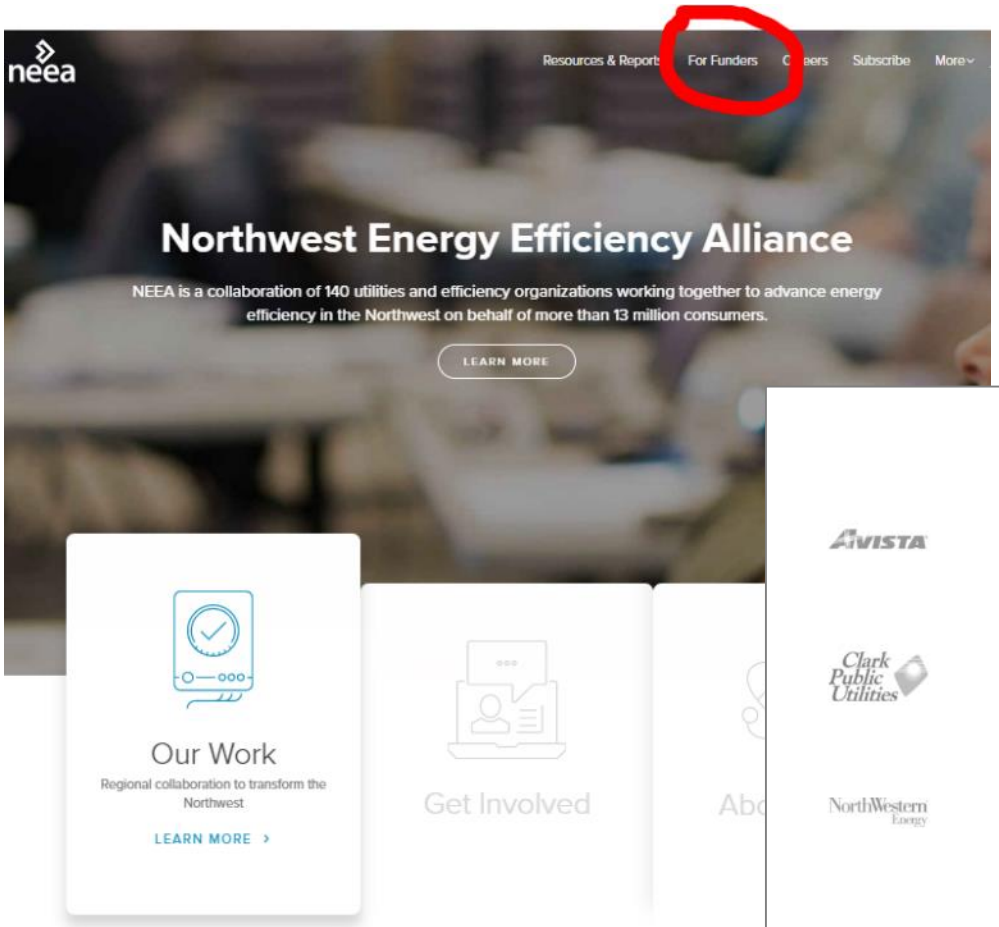
- Commercial Portfolio Updates (pp. 22-23)
- Commercial Code Enhancement Update (p. 24)
- CAC Conference Coordination (p. 25)
- Summary of Emerging Technologies (p. 26)

Announcements!

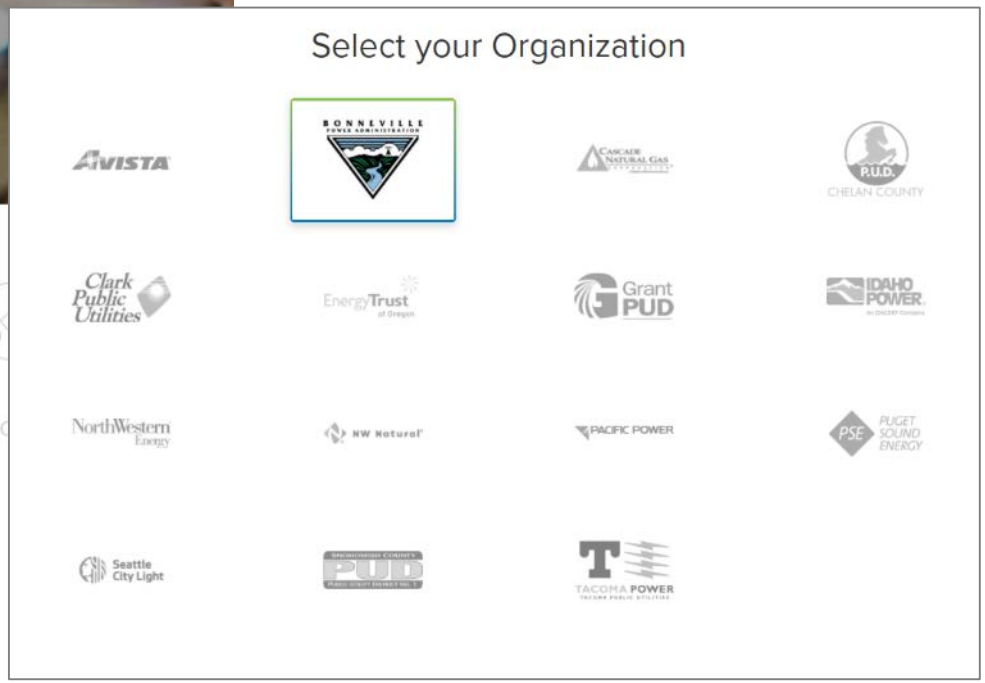
- Efficiency Exchange Conference:
  - May 15-16 in Tacoma
  - Workshops - Open to All & Complementary, if registered by May 10

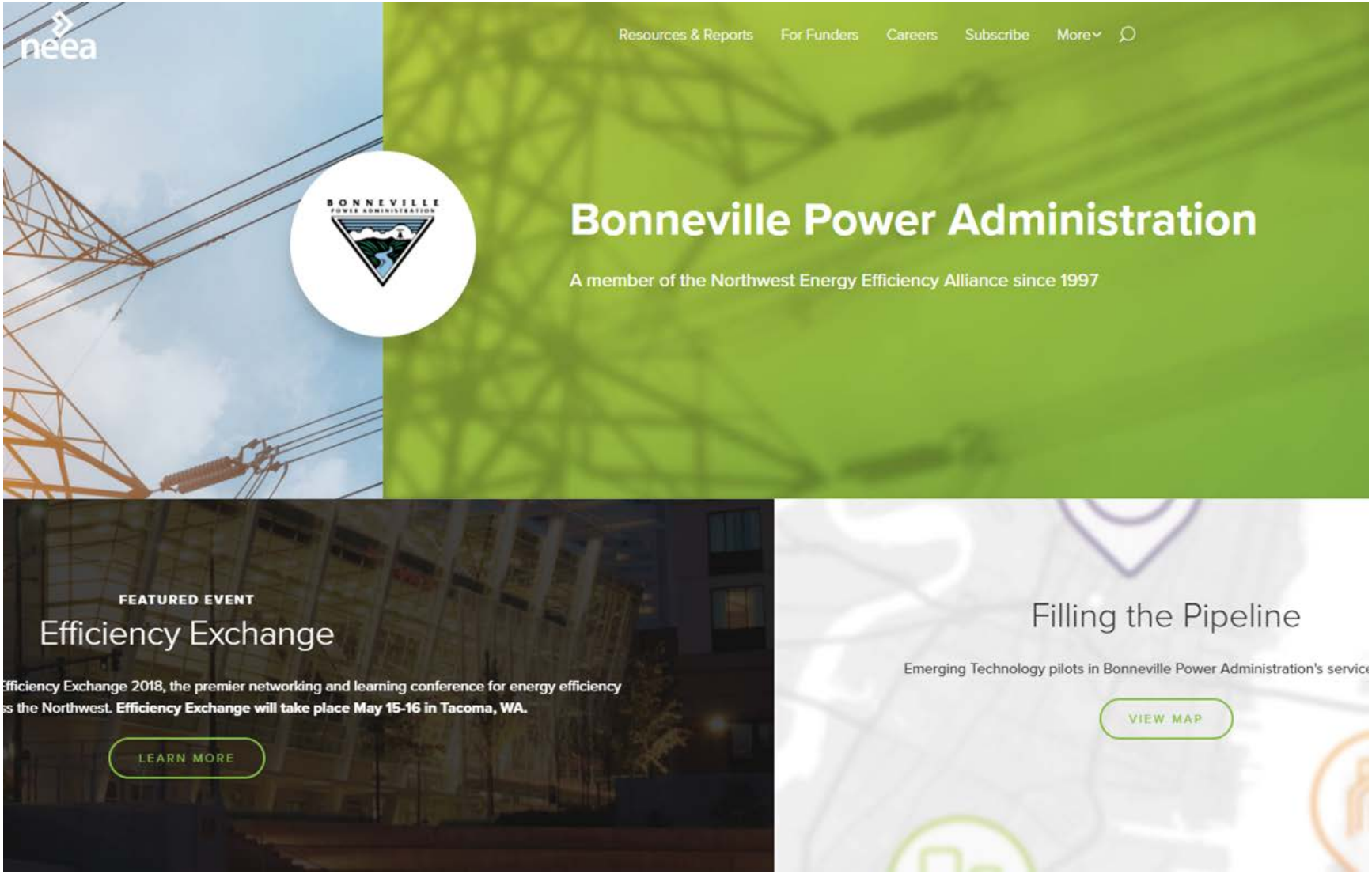
- Updated NEEA Website:
  - Launching end of April

Website update coming soon



NEW:
Individual funder landing pages

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Bonneville Power Administration
A member of the Northwest Energy Efficiency Alliance since 1997
FEATURED EVENT
Efficiency Exchange
fficiency Exchange 2018, the premier networking and learning conference for energy efficiency
s the Northwest. Efficiency Exchange will take place May 15-16 in Tacoma, WA.
LEARN MORE
Filling the Pipeline
Emerging Technology pilots in Bonneville Power Administration's servic
VIEW MAP

April 18, 2018

High Performance HVAC-

Very High Efficiency Dedicated Outside Air Systems (VHE DOAS)

Maria Murphy

Initiative Lifecycle Process

Key Activities Post- IS

- Further **validate savings estimates, costs, and other key assumptions** through additional data collection and analysis
- **Research and characterize market** structure to assess barriers and opportunities and inform design
- Encourage **additional high efficiency HRV manufacturers**
- Explore adaptation and/or development of **software tools** to better address design and increase sales
- **Raise awareness and educate** key market actors, particularly within the supply chain

What We Heard

- Updates on pilots
- Why focus only on VHE DOAS?
  - More analysis on competing systems
- Can we influence HVAC industry?
- Market opportunity

Project Updates

Current Pilot Projects

State Offices – Corvallis

Job Corps Dorms – Darby, MT

Law Offices – Portland

Pizza Restaurant – Corvallis

Utility Field Office – Libby, MT

Offices – Seattle (historic bldg.)

Airport Terminal –
Seattle (historic bldg.)

Restaurant – Portland

Office, Portland

Pre-existing Equipment: **9** packaged rooftop units with gas-fired heating (43 tons) and DX cooling (35 tons)
New Equipment: **4** high-efficiency HRVs and VRF heat pump system (18 tons heating & 16 tons cooling)
Affected Sq Ft: 11,615

Peak Reduction: **TBD** Winter | **47%** Summer

Savings:

57.4
Pre-Conversion EUI

19.5
Post-Conversion EUI

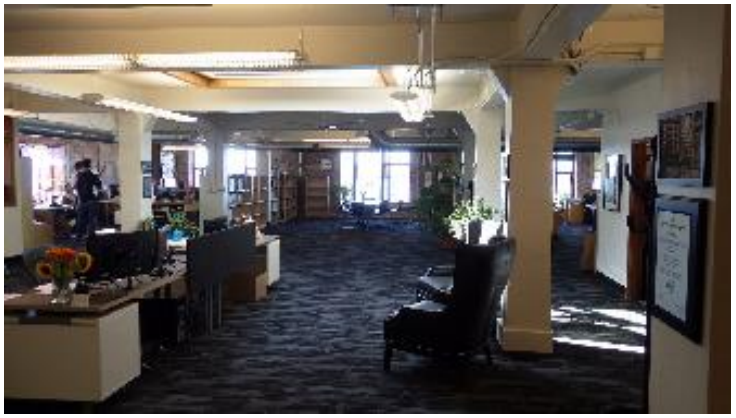
72%
HVAC

66%
Whole Bldg

Note: All results are preliminary

Office, Seattle

Pre-existing Equipment: VAV system- Combined heating capacity, including re-heat coils in the VAV distribution units, 16.4 tons heating & 14 tons cooling
New Equipment: **1** high-efficiency HRV and VRF heat pump system (15.6 tons heating & 14 tons cooling)
Affected Sq Ft: 6,000



Peak Reduction: **55%** Winter | **39%** Summer

Savings:

51.8
Pre-Conversion EUI

30
Post-Conversion EUI

68%
HVAC

42%
Whole Bldg

Note: All results are preliminary

Office Prototype Model, Boise

Affected Sq Ft: 11,615

Peak Reduction:

1 kW/sf	1 kW/sf
Winter	Summer

Savings:

45.1
Pre-Conversion EUI

32.1
Post-Conversion EUI

60%
HVAC

29%
Whole Bldg

Why Focus on VHE DOAS?

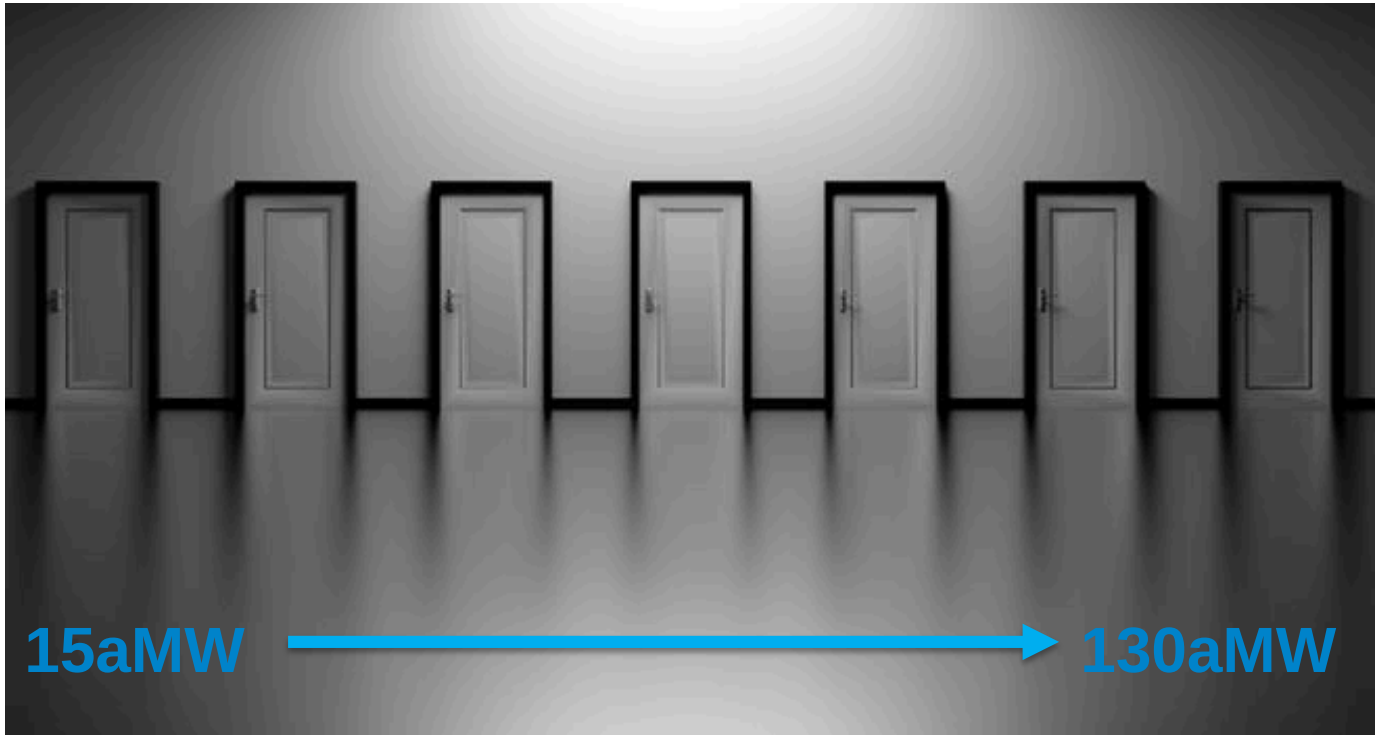
- Substantially lower energy consumption
  - Little to no supplemental heating and cooling of incoming air
  - Decreased run time
  - Down-sized heating and cooling system
  - High efficiency variable speed fans
- Increased functionality
- Lower maintenance

Initial Assumptions

System Type	Total cost ($/sf)	Incr. Cost ($/sf)	Savings (%)	Savings kBtu/sf	S/C (kBtu/$)
VHE DOAS (HP/VRF w/ 85%+ HRV)	$17	$11	50%	30	2.7
HE DOAS (HP/VRF w/ 70% HRV)	$18	$12	30%	18	1.5
E DOAS (HP/VRF w/ 50% HRV)	$12	$6	25%	15	2.5
Low E DOAS (WA Code) (Code Min. RTU w/ 50% HRV)	$9	$3	10%	6	2
Code RTU (Code Min. RTU only)	$6	0	0	0	0

Influencing the HVAC Industry

The Opportunity



Key Activities Post- IS

- Further **validate savings estimates, costs, and other key assumptions** through additional data collection and analysis
- **Research and characterize market** structure to assess barriers and opportunities and inform design
- Encourage **additional high efficiency HRV manufacturers**
- Explore adaptation and/or development of **software tools** to better address design and increase sales
- **Raise awareness and educate** key market actors, particularly within the supply chain

Questions?

TOGETHER We Are Transforming the Northwest

Avista
Bonneville Power Administration
Cascade Natural Gas Corporation
P.U.D. Chelan County
Clark Public Utilities
Cowlitz PUD
Energy Trust of Oregon
Grant PUD
Idaho Power An IDACORP Company
NorthWestern Energy
NW Natural
Pacific Power
PGE
PSE Puget Sound Energy
Seattle City Light
Snohomish County PUD Public Utility District No. 1
Tacoma Power Tacoma Public Utilities

Budget through Q2 2019

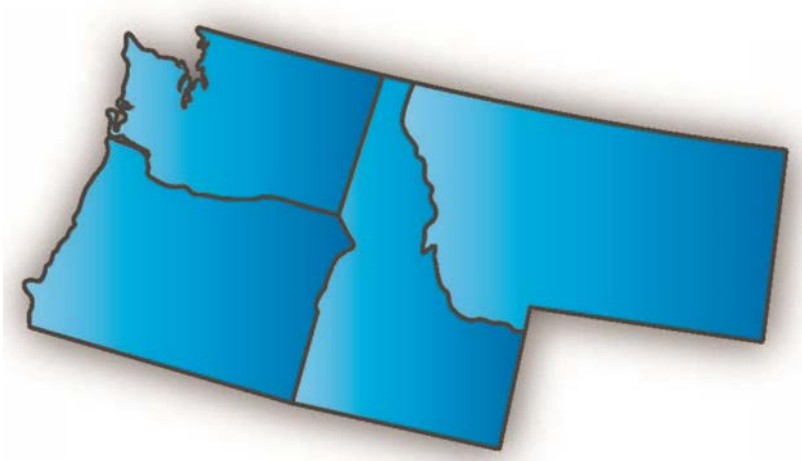
Activities	Amount
Data Collection and Assessment	$120,000
Technical Support and Training	$240,000
Market Characterization, Research, and Baseline	$100,000
Market Channel Development	$35,000
Marketing	$85,000
Upstream Manufacturer Incentives	$40,000
Program Management	$30,000
Total	$650,000

Roll Call

- Do you have any reservations about recommending a *yes* vote to your RPAC member?

CAC Member Share-out

Lunch!



C+I Lighting Regional Strategic Market Plan

2018 Plan Update for Discussion

April 18, 2018

C+I Lighting Regional Strategic Market Plan

Vision

Our customers choose quality, adaptable lighting that uses every kWh to its best advantage.

Mission

As a result of our collaboration, we maximize cost effective, long-term commercial and industrial lighting energy efficiency opportunities, prevent conflicting overlap of roles and improve coordination in the NW.

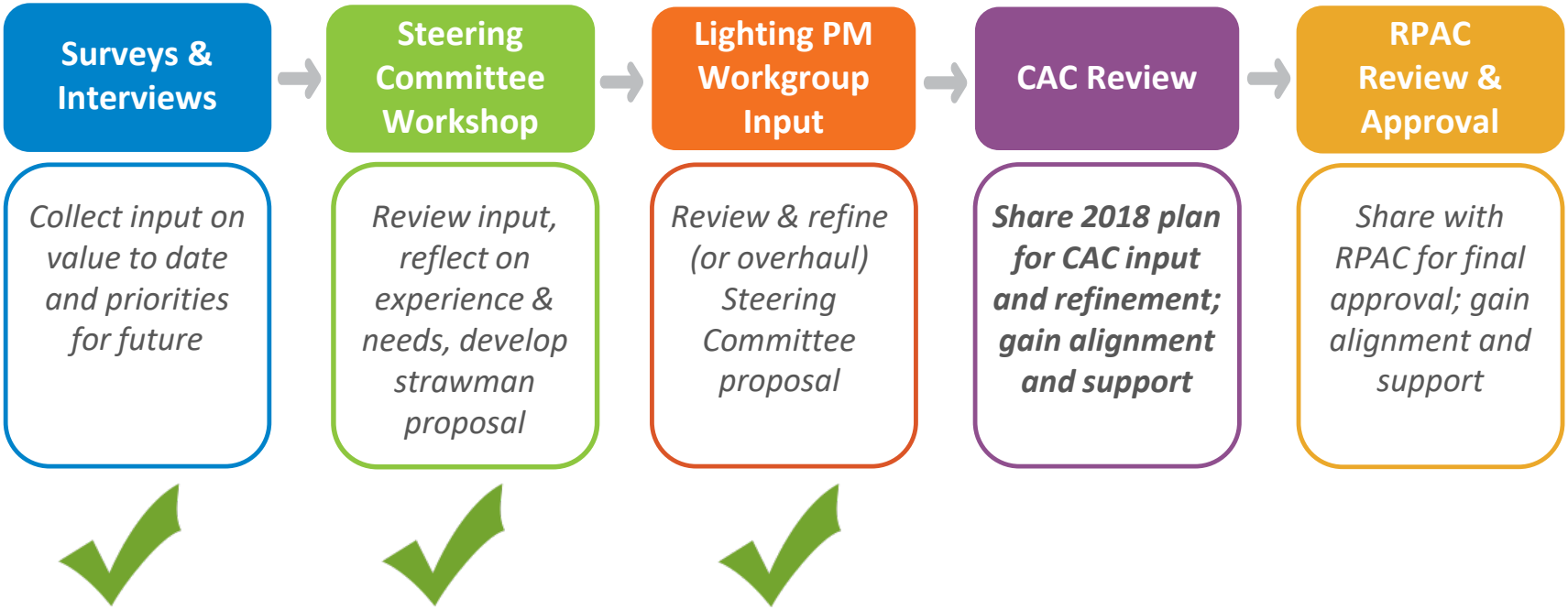
Goals

1) The most efficient, quality products are readily available in the marketplace.
2) Customers choose the most appropriate, efficient lighting system solution for their needs.

C+I Lighting Regional Strategic Market Plan

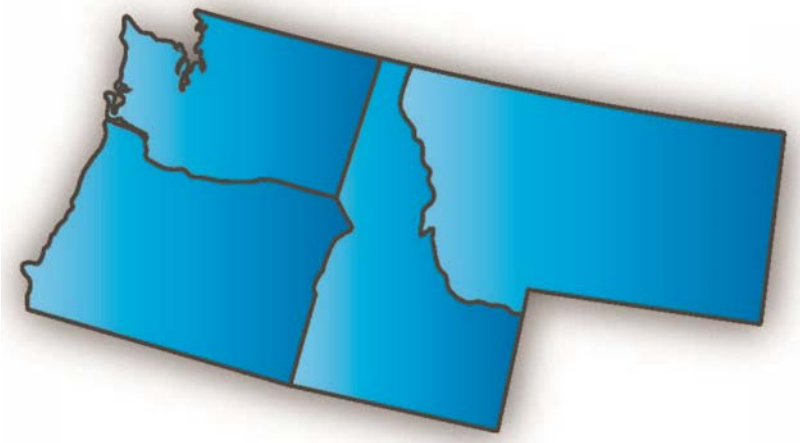
2017 Priority Strategies	2017 Actions
Identify synergies & complementary approaches to align upstream and coordinate mid and downstream interventions	- Midstream coordination - Supply chain leverage: develop common understanding of changes in supply chain & effective interventions
Create & implement a data plan	Timely, granular price trends
Create and leverage tools & resource to build customer demand	Offer consistent message to customers and allies on good, better best options for common use cases

2018 Update Process



Discussion

Approach	Do you have feedback/refinements on the adjustments to approach?
Priorities	Do you support the priorities? Are there refinement you'd like to recommend?
Actions	Which topics do you think are most urgent? In which do you want your organization to participate?



Steering Committee Observations & Recommendations

Steering Committee Workshop

We considered

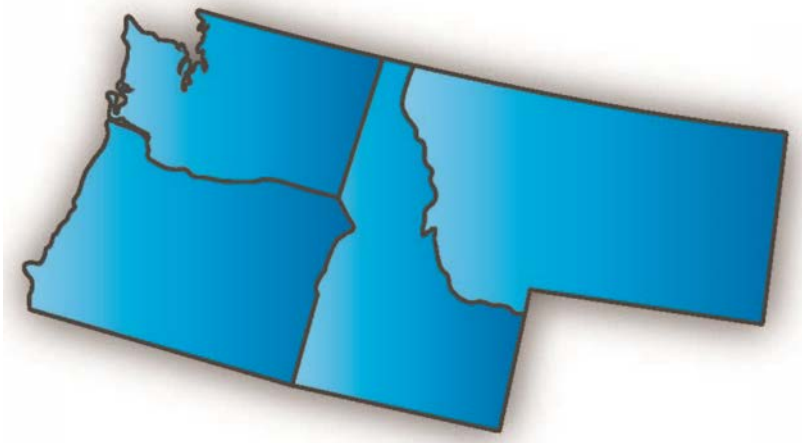
- Lessons learned
- Survey feedback
- How we can best achieve our long term vision, mission and goals

In order to

- Identify priorities for the region
- Make adjustments to approach to increase value of activities
- Build value over time

Lighting PM Work Group

- Aligned with the Steering Committee's recommendations for approach and priority strategies
- Selected top actions for 2018 within the priority strategies

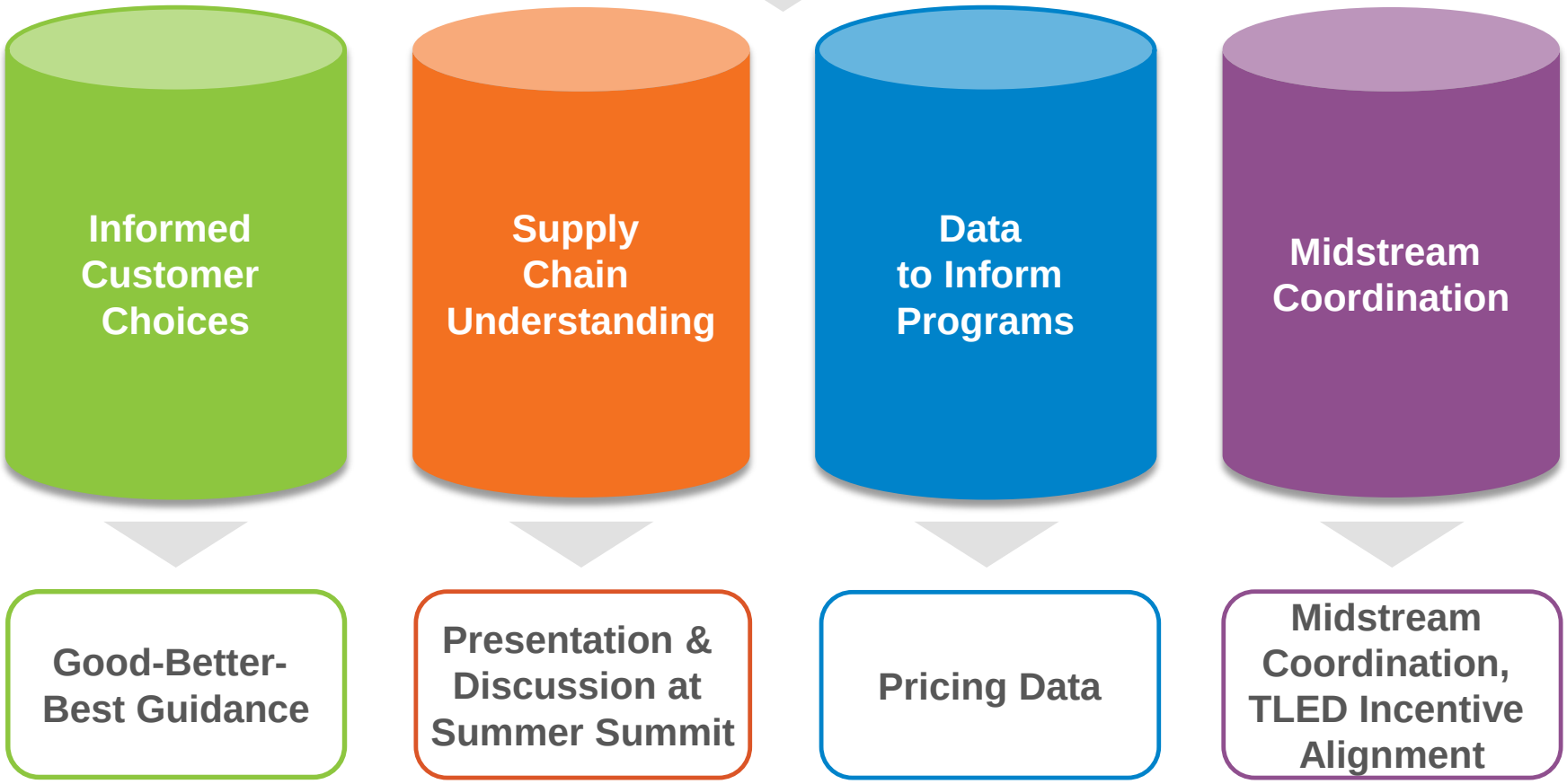


Lessons Learned:

Our Approach

2015-2017 Approach

Align on actions to address shared problems/needs



2015-17 Lessons Learned

- More informed
- Greater collaboration and mutual understanding
- Data and customer-facing resources that are increasingly hitting the mark

- Long timeframes to get to deliverable
- Not always clear that results are being used or effecting progress toward goals
- Strategies are not interrelated/reinforcing

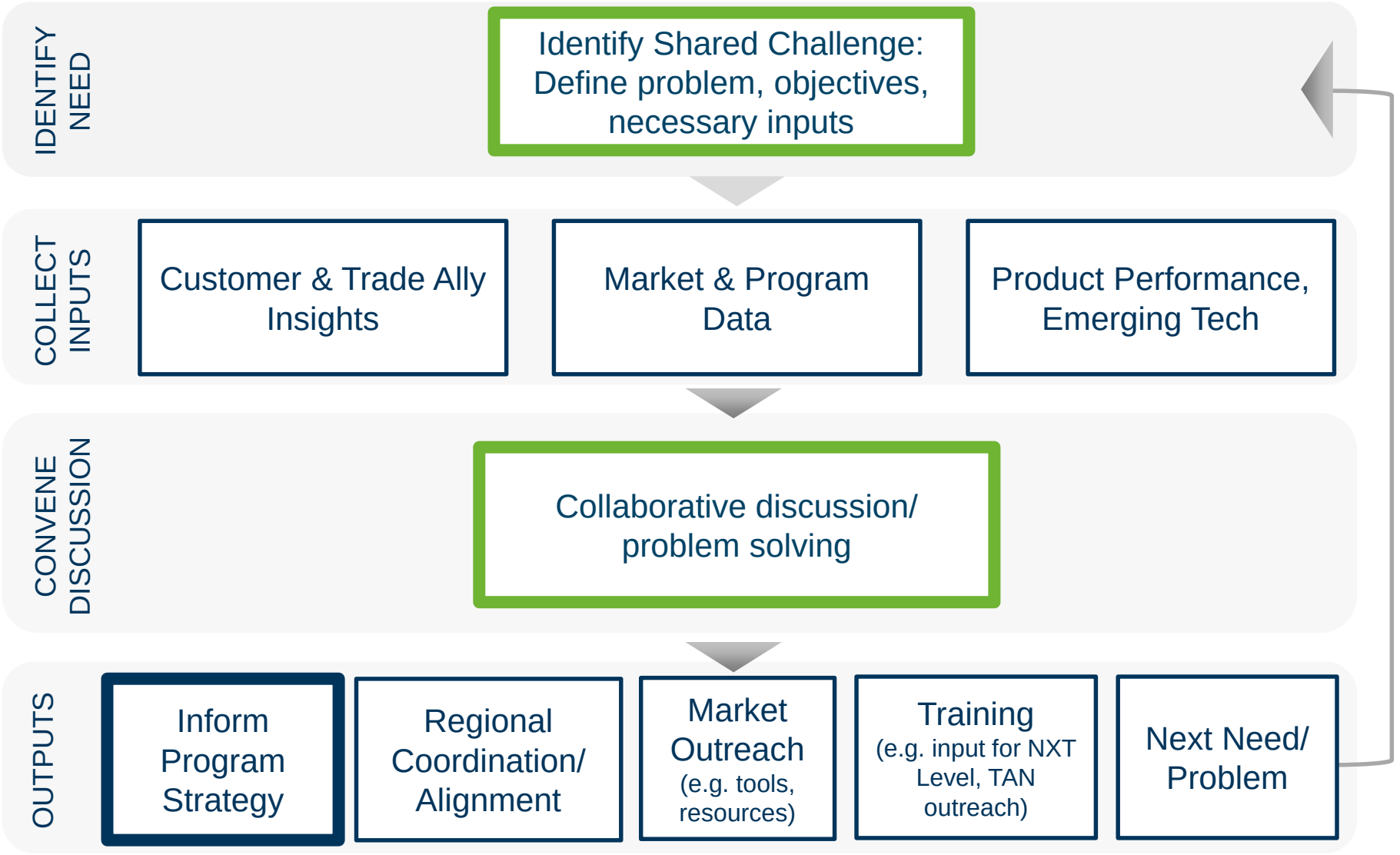
Example: TLED Discussion

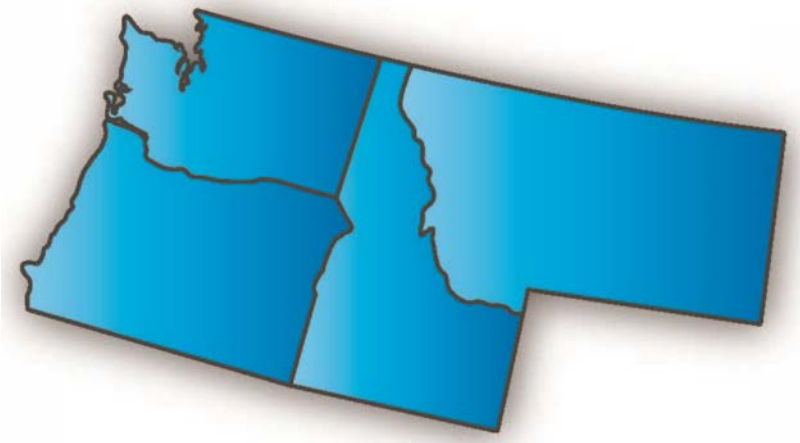
Updated approach

Concept for updated approach that is

- **More focused** on the priority challenges that emerged in the survey
- **More integrated** – information feeds directly into problem we're collaboratively tackling
- **More applicable** – first and foremost, results should serve your programs

Proposed Approach for 2018





Regional Survey Feedback to Inform 2018 Priorities

Regional Survey

- What's been most valuable?
- What should be the priorities for the coming year?

Responses collected from:

- Avista
- BPA
- Clark
- Idaho
- ETO
- Northwestern
- SCL
- SnoPUD

Plus the Council, NEEA, Evergreen, LDL & PNNL

Survey: Most valuable outcomes

- Most frequently mentioned as valuable
  - Data
  - Good-better-best guidance
  - Coordination on midstream and incentives

- Inherent value in RSMP driving conversations that help us learn from and coordinate with each other

Survey: Recommended Priorities

Market Data to Inform Programs

Avoid duplicate cost & effort.

Help us see what measures could take over programs 'by storm' such as TLEDs did. What's next?

Advanced Lighting Controls

Expand beyond interoperability

Identify opportunities to collaborate, be more unified in approach to market

Up/Mid/ Downstream Coordination

Emerging Technology

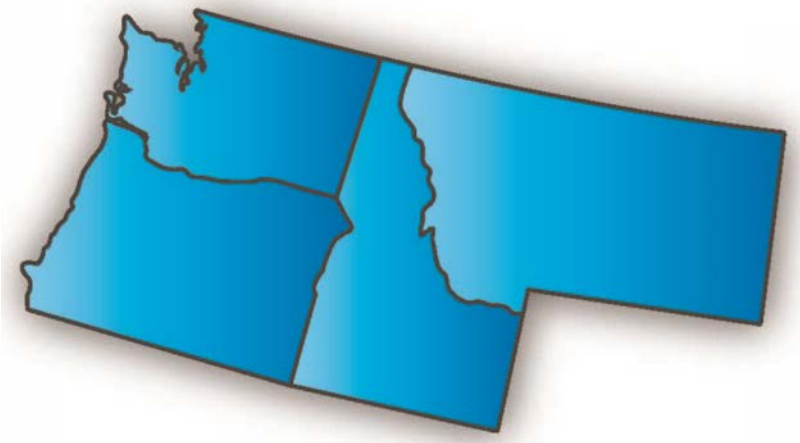
Have info & tools to stay up-to-date on changes

Market Actor Training

Proposed 2018 Priority Strategies

Increase adoption of advanced lighting control systems

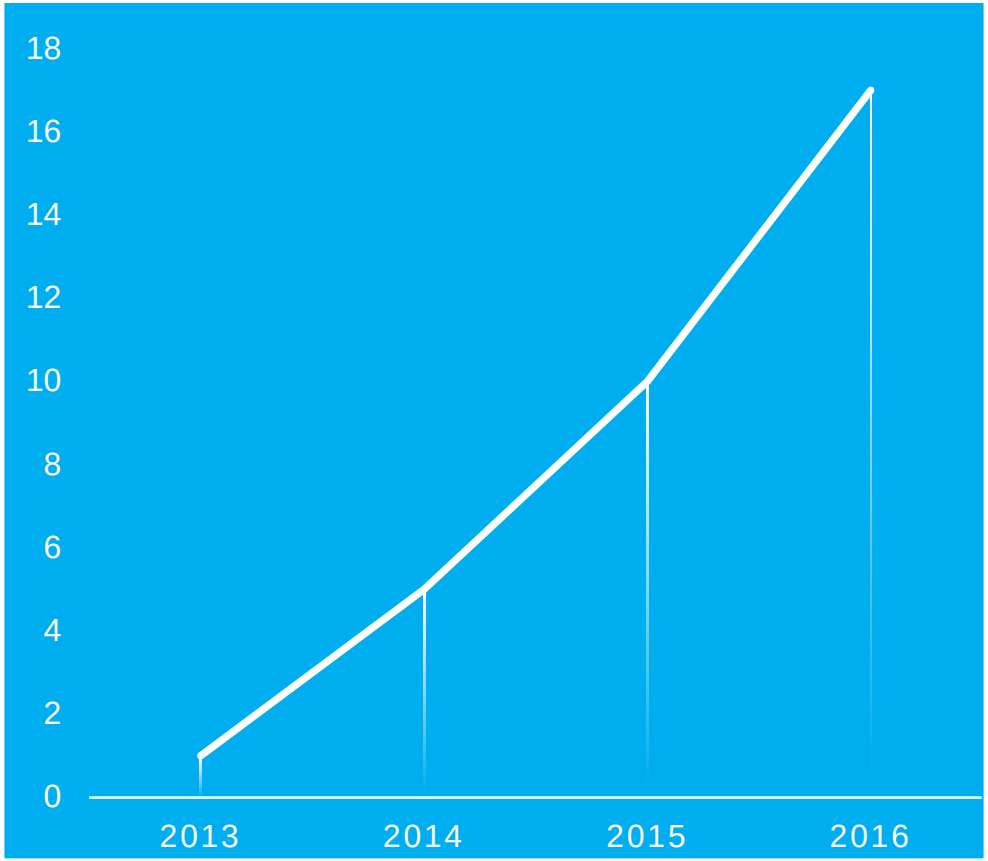
Inform program planning for commodity lamps (TLED, HID-LED, CFL-LED, etc.)



Priority 1: Advanced Lighting Control Systems

Advanced Lighting Control Systems

- Less than a quarter of the lighting load uses controls - <1% advanced controls
- Programs seeing very low (or no) rate of ALCS & LLLC in retrofit projects, yet other regions are seeing adoption
- As LED savings shrink, controls offer continued savings
- Cost reduction essential, requiring a strong & competitive market



LLLC Products Available

Advanced Controls

Proposed Priority Strategy

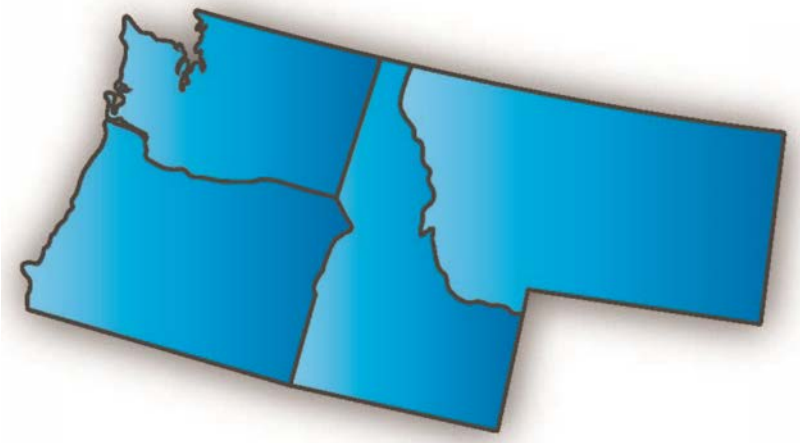
Increase adoption of advanced lighting control systems

2018 Focus

1) What are the key barriers keeping advanced controls from being installed (or going through programs) in the NW?
   - What can programs do to address these barriers?
   - What do customers and market partners need to support adoption?
2) What motivates customers to purchase (or not)? How can programs leverage these to increase adoption?

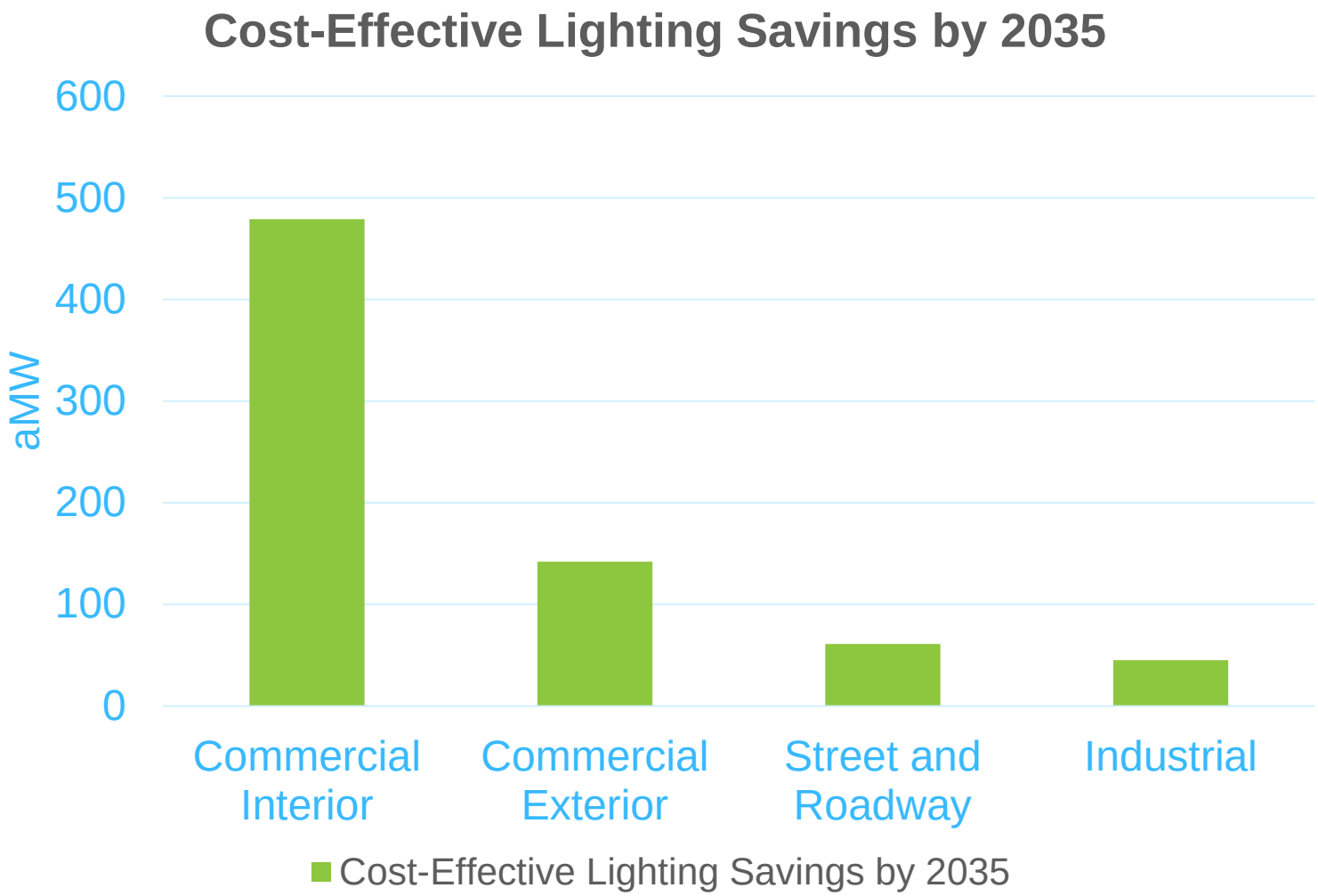
Questions for future consideration

- How can programs best achieve cost effectiveness?
- Which markets should be our focus?
- Which program strategies are most successful?
- What new control types and products are emerging? How should programs respond?



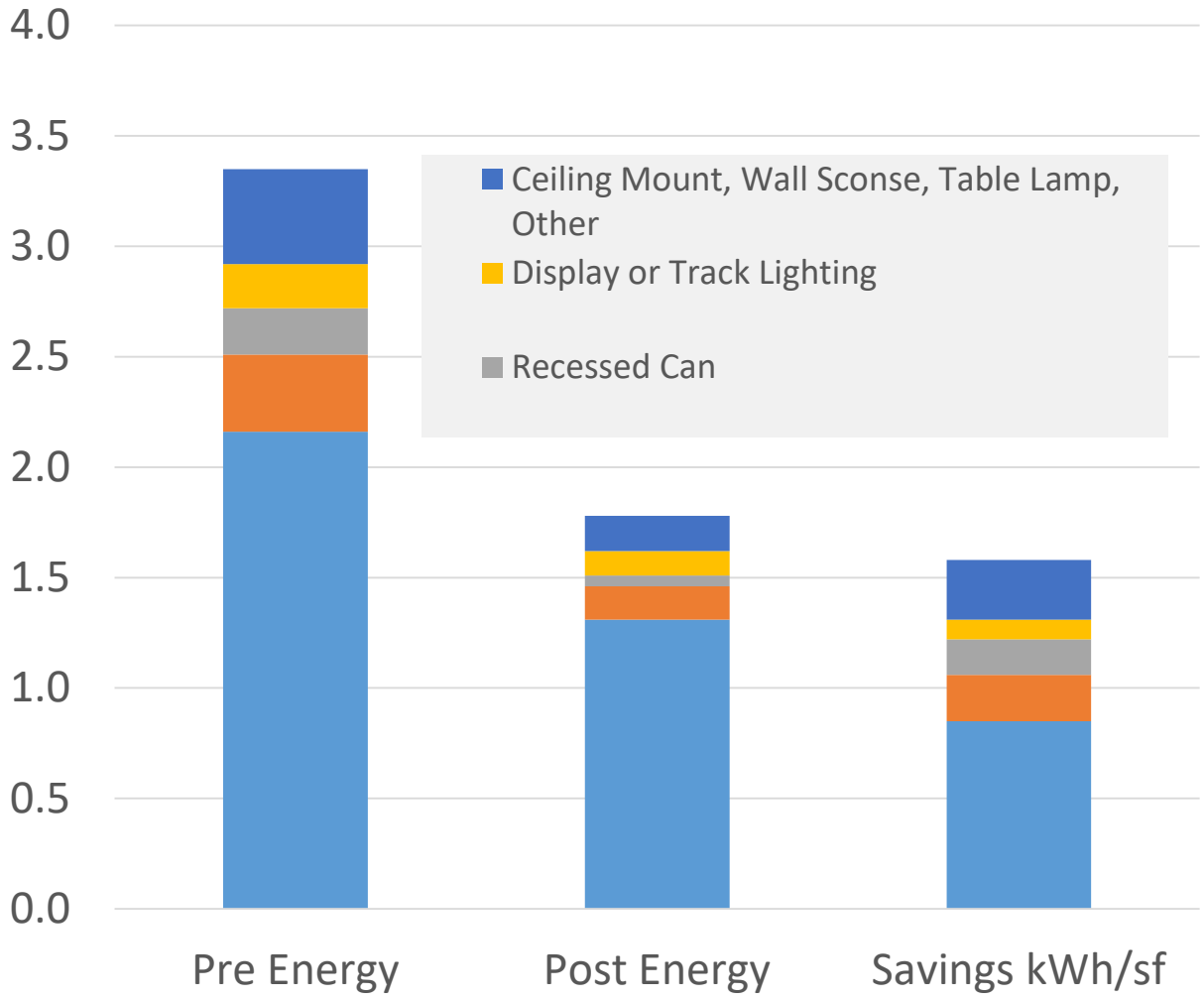
Priority 2: Commodity Lamps

Seventh Plan Cost-Effective Potential in C&I Lighting



Commercial Interior Lighting Potential

(by lighting application not including controls)

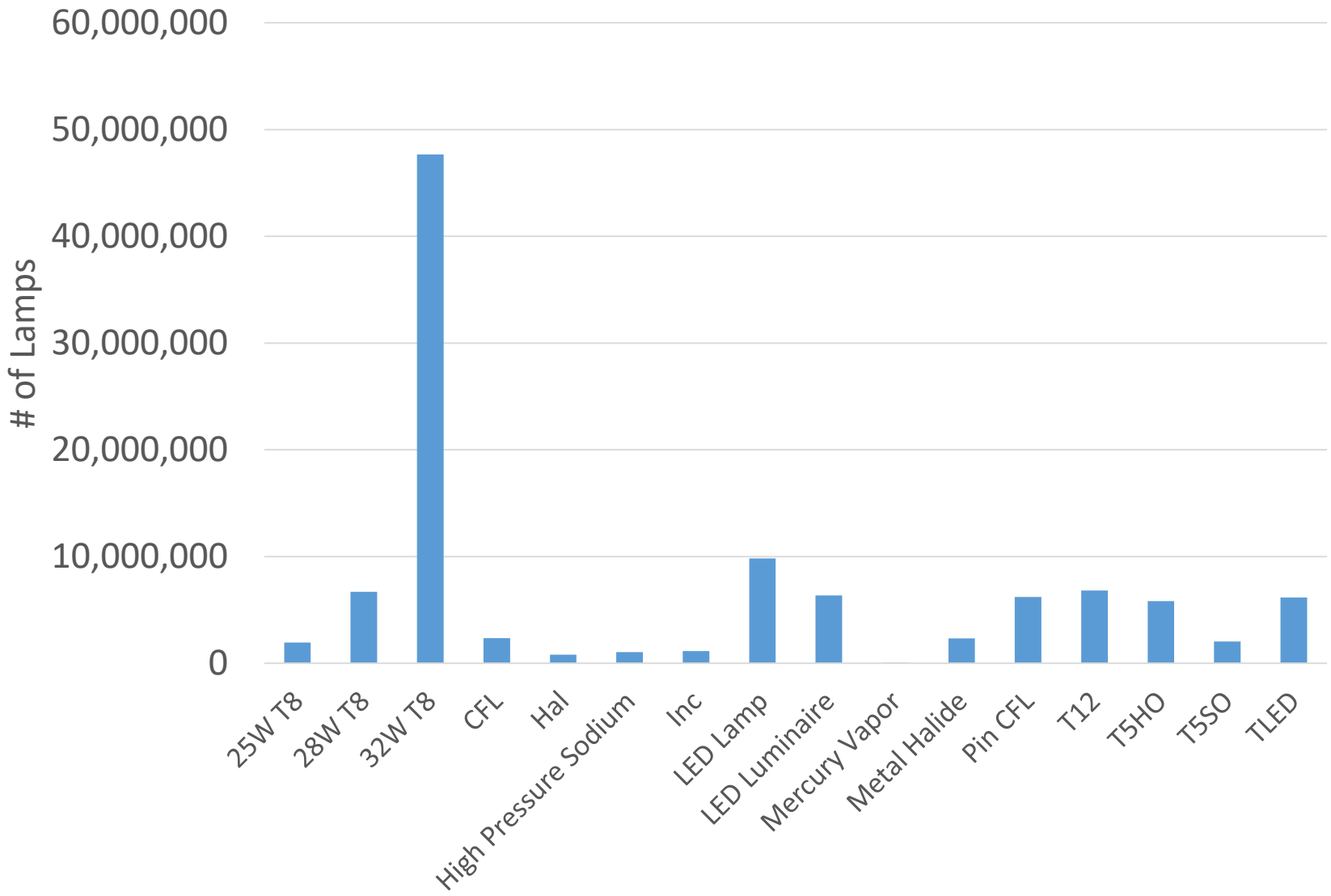


About half the potential is in systems other than linear fluorescent

Integrated fixtures and lamps compete in all these applications

Estimated 2017 Lamp Stock

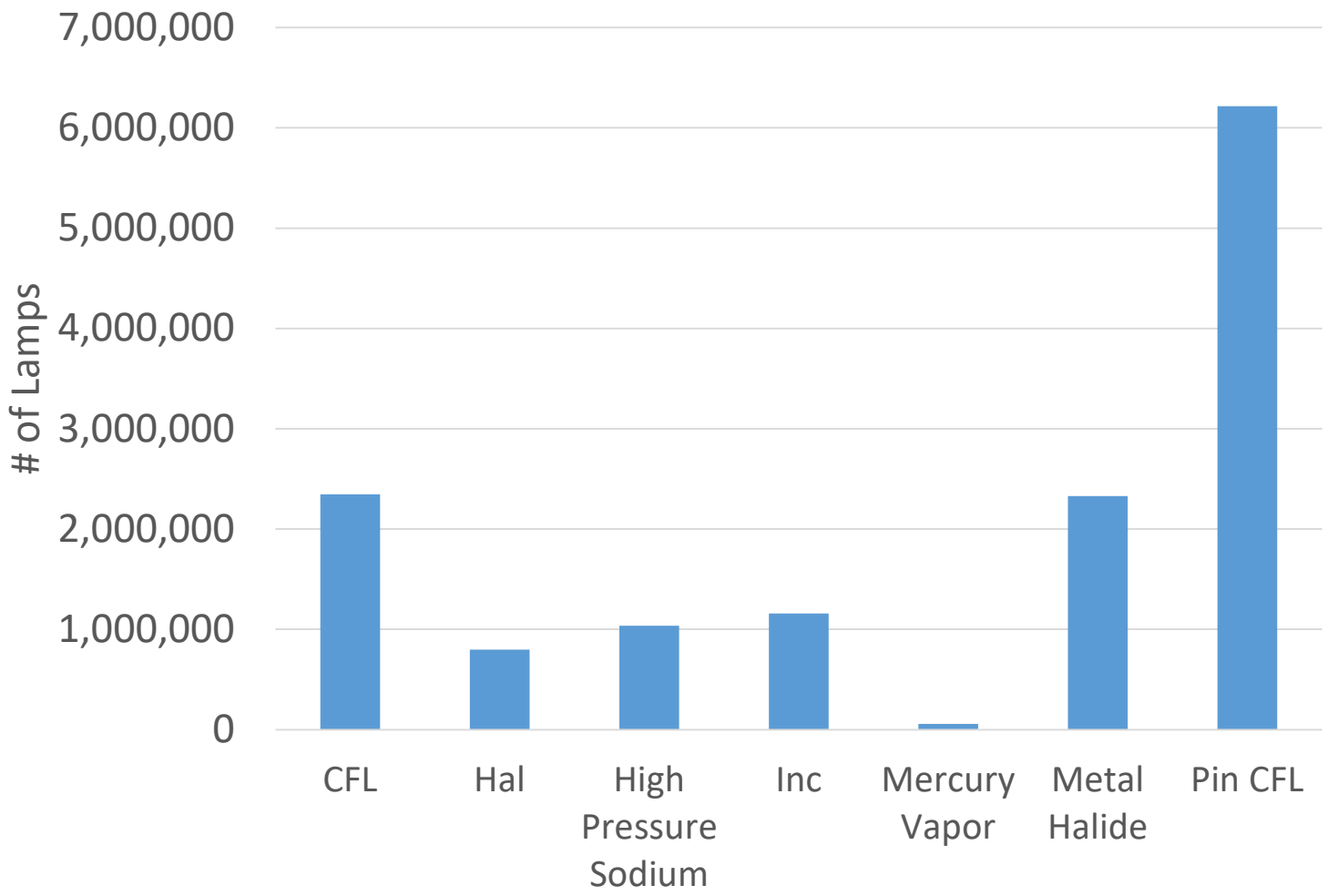
(From Navigant Non-Res Lighting Model)



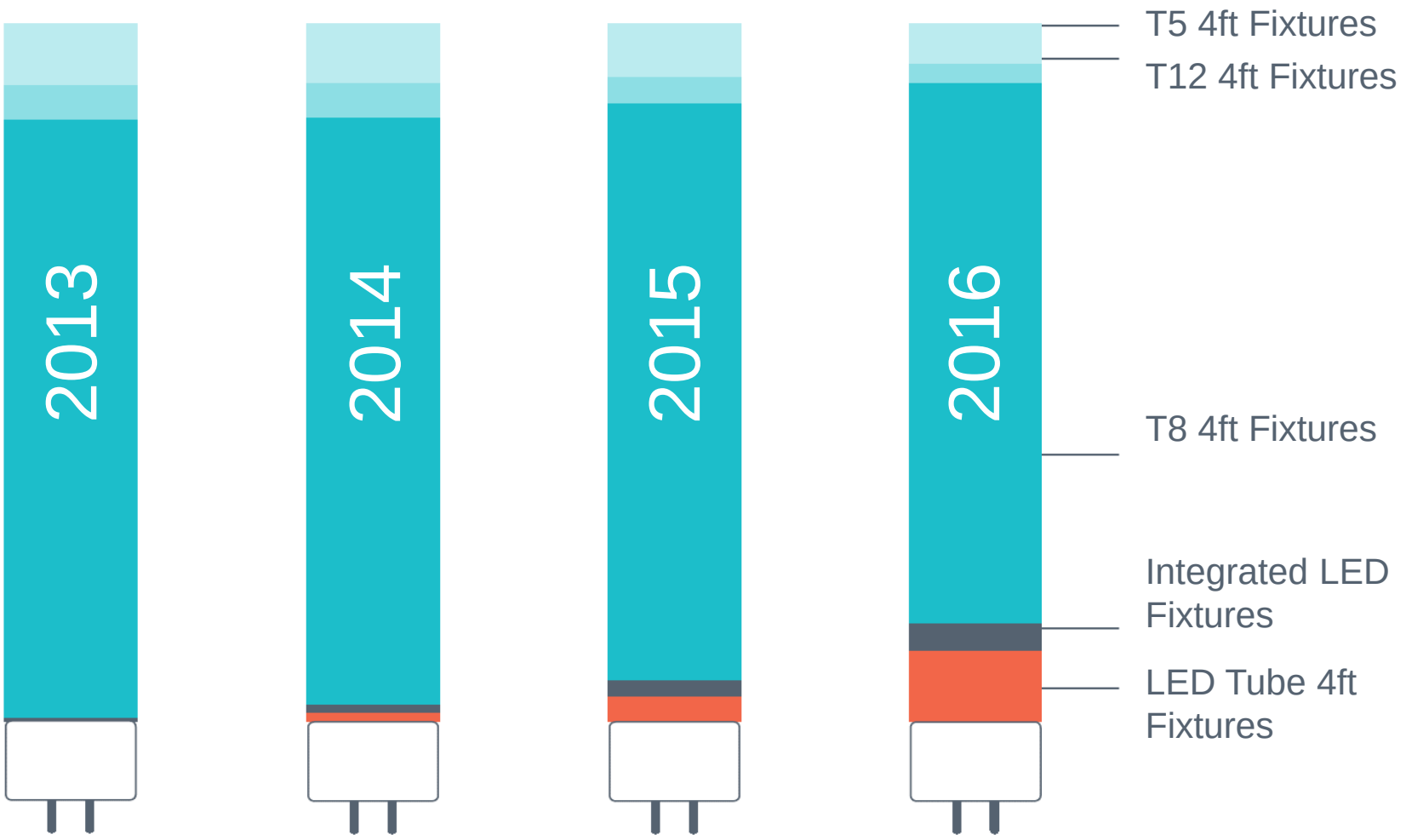
Estimated 2017 Lamp Stock

Excluding 4-foot linear and LED

(From Navigant Non-Res Lighting Model)



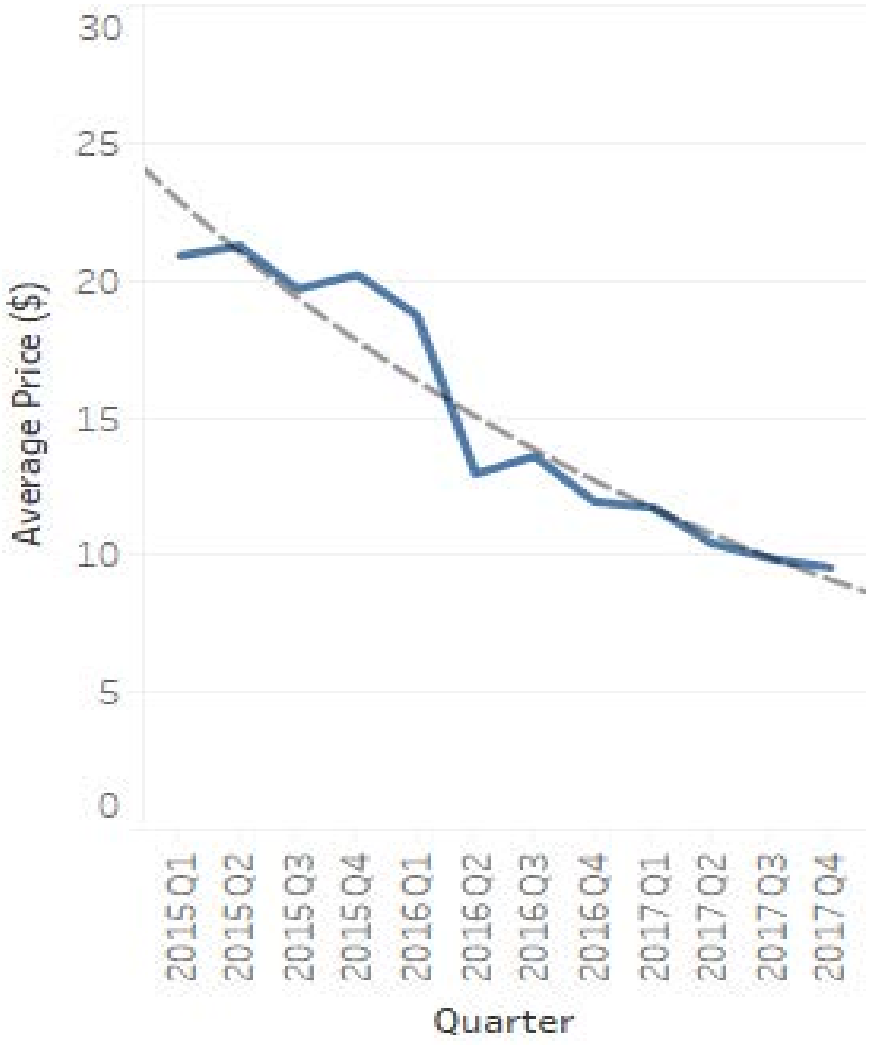
Commodity Lamps



TLEDs +311% Growth

Commodity Lamps

Rapid price drops in TLEDs have left programs scrambling to keep up & short on budget



Commodity Lamps: PSE 2016-2017

Exterior Installations

	kWh saved	%
A21 LED	271,536	0.91%
Canopy	1,136,437	3.80%
Flood Light	1,814,876	6.06%
Parking/Area	15,735,312	52.58%
Street	677,460	2.26%
TLED	565,695	1.89%
Wall Pack	3,070,299	10.26%
CFL LED	72,570	0.24%
HID LED	4,865,090	16.26%
Total	**28,209,274**	**94.26%**

Interior Installations

	kWh saved	%
High Bay	10,443,475	17.13%
Hort	2,709,536	4.44%
Parking/Area	732,924	1.20%
T8	789,150	1.29%
TLED	31,129,569	51.06%
Troffer	4,174,923	6.85%
Vapor Tight	816,977	1.34%
CFL LED	623,908	1.02%
HID LED	3,934,564	6.45%
Total	**55,355,028**	**90.79%**

What's next? HID-LEDs? CFL-LEDs? How can our programs better stay ahead of market shifts?

HID – LED replacement lamps

100 watt Metal Halide

8500 lumens
15,000 hrs

22W - claim of 100 watt HID equivalent

2640 lumens
50,000 hrs

Are these equivalent? Which products and product characteristics should we promote?

Commodity Lamps

Proposed Priority Strategy

Inform program planning for commodity lamps (TLED, HID-LED, CFL-LED, etc.)

2018 Focus

1. Accepting that many customers will choose replacement lamps over fixtures, what lamp characteristics or specifications should our programs/region promote?
2. How can available data be utilized to inform incentives & program strategy so that we stay ahead of the curve?

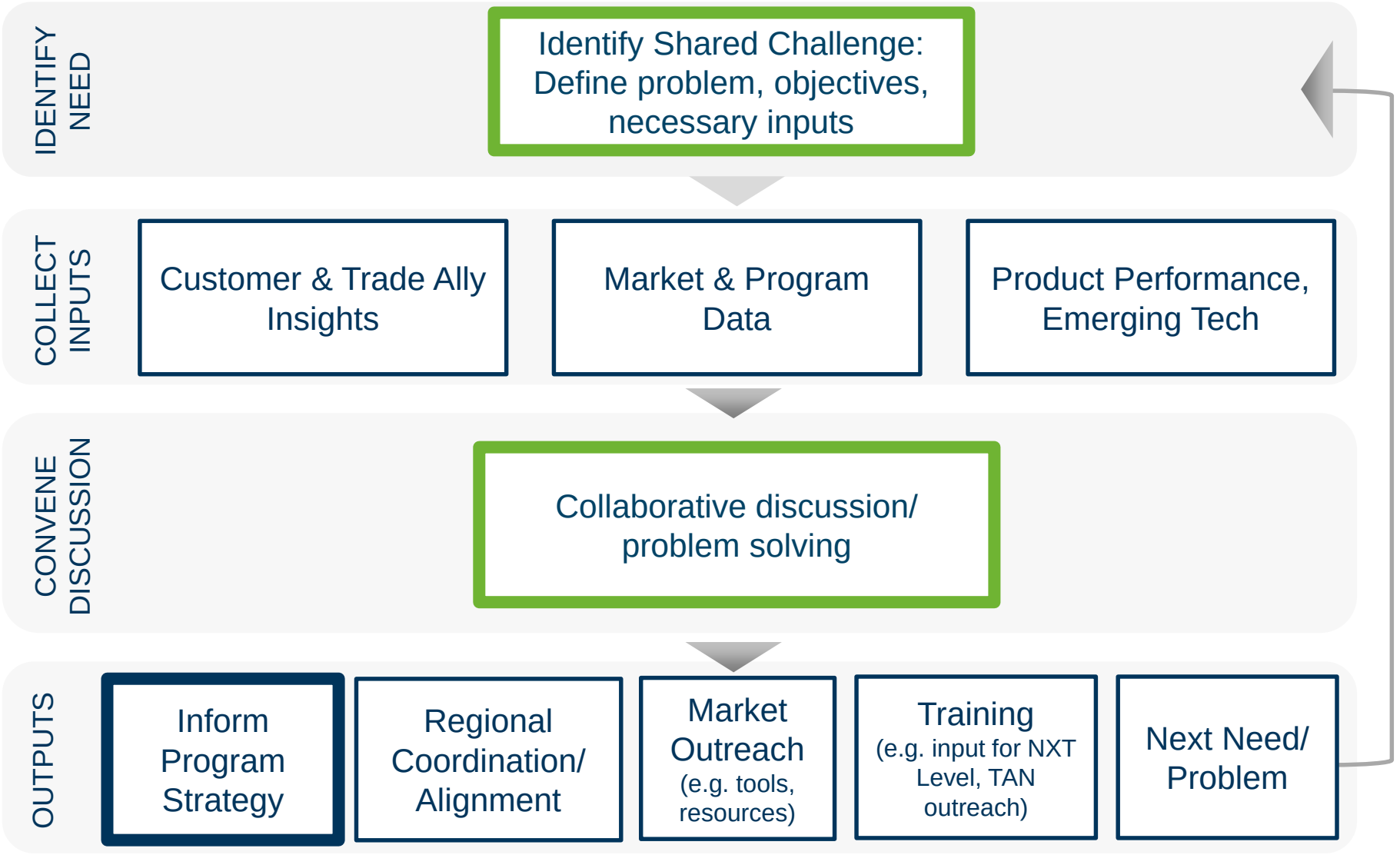
Questions for future consideration

- What additional data/analytics do we need?
- What program strategies are appropriate as price and savings decrease? When is the right time to exit?
- How can we encourage increases in efficacy? Is it worth doing?

Discussion

Approach	Do you have feedback/refinements on the adjustments to approach?
Priorities	Do you support the priorities? Are there refinements you'd like to recommend?
Actions	Which topics do you think are most urgent? In which do you want your organization to participate?

Proposed Approach for 2018



Advanced Controls

Proposed Priority Strategy

Increase adoption of advanced lighting control systems

2018 Focus

1. What are the key barriers keeping advanced controls from being installed (or going through programs) in the NW?
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Commodity Lamps

Proposed Priority Strategy

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2. How can available data be utilized to inform incentives & program strategy so that we stay ahead of the curve?

C+I Lighting Regional Strategic Market Plan

Thank you

TOGETHER We Are Transforming the Northwest

Avista · Bonneville Power Administration · Cascade Natural Gas Corporation · P.U.D. Chelan County · Clark Public Utilities · EnergyTrust of Oregon · Grant PUD · Idaho Power An IDACORP Company · NorthWestern Energy · NW Natural · Pacific Power · PGE · PSE Puget Sound Energy · Seattle City Light · Snohomish County PUD Public Utility District No. 1 · Tacoma Power Tacoma Public Utilities

April 18, 2018

Pay for Performance Panel Discussion

Joseph Fernandi, SCL
Kathleen Belkhayat, ETO
Mark Lenssen, PSE

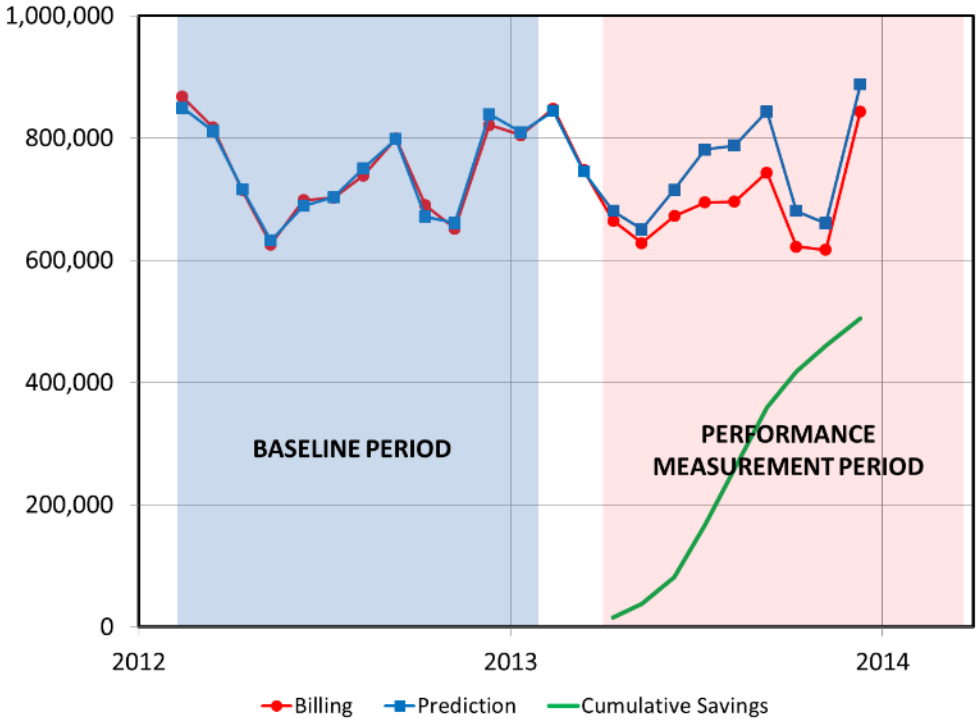


PAY FOR PERFORMANCE PROGRAMS

Joe Fernandi | April 17, 2018

PAY FOR PERFORMANCE (P4P) – WHAT IS IT?

- Program for improving building energy performance
- Incentive payments over time based on verified performance
- Energy savings are *measured* at a whole building level



P4P- BENEFITS

- EE measured at the building meter
  - Measure blind
  - Captures O&M, behavioral and interactive savings
- Supports deep-efficiency
- Capture multiple measures through a single transaction
  - Don't need to dissect into program boxes
- Allows for flexible and creative projects

P4P – WHEN DOES IT MAKE SENSE?

- Large projects (significant energy efficiency depth)
- Interactive effects (measures impacting multiple building systems)
- Long-term (multiple projects)
- Mix of capital improvement, operational & maintenance, behavioral savings

P4P – HOW DOES IT WORK?

- "Train" a baseline model (well-behaved building)
- Ensure "well-behaved" (can accurately predict consumption)
- Let participant deploy portfolio of projects/measures in building
- "Measure" savings, incentives over time based on verified performance
- Measure-blind (capital, O&M, behavioral at same rate)

PROGRAM BREAKOUTS

- ETO, PSE, SCL
  - Eligibility
  - Incentives
  - Pilots
  - Challenges/Lessons Learned

Seattle City Light

SEATTLE CITY LIGHT

Deep Retrofit P4P Program

HISTORY / PROOF OF CONCEPT

- **2013 Climate Action Plan**, adopted by the City Council through **Resolution 31447**, included a recommendation that City Light *"pilot a utility incentive program that would pay for actual energy savings over time instead of providing up-front payments for projected savings.";*
- Seattle City Light 3-Building Pilot on Deep Retrofit P4P (Ordinances 124381, 124382, and 124383) [2013-2016]

One Union Square

1111 3rd Avenue

Lake Union Building

PILOT – LESSONS LEARNED

- Baselines
  - Not all buildings are well-behaved
  - It can be difficult to isolate a stable period in time
  - Variables affecting consumption are sometimes not well-understood or haven't been collected
- Baseline Adjustments
  - Adversely affect the numerical precision of a model
  - Estimates and assumptions introduce art into science
  - Can be "messy"
  - Expectations and process should be clearly laid out

DEEP RETROFIT P4P – STAKEHOLDER WORKSHOP

- Held stakeholder workshop to inform program design
- Received input on incentive structure, eligibility, and reporting requirements
- Presented 3 incentive structures for feedback
- Stakeholder preference: <u>options</u>
  - **3-year** "persistence"
  - **5-year** "tiered"

P4P Workshop Participants	
Service Providers	17
Strategic Partners	7
Owners & Operators	7
SCL & City Staff	11
Total	**42**

DEEP RETROFIT P4P - ELIGIBILITY

- Existing commercial buildings
- Must have utility interval meter (or pulse-meter/BMS)
- "Deep" savings
  - At least 15% savings from capital measures
  - Must impact multiple building systems
- "Well-behaved" building (M&V Requirements)
  - Stipulates model results, not tool/model
- >50k SF or high energy intensity
- Not eligible for other programs (+ solar is separate contract)
- Workforce development & qualification/training requirements

DEEP RETROFIT P4P - INCENTIVES

- 2 “flavors”
- 3-year “Persistence” Model
  - $0.08/kWh
  - Paid on all “persisting” savings
- 5-year “Tiered” Model
  - $0.18/kWh
  - $0.02/kWh “bonus” per 5% savings increment (beyond 15%) - encourages *depth*
  - Paid on all “incremental” savings

DEEP RETROFIT P4P - REPORTING REQUIREMENTS

- Baseline Report
- Implementation Period Report
- Quarterly Reports
- Annual Reports
- Project Tracking
- Non-Routine Adjustments

M&V REQUIREMENTS

- Generally consistent with IPMVP Option C & ASHRAE Guideline 14
- Linear regression analysis
- Goodness of fit criteria
  - NMBE < 0.0005%
  - Estimated savings relative precision <25%
  - T-statistic for independent variable(s) larger than 1.3 for 80% confidence
- Incentives and savings based on *weather-normalized (TMY)*, not avoided energy use

CHALLENGES

- Certain barriers not addressed by current design:
  - Financing
  - Split Incentive
- Reduced avoided costs – difficult to make competitive
- Lack of measure certainty (measure life/attribution)
- Desire to reduce documentation requirements
- Internal training / competencies
- Participation / program uptake

TIMELINE/NEXT STEPS

- Deep Retrofit Program Launch: June 2018
- NC Program Launch: Late 2018
- Energy Efficiency as a Service: Late 2018

Pay for Performance Pilot

April 18, 2018

Energy Trust of Oregon

Pay for Performance Overview

Measures include O&M, behavioral and capital

Incentives paid annually for 3 years (based on meter readings)

Pay for Performance Allies are a key element- contract between customer and Ally

Pilot Status

Completed

- Ally training conducted
- 3 Allies
- Design & documentation

Underway

- Recruitment

Coming up

- Eligibility and Energy Reduction Plans
- Implementation & measurement

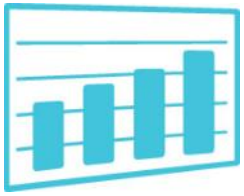
Design Overview (how it works)

Contract structure

- Customers and PfP Allies
- Customer and Energy Trust

Project requirements

- Energy Reduction plan
- Installation/implementation
- Measurement



Savings quantification

- Meter-based
- Regression model

Incentives

O&M	Capital (includes O&M)
$0.05/kWh	$0.08/kWh
$0.60/therm	$1.00/therm
Capped at 200% of 1st year incentives	Capped at 150% of 1st year incentives
<= 50% of savings from capital	> 50% of savings from capital

First year goals

- Late-2019/early 2020 savings
- 6 projects
- 3 million annual kWh
- 100,000 therms

Challenges & Lessons Learned

- Design
  - Cost-effectiveness & savings baseline
  - Quantification of savings
  - Ally requirements
- Uptake
  - Contracting structure
  - Duration of contract
  - Other obstacles

Thank you

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EnergyTrust of Oregon

PSE Pay for Performance

Drivers

- Because we had to…
- Looking for a better way to capture difficult to calculate energy savings and provides pathway for "opportunistic" projects
- Facilitates multiple projects rolled into a "single" one

A few program details

- Commercial, 50,000+, well behaved, pre-qualified with at least 15% savings potential
- Multiple capital projects, O&M, behavior
- Looking for both kWh and therms
- Quarterly documentation from customer/contractor

Funding Details

- Grant Agreement between PSE and customer (similar to a standard custom grant project)

Savings Methodology

- 12 months baseline used to develop regression model
- Fixed baseline (adj made for non-routine events)

- **Base Incentive:**
  - Calculated using proposed 1st year savings as percentage of baseline consumption
  - Not to exceed $.30/kWh, $5.00/Therm
  - Up to 50% of incentive can be paid after implementation of measures (end of Year 1)
  - Remaining incentive will be used to calculate a $/kWh(Therm) to be paid annually for the rest of the contract
- **Performance Incentive**:
  - Savings and incentive calculated after each of the 4 performance years
  - $0.05/kWh ($0.50/Therm) for annual savings above the proposed target

PSE PUGET SOUND ENERGY

Any Questions ?

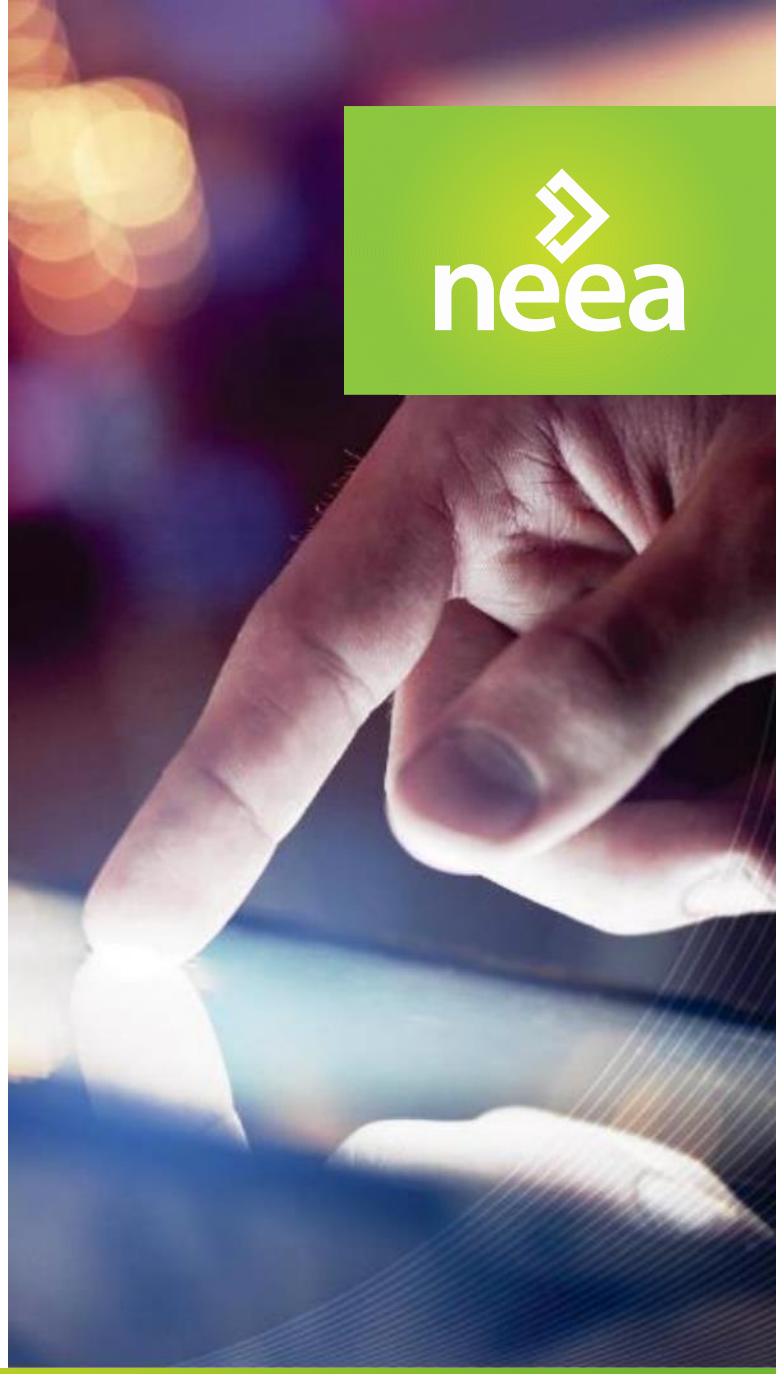
Break!

April 18, 2018

Market Opportunities

Emily Moore
Debbie Driscoll





Discussion Question #1

- What are the changes or challenges you see coming in commercial energy use in the coming years?

- *Individual Reflection: ~ 3-5 min*
- *Pair-Up Reflection: ~ 10 min*
  - *Write top 3 ideas*
  - *1 idea/card*
  - *Write BIG & legibly*
  - *Share-out 1 idea at a time*

Discussion Question #2

- What changes/challenges do you think will be of concern for building owners and managers?

- *Collaborative Discussion*

Discussion Question #3

- How are you preparing (or hoping to prepare) in your organization ?

- *Collaborative Discussion*

Discussion Question #4

- What is the most important challenge for us as a region to get ahead of or work more collaboratively to solve ?

- *Collaborative Discussion*

Meeting Wrap-Up

- Public Comment?
- Feedback on any of the following?
  - Agenda
  - Pre-meeting packet materials
  - Panel Discussion
  - What worked?
  - What was missing, needs improvement?
  - Did you understand relevance to THIS committee?
  - Anything else?

April 18, 2018

Thank you, CAC!!

TOGETHER We Are Transforming the Northwest