October 4th

Outdoor Lighting • CBSA • Project Updates

ETHAN

MANTHEY

hello

MY NAME IS

Dulane Moran

NEEA

CBSA Timeline: 2 Phases

We are here: Phase II
RFP in October 2017

Phase I
Q4 2016 - August 2017

Phase II
September 2017 – December 2019

Random Sampling

Creating Survey Instrument

Recruiting Participants

Building Audits

Data Analysis

COMMERCIAL BUILDING
STOCK ASSESSMENT

Project Details

- Two-stage design.
- Stage 1: virtual catalog of ~8,000 – 9,000 census blocks
- Stage 2: sampled from Stage 1; on-site inspection of 700-800 buildings
- Thousands of variables collected that characterize building use, shell, heating & cooling, lighting, vintage, refrigeration, hot water and more.
- An important regional resource that informs program design, load planning, and potential assessments

Next Steps

- Develop and release Phase 2 RFP (September - October)

- Contractor selected and in place (December)

- Begin stage one cataloging and survey finalization (Jan-April 2018)

- Begin site recruitment (May 2018)

- Data collected and clean (Q4 2019) (in time for 8th Power Plan)
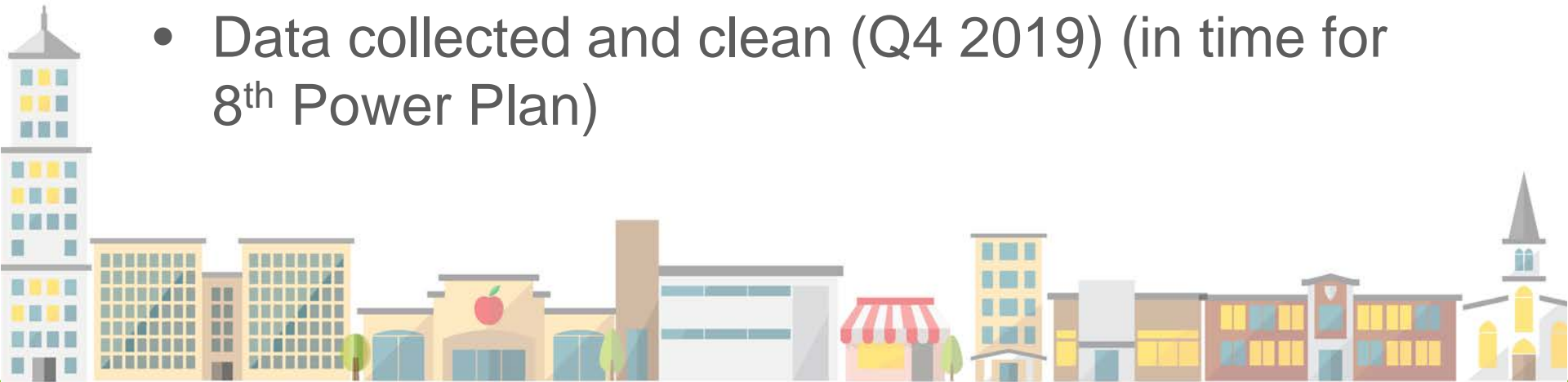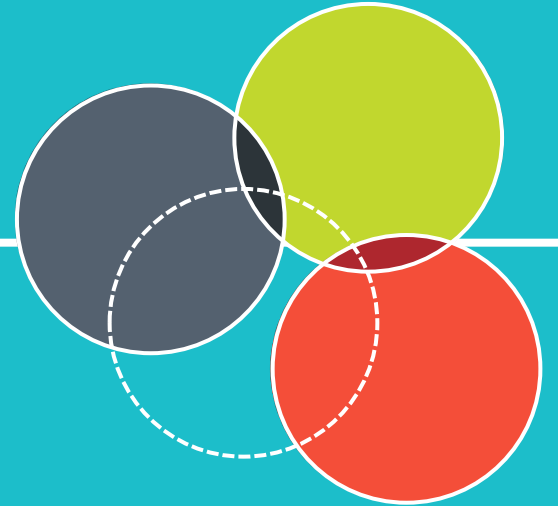
JESSICA

AIONA

Scoping the Outdoor Lighting Stock Assessment

Why study outdoor lighting

17% of total lighting consumption

DOE estimated that outdoor lighting accounts for 17% of total lighting use nationally.

Outdoor is 46% of BPA's non-residential lighting program activity

Based on our team's analysis, outdoor lighting comprised almost half of the FY15 Option 1 non-residential lighting program savings.

Inconsistent market size estimates for key segments

Current estimates of the street lighting in the region vary wildly: the Seventh Power Plan assumed one million fixtures, while two different NEEA reports estimated the stock at 1.7 million and 2.7 million fixtures, respectively.

10

How we think energy usage breaks out given what we know today

(% of regional consumption)

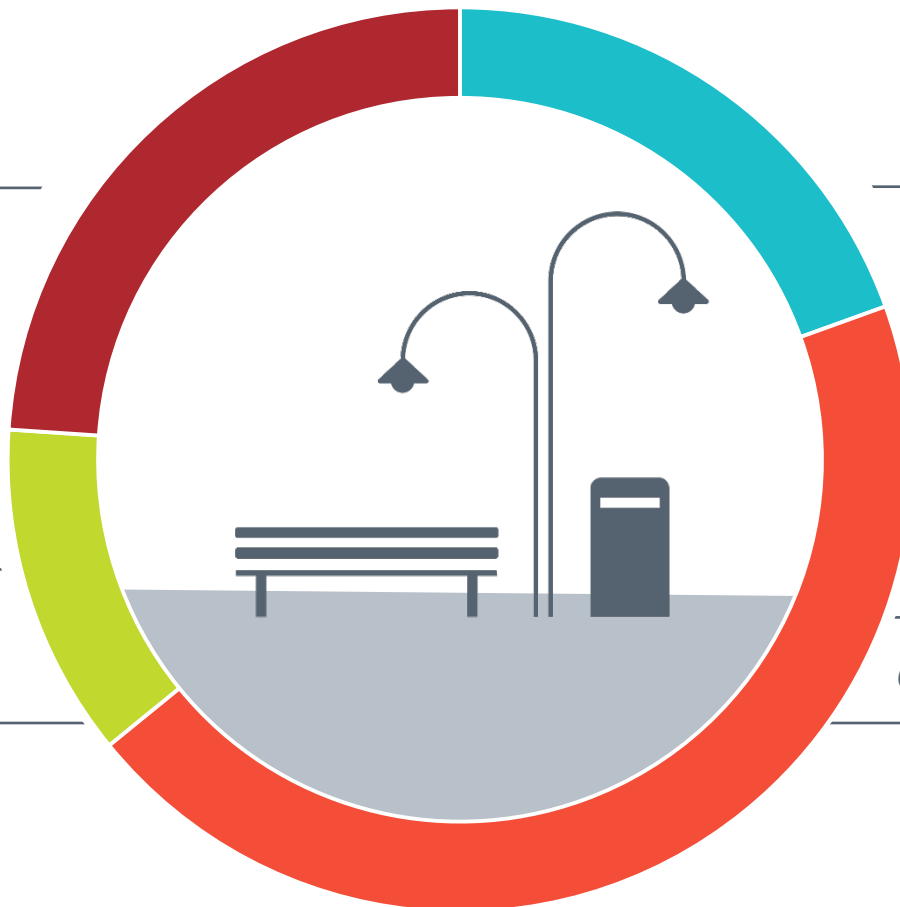**24%** *Outdoor (not associated with a building)*

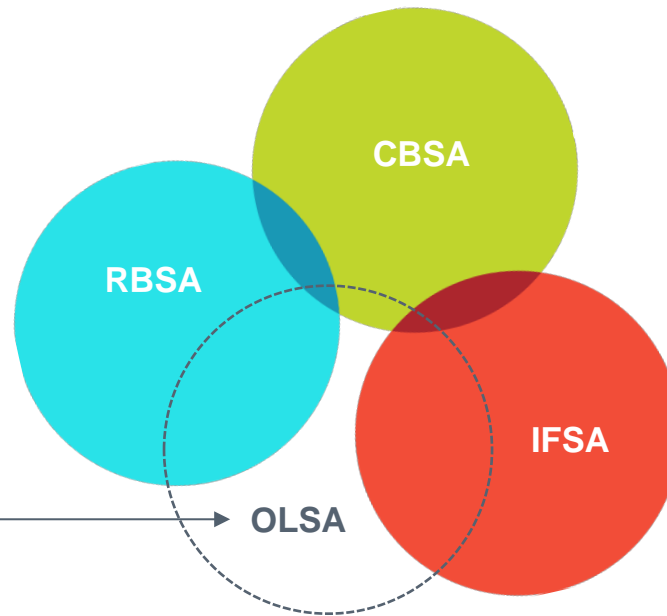**12%** *Industrial & Agriculture Exterior*

Residential Exterior **19%**

Commercial Exterior **45%**

Filling the gap

OLSA would complement other stock studies by filling in key gaps.

CBSA

RBSA

IFSA
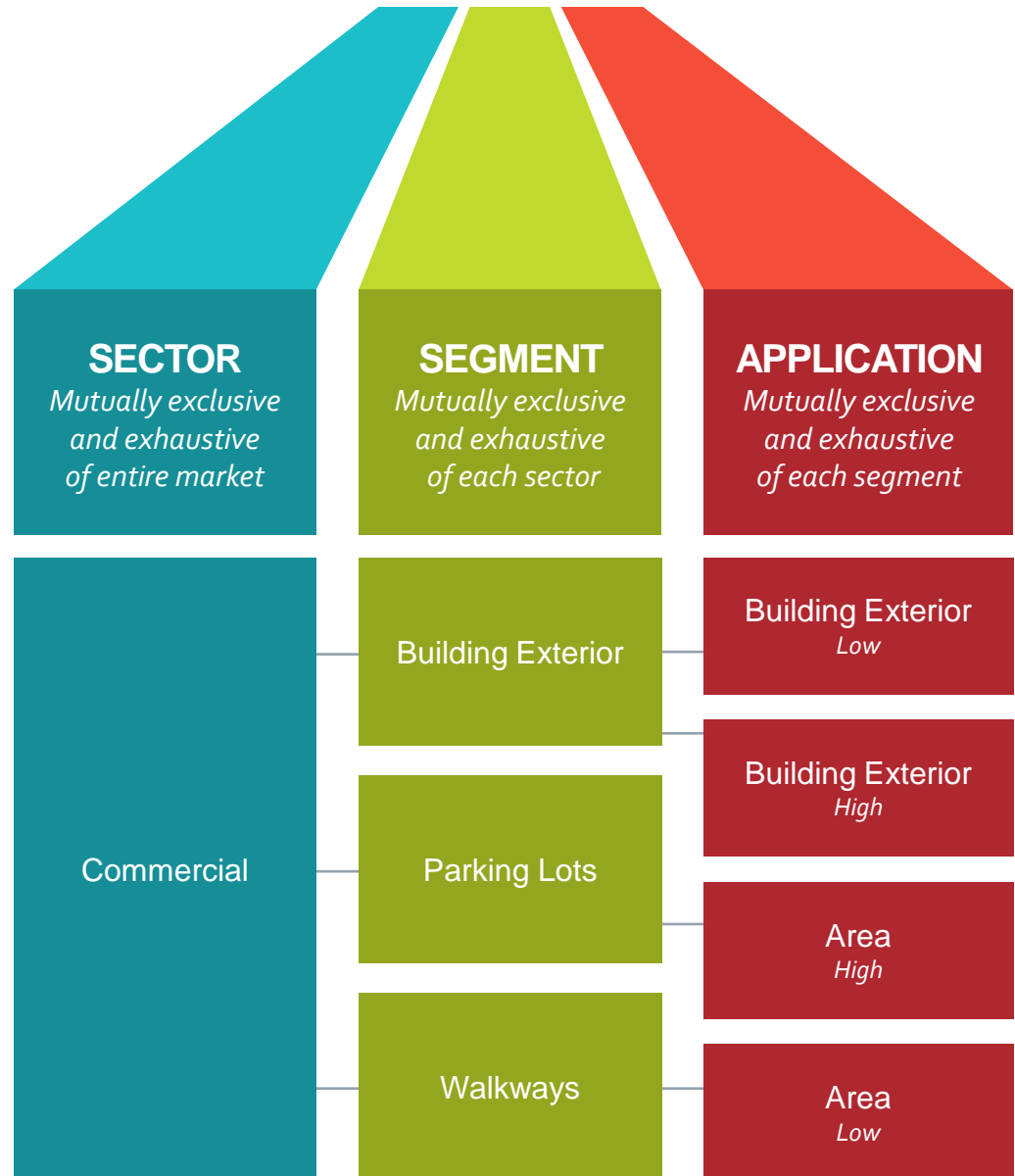
OLSA

Desired study outcomes

A study that enhances existing data by filling in gaps in order to provide

- Accurate market size estimates for all segments.
- Accurate market mix snapshot for all segments, including understanding which segments have largely converted to LED and which have not.

Defining Scope

What to include

Arriving at a Segmentation Strategy

SECTOR _Mutually exclusive and exhaustive of entire market_	**SEGMENT** _Mutually exclusive and exhaustive of each sector_	**APPLICATION** _Mutually exclusive and exhaustive of each segment_
Commercial	Building Exterior	Building Exterior _Low_
		Building Exterior _High_
	Parking Lots	Area _High_
	Walkways	Area _Low_

Sectors
Segments
Applications

Sector	Definitional Notes
RESIDENTIAL	• Includes outdoor lighting associated with residential homes. • Includes all outdoor covered by the RBSA. • Aligns with the BPA's residential lighting model. • Multifamily exterior included in commercial sector.
COMMERCIAL	• Includes all outdoor lighting associated with CBSA building types. • Includes outdoor lighting associated with multifamily buildings.
INDUSTRIAL	• Includes outdoor lighting associated all non-residential buildings or facilities that are NOT explicitly covered by the CBSA.
OUTDOOR	• Includes all lighting not associated with homes or buildings.

Sectors
Segments
Applications

Question

Does this capture the segments correctly?

Sector	Segment
RESIDENTIAL EXTERIOR	Building Exterior
	Landscape
COMMERCIAL EXTERIOR	Parking Garage (Embedded)
	Parking Garage (Stand-Alone)
	Parking Lots (Embedded)
	Building Exterior
	Walkway/Area
	Signage
	Exterior Sales
	Sporting Field
	Other
INDUSTRIAL & AGRICULTURE EXTERIOR	Building Exterior
	Parking Lots (Embedded)
	Facility/Area
	Other (Includes Stadiums, Airports, Docks, Harbors)
OUTDOOR	Street / Roadway
	Public Spaces/Parks
	Traffic Lights
	Billboard
	Parking Lots (Stand-Alone)

Sectors
Segments
Applications

Question

Does this capture the applications correctly?

Sector	Segment	Application
RESIDENTIAL EXTERIOR	Building Exterior	**Medium Screw Based and Reflector**
	Landscape	**Landscape**
COMMERCIAL EXTERIOR	Parking Garage (Embedded)	**Parking Garage Fixtures**
	Parking Garage (Stand-Alone)	**Parking Garage Fixtures**
	Parking Lots (Embedded)	**Area - High**
	Building Exterior	**Building Exterior – High and Low**
	Walkway/Area	**Area - High and Low**
	Signage	**Signage**
	Exterior Sales	**Area - High**
	Sporting Field	**High Output Spot Lighting**
	Other	**Other**
INDUSTRIAL & AGRICULTURE EXTERIOR	Building Exterior	**Building Exterior – High and Low**
	Parking Lots (Embedded)	**Area - High**
	Facility/Area	**High Output Spot Lighting**
	Other (Includes Stadiums, Airports, Docks, Harbors)	**Other**
OUTDOOR	Street / Roadway	**Street / Roadway – High and Low**
	Public Spaces/Parks	**Area - High and Low**
	Traffic Lights	**Traffic Lights**
	Billboard	**High Output Spot lighting**
	Parking Lots (Stand-Alone)	**Area - High**

Recommendation:
Scope OLSA at the Segment Level

Why Segments?

Optimum level of market granularity for OLSA scoping decision.

Best aligns with regional data sources and data gaps, avoiding overlap.

Enables flexibility in research approach and minimizes impact on models.

Question

Does it make sense to capture the scoping at segment level? Are we missing anything?

Segments by Sector

Based on the process detailed in the previous section, the team created a comprehensive list of outdoor lighting segments for possible inclusion in OLSA. This section presents this universe of outdoor segments, organized by sector. For each segment we've provided a definition (based on an existing regional definition when possible), a visual example, and an estimate of regional energy consumption in aMW.

Street and Roadway Lighting

The largest gap in regional knowledge and a significant portion (22%) of total estimated outdoor lighting energy consumption

FPO

Market Mix

Initial analysis of street lighting provided by PNW cities indicates half – or more – of all such lighting are already LED. Further analysis can cost-effectively refine this estimate. Anecdotally, there may be a large difference in LED penetration between urban and rural.

50% LED

50% HID
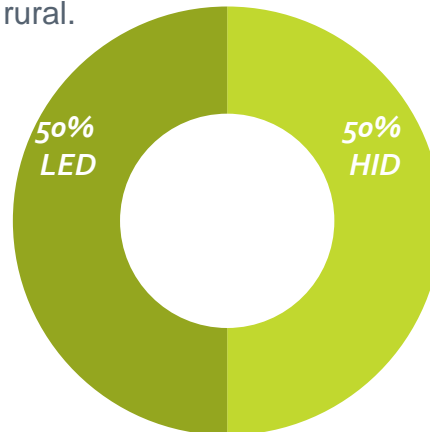
Market Size   *140 aMW*

Our current estimate of market size (140 aMW) is highly uncertain. The disparity in street lighting counts regionally means this segment could contribute significantly more – or less – to regional usage. Regardless, it is a relatively large segment.

90% *of Outdoor Sector*

22% *of all Outdoor Lighting*
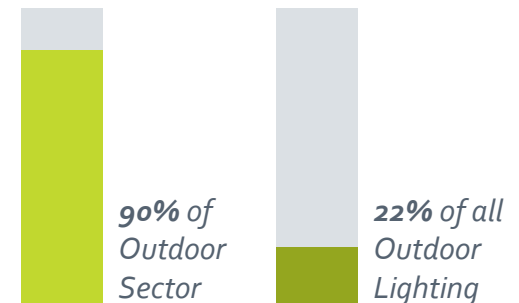
Industrial and Agricultural Exterior (All Segments)

NEEA's 2014 IFSA visited a limited number of industrial locations and did not differentiate between interior and exterior lighting when collecting and reporting data. Consequently, little is known about the market mix or market size for the sector and its four constituent segments (building exterior, embedded parking lots, facility/area, and other). The team opted to include "other" as a segment for OLSA because so little is known about the sector. Consequently, it's critical to have a catch-all segment and because some notable building types, such as airports, stadiums, and harbors fall into this sector (as the team is defining it).

Market Mix

Per BPA's non-residential lighting model, industrial lighting is almost 50% high bay, the majority of which is either metal halide (37%) or T5SO (30%).

14% T12
5% Other
14% 32W T8
37% MH
30% T5SO
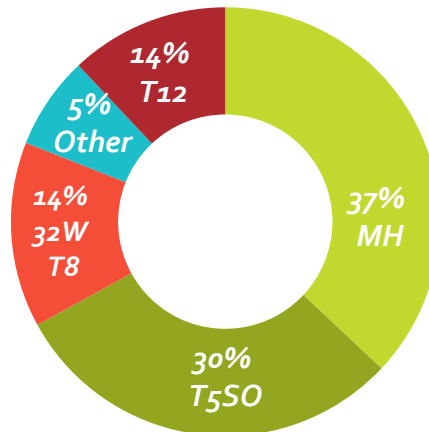
Market Size   *78 aMW*

The current estimate for industrial sector's outdoor lighting consumption is 78 aMW, about 12% of all outdoor lighting energy use. That places the entire industrial sector between the commercial walkway/area segment (43 MW) and commercial building exterior segment (96 aMW). However, the region knows very little about this size of this sector. It's possible, perhaps likely even, that OLSA could change these estimates significantly.
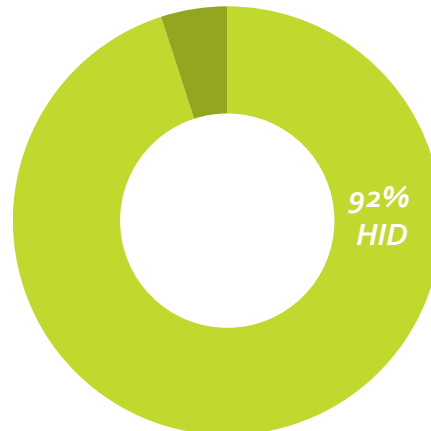
Standalone Parking Garages and Parking Lots

Both standalone parking garages and lots are currently unaccounted for in regional stock assessments.

Standalone parking garages and lots are the forgotten twins of those that are 'embedded' (i.e., those garages and lots associated with buildings sampled in the CBSA). While the market mix for embedded parking garages and lots (both captured by the CBSA) are likely similar to the mix for stand-alone garages and lots—since the applications are the same—the region does not have reliable market size estimates for standalone garages or lots. Both segments could be sizable and the team recommends that BPA use Task 2 to determine the best way to accurately estimate the market size for each. Unless the information is obtainable at a low cost, the team recommends leveraging the CBSA-based market mix for embedded garages and lots and focusing OLSA on market size.

FPO

Market Mix

BPA's non-residential lighting model shows embedded garages are largely HID (44%) followed by Fluorescent T8 (41%). Embedded lots, however, are almost entirely HID (92%), per previous CBSA.

92% HID

Market Size

The size of the standalone parking garage and lots market is unknown. For comparison, embedded garages and lots collectively make up 42% of the known commercial exterior lighting usage; the majority of which is associated with parking lots.

UNKNOWN

Public Spaces/ Parks

Like street and roadway lighting, public spaces such as parks were unambiguously not covered by of the existing stock assessments.

Since public spaces were not part of the previous or ongoing regional stock assessments, no estimates of this segment's market mix or size exist. It is possible that the market mix will mirror that of commercial walkway/area segment, adequately captured by the CBSA, but differences in ownership types (public versus private in most instances) could also result in a meaningfully different technology mixes. We don't know.

For these reasons, the team recommends that BPA use Task 2 to assess options for cost-effectively developing market size and mix estimates for this outdoor segment.

FPO

Market Mix

Market Size   *Unknown*

UNKNOWN

Commercial Building Exterior

While this segment is outdoor lighting's largest, previous (and ongoing) CBSA efforts have gathered sufficiently detailed and representative market size and market mix information about the lighting on commercial building facades. Simply put, the CBSA-based information already in BPA's non-residential lighting model represents the best possible information and there appears to be little value in OLSA further studying this segment.

In fact, with the exception of stand-alone parking garages, which were not covered as part of the CBSA, the team is not recommending OLSA include any of the identified lighting segments in the commercial sector.

Residential Landscape

BPA confirmed, in consultation with NEEA, that the ongoing RBSA has collected information about landscape lighting as part of the current assessment. As such, including residential landscape lighting in OLSA would be duplicative.

Traffic Lights and Billboards

Since neither of these two segments are associated with commercial buildings, they were not covered by the previous CBSA (nor will they be part of the next CBSA). While that suggests possible inclusion in OLSA, the team does not believe the market size for either segment is significant enough to merit the expense of future data collection. Based on analysis of national data sources, the team estimates the segments use a combined total of 16 aMW annually, which equates to approximately 1% of estimated outdoor lighting nationally.

With regard to market mix, several factors point to a market mix that is almost entirely LED. Most notably, DOE standards that become effective on January 1, 2006 effectively required LED technology for traffic light fixtures. This means there is likely very little savings opportunity for that segment.

Also Excluded from OLSA

Sector / Segment	Rationale for Exclusion	aMW	% of Outdoor
RESIDENTIAL BUILDING EXTERIOR	Sufficiently covered by the RBSA	127	20%
COMMERCIAL PARKING GARAGE (EMBEDDED)		13	2%
COMMERCIAL PARKING LOTS (EMBEDDED)		109	17%
COMMERCIAL WALKWAY/AREA		43	7%
COMMERCIAL SIGNAGE	Sufficiently covered by the CBSA	2	<1%
COMMERCIAL EXTERIOR SALES		9	1%
COMMERCIAL SPORTING FIELDS		6	<1%
COMMERCIAL OTHER		12	1%

Sampling Approach

How to sample

Luminosity

Are there other sampling methods we might use?
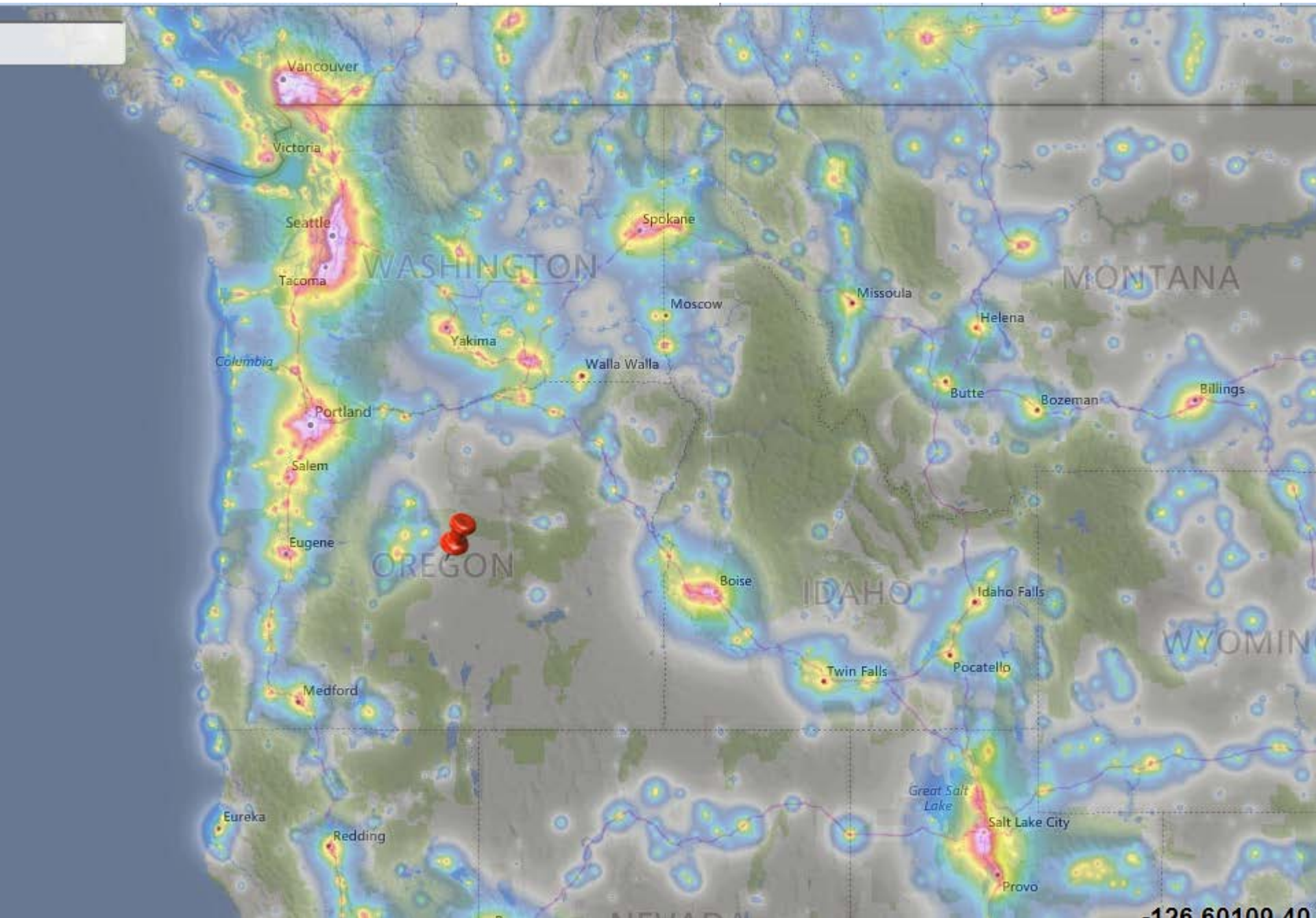
The study can use publicly available satellite imaging data detailing *nocturnal luminosity levels* as a possible foundation for sampling. The data would indicate which parts of the region use the most outdoor lighting.

:

1. Overlay and combine luminosity and Census block data.

2. Assign a luminosity score to every Census block in the Pacific Northwest.

3. Create lighting level strata (e.g., high, medium, and low) and assign each Census block to a strata

4. Sample a specific number of Census blocks from each strata, with an emphasis on those with higher luminosity

5. Determine, using Google Earth and Streetview, the presence of candidate lighting segments within sampled Census blocks.

The team can use the resulting information to estimate regional market sizes and, potentially, as a sampling frame for subsequent on-site data collection.

Data Collection Approach

Getting the data

Data Collection Approach: Combining primary and secondary data

Secondary Data
If reliable and available

Primary Field Data
Where needed
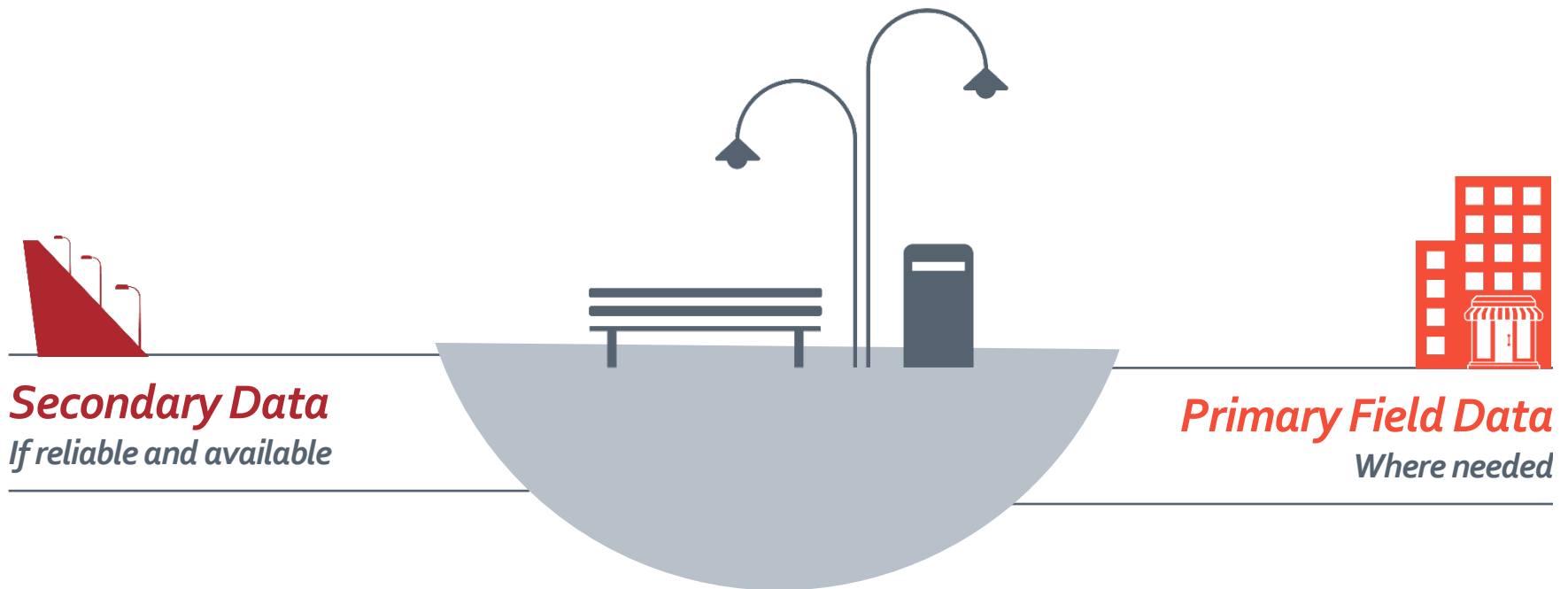
Possible Paths by Segment

The paths are not mutually exclusive. Preliminarily, the team believes both approaches may work for most of the eight candidate segments.

Sector	Segment	Sampling & Data Collection	Secondary Data
COMMERCIAL EXTERIOR	Parking Garage - Standalone	Yes	Yes
INDUSTRIAL & AGRICULTURAL EXTERIOR	Building Exterior	Yes	Yes
	Parking Lot - Embedded	Yes	Yes
	Facility/Area	Yes	Yes
	Other	Yes	Yes
OUTDOOR	Street and Roadway	Yes	Yes
	Public Spaces/Parks	Yes	No
	Parking Lot -Standalone	Yes	Yes

Coordination with CBSA

Integrate with CBSA protocols and communications as possible

We are seeking to make primary data collection as easy as possible and plan to use CBSA communications and protocols to guide us

Utility Notification

OLSA will piggy back off of CBSA's utility notifications for field work

Customer Contact Protocols

CBSA will have an customer contact protocols workgroup that we will coordinate and follow.

CBSA will have utility notification processes that we will use.

Comments or Questions?

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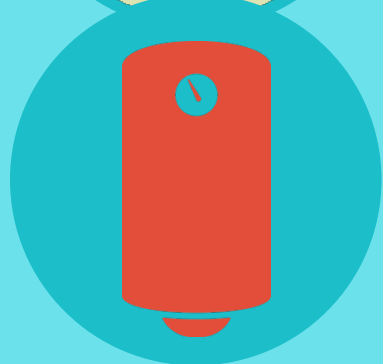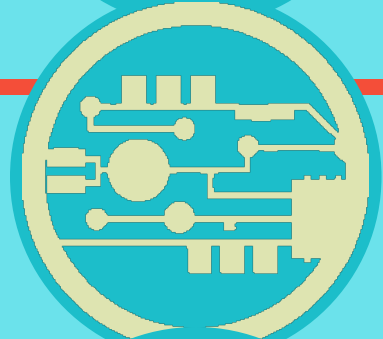
Quick Project Updates

Project	Status	
Data Center Draft Methodology	Contracted	⭐
OLSA Planning Phase	Contracted	⭐
Res Hot Water Draft Methodology	Contracted	⭐
Res HVAC Market Intelligence Study	Contracted	⭐
Res HVAC Model Development	Contracted	⭐
2017 Non-Res Distributor Sales Data	In Contracting	
Res Hot Water Model Development	In Contracting	
Res HVAC Baseline Field Study	In Contracting	
Data Center Model Development	*Pre-Contracting*	
Integrate Capacity into Res Lighting Model	*Pre-Contracting*	
HVAC Distributor Sales Data: Round 2	*Pre-Contracting*	

THX!

See you November 1st!