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# Reduced Wattage Lamp Replacement Initiative Market Progress Evaluation Report #1

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## EXECUTIVE SUMMARY

The Northwest Energy Efficiency Alliance (NEEA) contracted with Navigant and Cadeo (the team) in June 2015 to complete the first Market Progress Evaluation Report (MPER) of its Reduced Wattage Lamp Replacement Initiative (RWLR). NEEA sought to understand the initiative's early progress toward its goal of transforming the Northwest region non-residential lighting maintenance market.

### About RWLR

The overarching goal of RWLR is to transform standard purchasing practices in the non-residential lighting maintenance market. Specifically, RWLR seeks to make 25W and 28W T8 linear fluorescent lamps (LFLs) the primary lamps that replace 4-foot lamps. Known as reduced (or low) wattage (RW) lamps, these lamps are more efficient alternatives to the market's standard 32W option.

In early 2014, NEEA launched a market test of the RWLR initiative. During this phase, NEEA provided education, training and incentives to five regional distributors to promote RW lamps. Upon the market test's successful conclusion in early 2015, NEEA and NEEA funders authorized a scale up of the RWLR initiative to bring in more regional distributors. As of August 2016, NEEA has successfully recruited 13 regional distributors to partner with the initiative. NEEA also deepened its relationship with existing distributors by adding specific branches that did not originally participate in the market test.

### Evaluation Activities

The team conducted a series of evaluation activities aimed at gathering the market intelligence necessary to assess RWLR's progress toward market transformation as measured by the initiative's market progress indicators (MPIs). These tasks included analysis of distributor sales data, interviews with participating distributors and RW lamp manufacturers, and surveys of regional electrical contractors and non-residential lighting end users. The team also completed three review activities to ensure the initiative's market intervention strategy (logic model review), distributor sales data (data review), and energy savings reporting (Alliance Cost-Effectiveness or ACE model review) were sound.

### Progress Toward Market Transformation

Overall, the team found that RWLR has had mixed success progressing toward its short- and medium-term MPIs (MPI I-IV). After its first 18 months of full-scale implementation, RWLR is on track to address the identified supply-side and pricing barriers to greater RW adoption (MPI I and II, respectively). Additionally, RWLR has made progress, albeit more limited, toward addressing demand-side barriers (MPI IV) and causing lasting behavioral changes in the non-residential lighting maintenance market (MPI V).

However, the initiative's success in these areas has not yet translated into the RW sales totals or RW market share that NEEA hoped RWLR would generate in the medium-term (MPI III). This is primarily due to the nascence of the initiative as well as unanticipated competition in the non-residential maintenance market from tubular LEDs (TLEDs), an LED replacement for tubular fluorescent lamps. It is possible, however, that RW sales and market share will increase as RWLR matures—the initiative is only halfway

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through its short-term evaluation period (i.e., 1-3 years after full-scale deployment)—and enlists more regional distributors. Still, the competition from TLEDs will likely heighten as the technology continues to improve and decline in price. NEEA may need to make adjustments to account for the increasing appeal of TLEDs and work with regional utilities to develop a set of complementary non-residential lighting offerings.

Table 1 lists the status and anticipated timing of each MPI. Note that the team only offers a meaningful assessment regarding two long-term MPIs (MPI V and VI); the remainder of the long-term MPIs (VII-IX) are not applicable for this RWLR MPER and will be assessed in future MPERs.

**Table 1. MPIs Status Summary**

Number	MPI	Outcome Timing*	Status
I	Increased distributor promotion of RW T8s	Short term	On track
II	Decrease in RW T8 cost	Short term	On track
III	Increase in sales of RW T8s	Medium term	At risk
IV	Increased decision maker demand	Short term	Within range
V	Market momentum supports RW T8 sales	Long term	Within range
VI	Lighting distributors are interested in continued efficiency collaboration and new initiatives/programs	Long term	On track
VII	Federal standard requiring improved energy performance	Long term	Not applicable
VIII	RW T8 becomes the standard product choice in the T8 lamp market	Long term	Not applicable
IX	Improved general service fluorescent lighting (GSFL) energy performance	Long term	Not applicable

\*Short term: 1-3 years after scale-up; medium term: 3-5 years; long term: 5-10 years

## Key Findings

The findings and recommendations in this report are not based on a representative sample of the four state region – Idaho, Montana, Oregon and Washington. NEEA and its contractor did not conduct interviews in Idaho with the targeted audience for this report at the request of Idaho Power Company.

In addition to the team’s assessment of RWLR MPIs, it also identified the following key findings:

- 1. In 2015, RW lamps were 16.9% of participating distributor’s total 4-foot LFL sales.** The team’s RW market share estimate of 16.9% is 3.0% higher than the forecasted RW baseline for 2015 (13.9%). The overall RW market share was driven primarily by 28W lamp sales, which represented 83% of all 2015 RW sales.
- 2. Market reaction to 25W lamps is tepid.** While the total RW market share exceeded NEEA’s baseline forecast for 2015, 25W lamps (2.9%) fell short of their wattage-specific forecasted baseline (4.2%). Distributors cited lower light output levels and performance issues in colder temperatures as the primary barriers to greater 25W adoption. Several distributors said their salespeople did not feel comfortable recommending the lamps to customers.

- 3. A few distributors have successfully broken the 32W like-for-like purchasing cycle, while most distributors are still getting there.** Successful distributors employed strategies such as pulling the plug on 32W lamps (i.e., only offering RW) and offering a limited number of free RW lamps so end users could test them in the back of the house (e.g., in their own office space). However, the remainder—and majority—of distributors have struggled to influence decision makers and break the 32W like-for-like ordering practice. Distributors almost unanimously indicated that once an end user switches to RW lamps, it becomes their default lamp purchase. Contractors offered a less encouraging perspective on repeat purchases: they estimated that approximately 40% of customers re-order RW lamps.
- 4. TLEDs are a compelling option to many end users in the non-residential maintenance market.** Due to improvements in light distribution, lower wattages relative to RW lamps, and, most importantly, declining costs, TLEDs have become an attractive option for non-residential end users seeking to improve the efficiency of their lighting without undertaking a full remodel. As a result, TLEDs are increasingly a direct competitor to RW lamps. TLEDs remain significantly more expensive than RWs, but TLED incentives offered via some local utility programs have closed the gap, greatly reducing the payback period for TLEDs. In some cases, the utility incentives for TLEDs are so significant—typically due to program’s inability to keep pace with the rapidly dropping costs—that the incentives completely cover the price of the TLED.
- 5. RWLR drove distributors to negotiate special pricing agreements (SPAs) for RW lamps.** Seven out of 10 distributors interviewed said that they secured RW-specific SPAs with their manufacturers after enrolling in RWLR, citing the initiative as the driver for these negotiations. These distributors were clear that without NEEA’s intervention and focus on RW lamps they would not have negotiated the SPAs.
- 6. Achieving price parity has supply-side benefits too.** Securing the SPAs and offering the RW lamps at price parity was critical to not only overcome demand-side barriers but also supply-side barriers: distributor sales staff were more confident broaching the subject of RW lamps as an alternative to 32W lamps when the marginal cost was minimized or eliminated entirely. By helping supply-side market actors overcome their reticence to actively promote more efficient—and typically more expensive—products, programs can help break the like-for-like replacement cycle and expedite market transformation.
- 7. NEEA has successfully developed a midstream platform and cultivated a strong, long-term relationship with regional electrical distributors.** Without exception, distributors indicated that they valued their partnership with RWLR, trusted the initiative’s implementation staff, and were interested in continuing to work with NEEA, whether through RWLR or another future initiative. The strength of these relationships should allow NEEA to leverage the midstream platform developed through RWLR to explore other non-residential efficiency opportunities.
- 8. Through RWLR, NEEA established a valuable data collection infrastructure.** Each distributor participating in RWLR provides NEEA with sales data on a monthly basis. These data provide NEEA with information about their RW sales as well as critical, data-driven insights into non-residential lighting market trends. NEEA and its partners in the region will be able to use these data to maximize their midstream platform and pivot RWLR toward future efficiency opportunities.

## Recommendations

The team identified the following opportunities during its evaluation that may aid RWLR in its market transformation efforts.

- 1. Consider strategically spending hard-earned relationship capital at key moments.** Across the board, distributors said they trusted RWLR's implementation team and valued their long-term relationship with NEEA. Maintaining this trust for future initiatives is paramount, but NEEA should also consider whether it is worthwhile—for strategic opportunities or at key moments—to push reticent distributors a little harder to make a more significant change. This tradeoff between trying to generate more RW savings now or cultivating the midstream platform and relationship RWLR has developed for future opportunities is a complex decision and one best handled on a distributor-by-distributor basis. In general, however, the team's interactions with participating distributors suggests that distributor-RWLR relationships are strong enough to withstand the potential ups and downs that might result from a somewhat more aggressive implementation approach.
- 2. Continue to work with regional partners on a comprehensive strategy for addressing the emergence of TLEDs.** The team's interviews indicated that TLEDs have captured non-residential end user attention. Given the continued disparity in initial costs, TLEDs and RW lamps can both serve an important role in a comprehensive strategy aimed at improving the efficiency of the regional non-residential lighting maintenance market. However, it is imperative that NEEA continues to work closely with regional utilities to create complementary programmatic and incentives structures that maximize potential savings.
- 3. Update the logic model with greater specificity.** A few aspects of the current logic model would benefit from greater specificity. For example, MPI I has several goals related to a percentage of distributors marketing, stocking, or training staff about RW lamps. It is not clear whether these percentages relate to only participating distributors or all regional distributors. These ambiguities were not overly problematic as part of the first MPER, but it will become harder to objectively assess the maturation of RWLR if these key evaluation metrics remain unclear. Relatedly, NEEA should ensure the timing of each MPI goal aligns with its designation as a short-, medium-, or long-term goal. For example, one of the goals associated with MPI III—a medium-term outcome expected to result after 3-5 years of RWLR implementation—relates to RW market share in 2016.<sup>1</sup>
- 4. Find other opportunities to leverage the power of SPAs for other current – or future – initiatives.** The team's interviews with participating distributors revealed the tremendous impact SPAs can have on addressing price disparities and, relatedly, on sales volume. While nearly all RWLR participants are already benefiting from SPAs brokered with their supplies, NEEA should seek out similar opportunities for other current or future initiatives. It is likely NEEA can extend the value of SPAs to other energy efficiency products—lighting or another end use—to drive sales through other midstream approaches similar to RWLR.

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<sup>1</sup> NEEA has subsequently updated the logic model. The most recent update was completed on July 11, 2016.

## 1. INTRODUCTION

The Northwest Energy Efficiency Alliance (NEEA) contracted with Navigant and Cadeo team (the team) in June 2015 to complete the first Market Progress Evaluation Report (MPER) of its Reduced Wattage Lamp Replacement Initiative (RWLR). By initiating the MPER process, NEEA sought to understand the initiative's early progress toward its goal of transforming the non-residential lighting maintenance market. This MPER also builds upon the reduced wattage market characterization and baseline study that Cadeo completed earlier in 2015.<sup>2</sup>

### 1.1 MPER Goals

The goal of this MPER is to assess and document RWLR progress toward transforming the non-residential maintenance market and to provide NEEA with market intelligence for expediting and increasing the adoption of RW lamps in the Pacific Northwest. The findings and recommendations in this report are not based on a representative sample of the four state region – Idaho, Montana, Oregon and Washington. NEEA and its contractor did not conduct interviews in Idaho with the targeted audience for this report at the request of Idaho Power Company.

At a high level, the team's MPER objectives included the following:

1. Review the RWLR logic model to ensure the logical consistency and correct linkages between activities, outputs, outcomes, and market progress indicators (MPIs)
2. Review the ACE model to ensure NEEA is using the best available information and correctly estimating initiative savings
3. Measure and track progress toward market transformation based on MPIs
4. Review the sales data collected from participating distributors to confirm the data are accurate, complete, and appropriate for estimating initiative impacts
5. Estimate the market share of RW lamps
6. Collect market intelligence through interviews and/or surveys with participating distributors, RW manufacturers, and regional electrical contractors and non-residential lighting end users

### 1.2 RWLR Market Intervention Strategy

The overarching goal of RWLR is to transform standard purchasing practices in the non-residential lighting maintenance subsector. Specifically, RWLR seeks to make 25W and 28W T8 linear fluorescent lamps (LFLs) the standard lamps that replace failed 4-foot lamps. Known as reduced (or low) wattage (RW) lamps, these lamps are more efficient alternatives to the market's standard 32W option.

NEEA outlined the following market interventions for RWLR during its planning process:<sup>3</sup>

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<sup>2</sup> <https://neea.org/docs/default-source/reports/reduced-watt-lamp-replacement-market-characterization-and-baseline-report.pdf?sfvrsn=12>

<sup>3</sup> <http://neea.org/docs/default-source/default-document-library/neea-initiative-descriptions-2015-19.pdf?sfvrsn=6>

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- Nurture existing relationships and develop new ones with national manufacturers and regional distributors
- Facilitate the development of upstream incentive programs to shift stocking and marketing practices toward RW lamps
- Coordinate and align local utility programs and upstream incentives
- Develop data collection and savings reporting infrastructure
- Develop education and marketing strategies to help electrical distributors increase awareness and demand for energy efficient commercial lighting
- Pilot a market lift concept with distributors in the LFL maintenance market

In its RWLR logic model, provided in Appendix A, NEEA outlines how the successful implementation of these interventions would transform the market in the following ways:

- Increase availability and distributor stocking practices of energy efficient lighting
- Reduce price points on commercial lighting products
- Establish a centralized database on distributor lighting product sales, which will result in a more efficient and streamlined program implementation for the region
- Increase awareness and market demand for energy efficient commercial lighting products
- Align with out-of-region opportunities identified and shared within the Northwest

### 1.3 About RWLR

NEEA launched a market test of the RWLR concept in early 2014. During this phase, NEEA provided education and incentives to five regional distributors to promote RW lamps. Upon the market test's successful conclusion in early 2015, NEEA and NEEA funders authorized a scale up of the RWLR initiative to bring more regional distributors into the fold. NEEA contracted with D+R International (D+R) to implement both the market test and the full-scale RWLR initiative.

As of the end of August 2016, 13 regional distributors have partnered with NEEA under the RWLR banner (Table 2). In addition to the eight new participants identified below, NEEA has deepened its relationships with the existing market test distributors by adding branches that did not originally participate in the market test.<sup>4</sup> The addition of new distributors and previously nonparticipating branches of the market test distributors together resulted in a 40% increase<sup>5</sup> in the volume of LFL sales data collected in 2015.

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<sup>4</sup> NEEA intentionally did not enroll all branches of the original five market test distributors, as they wanted a control group for assessing the impact of RWLR incentives and education.

<sup>5</sup> Relative to the 2014 sales data collected through RWLR in total units (annualized).

Table 2. Summary of Participating RWLR Distributors

#	Distributor	Start Date	Status
1	Platt Electric Supply	11/1/2013	Market test participant
2	Eoff Electric Supply	1/1/2014	Market test participant
3	North Coast Electric	2/1/2014	Market test participant
4	Portland Lighting	1/1/2014	Market test participant
5	Graybar Electrical Supply	1/1/2014	Market test participant
6	Pacific Lamp and Supply	2/1/2015	Scale-up approval participant
7	Grainger	5/1/2015	Scale-up approval participant
8	Interstate Electric Supply	5/1/2015	Scale-up approval participant
9	Stoneway Electric Supply	10/1/2015	Scale-up approval participant
10	HD Supply	4/1/2016	Scale-up approval participant
11	Crescent Electric	1/1/2016	Scale-up approval participant
12	United Lamp Supply	4/1/2016	Scale-up approval participant
13	CED – Columbia Division	8/1/2016	Scale-up approval participant

Source: D+R International

It is critical to recognize that significant differences—in terms of size, product offerings, and management structures—exist between participating distributors. As a result, RWLR has not taken a one-size-fits-all approach; instead, the RWLR implementation team worked closely with each distributor to establish initiative participation terms most likely to generate increases in each distributor’s RW sales volume. Table 3 provides a brief summary of each participating distributor’s business model and presence in both the Northwest and nationally. The table includes the following two categories, as determined by the team through interviews, market research, and company website reviews:

- **Classification:** Possible classifications include:
  - MRO: Short for maintenance, repairs, and operation; identifies distributors whose primary customer base is made up of maintenance firms and facility managers
  - Full Line: Distributors that sell general electric products including lighting
- **Lighting Only:** If “Yes,” the distributor sells only lighting products (e.g., lamps, ballasts, fixtures); if “No,” the distributor sells products other than lighting

In total, the team estimates that the participating RWLR distributors represent approximately 30% of the region’s total 4-foot LFL annual sales.<sup>6</sup>

<sup>6</sup> The team is currently analyzing additional distributor sales data collected through BPA’s non-residential lighting market research.

Table 3. RWLR Participating Distributor Types

Distributor	Number of NW Branches	Number of US Branches	Classification	Lighting Only
Platt Electric Supply	85	125	Full Line	No
Eoff Electric Supply	12	12	Full Line	No
North Coast Electric	28	30	Full Line	No
Portland Lighting	1	1	MRO	Yes
Graybar Electrical Supply	9	217	Full Line	No
Pacific Lamp and Supply	1	1	MRO	Yes
Grainger	11	350	MRO	No
Interstate Electric Supply	6	6	Full Line	No
Stoneway Electric Supply	17	17	Full Line	No
HD Supply	2	650	MRO	No
Crescent Electric*	16	141	Full Line	No
United Lamp Supply	1	1	MRO	Yes
CED – Columbia Division	19	600+	Full Line	No

Source: BPA Northwest Distributor Database

\*Not all NW branches are currently participating in RWLR

## 1.4 Report Structure

NEEA uses MPIs, typically developed during the initiative planning process, to gauge the effectiveness of its market intervention efforts. The MPIs serve as a set of predetermined, comprehensive evaluation metrics by which NEEA and its contractor teams should objectively assess initiative performance.

As such, the team structured this report to focus on its assessment of RWLR's MPIs and to provide the NEEA with a concise evaluation of the initiative's early performance. The team also provided activity-specific findings memos as appendices for those seeking more detail about specific efforts and findings.

The body of this report consists of four sections, while the appendices contain both the aforementioned activity-specific findings memos and the team's data collection instruments. Collectively, the body of the report and its appendices offer a complete summary of the team's MPER research.

The report is structured as follows:

- **Executive Summary.** Summarizes the RWLR initiative, the evaluation tasks undertaken as part of this MPER, and the team's assessment of the RWLR's MPIs, as well as key findings and recommendations.
- **Introduction.** Details the RWLR's market intervention theory, initiative launch, scale up, and current set of participating distributors.
- **Methodology.** Outlines the approach the team used to complete each of the five evaluation activities. In most cases, additional methodological details are available in the activity-specific findings memos in the appendices.
- **MPI Findings.** Offers the team's assessment of the RWLR initiative's market transformation progress relative to the nine pre-identified MPIs.

- **Appendices:**

- *Appendix A-Appendix E:* Activity-specific findings memos that detail the team's specific findings for each activity. The team previously submitted each of these memos to NEEA during the MPER process.
- *Appendix F-Appendix J:* Market actor interview guides and survey instruments, including copies of all the data collection tools that the team used to gather market intelligence to support this MPER.

## 2. METHODOLOGY

The team gathered necessary market intelligence to assess RWLR's progress toward each identified MPI through the following activities:

- Logic model review
- ACE model review
- Initiative data review
- RW market share estimation
- Market actor interviews and surveys

The team details the methodology used to complete each activity in the following sections.

### 2.1 Logic Model Review

The team began its research by reviewing the latest version of the initiative's logic model.<sup>7</sup> Reviewing the logic model at the outset of the project provided the team with a detailed understanding of the theory underlying the initiative's market transformation efforts as well as the activities that NEEA believes will result in the intended outputs and short-, medium-, and long-term outcomes. In other words, the logic model offered a roadmap for the team to both understand and evaluate RWLR.

Perhaps most importantly, the logic model enumerated the nine MPIs by which the team could assess RWLR's progress in transforming the non-residential lighting maintenance market. As mentioned above, the team designed each of the market actor interview guides, survey instruments, and other evaluation activities to gather information regarding these MPIs.

In addition to familiarizing the team with RWLR and its MPIs, the team conducted a critical review of the logic model itself. Specifically, the team's review sought to confirm the following:

- **The linkages between identified activities, outputs, outcomes, and impacts are logically consistent**—i.e., each step in the logic model is clearly linked to its successor(s), and the logic model as a whole communicates the program logic clearly and concisely.
- **The current set of MPIs are comprehensive**—i.e., the MPIs offer opportunities to assess all targeted components of market progress.
- **The current set of MPIs are measurable**—i.e., each MPI is associated with one or more metrics for assessment that can be clearly compared against a goal.
- **The current set of MPIs are reflective of RW market transformation**—i.e., the MPIs align with the observed or anticipated changes in the market.

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<sup>7</sup> Version 8.0; updated on March 5, 2015. NEEA has subsequently updated the logic model. The most recent update was completed on July 11, 2016.

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After reviewing the materials, the team developed questions and conducted an in-depth interview with the RWLR initiative management team. The objective of this interview was to gain more insight into the development of the model and the RWLR initiative in general, including current barriers and opportunities. The team created the following framework for assessing the logic model systematically according to the objectives stated above. For each component of the logic model, the team identified key criteria for assessment, as described in Table 4.

**Table 4. Logic Model Assessment Criteria**

Logic Model Element	Criteria Description
<b>Barriers and Opportunities</b>	
Clarity	Is the barrier/opportunity easily understood by multiple audiences?
Correctness	Is the barrier/opportunity described accurately?
<b>Activities and Outputs</b>	
Clarity	Is the activity/output easily understood by multiple audiences?
Logical Linkages	Do the linkages correctly indicate cause and effect?
<b>Outcomes and Impacts</b>	
Reasonable Time	Is it reasonable to expect the outcome within the indicated timeframe?
Clarity	Is the outcome/impact easily understood by multiple audiences?
Logical Linkages	Do the linkages correctly indicate cause and effect?
<b>MPIs</b>	
Measurability	Can the MPI be measured through indicated metrics with available data or data the team will collect as part of the ongoing evaluation?
Clarity	Is the MPI easily understood by multiple audiences?
Reflects RW Market Transformation	Does the MPI align with current understanding of the market's transformation?

The team also examined the logic model overall for comprehensiveness, identified areas where key assumptions were missing or incomplete, and considered whether different or additional MPIs would be beneficial.

A summary of the team's logic model review findings can be found in Appendix A.

## 2.2 ACE Model Review

The team reviewed the RWLR-specific elements of NEEA's ACE model, which NEEA uses to estimate energy savings and initiative cost-effectiveness, with a focus on assessing the quality of the model's current inputs. To do so, the team created a framework for systematically assessing the quality of the ACE model inputs. Specifically, the team reviewed each RWLR model input to determine whether it was:

- **Current:** Is the input based on the most recently available market intelligence?
- **Representative:** Does the input reflect market conditions in the Pacific Northwest or is it based on information from another region?
- **Reasonable:** Given the imperfect market intelligence available to NEEA, is this the best possible input assumption at this time?

- **Documented:** Is the source of the input clearly indicated, interpretable by a third party, and available for review?

Additional details about the team's methodology for reviewing the ACE model, as well the team's findings, can be found in Appendix B.

### 2.3 Initiative Data Review

The team completed recurring quarterly data reviews to ensure D+R's data management procedures continued to accurately process the raw sales data gathered monthly from participating RWLR distributors. The accuracy of these data is paramount as both NEEA and the team use them to estimate RW market share, assess progress toward the relevant MPis, and pay distributor incentives.

The team completed its most recent review in July 2016. This review covered the initiative through the first quarter of 2016 and marked the team's third review of RWLR. Previous data reviews were completed in September 2015 (Q3 2015) and February 2016 (Q4 2015). For each review, the team validated the two RWLR data elements that it believed were most susceptible to misclassification errors:

- **Lamp type misclassification:** Specifically, are any of the lamps in the initiative database identified as RW actually standard wattage (i.e., 32W)? Conversely, are any of the lamps categorized as standard wattage actually RW?
- **Geographic misclassification:** Some distributors provided sales data for ZIP codes outside the Pacific Northwest. Were any of these lamps incorrectly associated with RWLR? Conversely, were any lamps sold in the region inadvertently left out of the initiative's regional count?

The team believed the classification of RW and standard wattage lamps was particularly susceptible to error because the categorization process is largely completed manually.<sup>8</sup> Further, wattage type misclassifications can lead directly to the incorrect allocation of savings and incentives, as well as potentially obfuscate RWLR's market transformation progress in the region. The same is true for misclassified ZIP codes.

D+R changed its data format from Excel workbooks to a database between the 2015 end-of-year (EOY) review and the Q1 2016 review. As a result, the team modified its data review process. In general, the team's process consisted of randomly sampling a statistically significant number of lamps (90% confidence at 10% precision) and verifying—using online manufacturer product specification sheets—key lamp characteristics such as length, wattage, shape, and technology.<sup>9</sup> The team then noted any discrepancies and reported them to NEEA.

The team's most recent (Q1 2016) data review finding memo offers more details about the methodology and is provided in Appendix C. Similar to the previous reviews, the team found the initiative's data to be accurate, complete, and sufficient to support estimating RW market share.

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<sup>8</sup> D+R temporarily experimented with web scraping to automate the collection of lamp details using distributor provided stock keeping units (SKUs) for two distributors but found they still needed to review and clean the scraped data. Ultimately, web scraping added time to their internal quality control (QC) process rather than simplifying it. As a result, web scraping is not part of D+R's categorization process.

<sup>9</sup> If the team was unable to find a manufacturer product specification sheet, it used websites such as Amazon.com or 1000bulbs.com to verify the product specifications.

## 2.4 RW Market Share Estimation

In March 2016, the team analyzed 2015 sales data for 12 participating RWLR distributors.<sup>10</sup> Using these data, the team estimated the 2015 market share of RW lamps as a fraction of all 4-foot T8 lamps.<sup>11</sup> Specifically, the team tabulated the total number of 25W, 28W, and 32W 4-foot T8 lamps sold in the region during 2015.

During the analysis, the team determined that a few distributors only reported a portion of their 2015 sales to D+R. The identified partial data was exclusively associated with three distributors that had recently enrolled in RWLR and had not yet provided D+R with their pre-initiative 2015 sales data. Whenever a distributor did not provide complete 2015 sales information, the team annualized their sales by dividing their reported sales by the number of months for which they reported sales, and multiplying that number by 12. However, this annualization process had little impact on the overall results since more than 97% of the total annualized sales were directly reported by RWLR participants (i.e., not estimated).

The team provided NEEA with two memorandums summarizing the team's 2015 RW market share estimates: one with distributor-specific values and one for the initiative overall. For confidentiality reasons, the team could not include the more detailed distributor-specific version of the memo in this report. However, the team has provided a copy of the initiative-level memo in Appendix D.

## 2.5 Market Actor Interviews and Surveys

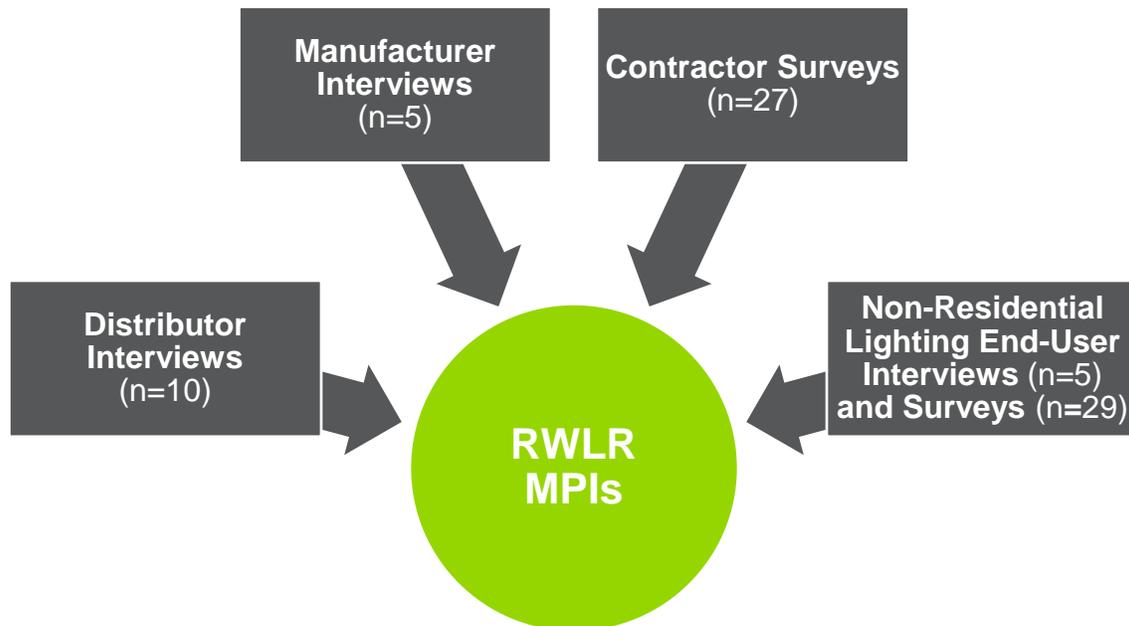
As shown in Figure 1, the team completed primary research with four different non-residential lighting market actors: distributors, manufacturers, electrical contractors, and non-residential lighting end-users. For each market actor, the team focused its questions on gathering the information necessary to assess the relevant MPIs. Below the team provides more detail for each market actor. Note: the findings and recommendations in this report are not based on a representative sample of the four state region – Idaho, Montana, Oregon and Washington. NEEA and its contractor did not conduct interviews in Idaho with the targeted audience for this report at the request of Idaho Power Company.

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<sup>10</sup> All of the distributors listed in Table 2 except CED.

<sup>11</sup> This analysis excludes tubular LED (TLED) lamps.

Figure 1. Summary of RWLR Market Actor Data Collections Efforts



The detailed findings from all four activities are provided in detail in Appendix E. Copies of the interview guides and surveys the team used are also provided in Appendices Appendix F-Appendix J.

### 2.5.1 Distributors

The team interviewed 10 out of the 12 current RWLR participants, including all five of the initiative's original market test participants.<sup>12</sup> In total, the team estimates that the interviewed participating RWLR distributors represent approximately 30% of the region's total 4-foot LFL annual sales.<sup>13</sup> The team worked closely with RWLR management to identify the best contact at each distributor and to schedule the interviews.

Specifically, through these interviews, the team sought to inform NEEA of the following:

- Barriers to greater RW lamp adoption
- The interaction of tubular LEDs (TLEDs) and RW lamps in the maintenance market
- Details of special pricing agreements (SPAs) with manufacturers
- How distributors promote and stock RW lamps

<sup>12</sup> The final two participating distributors, both of which are smaller – in terms of LFL sales volume – and added since the Market Test, did not respond to multiple requests for an interview.

<sup>13</sup> As noted previously, the team is currently analyzing additional distributor sales data collected through BPA's non-residential lighting market research. The team may update this RWLR market share estimate prior to finalizing this report.

## Reduced Wattage Lamp Replacement Initiative Market Progress Evaluation Report #1

The team also coordinated with Bonneville Power Administration (BPA), which was concurrently attempting to collect sales data from regional electrical distributors not participating in RWLR.<sup>14</sup> As a result of this coordination, the team did not interview any nonparticipating RWLR distributors. NEEA and BPA agreed that contacting nonparticipating distributors for both efforts may result in market actor confusion, research fatigue, and could potentially be detrimental to NEEA and BPA's long-term relationships and potential partnerships with these distributors.

A copy of the interview guide is provided in Appendix F. As evident in the guide, the team also asked questions—when time permitted—to support NEEA's ongoing Luminaire Level Lighting Control (LLLC) and NXT Level<sup>15</sup> market research efforts.

### **2.5.2 Manufacturers**

The team interviewed five lamp manufacturers. These manufacturers included large companies as well as smaller manufacturers. The team relied on a combination of existing contacts from other research and introductions from D+R to identify potential interviewees.

Through these interviews, the team hoped to understand the following:

- Barriers to greater RW lamp adoption, including cost
- The interaction of TLEDs and RW lamps in the maintenance market
- The extent to which manufacturers have SPAs with distributors
- The viability of the RWLR midstream platform for other products

A copy of the interview guide is provided in Appendix G. Similar to the distributor interview, the team also asked questions—when time—on behalf of NEEA's LLLC research.

### **2.5.3 Contractors**

The team collaborated with another team researching NEEA's NXT Level initiative to gather information from regional contractors. The NXT Level team included an RWLR-specific module in their online survey of Pacific Northwest trade allies. In total, the team received 27 completed RWLR modules through the NXT Level survey effort.<sup>16</sup>

The contractor surveys provided insight into the following areas:

- The percentage of RW sales as a portion of overall 4-foot LFL sales
- Customer awareness and satisfaction of RW lamps
- The percentage of customers who repeat orders for RW lamps
- Common practices when ballast(s) fail

A copy of the RWLR-specific questions included in the NXT Level survey are provided in Appendix H.

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<sup>14</sup> NEEA already collects and shares similar data for RWLR participants with BPA.

<sup>15</sup> Previously referred to as Top Tier Trade Ally, or TTTA.

<sup>16</sup> Additional detail about the survey sample frame is available in the NXT Level Report.

### ***2.5.4 Non-Residential Lighting End Users***

The team sought information from non-residential lighting end users to understand why they chose to use, or not use, RW lamps. For the purposes of this effort, the team defined non-residential end users as the decision makers for lighting in their respective non-residential building(s).

Similar to contractors, interviews and surveys with the customers making lighting-related purchasing and maintenance decisions provided critical insight into how demand-side market actors perceive RW lamps. In the larger context of the team's research, these bottom-up perspectives on RW lamps provided the team with an important and complementary perspective from the top-down market assessment offered by manufacturers and distributors.

The team initially planned to complete 30 short interviews with non-residential end users, utilizing a sample frame purchased for ongoing BPA market research.<sup>17</sup> However, the team successfully completed only five interviews despite significant outreach.

Due to the difficulty of cost-effectively completing these interviews, the team worked with NEEA and leveraged an ongoing commercial real estate (CRE) evaluation effort to complete 29 RWLR surveys. The interviews and surveys both focused on the following:

- Awareness of RW lamps among non-residential building owners
- Percentage of sockets utilizing RW lamps and where they are purchased
- Maintenance practices, including ballast failures
- Satisfaction with RW lamps

A copy of the interview guide and survey module are provided in Appendix I and Appendix J.

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<sup>17</sup> The team removed all customers that completed or refused the BPA survey to avoid potentially contacting the same customer twice.

### 3. MPI FINDINGS

The findings and recommendations in this report are not based on a representative sample of the four state region – Idaho, Montana, Oregon and Washington. NEEA and its contractor did not conduct interviews in Idaho with the targeted audience for this report at the request of Idaho Power Company.

Using the wide range of information collected through the evaluation activities detailed in the previous section, the team assessed each of the following nine RWLR MPIs:

- I. Increased distributor promotion of RW<sup>18</sup> T8s
- II. Decrease in RW T8 cost
- III. Increase in sales of RW T8s
- IV. Increased decision maker demand
- V. Market momentum supports RW T8 sales
- VI. Lighting distributors are interested in continued efficiency collaboration and new initiatives/programs
- VII. Federal standard requiring improved energy performance
- VIII. RW T8 becomes the standard product choice in the T8 lamp market
- IX. Improved general service fluorescent lighting (GSFL) energy performance

To understand in more detail whether the initiative is or is not transforming the non-residential lighting market, the team also assessed the specific goals associated with each MPI. For example, *MPI I – Increased distributor promotion of RW T8s* has four sub-goals, which the team labeled as 1a through 1d:

- **1a.** 70% of distributors market RW lamps by the end of 2016
- **1b.** 70% of distributors increased their stock by the end of 2016
- **1c.** 90% of distributors pursue SPAs by the end of 2016
- **1d.** 70% of distributors train staff to promote RW lamps by the end of 2016

Since RWLR is a relatively young initiative, the team focused on MPIs I-IV. According to the RWLR logic model, these are the MPIs for which NEEA anticipates outcomes to occur in the short term (1-3 years after scale up) and medium term (3-5 years after scale up).

The team also offers its assessment of progress toward MPIs V and VI, the initiative's first two long term MPIs (5-10 year after scale up). However, the team's assessment of these longer-term MPIs tends to be less comprehensive as insufficient time has passed to assess them more critically. The team did not offer an assessment for the remaining three long term MPIs (VII-IX) since these MPIs are not relevant until much later in the initiative maturation.

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<sup>18</sup> The initiative's logic model uses LW (low wattage), not RW (reduced wattage). However, for consistency with the initiative's name and the rest of this report, the team uses RW when listing the RWLR MPIs.

### 3.1 Classifications

In this section, the team assesses RWLR's progress toward each MPI and its sub-goals using all available market intelligence. The team assigned each MPI and MPI sub-goal to one of the status classifications shown in Figure 2 to consistently communicate the RWLR's progress. In the case of some long-term MPIs, the team was unable to offer a definitive status and instead indicated the status as to be determined at a later, more appropriate time.

Figure 2. MPI Status Classifications



### 3.2 Overall Findings

Overall, the team found that RWLR has had mixed success progressing toward its short- and medium-term MPIs (MPI I-IV).

After its first 18 months of full-scale implementation, RWLR is on track to address the identified supply-side and pricing barriers to greater RW adoption (MPIs I and II, respectively). Additionally, RWLR has made progress, albeit more limited, toward addressing demand-side barriers (MPI IV).

However, the initiative's success in these areas has not yet translated into the number of RW sales or RW market share that NEEA hoped it would generate in the short-term (MPI III). This is primarily due to the nascence of the initiative as well as unanticipated competition in the non-residential maintenance market from TLEDs. It is possible, however, that RW sales and market share will increase as RWLR matures—the initiative is only halfway through its short-term evaluation period—and enlists more regional distributors. Regardless, the competition from TLEDs is likely to only heighten as the technology continues to improve and decline in price. NEEA may need to make adjustments to account for the increasing appeal of TLEDs and develop, likely in conjunction with regional utilities, a set of complementary non-residential lighting offerings.

Table 5 lists the status and anticipated timing of each MPI. Note that the team was only able to offer a meaningful assessment regarding two long-term MPIs (MPI V and VI). The team found RWLR was making progress toward both MPIs by creating market momentum towards RW lamps and engaging distributors in a manner that fosters continued collaboration. The remainder of the long-term MPIs (VII-IX) are not applicable as part of this first RWLR MPER and will be assessed as part of future MPERs.

**Table 5. MPIs Status Summary**

Number	MPI	Timing*	Status
I	Increased distributor promotion of RW T8s	Short term	On track
II	Decrease in RW T8 cost	Short term	On track
III	Increase in sales of RW T8s	Medium term	At risk
IV	Increased decision maker demand	Short term	Within range
V	Market momentum supports RW T8 sales	Long term	Within range
VI	Lighting distributors are interested in continued efficiency collaboration and new initiatives/programs	Long term	On track
VII	Federal standard requiring improved energy performance	Long term	Not applicable
VIII	RW T8 becomes the standard product choice in the T8 lamp market	Long term	Not applicable
IX	Improved GSFL energy performance	Long term	Not applicable

\*Short term: 1-3 years after scale up; medium term: 3-5 years; long term: 5-10 years

### 3.3 MPI I: Increased Distributor Promotion of RW T8s

#### Status: On Track

RWLR's first MPI—*increased distribution promotion of RW T8*—relates to the initiative's ability to mitigate supply-side barriers to the adoption of RW lamps and to overcome the market inertia associated with the standard practice of purchasing 32W lamps.

According to the RWLR logic model, there are four specific goals associated with MPI I that the initiative should meet in the short term (i.e., 1-3 years after scaling up). These include the following:

- **1a.** 70% of distributors market RW lamps by the end of 2016
- **1b.** 70% of distributors increased their stock by the end of 2016
- **1c.** 90% of distributors pursue SPAs by the end of 2016
- **1d.** 70% of distributors train staff to promote RW lamps by the end of 2016

MPI I focuses specifically on influencing the behavior of regional distributors. However, since the team only interviewed participating distributors, it can only offer insight with regard to the initiative's ability to influence their behavior and not that of nonparticipating distributors.

## Reduced Wattage Lamp Replacement Initiative Market Progress Evaluation Report #1

Future MPERs will likely include interviews with nonparticipating distributors, which will provide the team additional insight into the initiative's ability to influence the regional distributors more broadly. For now, the team has noted where the reliance on participating distributors likely impacts the findings.

In the following subsections, the team summarizes the relevant market intelligence gathered related to each goal as well as the team's assessment of the initiative's progress (on track, within range, and at risk).

### **1a. 70% of Distributors Market RW Lamps by the End of 2016**

#### **Status: Within Range**

All of the distributors participating in RWLR confirmed they actively market RW lamps to their customers. Distributors mentioned marketing RW lamps through a variety of methods, including the following:

- Mail out flyers and other marketing materials
- In-store displays
- Trainings at branch(es)

Another way roughly half of participating distributors promoted RW lamps internally with sales staff was by using NEEA's incentive (or some portion of it) to offer sales performance incentive funds (SPIFs). These distributors noted that SPIFs are the biggest reason that their sales have grown and speculated that without the funding provided by NEEA, their RW share of lamps would have remained stagnant, or even shrank, in the last year.

While all distributors marketed RW lamps generally, several distributors indicated they do not actively market 25W lamps.<sup>19</sup> Almost every distributor mentioned being more comfortable promoting 28W lamps (versus 25W lamps) with their end users due to the 28W lamps' imperceptible difference in light output relative to 32W lamps and the potential for energy savings. Distributors noted that promoting 25W lamps requires a more complex discussion that either end users do not have time for or that the distributor, frankly, would rather not engage in for customer service reasons.

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“[In] any report you see a huge gap between 28W and 25W.

You really see issues with [fewer] lumens and it's amplified in cold environments. It's harder for a customer to go with a 25W because there is a disparity in lumen output, both printed and by looking at the fixture.”

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Distributors and manufacturers cited multiple barriers for 25W lamps,<sup>20</sup> the most common of which were insufficient light levels for certain activities and operational difficulties in colder temperatures (e.g., flickering and/or striation). Most distributors explicitly stated they were uncomfortable recommending 25W lamps for specific applications such as industrial, food industry, and some office spaces. Some distributors noted how some end users still used high intensity discharge (HID) lamps for industrial applications and that 25W lamps do not provide enough light output to meet regulations. When asked the temperature threshold for 25W usage, distributors indicated they did not trust 25W to perform well in temperatures below 50°F-60°F, which is a problem for most unconditioned

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<sup>19</sup> NEEA is currently conducting a case study to better document issues related to 25W lamps.

<sup>20</sup> The team presents a more detailed summary of these issues by distributor and manufacturer for 25W lamps in Appendix E.

buildings and warehouses in the Pacific Northwest. Due to these barriers, most distributors clearly stated that their salespeople were uncomfortable with the nuances surrounding the 25W lamps and only rarely proactively promoted them as an energy efficient option.

### **1b. 70% of Distributors Increased their Stock by the End of 2016**

#### **Status: Within Range**

Three out of 10 distributors interviewed stated they stocked increased levels of RW lamps after enrolling in the initiative. Two other distributors indicated they do not stock 25W lamps at all and—due the concerns noted above—only sell them if customers specify them in an order.

It is important to note the distinction between increasing RW stock and increasing RW sales. The initiative's ultimate goal is to increase RW sales and transform the market. However, the initiative lists increased stocking practices as a step toward that goal. The theory is if distributors increase RW stocking practices that sales staff will become more familiar with the technology and that having more RW lamps on hand will increase the likelihood of RW being part of over the counter or quick turnaround sales situations.

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“Before [getting involved with RWLR] we’d probably stock 5-10 thousand dollars’ worth and now 25-30 thousand. [We] went to having one box to having pallets around.”

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However, more often than not, the potential switch from a 32W to an RW lamp is complicated by the fact that an individual purchasing or picking up an order over the counter at the branch does not have the authority to change an existing order. One distributor explained that, “the guy in the store is usually picking up what his boss told him to buy or what was ordered.” About half of the distributors also noted that many times the exchange in-store is relatively fast and usually consists of picking up orders that cannot be changed after the fact.

As a result, and because distributors maintain different levels of inventory, it is possible to increase RW sales without appreciably increasing RW stocking or pushing RW over the counter. This conclusion underscores the importance of identifying demand-side decision makers – as far upstream as possible – since those are the demand-side market actors dedicating orders and establishing company procurement practices.

### **1c. 90% of Distributors Pursue SPAs by the End of 2016**

#### **Status: On Track**

Before participating in RWLR, none of the distributors had pricing conversations specifically for RW lamps with their partner manufacturers. Therefore, NEEA’s interest in RW lamps motivated seven of the 10 interviewed distributors to secure SPAs for RW lamps with their manufacturers by the middle of 2016. The interviewed distributors were clear that, if not involved in the initiative, they would not have felt empowered to work with their manufacturers to establish RW-specific SPAs to reduce the price differential between the RW and standard 32W lamps.

Only one distributor noted they were not able to work out an SPA with their primary manufacturer partner and they actually buy RW lamps from another source that is less expensive. Another distributor who does not have RW-specific SPAs (although SPAs for other products are in place) uses the NEEA incentive solely to bring down the RW cost.

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“What NEEA has done has been very impactful. NEEA has reached out to manufacturers in our area and have really worked to try and understand what they’re after.”

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Since the team did not interview any nonparticipating distributors, it cannot say definitively whether those distributors have secured or even pursued RW SPAs. However, because participating distributors did not have SPAs before RWLR—and said they would not have negotiated them if not for RWLR—it is unlikely.

#### ***1d. 70% of Distributors Train Staff to Promote RW Lamps by the End of 2016***

##### **Status: On track**

All 10 distributors interviewed noted that they train their staff on RW lamps. The training methods used by distributors varied from in-house sessions to external manufacturer visits. Several distributors indicated they used a portion of RWLR’s flexible incentive to fund training. One distributor explained: “We have outside salesmen assigned for contractors and we have pretty intense training that is very technical.”

According to a few distributors, the trainings were proving beneficial. One distributor that historically struggled to sell RW lamps claimed to have recently noticed an uptick in RW sales due to in-branch trainings for their sales staff. Another distributor employing a similar strategy noted that after the RW-focused training, “the good salespeople increasingly tried to go for the 28W, gave samples to the customer, or get the contact information for the decision maker.”

### **3.4 MPI II: Decrease in RW T8 Cost**

##### **Status: On Track**

According to the interviewed manufacturers, 25W and 28W lamps are typically 18%-35% more expensive to produce than 32W lamps. This marginal cost increase is typically passed on to distributors that then pass it on to customers. Minus NEEA’s market invention, this leaves end users facing higher out-of-pocket costs to switch to RW lamps.

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“T8’s are a commodity, and like copper wires or gas, most customers who buy T8s know what their pricing is, and they are very price conscious and sensitive.”

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The second MPI—*decrease in RW T8 cost*—acknowledges that the T8 LFL market is commoditized and highly price sensitive. Therefore, getting RW lamps to price parity with 32W lamps, or a close as possible, is paramount to increasing RW market share.

NEEA created two short-term goals related to decreasing RW cost that fall under MPI II:

- **2a.** 70% of distributors offer 28W lamps at price parity with 32W lamps by the end of 2016
- **2b.** 80% of distributors secured SPAs for RW lamps by the end of 2016

**2a. 70% of Distributors Offer 28W Lamps at Price Parity with 32W Lamps by the End of 2016**

**Status: On Track**

The initiative has, at least for participating distributors, achieved its short-term price parity goal. The team's research identified three distributor pricing scenarios for 28W lamps:

1. Eight out of 10 distributors reported selling 28W lamps at price parity, or even cheaper, than standard 32W lamps.
2. One distributor noted that a slight 5%-10% price differential remains between 28W-32W lamps (28W being more expensive)
3. Another distributor noted that their RW lamps remained more expensive than the standard (a 32W is roughly \$2 and a 28W \$3), even after incentives were applied.

The importance of price parity was summed up best by one large distributor that noted how even small differences in per-lamp costs add up: "Ten or twenty cents a lamp times thousands of lamps is a lot of money for property managers, that's dollars, that's operating income for these guys. I think there is a lot of price sensitivity out there when it comes to the larger [orders]."

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"Price makes the biggest difference [in the end-user's decision-making process], so throwing money at the price [to drive RW sales] is going to have the biggest effect."

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Three manufacturers noted that a driver for flat RW lamp cost is that these products have never been as high volume as their 32W counterparts—without an increase to 32W production levels, RW lamps will still need higher margins to maintain profitability.

Reaching the economies of scale necessary to meaningfully reduce RW price premiums would likely require market change beyond the Pacific Northwest. The Pacific Northwest is only approximately 4%<sup>21</sup> of the national LFL market so even 100% RW market share for the region may not be enough to change the economics of national production schedules. This perspective underscores the importance of SPAs in reaching price parity for 28W lamps.

Price parity is typically cited as a prerequisite for motivating demand-side market actors. However, price parity is also a motivating factor for supply-side actors, specifically distributor sales staff. Several distributors shared that their sales staff, always mindful of cost sensitivities and focused on customer service, are often reticent to promote RW to end users as 32W alternatives when RW lamps are more expensive. In these cases, the staff default to their comfort zone and simply fill orders. However, when RW and 32W reach price parity sales staff are often empowered and more comfortable proactively selling RW lamps. In essence, getting the lamp prices to parity—through RWLR incentives, SPAs, or both—amplifies the initiative's ability to transform the market by addressing both supply- and demand-side barriers.

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<sup>21</sup> Estimated based on share of national commercial floor space.

## **2b. 80% of Distributors Secured SPAs for RW Lamps by the End of 2016**

### **Status: On track**

The majority of distributors (seven of 10) have SPAs with their RW manufacturer. While most distributors with SPAs were unwilling to discuss the specifics of them, one distributor offered limited insight into the general SPA process.

According to this distributor, the process begins with the distributor engaging their manufacturer about a specific product or stock keeping unit (SKU) and negotiating what amounts to a per-lamp bulk discount. For example, this distributor noted they receive “\$1.50 back” for each 28W it sells. (For comparison’s sake, the same distributor receives \$0.60 for each 32W subject to a SPA with the same manufacturer.) Next, the distributor sells lamps in bulk to their customers. At the end of each month, the distributor notifies the manufacturer how many of each SKU subject to a SPA they sold. The manufacturer then sends the distributor a check, which retroactively reduces the distributor’s wholesale costs and increases profits. The distributor also shared that they renegotiate their SPAs approximately twice a year, collaboratively adjusting per-unit SPA values up or down depending on how many of each lamp the distributor sold. It is up to the distributor to push sales and keep their numbers up in order to convince the manufacturer to keep prices down and continue the SPA.

Here, the program’s midstream approach inherently drives RW lamp volume from participating distributors, helping them retain the SPAs. Therefore, the momentum gained through participation remains, even after exiting the program, as customers repeat purchases. This should continue to drive enough RW volume to maintain the SPAs with partner manufacturers. This finding also highlights the potential value of SPAs to drive the sales of other energy efficiency products—lighting or another end use—through a midstream approach similar to RWLR.

## **3.5 MPI III: Increase in Sales of RW T8s**

### **Status: At Risk**

MPI III—*increase in sales of RW T8*—is the first and only medium-term MPI (i.e., 3-5 years after scaling up). NEEA envisioned MPI III as a measurement of RWLR’s success overcoming demand- and supply-side barriers and existing market inertia in the short term. In a sense, MPI III is the first RWLR MPI measuring the initiative’s actual impact on RW lamp sales in the region.

There are two specific goals associated with MPI III in the medium term (i.e., 3-5 years after scaling up). These include the following:

- **3a.** 4 million RW lamps sold region-wide during 2015<sup>22</sup>
- **3b.** 50% market penetration among all participants by the end of 2016

Unlike the team’s assessment of MPIs I and II, which relied primarily on interviews with participating distributors, the team’s evaluation of MPI III leverages the team’s analysis of the sales data provided by distributors.

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<sup>22</sup> The logic model materials are inconsistent with regard to the timing of this goal. The logic model supporting documentation provided to the team explicitly states the goal of 4 million lamps is for 2015; however, the MPI is identified on the logic model itself as a mid-term outcome. This means NEEA does not anticipate this market change to occur until 3-5 years after RWLR scale up, or 2017-2019.

### 3a. 4 Million RW Lamps Sold Region-Wide During 2015

#### Status: At Risk

The team determined, using sales data collected by the initiative, that participating RWLR distributors sold just over 0.5 million RW lamps in 2015. Unlike for RWLR participants, the team does not have access to complete sales data for nonparticipating distributors. As a result, it is not possible to definitely determine the number of RW lamps sold region-wide.

However, it is possible to estimate region-wide sales using a series of assumptions:

- RWLR participants represent 30% of the regional T8 LFL market
- Nonparticipating distributors sell RW lamps at the same rate as participants

Both assumptions are subject to considerable uncertainty. The second assumption—of similar RW market shares—is perhaps more problematic, as the education and incentives NEEA provides to participants should, in theory, result in increased RW market share. In this sense, the assumption of similar RW market shares is aggressive and likely to produce a regional RW estimate at the higher end of the possible range.

As shown in Table 6, this exercise results in estimated RW sales of approximately 1.7 million lamps. While imperfect, the exercise does illustrate that region-wide RW lamps sales in 2015 are likely far fewer than 4 million.<sup>23</sup>

**Table 6. Estimated Region-Wide RW Lamp Sales, 2015**

Market Actors	25W	28W	Total
RW Sales (Participants)	88,188	425,202	<b>513,390</b>
RW Sales (Nonparticipants - Estimated)	205,772	992,138	<b>1,197,910</b>
<b>All Regional Distributors (Estimated)</b>	<b>293,960</b>	<b>1,417,340</b>	<b>1,711,300</b>

Source: 2015 RWLR distributor data and stated assumptions

### 3b. 50% Market Penetration Among All Participants by the End of 2016

#### Status: At Risk

The team estimated that, across all RWLR participants, the sales-weighted RW market share was 16.9%. As shown in Table 7, this value was primarily driven by 28W lamps sales and was 3.0% higher than the forecasted RW baseline for 2015 (13.9%).

<sup>23</sup> Again, if NEEA intended this level of RW sale in 2017-2019—not 2015—than the team’s assessment of this exercise would differ.

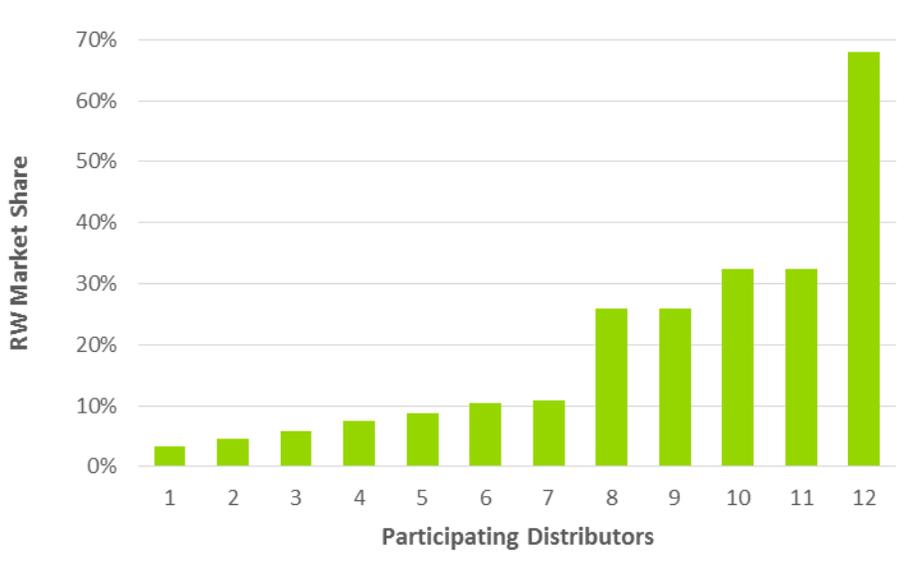
**Table 7. Comparison of Actual and Baseline RW Shares of RWLR Participants, 2015**

	25W Share (%)	28W Share (%)	Total RW Share (%)
Sales Data	2.9%	14.0%	16.9%
Baseline Forecast	4.2%	9.7%	13.9%
<b>Difference</b>	<b>(1.3)%</b>	<b>4.3%</b>	<b>3.0%</b>

Source: 2015 RWLR distributor data and RWLR baseline forecast memo<sup>24</sup>

While NEEA’s goal is for all participants to reach 50% RW market penetration by the end of 2016, the 2015 distributor-specific market shares indicate the initiative is unlikely to reach this goal. As evident in Figure 3, only one of the participants exceeded 50% in 2015. Further, more than half (seven) have RW market shares less than 11%.

**Figure 3. Participating Distributor RW Market Shares, 2015**



Source: 2015 RWLR distributor data

### 3.6 MPI IV: Increased Decision Maker Demand

#### Status: Within Range

MPI I focuses on RWLR’s ability to mitigate supply-side barriers to greater RW adoption. MPI IV—*increased decision maker demand*—offers a set of metrics to assess the demand side of the market. The third and final short-term MPI (along with MPI I and II), MPI IV, offers insight into RWLR’s progress generating greater demand for RW lamps through general awareness and causing lasting changes like encouraging RW lamps in maintenance specifications and changing standard LFL ordering practices. MPI IV consists of two goals:

- **4a.** 50% or more decision makers aware of the benefits of RW lamps by the end of 2016

<sup>24</sup>[https://neeanet.neea.org/sites/programs/rwlr/mre/NEEA%20RWLR\\_Comprehensive%20Baseline%20Forecast%20Memo%20-%202014-2017.docx](https://neeanet.neea.org/sites/programs/rwlr/mre/NEEA%20RWLR_Comprehensive%20Baseline%20Forecast%20Memo%20-%202014-2017.docx)

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- **4b.** 50% or more decision makers have implemented changes to their ordering practices by the end of 2016

The team's previous MPI assessment relied primarily on the interviews with participating distributors as well as the sales data they provided to NEEA. For MPI IV, the team leaned more heavily on the results of the electrical contractor and non-residential end-user surveys.

### **4a. 50% or More Decision Makers Aware of the Benefits of RW Lamps by the End of 2016**

#### **Status: On Track**

Similar to the 3b goal, goal 4a is not subject to official assessment for another year. However, the information collected during 2015 indicates the initiative is on track to meet this goal.

The team's surveys and interviews found high, as well as increasing, levels of RW awareness. Specifically, the team learned the following:

- 85% of surveyed non-residential end users were aware of the benefits of RW lamps
- 40% of surveyed contractors reported their customers are "a lot" or "somewhat more aware" of RW lamps over the past year
- 100% of interviewed RWLR distributors said that awareness was increasing across their customer base

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"We're seeing increased demand for TLED coming from the K-12 and local government market. They're not ready to go in with a full retrofit. The people in the public sector/institutional market are those who would have traditionally been interested in RWs."

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Overall, the awareness of the benefits of RW lamps is increasing but so is awareness of TLEDs. Across all market actors, the team found that TLEDs are increasingly becoming a major competitor to RW lamps among non-residential customers seeking to improve the efficiency of their lighting.

All distributors agreed that end users seeking energy-saving options were generally more aware of TLEDs than RW lamps and, consequently, tended to initiate and focus their efficiency-related conversations with distributors on TLEDs. Unprompted, 20% of surveyed non-residential end users offered they would rather

install a TLED when trying to save energy than an RW lamp. The majority of contractors that do not use RW lamps utilize TLEDs, with one calling it "the better option."

Most distributors also noted that the nature of the interplay between TLEDs and RW lamps hinges on whether the local utility offers a TLED incentive. One distributor stated: "There have been promotions offering \$10 off [TLEDs] and we sold over 10,000 lamps and... in eastern Washington they're offering \$15 for LED – if you're offering that high a rebate, then you're at the price level of a 32W [lamp]."

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"NEEA's program had the ill fate of coinciding with the advent of the TLED. All of a sudden no one wants to talk about LFLs, they want to talk about LEDs."

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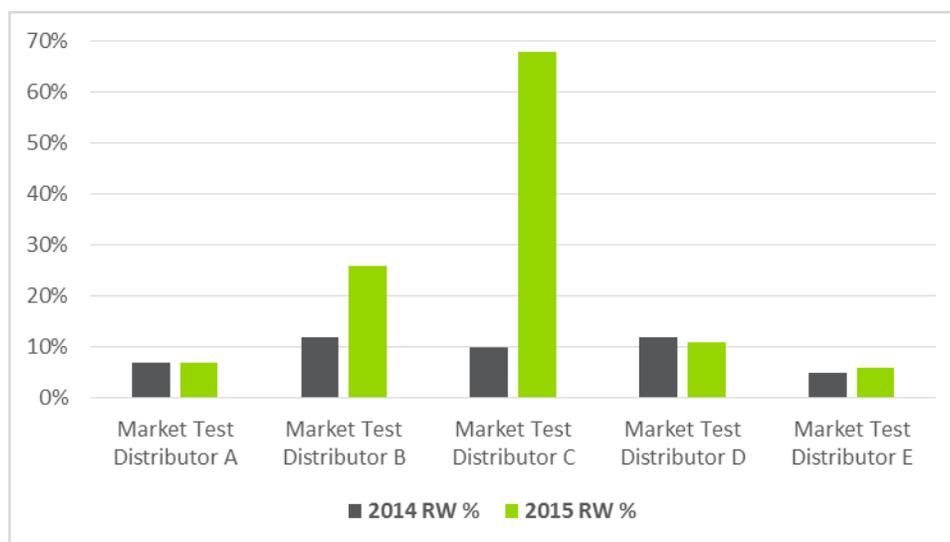
Simply put, if a TLED incentive is available, the difference in upfront cost between the two technologies is dramatically lessened and, per distributors, end users are much more likely to opt for the “more fun” TLED with its significantly lower wattage and perceived longevity. However, when the incentive for TLEDs is absent, distributors indicated they are often too expensive for most end users.

### 4b. 50% or More Decision Makers Have Implemented Changes to their Ordering Practices by the End of 2016

#### Status: At Risk

Sales data provides evidence of whether RWLR has successfully changed decision makers ordering practices. Figure 4 compares the RW market shares in 2014 and 2015 for each of the five distributors that were part of NEEA’s original market test. In theory, if the initiative was successfully causing decision makers to change their ordering practices then the figure would show increasing RW sales for most distributors. As illustrated below, this is the case for two participants, one of which (Market Test Distributor C) showed tremendous gains in 2015. The other three distributors showed no meaningful change, implying their end-user purchasing decisions remain unchanged.

Figure 4. Market Test Distributors: Change in RW Market Share, 2014-2015



Source: 2014 and 2015 RWLR distributor data

During its interview with the team, Market Test Distributor C shared why they had large gains—they “forced the hand” of their customers and phased out the sale of 32W lamps at RWLR participating branches. In other words, the distributor sold RW lamps as the default product for all 4-foot LFL applications unless 32W lamps were strictly specified by the end user or decision maker or if there was pushback that could lead to the loss of a sale.

According to this distributor, this strategy, coupled with employee training and education, successfully increased RW across all participating branches, which the team confirmed using RWLR sales data. Due to recent changes in management, the distributor shared that they have since gone back to allowing the 32W lamp, although most of their end users have stuck with RW lamps.

The same distributor also modified their traditional employee incentive structure when participating in RWLR. Instead of offering a single, large prize for the salesperson with the highest number of RW sales

(their most common internal incentive model), the distributor set the incentive threshold lower and allowed multiple winners to evenly split the incentive bounty. According to the distributor, this strategic shift motivated more of their salespeople—even the less savvy ones who do not typically win sales contests—to push sales of RW lamps, realizing they could also reach the threshold. This structure eliminated the “Bob always wins” mentality. However, it is unclear why this worked better than a straight per-case or per-lamp incentive (known as a spiff), as everyone can win with that approach too; this type of model is employed by other distributors who pay a bonus (such as \$0.25 per lamp) to each employee who makes a sale.

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“We recognized that if we gave one large award away that people would bow out because of the one guy who always wins. [So] we lowered the bar and made the threshold lower—everyone who made the threshold split the prize. Now we have full participation and up to 17, even 30, people winning and splitting the prize. Even had some people in different areas of the store trying to sell lamps. Everyone was in it to win and split it.”

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### 3.7 MPI V: Market Momentum Supports RW T8 Sales

#### Status: Within Range

The fifth MPI and the first long-term MPI—*market momentum supports RW sales*—posits that RW momentum in the market is critical for shaping future purchasing behavior. A large portion of the initiative hypothesis is that inertia or habit plays a huge role in the market for replacement of T8 lamps: once a socket is switched, it remains changed. Thus, increasing momentum early on is critical for future success.

The RWLR logic model contains three goals specific to MPI V:

- **5a.** Fewer than 10% of RW sockets revert to 32W lamp on replacement
- **5b.** Fewer than 5% of RW purchasers express dissatisfaction to distributors
- **5c.** 50% of maintenance specifications recommend RW lamps by the end of 2016

#### 5a. Fewer than 10% of RW Sockets Revert to 32W Lamp on Replacement

#### Status: Within Range

With the exception of a lone instance where a specific end user was not satisfied with their RW lamps, none of the distributors were aware of end users backsliding to 32W lamps after converting to RW lamps.

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“They’re very anxious to get more, the ones who have had [RW lamps] before.”

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The vast majority of distributors (seven out of 10) noted that once an end user switches to RW lamps, they continue to purchase them and tend to purchase more for additional buildings.

Surveyed contractors offered a less rosy picture of RW retention, indicating that approximately half of their customers repeat their RW orders. This percentage is well below the MPI

target and is important considering contractors are significant actors in the non-residential maintenance market. Unfortunately, due to time limitations, the team was unable to ask non-residential end users directly, as part of the CRE survey, whether they reverted to 32W lamps after installing RW lamps. The team will explore this issue further as part of the next MPER.

### ***5b. Fewer than 5% of RW Purchasers Express Dissatisfaction to Distributors***

#### **Status: On Track**

Overall, distributors reported that end users who purchased RW lamps are highly satisfied with the technology and that many do not even notice the switch 28W in terms of performance or light output. Roughly half of the surveyed contractors also said their customers could not tell the difference between an RW and a 32W lamp.

Manufacturers corroborated the supply-side perspective that end users are satisfied with RW lamps, saying that they believe customers are generally satisfied or very satisfied with 28W lamps. Both market actors indicated lower levels of satisfaction with 25W lamps, although that depended largely on whether the 25W lamp was the appropriate choice for a given application.

### ***5c. 50% of Maintenance Specifications Recommend RW Lamps by the End of 2016***

#### **Status: At Risk**

Interviewed distributors indicated that RW lamps were rarely specified in existing maintenance contracts. In fact, many noted that they see TLEDs specified more often than they do RW lamps.

The team asked contractors and non-residential end users what action they take when a ballast fails. The team found the following:

- Roughly 85% of both contractors and end users replace the ballast and maintain the fluorescent system—usually with the same wattage lamps
- 15% convert to a new integrated LED fixture

Based on the limited evidence detailed above, achieving the 50% goal will require RWLR to undertake additional effort.

## **3.8 MPI VI: Lighting Distributors are Interested in Continued Efficiency Collaboration and New Initiatives/Programs**

#### **Status: On Track**

RWLR's sixth MPI—*lighting distributors are interested in continued efficiency collaboration and new initiatives/programs*—speaks to the long-term relationship NEEA seeks to have with RWLR participants. While NEEA's midstream platform is currently focused on RW lamps, it is likely other non-residential efficiency measures will become viable options in the future in partnership with NW utilities. As such, NEEA views RWLR as not only a mechanism for improving the regional efficiency of the non-residential lighting maintenance market but also as a valuable step to engaging critical market actors, earning their trust, and engendering their long-term partnerships.

By all account, RWLR has been extremely successful in this regard. Without exception, distributors indicated they valued their partnership with RWLR, trusted the initiative's implementation staff, and were interested in continuing to work with NEEA, whether through RWLR or another initiative. The strength of these relationships should allow NEEA to leverage the midstream platform developed through RWLR to explore other non-residential efficiency opportunities.

It was clear to the team that, through RWLR, NEEA has successfully cultivated a strong, lasting, long-term relationship with regional electrical distributors.

### **3.9 MPI VII: Federal Standard Requiring Improved Energy Performance, MPI VIII: RW T8 Becomes the Standard Product in the T8 Lamp Market, and MPI IX: Improved GSFL Energy Performance**

#### **Status: Not Applicable**

The goals associated with these final three MPIs include the following:

- **8a.** Regional RW T8 sales of 6.5 million per year sustained for 3 years
- **8b.** 70% or greater RW T8 market penetration sustained for 3 years
- **9a.** Average installed wattage below 28W

As mentioned above, it is difficult given the age of the initiative to meaningfully assess RWLR's progress toward its other long-term MPIs and their related goals. NEEA does not anticipate any of these outcomes to occur until 5-10 years after RWLR is scaled up, which correlates to roughly 2020-2025. Simply put, it is too early in the RWLR maturation and market transformation effort to provide a sincere estimate of the initiative's progress toward MPI VII, VIII, and IX.<sup>25</sup>

Further, several of the goals associated with these long-term MPIs are continuations of shorter-term, previously assessed goals. For example, 8a—*Regional RW T8 sales of 6.5 million per year sustained for three years*—builds upon MPI goal 3a above.

At this time, it is not possible to offer additional thoughts on the initiative progress toward these goals. Consequently, the team offers a temporary assessment of not applicable for the purposes of the RWLR's first MPER.

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<sup>25</sup> A new GSFL standard will take effect in January 2018. However, the long-term timeframe for MPI VII indicates that the MPI refers to the next cycle of GSFL standards rulemaking.

## APPENDIX A. RWLR LOGIC MODEL REVIEW MEMO<sup>26</sup>

In this memo, the team presents the findings of its review of the Northwest Energy Efficiency Alliance's (NEEA) Reduced Wattage Lamp Replacement (RWLR) Initiative's logic model (Version 8, updated 03/05/2015,<sup>27</sup> included at the end of this memo for ease of reference). The objectives of this review were to confirm the following.

- **The linkages between identified activities, outputs, outcomes, and impacts are logically consistent.** Each step in the logic model leads clearly to its linked successor(s), and the logic model as a whole communicates the program logic clearly and concisely.
- **The current set of market progress indicators (MPIs) are comprehensive.** The MPIs offer opportunities to assess all the targeted components of market progress.
- **The current set of MPIs are measureable.** Each MPI is associated with one or more metrics for assessment that can be clearly compared against a goal.
- **The current set of MPIs are reflective of RW market transformation.** The MPIs align with the observed or planned changes in the market.

The team's review of the logic model occurred in two parts. In the first review, before completing any other evaluation tasks, the team assessed the logic model based on current knowledge of the RWLR initiative and reduced wattage lamp market. After conducting additional evaluation research, namely in-depth interviews with manufacturers, distributors, contractors, and building owners, the team revisited the logic model with a fortified understanding of the program and market. Below, the team presents a complete set of findings and recommendations from this two-part review.

### A.1 Review Process

This section outlines the approach the team used to review the NEEA RWLR logic model. The preliminary review of the logic model included:

- Attending a presentation by NEEA on the RWLR logic model, which described the key components and underlying assumptions of the logic model.
- Reviewing the RWLR logic model and accompanying documentation, which specified the details for each activity, the explanation of linkages, the metrics and goals associated with each MPI, a glossary, and a matrix connecting barriers to activities.

After reviewing the materials, the team developed questions and conducted an in-depth interview with RWLR initiative manager Elaine Miller, and Ray Hartwell of Ecosystem Economics. The objective of this interview was to gain more insights into the development of the model and the RWLR initiative in general, including current barriers and opportunities.

Finally, the team created a framework for assessing the logic model systematically according to the objectives stated above. For each component of the logic model, the team identified key criteria for assessment, as described in Table 8.

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<sup>26</sup> The team originally submitted this memo to NEEA on November 4, 2015.

<sup>27</sup> NEEA has subsequently updated the logic model. The most recent update was completed on July 11, 2016.

Table 8. Logic Model Assessment Criteria

Logic Model Element	Criteria Description
<b>Barriers &amp; Opportunities</b>	
Clarity	Is the barrier/opportunity easily understood by multiple audiences?
Correctness	Is the barrier/opportunity described accurately?
<b>Activities &amp; Outputs</b>	
Clarity	Is the activity/output easily understood by multiple audiences?
Logical Linkages	Do the linkages correctly indicate cause and effect?
<b>Outcomes &amp; Impacts</b>	
Reasonable Time	Is it reasonable to expect the outcome within the indicated timeframe?
Clarity	Is the outcome/impact easily understood by multiple audiences?
Logical Linkages	Do the linkages correctly indicate cause and effect?
<b>MPIs</b>	
Measurability	Can the MPI be measured through indicated metrics with available data or data the team will collect as part of the ongoing evaluation?
Clarity	Is the MPI easily understood by multiple audiences?
Reflects RW Market Transformation	Does the MPI align with current understanding of the market's transformation?

In addition to using these criteria for each logic model element, the team examined the logic model overall for comprehensiveness, identified areas where key assumptions were missing or incomplete, and considered whether different or additional MPIs would be beneficial.

After completing all evaluation activities the team revisited the logic model, particularly focusing on the specific goals associated with each MPI detailed in the supporting materials provided by NEEA. Here, the team assessed the specificity, measurability, and ability to meet the designated timeline set by NEEA. The team's summary findings are below.

## A.2 Findings

After a thorough review of each logic model element – barriers and opportunities, activities, outcomes, outputs, impacts, and MPIs – the team provides the following findings.

### **Barriers and Opportunities**

To review the barriers and opportunities presented in the logic model, the team focused on two criteria—clarity and correctness. Table 9 summarizes the team's key findings from the review of barriers and opportunities, and detailed findings follow the table.

To communicate the findings of our logic model review, the team used a ✓ symbol to represent model elements that met the review criteria, or a ✗ symbol when the team identified issues or missing pieces for an element.

**Table 9. Review of Logic Model Barriers and Opportunities**

Barrier/Opportunity	Clarity	Correctness
Barrier: Supply-side inertia	✓	✓
Barrier: Higher cost of RW T8	✓	✓
Barrier: Demand-side inertia	✓	✓
Opportunity: Distributor business model aligned with promotion of more expensive, higher margin products	✗	✗
Opportunity: Federal standard process through which improved efficacy can be locked in the market	✗	✗

The barriers are clear and correct regarding the RW T8 market in terms of distributor marketing/stocking practices, cost, and lack of awareness. However, the team suggests considering two additional barriers:

- The presence of TLEDs as a competing technology for RW T8s in the maintenance market. (TLEDs are not mentioned in the logic model.)
- Distributors may be unaware of or uninterested in the benefits of LW lamps. (This is implicit in the barrier “Supply-side inertia,” but may be worth drawing out explicitly.)

Two opportunities would benefit from additional clarity. First, the team believes the opportunity “Distributor business model is naturally aligned with promotion of more expensive, higher margin efficient products” may be unclear to multiple audiences. The team suggests clarifying the language to explain the program opportunity more explicitly, or adding a barrier to explain why distributors do not naturally promote RW T8s if they are a higher margin product. As noted above, the relationship with TLEDs should also be addressed here, since distributors may be motivated to promote TLEDs – another high-margin product currently receiving large incentives from utility programs – rather than RW T8s. Additionally, there is an inherent tension between the distributors’ desire to sell high-margin products and the RWLR initiative’s desire for RW T8s to be offered at price parity with 32W T8s. While incentives can offset this conflict, it adds complexity to the “high-margin” opportunity.

The second opportunity, which states “An ongoing federal standard process exists through which improved efficacy can be locked in the market” may not actually encourage RW T8 adoption. The federal standard may result in different outcomes, such as improving efficacy by driving the market toward LEDs, or other technologies. An interesting question therefore is, when the US Department of Energy (DOE) requires lamps to be more efficacious, how will manufacturers meet the standard, and what impact will that have on incremental cost differences between 32W T8s, RW T8s, and TLEDs? One potential outcome is the lighting maintenance market shifting toward RW T8s, but much uncertainty still remains surrounding TLED adoption and market potential.

### **Activities**

The team employed two criteria—clarity and logical linkages—for assessing the five activities described in the logic model. Table 10 summarizes the team’s review of logic model activities.

**Table 10. Review of Logic Model Activities**

Activity	Clarity	Logical Linkages
Develop and implement plan to enlist manufacturer support/support distributor negotiation with manufacturers	✗	✓
Design and administer RW T8 midstream incentive	✓	✓
Collect and analyze market data to inform adaptive management	✓	✗
Develop and execute marketing and E&T plan for distributors sales staff	✓	✓
Submit data and comments to Federal Standard proceedings	✓	✓

The team found the activities outlined in the logic model to comprehensively reflect the RWLR initiative’s design, and address the barriers and opportunities identified. However, as noted above, additional barriers exist that may not be adequately addressed by the current suite of activities—notably, additional activity may be required to address the competition from TLEDs for distributor attention and promotional resources. Furthermore, additional or refined activities related to the federal standard process may be beneficial as the initiative matures.

The team will monitor the first activity, “Develop and implement plan to enlist manufacturer support/support distributor negotiation with manufacturers” throughout the course of the evaluation and into the second review of the logic model. As noted in the logic model presentation, the manufacturer’s role in the initiative is still evolving. Also, the logic model documentation notes the potential of directly incenting manufacturers and developing alternate business models. The team will seek to identify ways to improve and modify this path in the logic model as a part of the second review.

The team notes that the linkage (d) between the activity “Collect and analyze market data to inform adaptive management” and the output “Database of T8 sales data” may be pointing in the wrong direction. The collection of data leads to the creation of the database, not vice versa. In the same activity, the team noted the term “marketshift baseline” would benefit from greater explanation.

**Outputs**

The review of the logic model outputs is summarized in Table 11.

**Table 11. Review of Logic Model Outputs**

Output	Clarity	Logical Flow
Calls/meetings between distributors and manufacturers	✓	✗
Incentive programs and incentives paid	✓	✓
Database of T8 sales data	✓	✓
Training for distributors	✓	✗
Marketing toolkit for distributors	✗	✗
Data and comments	✓	✓

The team agrees that the six outputs in the logic model comprehensively reflect the expected results of the current suite of activities, with the following comments regarding clarity and logical flow.

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The team believes the linkage (1) between the output “Calls/meetings between distributors and manufacturers” and the outcome “Decrease in RW T8 cost” lacks logical consistency in that it omits the implicit assumptions that the meetings will result in Special Pricing Agreements (SPAs) and that SPAs will result in reduced RW T8 costs. This linkage also holds the unstated assumption that manufacturers are motivated to enter into SPAs, and that distributors are willing to accept the terms of an SPA.

Regarding the outputs “Training for distributors” and “Marketing toolkit for distributors,” the team notes that no details were specified for the extent of participation, materials, guidelines or location. Further, the team notes that several assumptions are implicit in the linkages (3, 4, and 6) between these outputs and the outcomes of “Increased distributor promotion of RW T8s” and “Increased decision maker demand.” These assumptions, which, if included more explicitly may add clarity to the logic model, are:

- Distributors have access to decision makers and are able to influence their decisions.
- Distributors will use the marketing materials provided to them.
- Decision makers lack awareness of RW T8s and their benefits.
- Increased awareness will lead to changes in purchasing behavior.

### **Outcomes**

For each outcome, the team reviewed the reasonableness of the timeline indicated (short-, medium-, or long-term), and the outcome’s clarity and logical flow. The team also reviewed the MPIs indicated in association with the outcomes and impacts, and findings on the MPIs are presented in a subsequent section. Table 12 summarizes the team’s review of the logic model outcomes.

**Table 12. Review of Logic Model Outcomes**

<b>Outcome</b>	<b>Reasonable Timeline</b>	<b>Clarity</b>	<b>Logical Flow</b>
<b>Short-term</b>			
Decrease in RW T8 cost	✗	✓	✓
Increased distributor promotion of RW T8s	✓	✗	✓
Increased decision maker demand	✓	✓	✓
<b>Medium-term</b>			
Increase in sales of RW T8s	✗	✓	✓
<b>Long-term</b>			
Market momentum supports RW T8 sales	✓	✓	✓
Lighting distributors interested in continued efficiency collaboration and new initiatives/programs	✓	✓	✓
Federal Standard requiring improved energy performance	✗	✗	✗

The short-term outcomes are generally comprehensive and fit well within the program logic. However, the team believes the outcome “Increased distributor promotion of RW T8s” could benefit from more specificity. Specifically, the associated MPI I has several goals related to a percentage “of distributors” marketing, stocking, or training staff about RW lamps. It is not clear whether these percentages relate to only participating distributors or all regional distributors. The team believes it will become harder to objectively assess the maturation of RWLR if these key evaluation metrics remain unclear.

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Additionally, regarding the outcome “Decrease in RW T8 cost,” the team questions the reasonableness of the timeframe for one of the two elements included in the outcome. While the short-term timeframe is reasonable for securing special pricing agreements, the team believes it may be unreasonable to expect economies of scale to develop over the short-term timeframe of 1-3 years. Sales would need to increase substantially enough to create such economies for the manufacturer, and a regional increase may not be substantial enough to have this effect. A longer timeframe is likely required for these economies to materialize, result in price decreases, and be passed along to the distributor and end-use customer.

The medium-term outcome of increasing RW T8 sales is clearly and logically linked to program activities and short-term outcomes. The team suggests reconsidering the timeframe for this outcome as well clarifying that increased sales among program participants are expected in the short-term timeframe, while increased sales in the general marketplace are expected in the medium-term timeframe.

The long-term outcome “Federal standard requiring improved energy performance” needs further clarification. The DOE does not have the technical authority to improve the energy performance of a lamp, only its efficacy.

The team also identified a weak logical link for this outcome. The team believes it is possible that a higher efficacy standard could be too high for 32W lamps and thus shift the market toward LW lamps, but only if the efficacy would be achievable for 25W and 28W lamps. Additionally, this assumes decision makers would shift to choose LW lamps, even if 32W were still available, which would rely on the incremental cost decreasing between the two.

Further, regarding the current General Service Fluorescent Lamp (GSFL) standard, the team questions the timeframe associated with this outcome, as the standard has already been passed. This may simply require a rewording, if NEEA assumes there are more stringent standards or amendments on the way. If so, NEEA should update the logic model to state this assumption clearly. However, the question stated above remains: would higher standards necessarily lead to an increased market share of LW lamps or would there be a shift toward other technologies?

### **Impacts**

The team reviewed the two impacts described in the logic model for clarity and logical flow. Table 13 summarizes this review.

**Table 13. Review of Logic Model Impacts**

<b>Impact</b>	<b>Clarity</b>	<b>Logical Flow</b>
RW T8 becomes the standard product choice in the T8 lamp market	✓	✓
Improved GSFL energy performance	✗	✗

While the impacts are comprehensive and align with the RWLR initiative’s design, the impact pertaining to GSFL energy performance requires reexamination. As noted above, a federal standard will not necessarily result in improved energy performance for GSFLs.

### **MPIs**

In the team’s review of the MPIs, we focused on measurability, clarity, and accurate reflection of RW market transformation as the key review criteria. Table 14 shows the team’s key findings from the review of MPIs.

Table 14. Review of Logic Model MPIs

MPI	Measurability	Clarity	Reflects RW Market Transformation
MPI I	✓	✗	✓
MPI II	✓	✓	✓
MPI III	✓	✓	✓
MPI IV	✓	✓	✓
MPI V	✓	✓	✓
MPI VI	✓	✓	✓
MPI VII	✓	✗	✓
MPI VIII	✗	✓	✓
MPI IX	✓	✗	✓

The team determined that MPIs II, III, IV, V, and VI are clearly stated and reflect RW market transformation appropriately, and that NEEA has suggested reasonable and achievable methods for measuring them in the MPI documentation. The team will continue to look for opportunities to improve these MPIs or their measurement through the remainder of the evaluation activities, but this initial review did not reveal any issues with these MPIs. The following sections describe possible issues identified with MPIs I, VII, VIII, and IX.

**MPI I: Increased Distributor Promotion of RW T8s**

As mentioned previously in the ‘Outcomes’ section above, the team believes that MPI I would benefit from greater specificity regarding the associated goals for percentage “of distributors” marketing, stocking, or training staff about RW lamps. It is not clear whether these percentages relate to only participating distributors or all regional distributors.

**MPI VII: Federal standard requiring improved energy performance**

As noted above, the team suggests a rewording of the outcome associated with this MPI, which may require changes in the metrics used to measure this MPI.

**MPI VIII: RW T8 becomes the standard product choice in the T8 lamp market**

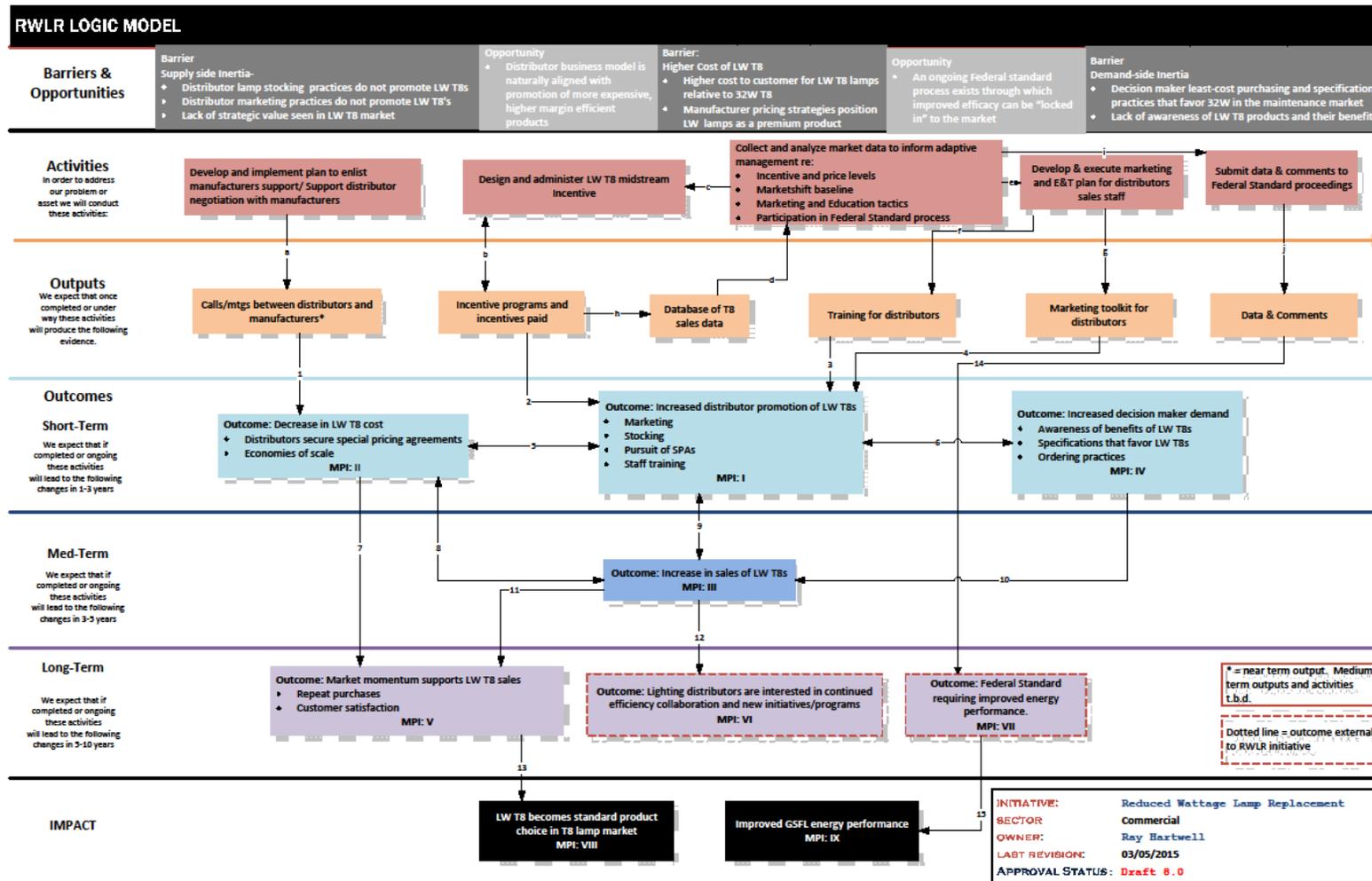
One of NEEA’s stated metrics for measuring this MPI is “Sustained lamp sales increase,” with a goal of “Regional RW T8 sales of 6.5 million per year sustained for 3 years.” While setting a goal for annual sales is reasonable in the short term, the team notes that over time, the market size for T8s may shrink as more efficacious technologies and products come online. A shrinking T8 market would make this absolute goal (6.5 million RW T8s per year) increasingly difficult to meet. The second metric listed in the MPI documentation, “Sustained market share/penetration increase” is a more reasonable way to measure whether the RW T8 is the standard product choice *in the T8 lamp market*, as this metric will scale as the size of the T8 market changes.

**MPI IX: Improved GSFL energy performance**

Following on the above comments on MPI VII, the team notes that there is much uncertainty surrounding this impact, and there may be an opportunity to clarify this MPI. NEEA has noted this uncertainty in the MPI documentation, and the team will look for opportunities for increasing clarity through subsequent evaluation activities.

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## A.3 RWLR Logic Model



## APPENDIX B. RWLR ACE MODEL REVIEW MEMO<sup>28</sup>

In this memo, Cadeo and Navigant (the team) present the findings of our initial review of the Alliance Cost Effectiveness (ACE) model that the Northwest Energy Efficiency Alliance (NEEA) uses to assess the impact of its Reduced Wattage Lamp Replacement (RWLR) Initiative.

Similar to the team's recent review of the RWLR logic model, this initial findings memo marks the first step in a two-part review of the ACE model. After completing additional evaluation research slated for late 2015 and early 2016, the team will revisit our initial findings and offer a second findings memo that incorporates all new information.

The team's initial review focused mainly on identifying and assessing the quality of inputs used in the ACE model. To do so, the team created a framework for systematically assessing the quality of the ACE model inputs. Specifically, we reviewed each RWLR model input to determine whether it is:

- **Current.** Is it based on the most recent market intelligence?
- **Representative.** Does the input reflect market conditions in the Pacific Northwest or is it based on information from other regions?
- **Reasonable.** Given the market intelligence available to NEEA, is this the best possible input assumption at this time?
- **Documented.** Is the source of the input clearly indicated and available for review?

While the team's review focused on assessing the model's key assumptions, the team also provides some high-level thoughts regarding the model itself. This includes areas where the ACE model spreadsheet could benefit from organizational changes or improvements to coding. These best practices are characteristics that facilitate external review and improve model reliability. Examples includes making all calculations transparent and thoroughly documenting all sources.

In its review, the team found that overall, the RWLR ACE model utilizes quality data and reasonable assumptions. However, the team recommends two changes to improve the model's inputs and clarity:

1. **Inconsistent Input Values.** The model inconsistently references certain inputs (i.e., disparities exist between documented inputs and the values used in the model) and uses incongruent data tables in different calculations where the same table could be used.
2. **Market Size Documentation.** The ACE model's market size estimate is complex. While the team is familiar with the inputs used in this calculation, the 'Market' tab would benefit from better documentation and contains numerous hardcoded values embedded in formulae.

The following section outlines, in greater detail, the methodology the team used to review ACE model.

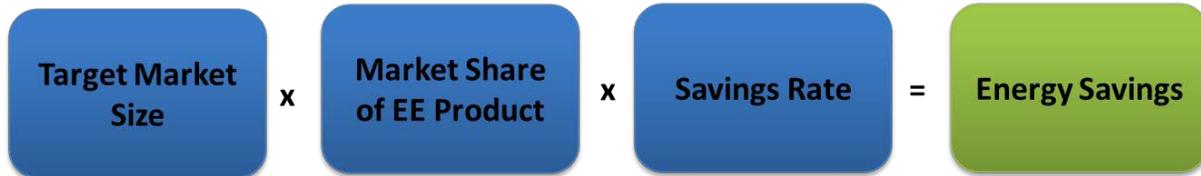
### B.1 Methodology

Figure 5 presents the three key data elements of the RWLR ACE model that determine the initiative's energy savings.

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<sup>28</sup> The team originally submitted this memo to NEEA on November 25, 2015.

Figure 5. NEEA RWLR ACE Model Structure



Source: NEEA RWLR ACE Model 'Intro' tab

The team used these three elements (target market size, market share of EE product, and savings rate) as well as the energy savings calculation itself to organize its review. The following five steps outline the methodology the team used to complete the initial model review.

- 1. Structural Review.** The team reviewed the model to understand its overall organization and how it estimates the three key elements of the savings equation (target market size, market share of EE product, and savings rate).
- 2. Identification of Primary Inputs.** Next, the team traced the calculation of each key element to its primary inputs. Primary inputs are the sources of raw data on which the key element calculations are based.
- 3. Review of Primary Inputs.** The team then reviewed each primary input using the four criteria listed above. That is, is the source of the input current, representative, reasonable, and documented?
- 4. Development of Alternatives.** After assessing the primary inputs using the aforementioned framework, the team identified alternative data sets and methodologies and sought to answer the following questions:
  - a. Regarding **target market size**, how should NEEA extrapolate sales data from a subset of regional electrical distributors to represent total sales in the Pacific Northwest?
  - b. Regarding **market share of EE product**, how should NEEA extrapolate from a subset of regional electrical distributors to arrive at the total market mix in the Pacific Northwest?
  - c. For **savings rate**, could NEEA use better data sources for key inputs such as hours of operation, delta wattage, and lighting savings yield?
- 5. Assess Any Modeling Issues.** Through the course of its review, the team was watchful for aspects of the model that could cause confusion or potentially produce incorrect results. These included inconsistencies or contradictions and hardcoded values which make for challenging updates and quality control.

## B.2 Findings

After a thorough review of the RWLR ACE model inputs and overall structure, the team offers the following findings. Table 15 provides a high-level overview of findings associated with the key criteria the team utilized during the review. In this table a check (✓) connotes that a particular input satisfies the given criteria, a check paired with a question mark (✓/?) indicates that the criteria is likely satisfied, but some uncertainty exists (perhaps insufficient documentation), and a question mark (?) indicates that the team had insufficient information to determine if the input meets the given criteria. Occasionally, the team identified an input's source but was unable to assess whether the input was current, representative, and

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reasonable because the documentation was insufficiently specific. As an example, the high consumer cost figures ('Cost Inputs'!B32:C32) cite "DOE NOPR" as the source, but do not specify from which notice of proposed rulemaking these figures were taken making it difficult to trace back the timeliness of this source. Similarly, the citation fails to specify if the primary source is national or regional.

The team recommends that model documentation be specific enough to enable a user or reviewer unfamiliar with the model to find the source material with minimal effort. References to source material should include, at minimum, the following elements:

- Name of the entity responsible for collecting/producing the data (e.g., NEEA, DOE, or Northwest Power and Conservation Council)
- Name and date of the publication (e.g., 2011 Residential Building Stock Assessment: Single-Family Characteristics and Energy Use – September 18, 2012)
- Where specifically the cited data is located within the referenced report/model (e.g., "Market Inputs tab, Cells A1:B10" or "Table 6: Final Distribution of Heat-Loss Assessment Sample – page 13")
- An online link or NEEAnet file path to the primary source of data (i.e., the full report or model).

The team will follow up with NEEA to get greater specificity for the inputs we were unable to adequately assess during this initial review. The team will use this information to more completely assess these inputs as part of the team's second ACE model review.

Following the table, the team expands upon these findings, organized by model input.

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Table 15. RWLR ACE Model Review of Inputs

Key Element of ACE Model	Input of ACE Model	Current	Representative	Reasonable	Documented	Issues
Target Market Size	Est. Annual Regional T8 Sales	✓/?	✓/?	✓/?	Non-Res Lighting Model Output	Assumptions and data sources of external model are not documented
	% Data Captured	✓/?	✓/?	✓/?	Calculated values, but sales data not documented	Calculations contain uncited hardcoded values
Market Share of EE Product	28W Lamp Share	✓/?	✓/?	✓/?	Calculated values, but sales data not documented	Calculations contain uncited hardcoded values
	25W Lamp Share	✓/?	✓/?	✓/?	Calculated values, but sales data not documented	Calculations contain uncited hardcoded values
Savings Rates	Operating Hours	✓	✓/?	✓	✓ From Draft 7 <sup>th</sup> Plan	Inconsistencies between data tables on 'CHAR' and 'Lighting Savings Yield' tabs
	Delta Wattage	✓	✓	✓	✓ ANSI Effective Wattage. Presented at RTF, 7/16/2013	None
	Lighting Savings Yield	✓	✓/?	✓	✓ From Draft 7 <sup>th</sup> Plan	Inconsistencies between data tables on 'CHAR' and 'Lighting Savings Yield' tabs

Source: Cadeo and Navigant analysis

### **Target Market Size**

- The market size relies on Navigant's/Cadeo's Non-Residential Lighting Model, but provides limited documentation of the assumptions, methodology, or data contained in that model which would limit less familiar reviewers. This issue is largely clerical, but the source data should be more thoroughly documented regarding its assumptions of timing, scope, and anticipated market effects. To improve clarity, the team recommends that NEEA reorganize the 'Market' tab and directly label the ACE model inputs as taken from the Navigant/Cadeo Non-Res lighting model.

### **Market Share of EE Product**

- The market shares may be correct, but hardcoding of values may lead to future errors. The extensive use of hardcoded values embedded within formulae make this tab prone to errors – especially when updating the model. The team recommends that updates to the 'Market' tab move away from hardcoding values in formulae. Rather than hardcoding ratios into formulae, develop a separate table of actual sales data from which to pull the ratios. Additionally, the team recommends a separate table for forecast values, and a logical operator (i.e. an IF/THEN/ELSE statement) to use forecasted values only when actuals are not available. This will keep the model up-to-date without the need to overwrite formulae.
- The market share of RW lamps may change over time as standards update. Because DOE set the minimum standard for GSFL at 32W, effective July 2012, these standards are likely up for review again in 2018. NEEA's efforts to make 28W the de facto bulb (if successful) would almost certainly provide the DOE with evidence that greater RW is possible and that establishing a more efficacious standard is feasible. The team recommends that going forward, the model account for changing market shares of RW lamps to capture the effect of future standards.

### **Savings Rate**

- Tables on 'CHAR' and 'Lighting Savings Yield' tabs present two contradictory data sets. The team found that the table on the 'Lighting Savings Yield' was actually a transposed version of 'CHAR'. To check for consistency, the team re-transposed the table, and performed a cell-by-cell verification. The team found the values in each table differed slightly. Accordingly, the operating hours and lighting savings yield (which both depend on the values in these tables) vary depending on which table is referenced.
- As shown in Table 16 because of the differences in values associated with each type of floor space, the Lighting Savings Yield worked out to be 98.5%, not 99.3% when using data from the 'CHAR' tab. Similarly, the operating hours work out to 3,716 instead of 3,625 when using the data from the 'Lighting Savings Yield' tab. The team recommends verifying which of these tables is more current, and using that table for both calculations to maintain consistency throughout the model.

Table 16. Comparison of Values from 'Lighting Savings Yield' and 'CHAR' Tabs

Building Type	'Lighting Savings Yield' Tab Values		'CHAR' Tab Values	
	Average HVAC System Electric Savings Yield	Floor Area %	Average HVAC System Electric Savings Yield	Floor Area %
Large Off	106.6%	15.1%	102.2%	9.6%
Medium Off	108.0%	12.0%	103.1%	9.4%
Small Off	105.4%	3.2%	92.8%	2.9%
Xlarge Ret	97.8%	2.7%	113.0%	4.0%
Large Ret	82.9%	1.1%	113.2%	0.9%
Medium Ret	87.2%	4.1%	99.1%	10.3%
Small Ret	96.2%	1.3%	96.7%	1.8%
School K-12	90.7%	3.1%	98.4%	7.3%
University	101.5%	2.2%	104.2%	3.7%
Warehouse	75.2%	10.1%	96.0%	13.2%
Supermarket	104.2%	0.6%	58.7%	2.0%
MiniMart	108.1%	0.3%	96.8%	0.3%
Restaurant	92.1%	1.2%	90.6%	1.6%
Lodging	91.4%	2.4%	83.9%	5.1%
Hospital	83.0%	4.5%	88.7%	3.1%
Residential Care	104.4%	5.8%	88.5%	3.7%
Assembly	108.2%	9.1%	104.5%	11.0%
Other	103.6%	21.3%	103.0%	10.0%
<b>Weighted Average Building</b>		<b>99.3%</b>		<b>98.5%</b>

Source: NEEA RWLR ACE Model, Tables from 'Lighting Savings Yield' and 'CHAR' tabs.

- Operating hour assumptions may not be representative.** The model relies on a weighted average of commercial building type-specific operating hours weighted by each building type's total of the regional floor space. This presents two issues. For one, it does not address the density of lighting in any given floor space – disproportionately weighing sparsely lit areas. A second layer of weighting by lighting power density for each type of floor space would improve upon this estimate. Secondly, there is the possibility that certain commercial building owners/managers are more likely to purchase reduced wattage lamps than others. For example, is it an easier sell reduce wattage lamps to buildings with higher lighting demands like hospitals? The team will explore this issue through the forthcoming market actor interviews and may offer a revised weighting scheme as part of the team's second ACE model review.

### Savings Calculations

- Missing measure life documentation.** The measure life value for RW lamps is hardcoded and undocumented. There is a comment in this cell that says the model could assume longer time to allow for slower start, but early replacement could counter this. As a solution to this issue, the team suggests developing a stock turnover model to calibrate the measure life to available sales

data. NEEA should coordinate any stock turnover modeling effort with a similar modeling effort planned as part of the Navigant/Cadeo team's work for Bonneville Power Administration. The turnover model, which is expected to be completed by mid-2016, could be a shared resource for the region that aids analyzing non-residential lighting stock and sales.

Also, the model did not include a rated life (e.g., 25,000 hours) for either RW lamp. As a result, it was not possible for the team to confirm that the model's current measure life and hours of use assumptions are properly synced. (Rated life divided by operating hours should equal measure life.) The stock turnover model will also correct for this issue.

### **Incremental Lamp Cost for Consumers**

- **Inconsistent inputs and incomplete sources for incremental lamp cost.** In its review, the team found that while the note in 'Cost Inputs'!C39' suggests an incremental cost of around \$2 for 28W product and \$4 for the 25W product, the table in range 'Cost Inputs'! A31:C34 suggests the same incremental cost (\$4.15) for Product 1 (28W) and Product 2 (25W). This discrepancy stems from a conversation with Charlie Grist at the Northwest Power and Conservation Council. NEEA will work through this issue with Charlie and the team will revisit the issue in the second phase of review in spring 2016.
- **Inadequate documentation on lamp costs sources.** Both of the aforementioned values are in fact calculations with hardcoded values embedded in them. The 'high' price product costs are taken from a Department of Energy Notice of Proposed Rulemaking (NOPR), but it is not clear which NOPR. NEEA could improve upon the documentation by specifying the year and name of the rulemaking along with more specific information about where this data can be found in the rulemaking documentation (e.g. technical support document chapter number and page). The 'mid' and 'low' price product costs are also undocumented and would benefit from a similar level of specificity in documentation.

## **B.3 Summary (First Review)**

Overall, the RWLR ACE model utilizes quality data and reasonable assumptions. However, the team recommends a few improvements to input data as well as the model's methodology and structure.

With regard to inputs, the team recommends syncing up the tables used to arrive at the operating hours and lighting savings yield. This requires verifying which table has more current data and recoding the calculations to consistently pull from that table. The team also recommends using a calibrated lifetime value from a stock turnover model. This move will sync up the model's assumption of hours of operation in different building types with the lifetime of the product. Again, the team recommends coordinating with similar upcoming efforts for the BPA.

With regard to structure and modeling best practices, the team recommends that any efforts to reorganize the 'Market' tab also move to eliminate the use of hardcoded values embedded in formulae. Further, these efforts should include more direct and thorough documentation. Input documentation should include at a minimum: the year of publication of the data, the party responsible for producing the data, specifics on where the primary source can be found. Additionally, notes on the underlying information used to arrive at or develop the data are helpful in review in that they clarify the timeliness, representativeness, and reasonableness of the data. Efforts to this end will make the model easier to update and produce reliable accurate results going forward.

## B.4 Secondary Review<sup>29</sup>

In this section of the memo, the team presents the findings of our second review of the RWLR ACE model. This second review follows the completion of additional evaluation research, namely various market actor interviews, performed in late 2015 and early 2016. This memo provides recommendations informed by this research.

The team's second review focused on three areas for improvement:

- **Following up on previous recommendations with new data.** The initial ACE model review included recommendations for potential model improvements after the team completed its data collection and analysis.
- **Expanding upon previous recommendations with new data.** Recent research may prove useful beyond the team's initial findings and opens the door for future model improvements.
- **Correcting newly discovered issues.** Between the first and second reviews, new issues have come to light which merit adjustments to the savings calculation methodology. This area outlines the changes to the calculations and describes the impact on savings.

The findings section of this memo is organized along these three key areas for improvement.

## B.5 Second Review Findings

After a second review of the RWLR ACE model, in light of the newly available evaluation research, the team offers the following findings. Table 17 provides a high-level overview of categorical recommendations for model improvement, as well as the specific model input and relevant data sources.

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<sup>29</sup> The team completed the remainder of this ACE model review memo after finishing our primary data collection efforts and in conjunction with the final RWLR MPER.

Table 17. Model Improvements, Data Sources, and Status

Categorical Improvement	Target Improvement	Data Source	Availability
Following up on Previous Recommendations	Lamp Cost	Bonneville Commercial Lighting Stock Turnover Model	As yet, unavailable Expected late 2016
		D+R Product Categorization	Uncertain
Expanding upon Previous Recommendations	Lighting Savings Yield	Bonneville Commercial Lighting Stock Turnover Model	As yet, unavailable Expected late 2016
		2014 Northwest Commercial Building Stock Assessment	Available
Correcting for Newly Discovered Issues	Delta Wattage	DOE GSFL Final Rule TSD December 2014	Available

The following sections delve deeper into these recommendations for improvement, the relevant data sources, and their status.

**Following up on Previous Recommendations with New Data**

- Lamp Cost.** In the initial review, the team found that a cell note in 'Cost Inputs'!C39' suggested an incremental cost of approximately \$2 for 28W lamps and \$4 for 25W lamps, the table referenced in range 'Cost Inputs'! A31:C34 includes the same incremental cost (\$4.15) for both wattages. This discrepancy stems from a conversation with the Northwest Power and Conservation Council.

After the team included this finding in the initial review in November 2015, NEEA recommended that the team work with Northwest Power and Conservation Council to resolve the issue. Per this recommendation, the team communicated with the Council in January of 2016. However, the team recommends that NEEA align the RWLR incremental cost assumptions the values used in BPA's in-progress regional Non-Residential Lighting model. That model is slated for completion in late 2016. In the interim, the team recommends that NEEA coordinate with BPA and the model development team to obtain the model's draft assumptions.

**Expanding on Previous Recommendations**

- Lighting Savings Yield.** The team recommends that NEEA rebalance the calculation of lighting savings yield based on the prevalence of linear fluorescent lamps in each building type, rather than the absolute floor space. In addition to matching the lifetimes of RW lamps to those used in the aforementioned BPA's Commercial Lighting Momentum Savings model, NEEA should also rebalance all ACE model calculations tied to the

representative floor space of each building type. In advance of the model’s availability, the team recommends NEEA use the representative wattage of T8 linear fluorescent lamps by building type from its own 2014 Commercial Building Stock Assessment. Switching to this weighting will correct for any disproportionality in one type of building favoring T8 linear fluorescent lamps over other applications. Doing so will not only improve the estimated average hours of use, but all factors that rely upon this weighting, including the lighting savings yield calculation. Using the same assumptions as BPA will promote consistency in regional analyses and help avoid double counting or understating savings.

**Identifying and Correcting for Other Issues**

- **Delta Watts.** The team recommends revising the calculation of Delta Watts based on System Input Power (SIP). The delta wattage was previously based on a direct comparison of the ANSI Effective Wattage (also known as the Reference Arc Power (RAP)). The delta watts in the savings calculation should use SIP instead of RAP as this represents the actual energy consumption experienced by the consumer. Moving to this approach will correctly account for the ballast factor (BF) and ballast luminous efficiency (BLE). The SIP is given by the following equation:

$$SIP = RAP \times BF \times n \times 100 / BLE,$$

where *n* is the number of lamps in question.

While BF does not change between lamps of different nominal wattage, BLE does. BLE also changes depending on the type of ballast, whether it be instant start or programmed start. Table 18 and Table 19 show the input values and calculated SIP for 32W, 28W, and 25W lamps.

**Table 18. System Input Power with Instant Start Ballast**

Nominal Wattage (W)	ANSI Rated Wattage (W)	Reference Arc Power (W)	Ballast Factor	Number of Lamps	Ballast Luminous Efficiency (Instant Start)	System Input Power (W) (Instant Start)
32	32.5	29.0	0.88	1	92.2	27.7
28	28.4	26.0	0.88	1	92.0	24.9
25	26.6	24.2	0.88	1	91.9	23.2

**Table 19. System Input Power with Programmed Start Ballast**

Nominal Wattage (W)	ANSI Rated Wattage (W)	Reference Arc Power (W)	Ballast Factor	Number of Lamps	Ballast Luminous Efficiency (Programmed Start)	System Input Power (W) (Programmed Start)
32	32.5	29.0	0.88	1	90.8	28.1
28	28.4	26.0	0.88	1	90.5	25.3
25	26.6	24.2	0.88	1	90.3	23.6

Making this adjustment results in an overall reduction in Delta Watts of 6 percent for both the 25W and 28W lamps relative to the previous methodology. Table 20 shows the decline in Delta Watts between the old calculation using RAP and the new calculation using SIP.

**Table 20. Delta Watts (RAP vs SIP)**

Nominal Wattage	Delta W (RAP)	Delta W (SIP) (Instant Start)	Delta W (SIP) (Programmed Start)	Average Delta W (SIP)	Change in Delta W (RAP vs SIP)
32	0.0	0.00	0.00	0.00	0%
28	3.0	2.81	2.82	2.82	6%
25	4.8	4.51	4.52	4.51	6%

## APPENDIX C. DATA REVIEW FINDINGS MEMO (Q1 2016)

This memo details the findings of the Cadeo/Navigant team's Q1 2016 review of D+R International's (D+R) data cleaning, analysis, and reporting processes in support of NEEA's Reduced Wattage Lamp Replacement (RWLR) initiative. This marks our team's third review of RWLR; we completed our previous data reviews in September 2015 (Q3 2015) and in February 2016 (Q4 2015).

The objective of the recurring data reviews, part of the team's ongoing Market Research and Evaluation Report (MPER), is to ensure D+R's data management processes continue to accurately interpret the raw sales data gathered from participating RWLR distributors. The accuracy of these data is paramount as NEEA uses them to track identified initiative market progress indicators and pay distributor incentives.

The Cadeo/Navigant's Q1 2016 data review focused on program data gathered since the team's Q4 2015 or End-of-Year (EOY) review. As a result, the team first identified all new model numbers added to the database between EOY 2015 and Q1 2016. After isolating these records, the team reviewed a random sample of new model numbers for possible misclassifications or errors.

The Q1 2016 review included the 11 distributors listed in Table 21, all but two of which were part of the 2015 EOY review (HD Supply and Crescent).

**Table 21. RWLR Participating Distributors Included in Data Reviews**

Distributor	Included in Initial Data Review (Q3 2015)	Included in EOY 2015 Data Review	Included in Q1 2016 Review
Eoff	Yes	Yes	Yes
Grainger	Yes	Yes	Yes
Graybar	Yes	Yes	Yes
Interstate	Yes	Yes	Yes
North Coast	Yes	Yes	Yes
Platt	Yes	Yes	Yes
Portland Lighting	Yes	Yes	Yes
Pacific Lamp Supply	Yes	Yes	Yes
Stoneway	No	Yes	Yes
HD Supply	No	No	Yes
Crescent	No	No	Yes

\* *United Lamp Supply recently enrolled in RWLR but their data was not available in D+R's online database at the time of this review.*

### C.1 Methodology

This section outlines the methodology the team used to review D+R's data cleaning, analysis and reporting processes. For the Q1 2016 review, the team conducted checks for three data elements that the team identified as most susceptible to misclassification:

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1. **Reduced Wattage Lamps:** To confirm that lamps identified in the data as 25W and 28W are actually reduced wattage lamps and not standard 32W lamps.
2. **Standard Wattage Lamps.** To confirm that lamps identified in the data as 32W lamps are actually standard 32W wattage lamps and not 25W or 28W reduced wattage lamps.
3. **ZIP Codes.** To confirm that only sales within NEEA's area were counted as initiative sales.

While our team reviewed new reduced wattage and standard lamp model numbers sold by any participating distributor, we only verified zip codes for HD Supply and Crescent, as they enrolled in RWLR since our most recent review. (Our team previously verified the zip code classifications used by the other distributors, which were unchanged.)

The team believed the classification of reduced wattage and standard wattage lamps was particularly susceptible to error because the categorization process is largely completed manually.<sup>30</sup> Further, wattage type misclassifications can lead directly to the incorrect allocation of savings and incentives, as well as potentially obfuscate RWLR's market transformational progress in the region. The same was true for misclassified ZIP codes (i.e., was a specific lamp sale inside or outside of NEEA's territory).

D+R changed its data format from Excel workbooks to a database format between the 2015 EOY review and the Q1 2016 review. As a result, the team modified its process for identifying new model numbers and zip codes prior to its review:

1. Run a query in the RWLR database to identify new model numbers added between EOY 2015 and Q1 2016 and corresponding lamp characteristics (length, wattage, shape, technology).
2. Copy results into an Excel worksheet named 'Combined Products.'
3. Run a query in the RWLR database to identify sales by HD Supply and Crescent with corresponding zip codes.
4. Copy results into an Excel workbook named tab 'Combined ZIP Codes.'
5. Sort both workbooks via random variable in descending order.

Each portion of the review (RW lamp classifications, standard wattage classifications) was broken down into a series of steps, detailed below.

### Verifying Reduced Wattage Lamp Classifications

**Goal:** Verify that D+R assigned the correct lamp characteristics (length, wattage, shape and technology) for all new model numbers of RWLR-eligible lamps.

**Population Definition:** All new reduced wattage 25W and 28W lamps (since 2015 EOY review)

**Population Size:** 85

**Sample Size:** 39

**Sampling Precision at 90% Confidence:** 10%

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<sup>30</sup> D+R temporarily experimented with web scraping to automate the collection of lamp details using distributor provided SKUs for two distributors, but found they still needed to review and clean the scraped data. Ultimately, web scraping added time to their internal QC process rather than simplifying it. As a result, web scraping is not part of D+Rs categorization process.

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**Stratification:** None<sup>31</sup>

**Verification Process:**

1. Filter the identified new lamps for only RWLR-eligible lamps (T8 shape, 48 inch length, and wattages of 25W and 28W).
2. Verify the length, wattage, shape and technology listed using online manufacturer product specification sheets for the first 39 new model numbers.<sup>32</sup>
3. Note any discrepancies.

### Verifying Standard Wattage Lamp Classifications

**Goal:** Verify that D+R assigned the correct lamp characteristics (length, wattage, shape and technology) for all new model numbers for non-RWLR lamps.

**Population Definition:** All new standard 32W lamps (since 2015 EOY review)

**Population Size:** 603

**Sample Size:** 62

**Sampling Precision at 90% Confidence:** 10%

**Stratification:** None<sup>33</sup>

**Verification Process:**

1. Filter the identified new lamps for only non-RWLR wattage categories (e.g., filtered out 25W and 28W).
2. Verify length, wattage, shape and technology listed using manufacturer product specification sheets for the first 62 new model numbers.
3. Note any discrepancies.

### Verify ZIP Code Allocations

**Goal:** Ensure D+R assigned Crescent and HD Supply's sales in the correct ZIP codes to NEEA's territory.

**Population Definition:** All ZIP codes associated with Crescent and HD Supply sales

**Population Size:** 11,052

**Sample Size:** 69

**Sampling Precision at 90% Confidence:** 10%

**Stratification:** ZIP Codes Identified as Within/Outside NEEA Region

**Verification Process:**

1. Filter the zip codes worksheet to show only RWLR-eligible wattages (25W and 28W).
2. Sort entries via random variable in descending order.
3. Verify that the first 69 ZIP codes listed were within NEEA's region using the list of NEEA ZIP codes.

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<sup>31</sup> However, by combining and randomizing data from all participating distributors, our approach implicitly accounts for the different number of RW lamp types sold by each distributor.

<sup>32</sup> If the team was unable to find a manufacturer product specification sheet, the team used websites such as amazon.com or 1000bulbs.com to verify the product specifications.

<sup>33</sup> Similar to our approach for RW lamps, by combining and randomizing data from all participating distributors, our approach implicitly accounts for the different number of standard wattage lamp types sold by each distributor.

4. Note any discrepancies.

## C.2 Results

This section details the results of our data review.

### Reduced Wattage Lamps

The team did not find any incorrectly assigned characteristics when verifying three different lamp characteristic (shape, wattage, and length) for the 39 randomly sampled RW lamps. However, there were two lamps the team was unable to verify, as the team was not able to find any relevant lamp specifications through a detailed web search for the listed model numbers.

**Table 22. Reduced Wattage Lamps Mischaracterizations**

Model Number	Description	Brand	Shape	Wattage	Lumens	Finding
195977	None	Eiko	T8	28	2625	Lamp not found
195443	None	Westinghouse	T8	28	2725	Lamp not found

We determined that the unverifiable reduced wattage lamps represented less than 0.01% of total reduced wattage lamps. Therefore, even though the team was unable to verify the shape, wattage and length of these lamps, any potential misclassification would not have an impact on initiative savings.

### Standard Wattage Lamps

For the random sample of 62 non-RWLR-eligible lamps, the team discovered only two incidences in which either a lamp's shape, wattage, and length were incorrect in the provided data. However, there were two lamps the team was unable to verify, as the team was not able to find any relevant lamp specifications through a detailed web search for the listed model numbers. Table 23 summarizes our findings.

The reason our team verified standard wattage lamps was to ensure that no 25W or 28W lamps were incorrectly assigned as standard wattage lamps, thus resulting in NEEA under reporting savings. When our team looked up wattages lamps with incorrect wattages, we determined that none of the lamps were 25W or 28W lamps. We also determined that the unverifiable standard wattage lamps represent 0.07% of all standard wattage lamp sales. Therefore, neither of the issues identified by the team impacts initiative savings.

Table 23. Standard Wattage Lamps Mischaracterizations

Model Number	Description	Brand	Shape	Wattage	Length	Finding
SYL LED19T8L48F850SU B (75091) 4	NULL	Sylvania	T8	16	48	Incorrect Wattage (16.5W)
F54W/T5/830/WM/EC O	NULL	GE	T5	51	48	Incorrect wattage (54W)
155260	None	Westinghouse	T8	32	48	Lamp not found
2958	None	Eiko	T8	32	48	Lamp not found

### ZIP Codes

The team found no errors in D+R’s reporting of ZIP codes for HD Supply and Crescent. All of the ZIP codes for RW lamps were correctly categorized as “IN” NEEA’s territory.

## C.3 Opportunities and Considerations

As part of the review, the team identified 135 program records in which the field capturing the lamp’s lumens (in the product\_id table) appears in a date format. The majority of these records were entered on 2/14/2016. The team recommends instituting standard data checks following any import of new data or reconsidering the data type format for this field (currently NVARCHAR).

During its review, the team also noticed that some records in the Model\_Num column of the product\_id table were truncated, for example: “SYL LED4B10C/BLUNT/DIM/827 (788”. This could be an issue with the import procedure or an issue with the export procedure by the reporting distributor. The team suggests D+R review the import process to ensure data is not truncated when it is imported into the database and institute QA procedures following import of new data.

## C.4 Summary

Overall, our team found D+R’s data cleaning, analysis, and reporting processes to be thorough and accurate, despite some minor concerns regarding the new data format.

Our team did not find any errors that would impact overall RWLR reporting. Specifically, our team did not identify any 25W or 28W lamps in our sample of standard wattage lamps or errors with regard to ZIP code allocation.

With the exception of the minor formatting and importing suggestions offered in the “Opportunities and Considerations” section above, our team does not recommend any changes to the initiative’s current process for collecting, analyzing, and reporting RWLR data.

## APPENDIX D. 2015 REDUCED WATTAGE LAMP MARKET SHARE ESTIMATES

### D.1 Introduction

In early 2014, the Northwest Energy Efficiency Alliance (NEEA) launched a Market Test of the Reduced Wattage Lamp Replacement (RWLR) Initiative, which provided education and incentives to five regional distributors with the goal of promoting the installation of 25W and 28W T8 linear fluorescent lamps (LFL) in the commercial maintenance market. These lamps, known as reduced (or low) wattage (RW) lamps, are energy efficient alternatives to the current market standard for T8 lamps (32W).

This memorandum details the methodology and result of Navigant and Cadeo's (the team) analysis of RW market shares for 2015. NEEA will use the team's estimate of reduced wattage market share, in conjunction with initiative forecasted RW baseline market share<sup>34</sup> and regional utility program reduced wattages sales, to estimate RWLR's net market effects and energy savings for 2015.

### D.2 Initiative Participation

After successfully completing the Market Test, NEEA authorized scaling up the RWLR initiative in early 2015. As of early March 2016, 12 regional distributors had enlisted in RWLR. Beyond adding these seven participants, NEEA also deepened its relationship with existing Market Test distributors by adding branches that did not originally participate. Together, the addition of new distributors and previously nonparticipating branches to RWLR resulted in a 40 percent increase<sup>35</sup> in the volume of LFL sales data collected in 2015 – despite a 5 percent contraction in the overall known market size between 2014 and 2015.<sup>36</sup>

### D.3 Methodology

The team analyzed the end-of-year sales data for all 12 participating RWLR distributors provided by D+R to estimate the market share of reduced wattage lamps in 2015 as a fraction of all 4-foot T8 lamps.<sup>37</sup> Specifically, the team tabulated the total number of 25W, 28W, and 32W 4-foot T8 lamps sold in the region during 2015.

Upon analyzing these data, the team determined that a few distributors only reported a portion of their 2015 sales to D+R. The identified partial data was exclusively associated with three distributors that recently enrollment in RWLR and that had not yet provided D+R pre-initiative 2015 sales data. Whenever a distributor did not provide complete 2015 sales information, the team annualized their sales by dividing their reported sales by the number of months for which they reported sales, and multiplying by 12. The annualization process had little impact on the overall results since more than 97% of the total annualized sales were directly reported by RWLR participants. Table 24 summarizes the total reported and

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<sup>34</sup> For more information about the initiative's forecasted baseline RW market shares, please see the team's 2015-2017 Baseline Forecast Memo.

<sup>35</sup> Relative to the 2014 sales data collected through RWLR, in total units (annualized).

<sup>36</sup> Measured as the ration of annualized sales data for distributors that provided sales data in both 2014 and 2015.

<sup>37</sup> This analysis excludes TLED lamps.

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annualized 2015 RWL sales. The team used the latter value (annualized sales) to calculate RW market shares.

**Table 24. Total Reported and Annualized 2015 4 ft T8 LFL Sales**

Reported Sales (All Wattages)	Annualized Sales (All Wattages)	% Reported (of Annualized)
2,965,537	3,042,147	97.5%

### D.4 Results

Using the annualized data, the team calculated 2015 RW shares of 2.9% and 14.0% for the 25W and 28W categories leading to an overall market share for RW lamps of 16.9%. Table 25 provides both the overall annualized sales by wattage level as well as the market share for each category.

**Table 25. Annualized Sales and Market Share of 4ft T8 LFL by Wattage (2015)**

Metric	25W	28W	32W	TOTAL
Total Sales (lamps)	88,188	425,202	2,528,757	<b>3,042,147</b>
Market Share (%)	2.9%	14.0%	83.1%	<b>100.0%</b>

The team's overall RW market share estimate of 16.9% is 3.0% higher than the forecasted RW baseline for 2015 (13.9%). As shown in Table 26, actual 2015 sales of 28W lamps outpaced their forecast, while 25W lamps did not. However, the difference between the 28W forecasted baseline and actual sales was large enough to offset the disparity between the forecast and actual sales for 25W lamps.

**Table 26. Comparison of Actual and Baseline RW Shares for 2015**

	25W Share (%)	28W Share (%)	Total RW Share (%)
Sales Data	2.9%	14.0%	16.9%
Baseline Forecast	4.2%	9.7%	13.9%
<b>Difference</b>	<b>(1.3)%</b>	<b>4.3%</b>	<b>3.0%</b>

## APPENDIX E. MARKET ACTOR INTERVIEWS AND SURVEYS FINDING'S MEMO

In this memo, the team presents the findings of interviews with distributors participating in the Northwest Energy Efficiency Alliance (NEEA) Reduced Wattage Lamp Replacement Initiative (RWLR) and manufacturers who produce reduced wattage lamps. The team interviewed 10 out of the 12 current RWLR participants, including all five of the initiative's original Market Test participants, and five manufacturers. Additionally, the team surveyed 34 Building Owners (note: all respondents did not answer all questions) through NEEA Commercial Real Estate Market Characterization Survey (includes program parts and non-parts).

The interviews will inform RWLR's first Market Progress Evaluation Report (MPER) and provide NEEA with a qualitative assessment of the reduced wattage (RW) market and the status of Market Progress Indicators (MPIs). Specifically, the team sought to inform NEEA of:

- Barriers to greater RW lamp adoption
- The interaction of tubular LEDs (TLEDs) and RW lamps in the maintenance market
- Details of special pricing agreements (SPAs) with manufacturers
- How distributors promote and stock RW lamps
- While these interviews provide insightful and direct input from initiative participants, the interviews are qualitative in nature and should not be interpreted strictly as quantitative data. The team summarized market actor responses using distributor counts whenever possible. In cases where distributor's' responses were less definitive (e.g., it was unclear in two interviews whether the distributors use the NEEA incentive exclusively for pricing), or the participant was unable to talk about a certain topic (e.g., pricing) the team subtracted that participant from the overall count. Therefore, the count of total respondents is not consistently out of 10

### E.1 Key Findings

1. The team identified 10 key findings relevant to the evaluation of NEEA's RWLR initiative:
2. NEEA's involvement in RWLR caused distributors to engage their manufacturers and negotiate SPAs for RW lamps
3. Selling RW lamps at price parity with 32W is critical for uptake – and SPAs are the best way to achieve it
4. Once an end user switches to RW lamps, it becomes their default lamp purchase
5. The person purchasing the lamp at the branch is usually not the decision maker
6. A few distributors have successfully broken the 32W "like-for-like" purchasing cycle...
7. ....while most distributors are still getting there
8. Nationwide, the T8 market continues to shrink and manufacturers do not see RW lamps bucking that trend
9. Dramatic technology improvement and cost reduction have made TLEDs compelling to many end users

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10. 28W lamps can be plug-and-play replacements for 32W lamps—not so for 25W lamps

11. The vast majority of RW lamps are installed in commercial buildings

With respect to RWLR’s MPIs, the team found that the initiative has seen early success in many of its short-term MPIs, in particular those related to participating distributor business practices. These practices have translated into increased RW sales for some but not all distributors. Some long-term MPIs for wider RW lamp market adoption may be at risk due to broader trends in the lighting market; the team will report in greater detail on these findings in the final report once all market characterization surveys and the most recent sales data are available.

Table 27 summarizes the team’s initial assessment of each MPI as “On Track,” “Within Range,” or “At Risk.”

- **On Track:** RWLR is likely to meet the relevant MPI within the specified time range without changes to the current design or delivery of the initiative.
- **Within Range:** RWLR may meet the relevant MPI within the specified time range, but may need to make moderate changes to the design or delivery of the initiative to increase the likelihood of success.
- **At Risk:** At present, RWLR is unlikely to meet the relevant MPI without significant changes to current design or delivery of the initiative.

**Table 27. Summary of MPI Status Based on Interview Findings**

MPI	Status
I. Increased distributor promotion of RW T8s	On Track
II. Decrease in RW T8 cost	Within Range
III. Increase in sales of RWT8s	At Risk
IV. Increased decision maker demand	TBD: Pending contractor and end-user surveys
V. Market momentum supports RW T8 sales	Within Range
VI. Lighting distributors are interested in continued efficiency collaboration and new initiatives/programs	On Track
VII. Federal Standard requiring improved energy performance	TBD: Will address in final report
VIII. RW T8 becomes the standard product choice in the T8 lamp market	TBD: Will address in final report
IX. Improved GSFL performance	TBD: Will address in final report

### 1. NEEA’s involvement in RWLR caused distributors to engage their manufacturers and negotiate SPAs for RW lamps

Before participating in RWLR, none of the distributors had pricing conversations with their partner manufacturers specifically for RW lamps. NEEA’s interest in RW lamps empowered and motivated all distributors to engage their partner manufacturers and negotiate pricing for the lamps. Now, seven out of

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nine RWLR distributors have secured SPAs or have informal pricing negotiations for RW lamps with their manufacturers. The distributors interviewed were quite clear that, if not involved in the initiative, they would not have worked with their manufacturers to establish RW-specific SPAs to reduce the price differential between the RW and standard 32W lamps. Three out of four manufacturers who commented on SPAs for RW lamps indicated that they had in place, or at least offered SPA pricing, for RW lamps when the opportunity arose (typically driven by volume).

This reinforces the program theory that that distributor size – and importance within the industry – enable distributors to command the best possible price. The 12 distributor program participants are not one-size-fits all, especially in terms of pricing and sales volume, evidenced by the variety in SPAs with manufacturers. Each distributor, therefore, has a different buying power in how far they can negotiate prices down (if at all) for lamps. For example, larger, multiple branch distributors with higher sales volume tend to have more buying power and more leverage in negotiating prices than a single branch distributor with lower sales.

Six out of the seven distributors with SPAs were unwilling to discuss the specifics of SPAs with their partner manufacturers, but one distributor offered limited insight into general SPA process.

According to this distributor, the process begins with the distributor engaging their manufacturer about a specific product or stock keeping unit (SKU) and negotiating what amounts to a per-lamp bulk discount. For example, this distributor noted they receive “\$1.50 back” for each 28W it sells. (For comparison’s sake, the same distributor receives \$0.60 for each 32W subject to a SPA with the same manufacturer.) Next, the distributor sells lamps in bulk to their customers. At the end of each month, the distributor notifies the manufacturer of how many of each SKU subject to a SPA they sold. The manufacturer then sends the distributor a check, which retroactively reduces the distributor’s wholesale costs and increases profits. The distributor also shared that they renegotiate their SPAs approximately twice a year, collaboratively adjusting per-unit SPA values up or down depending on how many of each lamp the distributor sold. It is up to the distributor to push sales and keep their numbers up in order to convince the manufacturer to keep prices down and continue the SPA. Here, the program’s midstream approach inherently drives RW lamp volume from participating distributors, helping them retain the SPAs. Therefore, the momentum gained through participation remains, even after exiting the program, as customers repeat purchases. This should continue to drive enough RW volume to maintain the SPAs with partner manufacturers. This finding also highlights potential value of SPAs to drive the sales of other energy efficiency products – lighting or another end use – through a midstream approach similar to RWLR.

Only one distributor noted that they were not able to work out SPAs with their primary manufacturer partner, and that they actually buy RW lamps from another source that is less expensive. The other distributor who does not have RW-specific SPAs (although SPAs for other products are in place) uses the NEEA incentive solely to bring down RW cost.

### **2. Selling RW lamps at price parity with 32W is critical for uptake—and SPAs are the best way to achieve it**

All distributors reported that price parity – or as close to it as possible – is paramount for increasing RW market share. Manufacturers shared this sentiment for the maintenance market in particular: one noted that RW lamps are typically more common in projects as opposed to counter sales, meaning that the lamps are often used in lighting retrofits where they are specified in the project order versus purchased by

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a customer coming into the branch. Interestingly, many (four out of 10) distributors achieved parity without utilizing the NEEA incentive, due to the newly formed partnerships with manufacturers described above.

The importance of price parity was summed up best by one large distributor: “T8’s are a commodity, and like copper wires or gas, most customers who buy T8s know what their pricing is, and they are very price conscious and sensitive.” A different large distributor noted how even small differences in per-lamp costs add up: “ten or twenty cents a lamp times thousands of lamps is a lot of money for property managers, that’s dollars, that’s operating income for these guys. I think there is a lot of price sensitivity out there when it comes to the larger [orders].” Another distributor was even more direct: “price makes the biggest difference [in the end user’s decision-making process], so throwing money at the price [to drive RW sales] is going to have the biggest effect.”

Less obviously, offering RW and 32W lamps at comparable prices also encourages greater RW sales by empowering distributor sales staff both onsite and at the branch counter. Several distributors shared that their sales staff, always mindful of cost sensitivities and focused on customer service, are often reticent to promote RW to end users as 32W alternatives when RW lamps are more expensive. In these cases, the staff default to their comfort zone and simply “fill orders”. However, when RW and 32W reach price parity sales staff are often more emboldened and comfortable proactively “selling” RW lamps. In essence, getting the lamp prices to parity amplifies the initiative’s ability to transform the market by addressing both supply and demand-side barriers.

Our research identified three pricing scenarios for 28W lamps:

- Eight out of 10 distributors reported selling 28W lamps at price parity, or even cheaper, than standard 32W lamps.
- One distributor noted that a slight 5-10% price differential remains between 28W-32W lamps (28W being more expensive).
- Another distributor noted that their RW lamps remained more expensive than the standard (a 32W is roughly \$2 and a 28W \$3), even after incentives have been applied.

Pricing scenarios for 25W lamps were more similar across distributors. For four distributors interviewed, they were roughly 10-20% more expensive than 32W lamps. However, three distributors reported selling 25W at parity. Two distributors do not stock 25W lamps.

Manufacturers reported that 25W and 28W lamps are typically 18-35% more expensive to produce than 32W lamps; some reported slightly higher costs for 25W lamps. They typically pass through this cost increase to distributors. Cost is dropping and technology is improving for LED alternatives, but manufacturers are not investing in further improvements in RW technology and project relatively stable production cost into the future. The increased levels of phosphor in RW lamps and a more expensive fill gas (krypton) contribute to their higher cost, relative to 32W lamps.

Three manufacturers noted that a driver for flat RW lamp cost is that these products have never been as high volume as their 32W counterparts; without an increase to 32W production levels, RW lamps will still need higher margins to maintain profitability. .

It is important to note that reaching the economies of scale necessary to meaningfully reduce RW price premiums would likely require market change beyond the Pacific Northwest. The Pacific Northwest is only

approximately 4%<sup>38</sup> of the national LFL market so even 100% RW market share for the region may not be enough to change the economics of national production schedules. This perspective underscores the importance of SPA agreements in reaching price parity for 28W lamps.

### 3. Once an end user switches to RW lamps, it becomes their default lamp purchase

With the exception of a lone instance where a specific end user was not satisfied with their RW lamps, none of the distributors were aware of end users backsliding to 32W lamps after converting to RW. Manufacturers noted that customers are generally satisfied or very satisfied with 28W lamps, though they are less satisfied with 25W lamps due to compatibility issues.<sup>39,40</sup>

The vast majority of distributors (seven out of 10) explicitly noted that once an end user switches to RW lamps, they continue to purchase them and tend to purchase more for additional buildings. One distributor shared “they’re very anxious to get more, the ones who have had [RW lamps] before.” Overall, distributors reported that end users who purchased RW lamps are highly satisfied with the technology, and that many do not even notice the switch 28W in terms of performance or light output.

When asked what percentage of their customers repeat orders for RW lamps, contractors reported a weighted average of approximately 40%.

### 4. The person purchasing the lamp at the branch is usually not the decision maker

More often than not, the switch from a 32W to a RW lamp is complicated by the fact that the individual purchasing the lamp at the branch does not have the authority to change for existing order. One distributor explained that “the guy in the store is usually picking up what his boss told him to buy or what was ordered.” About half of the distributors also noted that many times the exchange in-store is relatively fast and usually consists of picking up orders that cannot be changed after the fact. One manufacturer noted that maintenance budgets are usually set once per year (in the fall for the next calendar year), making it difficult to upsell lamp replacements without competitive pricing.

However, another distributor noted that “if the electrical contractor is (or is with) the business owner then they’re more open to changing.” These instances tend to occur more often onsite at the project. There, the presence of the ‘expert’ or trusted decision maker encourages conversation or discussion of options to unfold. This discussion allows the branch salespeople to ‘sell’ RW by explaining the compelling reasons to switch. If the salespeople or the electrical contractor are able to facilitate that conversation, a switch to RW is more likely.

Our research identified two primary opportunities to convince an end user to transition from a 32W to a RW lamp:

- **Proactive Onsite Communication.** One distributor explained that “in the field it’s a much higher conversion rate” as the salesperson or contractor can directly engage the decision maker in a conversation about the benefits of switching to RW lamps.
- **At the Branch Sales Counter.** A few distributors noted that occasionally they’ll have an in-store pick up where the customer wants to impress the ‘guy with the buying power’, and actually bring back a sample RW lamp to flaunt its energy-saving capabilities, but that such instances are rare.

<sup>38</sup> Estimated based on share of national commercial floor space

<sup>39</sup> NEEA is currently conducting a case study to better document compatibility issues with 25W lamps.

<sup>40</sup> We explore compatibility issues further, as well as applications that are best suited for 25W lamps, later in the document under Key Finding #9

In both situations, leveraging relationships is key for reaching decision makers and influencing purchases. If a trusted salesperson has a long standing relationship with an end user, that person is more likely to give RW lamps a shot when the salesperson suggests them.

For national accounts, responses varied as to whether a regional initiative could affect decision-making. Two manufacturers reported seeing this effect for other technologies (including TLED), but another felt that investigating myriad rebate offerings across the country was too complex for some accounts to analyze in their decision-making processes.

##### **5. Some distributors have successfully broken the purchasing cycle...**

A few distributors had notable success selling the RW lamps at high volume. One particular distributor shared how they “forced the hand” and phased out the sale of 32W lamps at RWLR participating branches. Unless 32W lamps were strictly specified by the end user or decision maker, or if there was pushback that could lead to loss of a sale, they stuck with RW lamps as the default product for all 4-foot linear fluorescent lamp (LFL) sales. According to this distributor, this strategy, coupled with employee training and education, successfully increased RW across all participating branches (the team confirmed this increase using RWLR sales data). Due to recent changes in management, the distributor shared that they have since gone back to allowing the 32W lamp, although most of their end users have stuck with RW lamps.

The same distributor also modified their traditional employee incentive structure when participating in RWLR. Instead of offering a single, large prize for the salesperson with the highest number of RW sales (their most common internal incentive model) the distributor set the incentive threshold lower and allowed multiple winners to evenly split the incentive bounty. According to the distributor, this strategic shift motivated more of their salespeople – even the less savvy ones who don’t typically win sales contests – to push sales of RW lamps, realizing they could also reach the threshold. This structure eliminates the “Bob always wins” mentality. However, it’s unclear why this works better than a straight per-case or per-lamp incentive (known as a spiff), a model employed by other distributors who pay a bonus (such as \$0.25 per lamp) to each employee who makes a sale, as everyone can win with that approach too.

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“We recognized that if we gave one large award away that people would bow out because of the one guy who always wins. [So] we lowered the bar and made the threshold lower—everyone who made the threshold split the prize. Now we have full participation and up to 17, even 30, people winning and splitting the prize. Even had some people in different areas of the store trying to sell lamps. Everyone was in it to win and split it.”

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About half of the distributors use the NEEA incentive (or some portion of it) for spiffs. These same distributors noted that spiffs have a huge impact, and they are the biggest reason that their sales have grown. These distributors speculated, without the funding provided by NEEA to enable these spiff/incentives, that their RW share of lamps would have remained stagnant, or even shrank, in the last year.

It’s important to also note that at least one distributor does not permit spiffs, so this distributor relied more heavily on education, awareness, and using NEEA’s incentive to drive down price.

**6. ...while most distributors are still getting there**

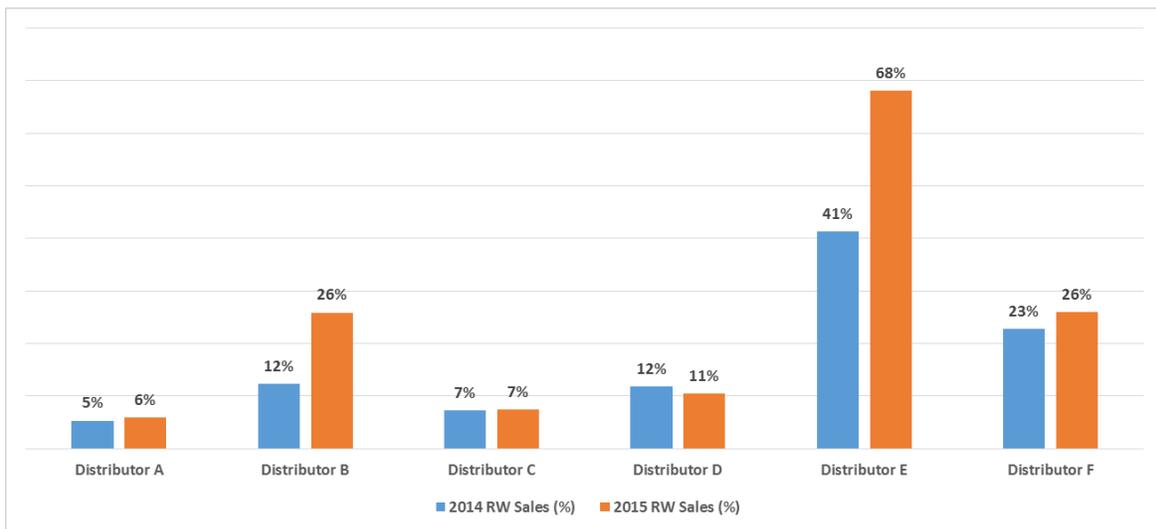
A few distributors admitted to struggling to convert their end users to RW lamps. For example, one distributor explained that “we try and substitute whenever we can, ‘heard you say 32W, we’re going to send you a 28W instead’... but we can’t dictate to our customers what they can and cannot buy. We want to help them get the best product for their money, and we think the 28W and 25W in some projects can be [it]” These distributors are still searching for a way to effectively communicate the advantages of RW lamps while not forcing the decision and break the 32W like-for-like purchasing cycle.

However, one distributor that historically struggled to sell RW lamps claimed to have recently noticed an uptake in RW sales due to in-branch trainings about the lamps for salespeople. Another distributor employing a similar strategy noted that after the RW-focused training “the good salespeople try to go for the 28W or give samples to the customer or get the contact information for the decision maker.”

In addition to education, working through a cycle of sampling, follow-ups, and overall proactivity is how these distributors are trying to break the cycle and reach decision makers to increase RW sales.

To illustrate the distributor-by-distributor variability associated with increased RW sales, Figure 6 compares 2014 and 2015 RW sales for a sample of five RWLR participants: two with a noticeable increase and three with relatively static RW sales.

**Figure 6. Comparison of 2014 and 2014 RW Sales (% of total LFL) for a Sample of RWLR Participants**



**7. Nationwide, the T8 market continues to shrink and manufacturers do not see RW lamps bucking that trend**

It is not news that the linear fluorescent market is shrinking. All but one manufacturer reported decreases in T8 sales for 2015 of 15% or more, and all projected decreases in the upcoming years due to LED penetration. One small manufacturer estimated they would stop producing T8s altogether within the next five years. All manufacturers reported steady (three respondents) or decreased (two respondents) shares of RW lamps and had not observed any significant regional exceptions. Current shares ranged from 5%

to 30%. These trends do not bode well for large increases in the gross volume of RW lamps in upcoming years.

#### **8. Dramatic technology improvement and cost reduction have made TLEDs compelling to many end users**

TLEDs are a competitor for RW, both in mindshare and in the shopping cart. All distributors and manufacturers agreed that the growth of TLEDs has slowed the sales of RW lamps. All distributors agreed that end users seeking energy-saving options were generally more aware of TLEDs than RW lamps, and, consequently, tended to initiate and focus their efficiency-related conversations with distributors on TLEDs.

TLEDs, by virtue of being a technology easily differentiated an existing LFL system, also “feel” more like an upgrade than replacing 32W lamps with RW lamps. As one distributor put it, “you can point to TLEDs” and people will recognize the upgrade, whereas the same is not true for the switch from 32W to 25W or 28W. TLEDs also save more energy than RW lamps: manufacturers cited wattages down to 14 or 15 watts. These low wattages coupled with comparable light quality and output make the return on investment (ROI) more enticing: three manufacturers reported that the ROI is actually better for TLED than it is for RW lamps (though respondents did not specify whether this accounts for utility incentives). These physical distinctions have an impact on end users’ decision-making process.

One distributor explained that “now that LEDs are sexy, customers will skip over the discussion of [more efficient] linear fluorescents and move to LEDs because of their perceived longevity, even though they’re more money upfront.” Salespeople must be knowledgeable of the benefits of RW, both in terms of price and installation, to in turn convey these benefits to end users weighing their options. However, both LED and RW lamps have their benefits, and salespeople must know and feel comfortable recommending one over the other depending on the situation and what makes most sense for the end users specific need.

Most distributors also noted the nature of the interplay between TLEDs and RW lamps hinges on whether the local utility offers a TLED incentive. One distributor noted that “there have been promotions offering \$10 off [TLEDs] and we sold over 10,000 lamps and... in eastern Washington they’re offering \$15 for LED – if you’re offering that high a rebate, then you’re at the price level of a 32W [lamp].”

Simply put, if a TLED incentive is available, the difference in upfront cost between the two technologies is dramatically lessened and, per distributors, end users are much more likely to opt for the “more fun” TLED with its significantly lower wattage and perceived longevity. However, when the incentive for TLEDs is absent, distributors indicated TLEDs are often too expensive for most end users.

Lastly, a few distributors noted how most of their TLEDs are going through contractors or maintenance. The larger end users are testing out TLEDs in the ‘back of the house’ first, and then moving into more public places and increasing order size once they see results. One distributor in particular noted how one in six of the specifications they see requires LEDs. In these instances, they noted there is very little – if any – wiggle room for RW lamps as the technology has largely been bypassed.

#### **9. 28W lamps can be plug-and-play replacements for 32W lamps—not so for 25W lamps<sup>41</sup>**

One distributor summed up the consensus opinion that 25W and 28W, while both RW lamps, are very different products: “28W is an easier sell because it will fit in any instance that a 32W will work...because

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<sup>41</sup> It is important to note that some TLEDs are also subject to compatibility issues with existing ballasts. Since the team’s interviews focused on RW lamps, the interviews did not dive deeply into these issues.

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of the limitations of the 25W lamp we need someone who understands the variables and impacts to talk to the end user about the lamp". Every distributor mentioned being much more comfortable discussing 28W lamps (versus 25W lamps) with their end users due to 28W interchangeability with 32W lamps, imperceptible difference in light output, and potential for energy savings. In short, 25W require a complex discussion that either end users do not have time for or that distributors, frankly, would rather not have for customer service reasons. Manufacturers echoed this sentiment: one referred to 28W lamps as a "workhorse" product, but noted "cringing" when distributors mentioned using 25W lamps as plug-and-play alternatives without considering existing system compatibility and light output needs.

The vast majority of distributors and manufacturers cited multiple barriers for 25W lamps, most commonly lower light levels and operational difficulties (e.g., flickering and/or striation) in colder temperatures. Most distributors explicitly stated they were uncomfortable recommending 25Ws for specific applications such as industrial, food industry, and some office spaces. Two manufacturers also noted incompatibility with some dimming controls, and one cautioned that distributors or end users need to check ballast compatibility in order to install 25W lamps as some older ballasts do not have sufficient voltage to reliably start these lamps. Some distributors noted how some end users still used HID for industrial applications, and the 25W lamps do not provide enough light output to meet regulations. When asked the temperature threshold for 25W usage, distributors indicated they did not trust 25W to perform well in temperatures below 50-60 degrees, which is a problem for most unconditioned buildings and warehouses in the Pacific Northwest.

Due to these barriers, most distributors were clear that their salespeople were uncomfortable with the nuances surrounding the 25W lamps and only rarely mention them as an option. Additionally, two distributors indicated they do even not stock 25W lamps, only selling them if they are specified in an order.

In light of the multiple barriers cited by distributors for 25W lamps, there is one application in particular where they have been successful. In projects where areas were previously over lit, such as some offices and schools, 25W lamps were cited as an excellent option to reduce lighting to the appropriate level. One distributor explained that "retrofits in areas where places are over lit are really good projects to use 25W lamps. We can get higher quality light and reduce the lumen output and energy."

However, the concerns distributors expressed about 25W lamps outweighed the success stories. To better understand these concerns, the team explored the relationship between 25W sales levels, the customers served, and primary LFL manufacturer for each RWLR distributor.

First, the team calculated the share of each distributor's RW wattages sales that were 25W lamps (i.e., 25W sales/ (25W + 28W sales) and then sorted them in descending order. From this arrangement, the team identified three tiers of distributors, those with: high, moderate, or low levels of 25W lamp sales.

- **Tier 1. High 25W Sales.** Distributor A was a standalone for high sales, as 94% of RW lamp sales were 25W. Sylvania was Distributor A's the primary manufacturer. This distributor reported that both 25W and 28W lamp prices hovered one dollar above the 32W price and their customer base is primarily commercial office space. The combination of these two factors – similar 25W and 28W prices and conditioned office space – likely enabled greater 25W lamp sales. The rationale that more energy can be saved with a bulb of the same price could be driving these 25W sales, as well as the distributor's sales comfort suggesting the lower wattage.
- **Tier 2. Moderate 25W Sales.** Five distributors had 25W sales shares between 31% and 47% (again, as a percent of total 25 and 28W sales). These distributors' primary manufacturers were

Sylvania and Philips. The customer base for these distributors was largely contractors, with some industrial. 25W lamps were mostly at price parity with 32W lamps. The majority of these distributors noted customer apprehension with 25W lamps due to light levels, or temperature, which could account for lower than anticipated sales volume.

- **Tier 3. Low 25W Sales.** Six distributors had 25W RW sales shares from 0% to 13%. Three of these distributors' 25W shares fell between 1% and 2%, with another slightly higher at 13%. In this cohort, three of the partner manufacturers were GE, and one Sylvania. The two distributors with 0% shares did not stock 25W lamps; their partner manufacturers were GE and Eiko. For the distributors who sell 25W lamps, most noted how their salespeople were uncomfortable discussing the nuances of 25W lamps with customers. Additionally, one of the distributors who does not stock 25W lamps does so because of negative feedback associated with the lamps.

Table 28 summarizes the primary LFL manufacturer, the share of 25W lamp sales, and related findings from distributor interviews. Specifically, these findings discuss the 25W lamp pricing in relation to 28W and/or 32W lamps, the primary customer base, and the split of RW lamps between commercial and industrial applications. To ensure confidentiality, the distributors name and the exact share of 25W lamps has been removed.

Table 28. Primary LFL Manufacturer and 25W Lamp Shares by Distributor

Distributor	Primary LFL Manufacturer	Share of 25W Lamp Sales of RW Lamps	Related Findings from Distributor Interviews
A	Sylvania	High	<ul style="list-style-type: none"> <li>25W and 28W are the same price, roughly \$1 more than 32W</li> <li>Customer base is 100% commercial: mainly, commercial office space, hospitality, multifamily, and retirement. Large focus on MRO</li> </ul>
B	Philips	Moderate	<i>Did not interview.</i>
C	Philips	Moderate	<ul style="list-style-type: none"> <li>25W and 28W are at price parity with 32W</li> <li>Customer base is 80% electrical contractors</li> <li>Commercial/industrial split is 85/15 for 28W and 90/10 for 25W</li> </ul>
D	Sylvania	Moderate	<ul style="list-style-type: none"> <li>25W and 28W are at price parity with 32W</li> <li>Large industrial presence: also, contractors, national accounts, and cross channel partners</li> <li>Commercial/industrial split is 80/20 for 28W (not given for 25W)</li> </ul>
E	Philips	Moderate	<ul style="list-style-type: none"> <li>Unable to discuss pricing</li> <li>Customer base is 85% contractors, remaining are end users/national accounts</li> <li>Commercial/industrial split is 80/20 for 28W and 95/5 for 25W</li> </ul>
F	Philips/ GE/ Sylvania	Moderate	<ul style="list-style-type: none"> <li>28W and 32W are at price parity, 25W remains higher</li> <li>Customer base is 100% commercial: mainly commercial properties, very little retail</li> </ul>
G	GE	Low	<ul style="list-style-type: none"> <li>25W and 28W are at price parity with 32W</li> <li>Large MRO presence, and most customers are end users</li> <li>Commercial/industrial split across all wattages is 70/30</li> </ul>

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Distributor	Primary LFL Manufacturer	Share of 25W Lamp Sales of RW Lamps	Related Findings from Distributor Interviews
H	Sylvania	Low	<ul style="list-style-type: none"> <li>• 5-10% price differential between the 28W- 32W and the 25W is roughly 20% higher than 32W</li> <li>• Customer base is contractors, industrial plants, and commercial facilities</li> <li>• No commercial/industrial split given</li> </ul>
I	GE	Low	<ul style="list-style-type: none"> <li>• 15-20% price differential between the 28W- 32W and the 25W is roughly 50% higher than 32W</li> <li>• Customer base is 60-70% contractors (50/50 split between MRO and new construction)</li> <li>• Commercial/industrial split is 75/25 for 28W and 93/7 for 25W</li> </ul>
J	GE	Low	<i>Did not interview.</i>
K	Eiko	Low	<ul style="list-style-type: none"> <li>• Unless specified by a customer, do not stock 25W lamps.</li> <li>• Customer base is primarily contractors.</li> <li>• Commercial/industrial split is 85/15 for 28W lamps.</li> </ul>
L	GE	Low	<ul style="list-style-type: none"> <li>• Do not sell 25Ws.</li> <li>• Customer base is 70-80% building/business owners, the rest are contractors. No industrial.</li> </ul>

*Source: Analysis of Distributor Interview Findings and RW Lamp Market Share*

**10. The vast majority of RW lamps are installed in commercial buildings**

For the reasons mentioned above, distributors reported that the vast majority of RW lamps – especially for 25W lamps, are installed in commercial applications. **Table 29** summarizes the percentage of lamps sold by sector, broken out by 28W and 25W. Through interviews, the team found that most of these commercial spaces are schools, government buildings, and offices. Distributors said there was only a small amount of RW specification in new construction, as that avenue is mainly served by LED fixtures or, in budget-conscious scenarios, standard linear fluorescent lighting.

**Table 29. Reduced Wattage Lamps by Sector**

Wattage	Commercial	Industrial
25W	93%	7%
28W	79%	21%

*Source: Analysis of Distributor Interview Findings (Weighted by Distributor Sales Volume)*

Manufacturers listed office, warehouse and retail as the most common locations for RW lamps. ‘

**MPI Discussion**

In addition to informing our team’s characterization of the current non-residential lighting market for RW lamps, the interviews with distributors also offer insights into NEEA’s progress achieving the MPIs developed for the RWLR Initiative.

In Table 4, we offer an initial assessment of whether NEEA is currently on track to accomplish each MPI by its associated date. This assessment is based solely on the distributor interview findings. We will expand our assessment, in the final report, to include additional insight from interviews with end users and contactors as well as our team’s analysis of the regional sales data.

The team classified each MPI as ‘On Track’, ‘Within Range,’ or ‘At Risk.’

**Table 30. Findings Related to MPIs**

MPI	RWLR Goal(s)	Evidence in Interview/Survey Findings	MPI Status
I	70% of distributors market RW lamps by end of 2016	All participants confirmed they marketed RW lamps, although the extent to which other distributors market RW lamps is unknown. Participants represent ~35-40% of total LFL distribution channel in the region.	On Track
	70% of distributors increased their stock by end of 2016	Some increased stock, most were unsure.	
	90% of distributors pursue SPAs by end of 2016	Seven out of nine participants have SPAs or pricing arrangements for RW lamps.	
II	70% of distributors train staff to promote RW lamps by end of 2016	All participants train staff.	On Track
	70% of participating distributors offer 28W lamp at price parity to 32W by end of 2016	Eight out of 10 participants offer at price parity, similar opportunity exists (through SPAs) for nonparticipants.	

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MPI	RWLR Goal(s)	Evidence in Interview/Survey Findings	MPI Status
	80% of distributors have secured SPAs for RWs by end of 2016	Seven out of nine participants have SPAs, all arranged after enrolling in RWLR.	
III	4 million RW lamps sold region-wide during 2016 50% market penetration among all participants by end of 2016	While this information is not directly answered in interviews, the vast majority noted an increase in sales of RW.*	At Risk
IV	50% or more decision makers aware of RW benefits by end of 2016  50% or more decision makers changed ordering practices by end of 2016	Participating distributors reported awareness is increasing across all market actors. 85% of building owners surveyed were aware of RW lamps. 78% of contractors surveyed sell/install RW lamps.  Participating distributors reported the majority of end-user change ordering practices IF they could convince them to try RW lamps. Roughly 40% of contractor customers repeated orders for RW lamps, and 83% of building owners utilize them in their building(s).	Within Range
V	Fewer than 5% of RW purchasers express dissatisfaction to distributors	Very few instances of dissatisfaction for 28W lamps, end users typically repeat/increase RW purchases. Heard recurring issues with 25W lamps.	Within Range
VI	100% of program participants participate in subsequent efforts	Roughly half provided suggestions for products to utilize similar program structure.	On Track
VII	Federal Standard required for GSFLs	Outside the scope of this memo – team will address in the final report	N/A
VIII	Regional RW sales of 6.5 million per year, sustained for three years 70% or greater RW T8 market penetration sustained for three years	Outside the scope of this memo – team will address in the final report	N/A
IX	Average installed wattage below 28W	Outside the scope of this memo – team will address in the final report	TBD

\*Team will report in more detail on sales data findings in the final report

## APPENDIX F. DISTRIBUTOR INTERVIEW GUIDE

<b>Interviewee</b>	
<b>Company</b>	
<b>Position</b>	
<b>Phone Number</b>	
<b>RWLR Participant (Y/N)</b>	
<b>Interviewer</b>	
<b>Date &amp; Time</b>	

### Overview of Data Collection Activity

Descriptor	This Instrument
Instrument Type	In-depth Interview Guide – Distributor
Collection Method	Phone Interview
Estimated Time to Complete	One hour
Population Description	All lighting distributors operating in the NW
Population Size	~40
Completion Goal	15
Researching Firm	Cadeo

### Key Research Objectives

Research Objective	RWLR MPI Addressed	Corresponding Questions	RWLR	TTTA	LLLC	Market Strategy
A. Estimate RW market saturation	I, IV, V	1-10, 13, 26-29, 32-35, 40	Yes	No	No	Yes
B. Understand barriers to RW sales/installations	II, V	3-4, 7, 11-12, 14, 31, 37-39, 41	Yes	No	No	Yes
C. Determine what level of promotion, stocking, training, and marketing exists for RW	III	5, 11, 15-17, 23-25	Yes	No	No	Yes
D. Determine the extent to which distributors and manufacturers have SPAs for RW lamps	II, III, VI	27, 30-31	Yes	No	No	Yes

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Research Objective	RWLR MPI Addressed	Corresponding Questions	RWLR	TTTA	LLLC	Market Strategy
E. Explore how RWLR can impact bulk purchases and Federal Standards	VII	1, 12, 36	Yes	No	No	Yes
F. Explore viability of RWLR midstream platform to promote other efficient products	N/A	18-22	Yes	No	Yes	Yes
G. LLLC Specific Questions	N/A	42-53	No	No	Yes	Yes
H. TTTA - Identify distributors' current sources of information on lighting technologies	N/A	54-56, 67-69	No	Yes	No	Yes
I. TTTA - Obtain feedback for TTTA curriculum development	N/A	58-65	No	Yes	No	Yes
J. TTTA - Obtain feedback on perceived levels of expertise of current lighting contractors	N/A	60, 66	No	Yes	No	Yes
K. TTTA - Identify how distributors share information on lighting with lighting contractors	N/A	57-58	No	Yes	No	Yes

*RWLR: Reduced Wattage Lamp Replacement, TTTA: Top Tier Trade Ally, LLLC: Luminaire Levels Lighting Controls*

**(Note:** Cadeo will attempt to complete the entire interview (i.e., questions related to all three initiatives) if the respondent is able to answer questions regarding all three initiatives (RWLR, LLLC and TTTA). However, due to the length of the combined guide, Cadeo may need to conduct the interview in two separate interviews (with the same respondent) or refer the respondent to a member of the LLLC or TTTA research team for a follow-up interview. If the respondent cannot answer questions related to LLLC and TTTA, Cadeo will obtain the contact information for the appropriate respondent and provide that information to the LLLC or TTTA team for a later interview.)

**(Note:** Unless noted otherwise, all questions will be asked to all participants.)

### Introduction (1 minute)

Thank you for participating in this interview. This interview will help the Northwest Energy Efficiency Alliance (NEEA) better understand the performance of its Reduced Wattage Lamp Replacement Initiative (RWLR), which provides incentives and education to promote the sales of 25W and 28W linear fluorescent lamps. We are interested in better understanding how RW lamps fit into your product offerings, which customer types most often purchase RW lamps, and why other customer types do not.

## Reduced Wattage Lamp Replacement Initiative Market Progress Evaluation Report #1

This information will allow NEEA offer the best possible program.<sup>42</sup> Everything you share is anonymous and will be reported in aggregate.

We also have some questions about training—that is, training on lighting design and specification, installation, and sales—and other questions about advanced lighting controls. Are you the right person to talk to about training?

**(If respondent is *not* the right person to discuss training)** Who should we contact about lighting training? **(Collect alternative contact name, title, email address, and phone number for TTTA:**  
\_\_\_\_\_)

Are you the right person to talk to about advanced lighting controls?

**(If respondent is *not* the right person to discuss advanced lighting controls)** Does anyone in your organization have experience with advanced lighting controls?

**(IF YES)** Who should we contact about advanced lighting controls? **(Collect alternative contact name, title, email address, and phone number for LLLC:**  
\_\_\_\_\_)

### Background (4 minutes)

1. What is your primary customer base (e.g., Installers/contractors? Building owners? Designers? Specifiers? Other? **(Probe:** proportions between contractors, direct to end users, and national accounts)
2. (IF NON-PART) Do you sell 25W or 28W linear fluorescent lamps? Both?
  - a. (IF NO) Why is that? **(Probe:** lack of familiarity, customer interest, concerns with technologies
  - b. (IF NO) Have you ever stocked/sold them?

### Customer Awareness and Perception (10-12 minutes)

3. Using a scale of “very aware, somewhat aware, not too aware, or not at all aware” please describe your customers’ awareness of RW lamps as a replacement option for 32W T8s?
4. Over the last year, would you say that your customers have become a lot more aware, somewhat more aware, remained the same, become somewhat less aware, become a lot less aware of RW lamps? (If answers are a lot/somewhat more aware or less aware, ASK...)
  - a. Why do you think that is?
  - b. (ASK ONLY IF ANSWER TO Q4 IS A LOT/SOMEWHAT MORE AWARE) Has the change in awareness led to RW lamps being specified in orders more often, less often, or stayed the same in the last year?
  - c. (ASK ONLY IF ANSWER TO Q4 IS A LOT/SOMEWHAT MORE AWARE) Have increased special pricing agreements for RW lamps led to RW lamps being specific in orders more often, less often, or stayed the same in the last year?

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<sup>42</sup> Interviewer will review BPA’s distributor database, as well as NEEA’s communication logs, prior to each interview.

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5. What do you tell your customers about RW lamps?
6. Are there certain types of customers (contractor or end users) who tend to buy RW lamps? (IF YES, ASK...)
  - a. What kind of customer is that?
  - b. Why do you think that is?
  - c. Do these customers tend to come from certain parts of the non-residential market such as schools, offices, hospitals, etc.? (**Probe:** which parts? Vary by size?)
7. Are there certain customer types that will not buy RW lamps?
  - a. (IF YES) What kind of customer is that?
  - b. Why do you think that is?
  - c. Do these customers tend to come from certain parts of the non-residential market such as schools, offices, hospitals, etc.? (**Probe:** which parts? Vary by size?)
8. In general, have you noticed an increase, decrease, or the same level of interest in RW lamps in the last year? Why do you think that is?
9. Have you noticed an increase, decrease, or the same level of customer purchases in RW lamps in the last year? Why do you think that is?
10. What percentage of customers who order RW lamps ultimately repeat orders for RWs?
11. Assuming a project or purchase will include linear fluorescent lamps, is there any type of project or application for which you would NOT recommend RW lamps? (IF YES, ASK...)
  - a. What are these projects?
  - b. Why? (**Probe:** Performance problems in a specific application; would recommend a different technology such as 32W or TLED, etc.)
12. What have your customers told you about their experiences with RW lamps?
  - a. Does the feedback differ between contractors versus end users or national accounts? If so, how?

### RWLR Participants Only (12-15 minutes)

13. Have you observed any change in your RW sales since enrolling in RWLR?
  - a. (IF NOT) Why not?
  - b. (IF YES) What factors do you think drove that increase? (**Probe:** Incentives causing lower prices, distributor's own efforts at promoting RWs, etc.)

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14. What else could NEEA do to increase RW lamp sales? (**Probe:** Facilitate further discussion with manufacturers.)
15. As you know, the RWLR initiative allows distributors to deploy the NEEA incentives as it sees fit. How have you deployed the incentives? Have you...
  - a. Used it for training?
  - b. Lowered the cost of RW lamps?
  - c. Supplied a portion of the incentives as bonuses to sales staff?
  - d. Other: (Specify):\_\_\_\_\_
16. Please describe the training you provide to your employees regarding RW lamps. (**Probe:** Who receives the training (probe: counter sales, inside sales, outside sales, branch managers, etc.), benefits/applications of RWs relative to 32W, benefits of RWLR)?
17. Do you utilize any NEEA-provided materials for training?
  - a. (IF YES) Which materials? Are there other materials you would find useful?
  - b. (IF NO) Why? What other materials do you use instead?
18. Are you currently participating in any other regional midstream programs? (*By midstream we mean programs that pay incentives directly to distributors*)
  - a. (IF YES) Which programs and why?
  - b. (IF NO) Have you ever? Why not?
19. How would you compare the merits of the following lighting program models:
  - a. Midstream programs that use increasing incentives based on predetermined milestones?
  - b. Midstream programs that use per-lamp rebates?
  - c. An upstream program that works through manufacturers to buy down prices?
  - d. A downstream program that works through end users and contractors and uses per-lamp rebates?
20. Are there any ways you recommend changing or restructuring the RW program for greater impact or uptake?
  - a. (IF YES) How so?
21. Are there any other energy efficiency products you feel would work well in a similar midstream market transformation program model?
  - a. (IF YES) Which products and why?

### RWLR Nonparticipants Only (1-2 minutes)

22. Do you participate in any utility lighting incentive programs?
- (IF YES) What other incentive program(s) do you participate in?
  - Do you have any recommendations or knowledge to share with NEEA based on your experiences with those programs?

### Promotion, Stocking, and Pricing (10-12 minutes)

23. When a customer purchases RW lamps from you, who typically most influences the purchase decision? Is it the distributor, the contractor, specifier, or the end user?
24. Has your stocking of RWs changed over the last few years (or, if participant, since joining the Initiative)?
- (IF YES) How has it changed and why?
25. Approximately, what percentage of your customers have maintenance specifications that recommend RW lamps?
- If the customer has a maintenance spec that specifies 32W, how could NEEA work to change that specification to a RW option?
26. Regarding ballast failure, what percentage of the time do your customers... [READ OPTIONS]
- Replace the ballast and maintain the fluorescent system (\_\_\_\_\_ %)
  - Move toward and integrated fixture (possibly LED) (\_\_\_\_\_ %)
  - Perform a group replacement of all ballasts (\_\_\_\_\_ %)
  - Others (please specify) \_\_\_\_\_ (\_\_\_\_\_ %)
27. Assuming equivalent volumes, typically what is the price premium you would pay manufacturers for RW lamps relative to 32W lamps?

Lamp	Price Differential
32W	100%
28W	_____%
25W	_____%

28. Please explain what factors you consider in setting prices for RW lamps compared to 32W lamps?
- [Ask only participating retailers] How have you applied the NEEA incentive to that paradigm?

29. Using a scale of “very sensitive, somewhat sensitive, not too sensitive, or not at all sensitive” please describe how sensitive are customers to the disparity, if any, in pricing between 32W/RW lamps?
30. Have you secured any special pricing agreements (SPAs) with manufacturers for RW T8 lamps?
  - a. If not, are you actively pursuing SPAs with manufacturers for RW lamps? Why/why not?
  - b. What about with customers? If not, are you actively pursuing SPAs with customers for RW lamps? Why/why not?
  - c. Are there any requirements on your end to maintain SPAs with the manufacturer?
  - d. Are there any ways you believe NEEA could assist in securing or maintaining SPAs with manufacturers?
31. Holding all other factors equal (customer, order size, time of year, etc.), are sales of RW lamps more profitable or less profitable for you than 32W lamps?
  - a. Why is that?
  - b. Do you think this will change in the next few years? How would it change?

### Market and Sales (10-15 minutes)

32. Please give us your best estimate of the region’s total 4-foot T8 annual sales.
33. What is your estimated market share of T8 lamps sales in the Northwest?
34. (IF NON-PART) Approximately, what percent of your current total 4-foot T8 sales would you estimate are RW lamps?
35. Generally, what factors do you believe are most important to driving future RW lamp sales?
36. How do you think upcoming general service fluorescent lamp federal standards will impact RW lamp sales?
37. What do you see as barriers to increased RW lamp adoption in the maintenance market?
  - a. **Probe:** Availability, performance, cost, LED penetration, customer perception/awareness
38. Are there any barriers specific to 25W lamps as opposed to 28W lamps?
  - a. (IF YES) What are these barriers?
39. Can you talk about the interaction between TLEDs and RW lamps in the maintenance market?
  - a. Do certain customer types tend to choose one over the other? Which one? Why?
40. Please estimate to your best ability the percent (out of 100%) of 25W, 28W and 32WT8 lamps going to each sector:

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Sector	32W Lamps	28W Lamps	25W Lamps
Commercial	____%	____%	____%
Industrial	____%	____%	____%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

41. What are the challenges to selling RW lamps in these three different scenarios?
- Spot replacement?
  - Group replacement?
  - Renovation projects?

### LLLC (15 minutes)

**(If respondent stated in introductory section that they are the right person to discuss advanced lighting controls)** We are also seeking to understand the use of advanced lighting control technologies, specifically focusing on Luminaire Level Lighting Controls (LLLC). We use LLLC to refer to technology that has sensors embedded directly into each light fixture during the manufacturing process so that localized control over each fixture (or group of fixtures) is possible.

- Is now a good time to talk with you about LLLCs?
- (IF NO) Can you please tell me a few days and times over the next two weeks when we can schedule a short follow-up discussion about LLLCs? (**Record at least two days/ times for follow-up discussion:** \_\_\_\_\_)
- (IF YES) Can you tell us about your experience with LLLC products? Specifically:
  - What manufacturers of LLLC products do you currently carry?
  - Are any of these LLLC manufacturers more actively promoting LLLCs than others? If so, which?
  - What positive experiences can you share with us regarding LLLC products?
  - What negative experiences can you share with us regarding LLLC products?
- What training, if any, have the LLLC manufacturers provided to you?
- What building types or types of businesses have you seen LLLC products installed in?
- How has your customers' interest of LLLC products changed over the past three years? [*Probe: What types of customers seem to have the greatest interest in LLLC technology?*]
- Assuming equivalent fixtures, typically what is the price premium you would pay for an LLLC equipped fixture relative to standard separate systems (ex. occ sensor & fixture)?
- How do you see that changing over the next three years?

9. How are you promoting LLLCs?
10. What barriers have you experienced when trying to sell LLLC products?
11. What benefits have you observed regarding LLLC installations? [*Probe: What benefits did customers mention specifically?*]
12. Is there anyone else in any field that we should talk to as part of our research on LLLC systems (architects, lighting designers, etc.)?

## TTTA (30 minutes)

**(If respondent stated in introductory section that they are the right person to discuss training)**

NEEA is also developing a training program for lighting trade allies to improve the energy savings from the projects they design, sell, and install. Therefore we would like to get your insights about what training might be most valuable for lighting contractors you work with.

1. Is now a good time to talk with you about training?
2. (IF NO) Can you please tell me a few days and times over the next two weeks when we can schedule a short follow-up discussion about training? (**Record at least two days/ times for follow-up discussion:** \_\_\_\_\_)

(IF YES) First, I'd like to get a little bit of information about your company and the other companies you work with.

3. How many employees does your company have?
4. Approximately what percentage of your sales are equipment that go into non-residential facilities?
5. What other kinds of companies do you work with to provide lighting design and installation services for clients and in what ways do you work with them?

[Probe about how they work with, and how much of their work is done with, the following:]

- a. Lighting designers
  - b. Architects and design engineers
  - c. Interior designers
  - d. ESCOs
  - e. Lighting installers
  - f. Electrical contractors
  - g. Other [specify]
6. How, if at all, does the work you do with these types of companies vary by...
    - a. The type or size of project

- b. The location where the work is being done [Probe about whether it is done in an urban or rural area]
7. How do you and other employees of your company stay up-to-date about the latest lighting and lighting control technologies?  
[Probe for sources such as word of mouth from colleagues, trade association training seminars, and manufacturer rep presentations.]
8. How frequently do you and other employees of your company receive this information or attend these sessions?
9. Do these resources provide sufficient support to keep you and other employees of your company up-to-date on lighting and lighting control technologies?
10. [If not] What is lacking?
11. How do you and your staff/colleagues stay up-to-date about building and equipment energy codes?
12. Do these resources provide sufficient support to keep you and your staff/colleagues up-to-date on codes?
13. [If not] What is lacking?
14. All in all, about how many hours a year, on average, would you say you and other employees of your company spend getting information on lighting, lighting control technologies, and codes through these resources?
15. What lighting certifications, if any, do you and your staff/colleagues currently hold?
16. In what ways, if any, do you pass information about the latest lighting and lighting control technologies on to the lighting design and installation contractors you work with?
17. What contractors, or types of contractor, are you most likely to share that kind of information with, if any? Why?
18. In what ways might it affect your business if the lighting design and installation contractors you work with took advanced training on lighting and lighting controls? [Probe about how it might affect the following:]
  - a. What they would sell or be willing to sell
  - b. The risk of callbacks or dissatisfied customers
  - c. Whether or not they were willing to recommend a contractor to a customer
19. I'm going to read each of the following types of service that a lighting contractor might provide. For each one, please tell me whether you think the current overall level of expertise in the market is completely adequate, nearly adequate, or far from adequate. [Read list of topics]
  - a. Conducting lighting audits of existing buildings

- b. Assessing the technical characteristics of lighting technologies
  - c. Selecting the best lighting control product or system for a given application
  - d. Setting up and commissioning lighting control systems
  - e. Training others how to operate lighting control systems
  - f. Knowledge of standards and best practices in lighting design
  - g. Using photometric software for planning LED luminaire selection and placement
  - h. Energy code requirements, including when and where they apply
  - i. Communicating the benefits of retrofit and design options
20. How important do you think it is that lighting contractors have expertise in luminaire-level lighting controls, also known as “smart fixtures” and “illuminated intelligence”? [Probe for reasons why they do or do not think it is important]
21. How likely would you be to encourage the lighting contractors you work with to take advanced lighting training developed by NEEA? Why? What would you do to encourage them?
22. What would prevent lighting distributors, such as yourself, and the lighting contractors that work with them from taking advanced training on lighting and lighting controls?
23. What might encourage them to take such training?
24. What benefits, if any, might you offer to contractors with advanced training on lighting and lighting controls to get them to work with you?
25. Other than by offering a formal training curriculum, how else could NEEA assist you in bringing the lighting design and installation contractors you work with up to speed on the latest lighting and lighting control technologies?
26. Suppose that a good proportion of the top lighting contractors in the region got advanced training like we’ve been talking about – what affect, if any, would that have on the adoption of more efficient lighting? What would keep building and business owners from adopting the most efficient lighting?
27. Finally, we would like to get a sense of advanced lighting and control technologies are currently sold with and without utility incentives. First, over the past year or so, about what percentage of your sales did advanced lighting and lighting control technologies comprise? [If needed: “By advanced lighting and lighting controls, I mean highly efficient lighting like LEDs, luminaire-level lighting, and advanced lighting controls such as scheduling or networked controls.]
28. When proposing projects customers that included advanced lighting or lighting controls, how often do you discuss whether or not they are planning to apply for utility incentives? [Probe for differences between customers that are end users and those that are contractors. Try to get %]

29. [IF DISCUSSES INCENTIVES AT LEAST HALF THE TIME] For each of the following types of advanced lighting and control technologies, can you give me your best estimate of the percentage of sales that are done with utility incentives? [IF NEEDED: As opposed to being done without utility incentives.]
- a. LED high bay, screw-in, and exterior
  - b. All other LED types
  - c. T5 and Super T8 tubes
  - d. Occupancy-based, scheduling, and daylighting dimming lighting controls
  - e. EMS or networked lighting controls
  - f. Luminaire-level lighting controls

Finally, just a couple of questions about the Northwest Lighting Network website.

30. How many times would you say you have visited the Northwest Lighting Network website in the past six months?
31. [IF VISITED NWLN website] What information were you looking for on the website?
32. [IF VISITED NWLN website] How was your experience using the website? [Probe about whether they found the information, how difficult it was to navigate, how useful it was]

Thank you for your time and input – we are always available for any questions or feedback you may have as we continue this research.

## APPENDIX G. MANUFACTURER INTERVIEW GUIDE

<b>Interviewee</b>	
<b>Company</b>	
<b>Position</b>	
<b>Phone Number</b>	
<b>Interviewer</b>	
<b>Date &amp; Time</b>	

### Overview of Data Collection Activity

<b>Descriptor</b>	<b>This Instrument</b>
Instrument Type	In-depth Interview Guide -- Manufacturers
Collection Method	Phone Interview
Estimated Time to Complete	One hour
Population Description <sup>43</sup>	All reduced wattage linear fluorescent lamp manufacturers
Population Size <sup>44</sup>	5
Completion Goal	5 (Census)
Researching Firm	Cadeo

<sup>43</sup> Our team estimates there are a total of 10-15 linear fluorescent manufacturers. However, we believe that only approximately five manufacture reduced wattage lamps. We will work closely with RWLR program staff to ensure we identify all RW manufacturers and have the appropriate sample frame.

<sup>44</sup> Ibid.

# Reduced Wattage Lamp Replacement Initiative Market Progress Evaluation Report #1

## Key Research Objectives

Objective	RWLR MPI Addressed	Corresponding Questions	RWLR	TTTA	LLLC	Market Strategy
A. Estimate RW market saturation	I, IV, V	1-4, 7, 11, 14-15, 17-20, 24, 27-30	Yes	N/A	No	Yes
B. Understand barriers to RW sales/installations	II, V	6, 9-10, 12, 16, 21	Yes	N/A	No	Yes
C. Determine what level of promotion or marketing exists for RW lamps	III	5-8	Yes	N/A	No	Yes
D. Determine the extent to which distributors and manufacturers have SPAs for RW lamps	II, III, VI	25	Yes	N/A	No	Yes
E. Explore how RWLR can impact bulk purchases and Federal Standards	VII	13, 22	Yes	N/A	No	Yes
F. Explore viability of RWLR midstream platform to promote other efficient products	N/A	23-24, 26	Yes	N/A	No	Yes
G.LLLC-Specific	N/A	31-33	No	N/A	Yes	Yes

RWLR: Reduced Wattage Lamp Replacement, TTTA: Top Tier Trade Ally, LLLC: Luminaire Levels Lighting Controls

## Introduction (1-2 minutes)

Thank you for participating in this interview. This interview will help the Northwest Energy Efficiency Alliance (NEEA) better understand the performance of its Reduced Wattage Lamp Replacement Initiative (RWLR), which provides incentives and education to distributors to promote the sales of 25W and 28W linear fluorescent lamps. We are interested in better understanding how reduced wattage (RW) lamps fit into your business model, which distributors most often purchase RW lamps, and why others do not. While the focus of our discussion is on RW lamps, I want to mention that we are also researching advanced lighting controls. Specifically, we are investigating light fixtures with sensors embedded directly into them during the manufacturing process that enable localized control over each fixture (or group of fixtures).

1. Do you know whether your company manufactures this type of advanced lighting control?
2. (IF YES) Are you the right person to talk to about advanced lighting controls?

(IF YES) Thanks. We will follow up with you on this topic in the next couple of weeks.  
 (IF NO) Who should we contact about advanced lighting controls? **(Collect alternative contact name, title, email address, and phone number for LLLC:**

\_\_\_\_\_)

**(Interviewer Note:** Gauge respondent's familiarity with the RWLR, as well as with the specific distributors that currently participate in the initiative.)

### Background Knowledge (1-2 minutes)

3. Approximately what portion of your overall 4-foot T8 fluorescent lamp sales are RW?
4. Do you manufacture RW lamps for all linear fluorescent applications?

### Customer Perception and Practices (13-15 minutes)

5. What different customer types you serve? (**Probe:** distributors, retailers, direct)
6. Roughly, what share of your total lamp shipments go to each customer type?
7. Do you feel that your distributor customers are aware of the benefits of RW lamps? Why/why not?
8. Do distributor customers tend to be open to stocking RW lamps?
  - a. Why/why not?
  - b. What are the barriers to your distributor customers purchasing RW lamps? (**Probe:** price, awareness, perception)
  - c. Are there any barriers specific to 25W lamps compared to 28W lamps?
9. Which types of distributor customers – maintenance, repair, and operations (MRO), full line, lighting only - tend to stock larger quantities of RW lamps?
  - d. MRO - Full Line - Lighting only (*circle*)
  - e. Why do you think that is?
  - f. What about the distributors who do not? Why do you think that is?
10. How do you market RW lamps to distributor customers? (**Probe:** share promotional materials?)
11. What do your distributor customers tell you about their experience selling RW lamps?
12. Using a scale of "very satisfied, somewhat satisfied, not too satisfied, or not at all satisfied" please describe your distributor customers' satisfaction with RW lamps.
  - a. Why do you think that is?
13. Which types of end-use customers most commonly purchase RW lamps?
  - a. Why is that?
  - b. Are there any end-use customers that never or rarely purchase RW lamps?

- c. What are the barriers to these customers purchasing RW lamps? (**Probe:** price, awareness, perception)
  - d. Are there any barriers specific to 25W lamps compared to 28W lamps?
14. Using a similar scale of “very satisfied, somewhat satisfied, not too satisfied, or not at all satisfied”, how would you rate end-use customers’ satisfaction with RW lamps?
- a. Why do you think that is?
15. Do any of your national accounts purchase RW lamps?
- b. (IF YES) How, if at all, would the RWLR Initiative impact national accounts’ purchasing behavior?

### Market Assessment (13-15 minutes)

16. Have you observed any changes in distributor customer orders of RW lamps in the past year:
- a. Nationally?
  - b. In the Pacific Northwest (i.e., Idaho, Montana, Oregon and Washington)?
  - c. (Depending on respondent familiarity with RWLR) Between distributors you know are currently enrolled in the RWLR initiative versus others?
17. (IF YES) What do you think could be driving this change?
18. What improvements in performance of RW lamps are necessary to make them more universally adopted? (**Probe:** efficacy, light quality, or lifetime, and decrease in manufacturing cost)
- a. Do you foresee any of those changes happening?
  - b. (IF NO) Why not?
19. What do you believe is the biggest driving factor of T8 lamp sales? (**Probe:** GDP, customer purchasing patterns)
20. Please give us your best estimate of the Northwest region’s total 4-foot T8 annual sales.
21. Have you noticed a decrease in T8 sales overall?
- a. If yes, at what rate? ( \_\_\_\_\_/year)
  - b. If no, do you anticipate a decrease? Why/why not?
22. NEEA envisions regional sales for RW lamps reaching 70% of the 4ft. T8 market by approximately 2018. Based on your current manufacturing and sales of RWs, do you think this goal is achievable?
- a. Why/why not?

23. This question is about the presence of TLEDs vs. RW lamps in the maintenance market.
- Can you please discuss how these products compete in the maintenance market?
  - Are there certain distributors or end-user types that tend to choose one over the other?
  - Which factors drive these purchase decisions?
24. How, if at all, would the upcoming federal standards on general service fluorescent lamps affect RW lamps sales?
- Why is that?

### Pricing and Partnerships (7-9 minutes)

25. What are your thoughts regarding the midstream program model that NEEA uses for the RWLR initiative where they direct education and incentives toward distributors?
- How do you feel this approach compares to an upstream program designs that work through manufacturers?
  - What about a downstream program that works primarily with end users?
26. Do you have any specific thoughts about how to transform the market toward RW more quickly? (**Probe:** Incentives/support to manufacturers and/or end users)
27. Do you have any special pricing agreements (SPAs) with distributors or end-user customers for RW lamps?
- (IF NO) Are you actively developing any, RW SPAs with any distributors? Why/why not?
  - (IF NO) Are you actively developing RW SPAs with any end-user customers? Why/why not?
  - (IF YES) With which types of distributors and/or end-user customers? Why?
  - (IF YES) How does a typical SPA work?
28. Are you currently engaged in any conversations with NEEA regarding their Reduced Wattage Lamp initiative?
- (IF YES) What aspects of the initiative are working for your company?
  - (IF YES) What could NEEA do better?

### Cost (5-7 minutes)

29. What is the cost differential to manufacture RW lamps relative to 32W lamps?

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Lamp	Cost Differential
32W	100%
28W	____%
25W	____%

- a. (IF DIFFERENT) What drives this disparity?
30. Do you anticipate this changing over the next few years? Why/why not?
- a. Does your strategy around RW lamps changes as TLEDs gain traction in the market? Is it a race to the bottom?
31. Do sales of RW lamps tend to be more or less profitable for you than other similar options? Why?
- a. Do you consider RW lamps to be premium products with different profit rates than 32W lamps?
32. We recognize that wholesale prices vary depending on the purchaser and any SPAs, but what – on average - is the price differential of RW lamps relative to 32W lamps for your customers? (IF EASIER: How much more, per lamp and in dollars, are 25W or 28W than 32W lamps?)

Lamp	Price Differential
32W	100%
28W	____%
25W	____%

- a. (IF DIFFERENT) What drives this disparity?

Thank you for your time and input – we are always available for any questions or feedback you may have as we continue this research.

## APPENDIX H. ELECTRICAL CONTACTOR SURVEY

### Introduction

These questions will help NEEA better understand the performance of its Reduced Wattage Lamp Replacement Initiative (RWLR), which provides incentives and education to promote the sales of 25W and 28W linear fluorescent lamps (i.e., “reduced wattage” lamps) as replacements for 32W lamps. We are interested in how reduced wattage lamps fit into your product offerings. This information will help NEEA offer the best possible program.

### RWLR-Specific Questions

Q1. Do you sell and install 25W and/or 28W 4-foot T8 lamps as an alternative to standard 32W lamps?

1. Yes
2. No
98. Don't know

[ASK IF Q1=2, THEN SKIP REMAINDER OF RWLR MODULE]  
[MULTIPLE RESPONSE]

Q2. Why is that?

1. Unaware of 25W and 28W lamps prior to this survey
2. Customers prefer 32W
3. Uncomfortable installing 25W and 28W due to lighting levels
4. Uncomfortable installing 25W and 28W due to temperature limitations
96. Other, please specify: [OPEN-ENDED RESPONSE]

Q3. Approximately what percentage of your total 4-foot T8 sales are 25W and/or 28W lamps?

[SINGLE RESPONSE]

1. Less than 5%
2. 6-10%
3. 11-15%
4. 16-20%
5. 21-30%
6. 31-40%
7. 41-50%
8. 51-60%
9. 61-70%
10. 71-80%
11. 81-90%
12. More than 90%
98. Don't know

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Q4. Over the last year, would you say that your customers have become a lot more aware, somewhat more aware, remained the same, become somewhat less aware, become a lot less aware of 25W and 28W lamps?

[SINGLE RESPONSE]

1. A lot more aware
2. Somewhat more aware
3. Remained the same
4. Somewhat less aware
5. Become a lot less aware
98. Don't know

Q5. What is the most common feedback you hear from customers regarding 25W and/or 28W lamps?

[MULTIPLE RESPONSE]

1. Customer cannot tell the difference from a standard 32W
2. Customer doesn't like the light output
3. Lamps work well in some applications, but not others
4. Customer has noticed a difference in their bills
96. Other, please specify: [OPEN-ENDED RESPONSE]

Q6. What portion of customers who order 25W or 28W lamps ultimately repeat orders for reduced wattage lamps?

[SINGLE RESPONSE]

1. All (100%)
2. Most (70-99%)
3. Some (40-69%)
4. Not many (10-39%)
5. Very few/none (Less than 10%)
98. Don't know

Q7. When a customer's ballast fails, what percentage of the time do your customers...

[RESPOND TO ALL]

1. Replace the ballast and maintain the fluorescent system (\_\_\_\_\_ %)
2. Convert to a new integrated LED fixture (\_\_\_\_\_ %)
3. Perform a group replacement of all ballasts (\_\_\_\_\_ %)
96. Other, please specify: [OPEN-ENDED RESPONSE]

## APPENDIX I. NON-RESIDENTIAL END USER INTERVIEW GUIDE

<b>Interviewee</b>	
<b>Company</b>	
<b>Position</b>	
<b>Buildings Owned</b>	
<b>Phone Number</b>	
<b>Interviewer &amp; Other Attendees</b>	
<b>Date &amp; Time</b>	

### Overview of Data Collection Activity

Descriptor	This Instrument
Instrument Type	In-depth Interview Guide – Building Owners
Collection Method	Phone Interview
Estimated Time to Complete	15-20 minutes
Population Description	All NW Building Owners/Property Managers
Population Size	100,000+
Completion Goals	30
Researching Firm	Cadeo

### Key Research Objectives

Objective	RWLR MPI Addressed	Corresponding Questions	RWLR	TTTA	LLLC	Market Strategy
A. Estimate RW market saturation and decision maker demand	I, IV, V, VII	1-5, 9-12, 21-24	Yes	N/A	No	Yes
B. Understand barriers to RW sales/installations	II	4-7, 17-20, 25-26	Yes	N/A	No	Yes
C. Identify reasoning for and against RWs in commercial buildings	IV, VI	7-8, 11, 25-26	Yes	N/A	No	Yes
D. Explore interest in using a platform similar to RWLR for other products	N/A	N/A	Yes	N/A	No	Yes
E. LLLC Objectives	N/A	27-31	No	N/A	Yes	Yes

RWLR: Reduced Wattage Lamp Replacement, TTTA: Top Tier Trade Ally, LLLC: Luminaire Levels Lighting Controls

## Introduction (1-2 minutes)

Thank you for your participation in today's interview. This interview will help the Northwest Energy Efficiency Alliance (NEEA) better understand the performance of its Reduced Wattage Lamp Replacement Initiative (RWLR), which provides incentives and education to promote the sales of 25W and 28W linear fluorescent lamps (which we refer to as reduce wattage lamps) rather than 32W lamps. We are interested in better understanding how RW lamps fit into your product choice for your buildings. This information will allow NEEA to offer the best possible program.

We may also ask you questions that pertain to the Luminaire Levels Lighting Controls (LLLC) initiative, but if you are not the right person for these questions, we will skip them. This information will allow NEEA to improve its programs.

**(Interviewer Note:** If relevant, collect contact information for LLLC: \_\_\_\_\_)

**(Interviewer Note:** Gauge respondent's familiarity with the RWLR, as well as with the specific distributors that currently participate in the initiative.)

Probe to confirm/identify the correct respondent:

- *Are you involved in specifying, ordering, and/or installing lighting equipment in the buildings you own or manage? If not, can you refer us to the person most familiar with lighting decisions at the facility?*

## Building Information and RW Lamp Utilization (5-7 minutes)

1. What is your role/title?
  - a. Manager - Building Operator - Maintenance Supervisor - Other \_\_\_\_\_
2. How would you describe the buildings for which you are responsible for lighting decisions in terms of:
  - a. Type of buildings? (**Probe:** office, school, government, hospital, etc.)
  - b. Number of buildings?
  - c. Size of buildings?
  - d. Most common lighting systems?
  - e. Any use of controls?
3. Are there 4 foot T8 fluorescent lamps in your building(s)?
4. Are you aware of RW lamps? (*If necessary, interviewer will give brief explanation of RW lamps*).  
(IF UNAWARE, SKIP TO NEXT SECTION)
5. Do you use RW lamps in any of your buildings?
  - a. (IF NO) What have you heard about RW lamps? (**Probe:** benefits and drawbacks)

- i. What barriers keep you from using RW lamps?
    - ii. What could motivate you to use them?
  - b. (IF YES) Which building(s)?
  - c. (IF YES) Why did you purchase them?
  - d. (IF YES) Approximately what portion of your total T8 lamps are RW (i.e., 25W or 28W)?
  - e. (IF YES) Do you know whether the RW lamps are 25W, 28W or both?
    - i. (IF BOTH) What portion of your RW lamps are 25W? What portion are 28W?
    - ii. (IF BOTH) Why is this? (**Probe:** are there aspects of the 25W or 28W lamps that drive you to use them more or less often?)
  - f. (IF YES) Do you intend to purchase additional RW lamps for use in one or all of your buildings? Why/why not?
6. How did you learn about RW lamps? (**Probe:** who and where)
7. What has been your experience using RW lamps regarding the following? Please answer on a scale of "very satisfied, somewhat satisfied, not too satisfied, not at all satisfied."
  - a. Availability
  - b. Performance
  - c. Cost
8. (IF Q5E = BOTH) In your experience, which lamp have you been more satisfied with, 28W or 25W? Why?

## Maintenance and Purchasing Practices (10-15 minutes)

9. How is lighting maintenance managed in your organization?
10. How do you decide what lighting products to purchase?
  - a. Does your building have a specification for lamp replacement or is the purchaser responsible for choosing the lamps?
  - b. What sources do you rely on to inform lamp specification decisions?
  - c. What sources do you rely on to inform purchasing decisions?
    - i. (**Probes:** *please provide specific examples where applicable,*
      1. Contractors
      2. Distributors

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3. Online/physical retailers
  4. Web/hard copy publications
  5. Associations
  6. Publications
11. Starting with the most important, then the second most, third most, and so on, which factors do you consider when purchasing lamps for maintenance? (**Probe**: cost, recommended product, aesthetics, efficiency, etc.)
  12. What do you do when the ballast fails and why? What percentage of the time do you... [READ OPTIONS]
    - o Replace the ballast and maintain the fluorescent system (\_\_\_\_%)
    - o Move toward an integrated fixture, possibly LED) (\_\_\_\_%)
    - o Perform a group replacement of all ballasts (\_\_\_\_%)
    - o Others (please specify) \_\_\_\_\_ (\_\_\_\_%)
    - a. Who decides this?
  13. Do you typically replace individual lamps when they burnout, or replace all lamps at the same time?
    - a. Why is that? (**Probe**: cost, time, ease)
  14. How frequently do you purchase lamps? (**Probe**: weekly, bi-weekly, monthly, other (please specify))
  15. What is a typical order size (number of lamps) for lamp replacement?
  16. From where do you typically purchase your T8 4-foot linear fluorescent lamps? Please provide a rough approximation, in percentages, of breakdown for place of purchase.

Lamp Source	Percent of Total Purchases
Distributors	____%
Contractors	____%
Retailers (Big Box)	____%
Retailers (Local Hardware)	____%
Online Retailers	____%
<b>Total</b>	<b>100%</b>

- a. (IF ONLINE RETAILER > 0% in Q16) Which website do you most frequently use?
17. Would this answer differ if you were replacing a single bulb versus a larger project?

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18. Do you purchase ballasts from the same locations?

a. (IF NO) Where do you purchase ballasts?

Ballast Source	Percent of Total Purchases
Distributors	____%
Contractors	____%
Retailers (Big Box)	____%
Retailers (Local Hardware)	____%
Online Retailers	____%
<b>Total</b>	<b>100%</b>

19. Has anyone from your lamp supplier talked to you about RW lamps? (IF YES, ASK...)

- What information or insight have they provided?
- Did you take action based on that information? Why/why not?
- Did they offer any special pricing agreements or packages?

20. What causes you to purchase linear fluorescent lamps from a particular source over another?

a. **Probe:** Special pricing? Location?

### Cost – ONLY IF AWARE OF RW (3-5 minutes)

21. Have you observed a difference in price between 25W, 28W, and 32W T8s?

a. (IF YES) What is it? (**IF EASIER:** How much more, per lamp and in dollars, are 25W or 28W than 32W lamps?)

Lamp	Price Differential	Actual Price
32W	100%	\$__
28W	____%	\$__
25W	____%	\$__

22. Is the price differential between RW lamps and 32W lamps a barrier for you?

a. (IF YES) Is the price difference for 25W lamps a larger barrier than 28W lamps?

23. Have you secured any special pricing agreements (SPAs) for RW lamps?

- If yes, what is the typical nature of these SPAs?
  - Volume discounts, special financing, etc.?

- b. Are these SPAs with distributors or retailers?
24. Is there a particular price point you would need to receive for 25W or 28W lamps in order to purchase them instead of 32W lamps?
- a. What is that price?
  - b. Is there a financial basis for this decision such as hurdle rate or capital cost, or is this a case by case decision?

### Other Efficient Lighting Options (3-5 minutes)

25. Other than RW lamps, do you utilize other energy efficient lighting options?
- a. (IF YES) what options do you utilize?
  - b. What factors weigh in on your decision picking one bulb over another?
26. Have you heard about tubular LED (or TLED) replacements?
- a. (IF YES) Have you installed any TLED replacements?
  - b. (IF YES) Why did you chose the TLED over a fluorescent lamp?
  - c. Do you intend to repurchase TLEDs? Why/why not?
  - d. Does price of TLED influence this decision? Why/why not?

### LLLC (13-15 minutes)

1. Have you heard about Luminaire Level Lighting Controls? (i.e. controls embedded within lighting fixtures that are capable of sensing and control of each individual fixture)
2. (IF NO) Have you heard about the following advanced lighting controls:
  - o CREE's SmartCast
  - o Phillips' Spacewise
  - o Lutron's EcoSystem
  - o Others (specify) \_\_\_\_\_
3. (IF YES) Have you installed any LLLC's in your buildings?
  - a. (IF YES) Can you tell us:
    - i. Building Type? (i.e., Office, Warehouse, etc.)
    - ii. Approximate building size?

- iii. Geographic location?
  - iv. Was it part of a new construction project?
    - 1. (IF NO) Approximately what percentage of the lighting fixtures were renovated with the LLLC controls?
    - 2. Product name and approximate install date?
  - v. Why did you choose to install this product (PROBE for how they got information, perceived benefits, etc.)?
4. If you were to consider installing LLLC in future buildings, what reasons (or benefits) would you cite for why they should be installed? (PROBE: some benefits could include cost parity with common lighting control technologies, significant benefits aside from energy savings, LLLC systems require minimal maintenance).
5. Are there reasons why you would not consider installing LLLC systems in future buildings? Please cite specific concerns.
- a. Who performs lighting maintenance projects for your building(s) (probe for internal staff (and their title), contractors, etc.)?
  - b. Who performs lighting retrofit projects for your building(s) (same probe as above)?
  - c. [If “contractors” are mentioned in either a or b] How do you select contractors to work with you on your lighting projects? (probe for word of mouth, previous experience, utility trade ally lists)
  - d. [If answered c] Are there any specific skills or certifications that you prefer your contractors to have? Are any of these requirements?

Thank you for your time and input – we are always available for any questions or feedback you may have as we continue this research.

## APPENDIX J. NON-RESIDENTIAL END USER SURVEY INSTRUMENT

**[DISPLAY]:** Next, I'd like to ask you a small number of questions about 25W and 28W linear fluorescent lamps. These lamps, also known as low or reduce wattage lamps, are an energy efficient alternative to standard 32W linear fluorescent lamps.

RWLR1. Prior to this survey, were you aware reduced wattage lamps?

- a. Yes
- b. No

**[IF RWLR1=A, ASK RWLR1; OTHERWISE SKIP TO RWLR7]**

RWLR2. Do you currently use reduced wattage lamps in any of your buildings?

- a. Yes
- b. No, but I used to
- c. No

**[IF RWLR2=A, SKIP TO RWLR5. IF RWLR2=B, ASK RWLR3. IF RWLR2=C, ASK RWLR4. RESPONDENTS SHOULD ONLY ANSWER RWLR3 OR RWLR4, THEN SKIP TO RWLR7]**

RWLR3. Why don't you use them anymore?

**[ALLOW MULTIPLE RESPONSES]**

- a. Dissatisfied with lighting levels
- b. Dissatisfied with performance (e.g. flickering, slow start)
- c. Didn't work due to colder building temperature
- d. Didn't notice a difference in our bill
- e. Wasn't worth higher per-lamp cost
- f. Generally prefer 32W
- g. Other [RECORD ANSWER]

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RWLR4. Why haven't you tried reduced wattage lamps?

**[ALLOW MULTIPLE RESPONSES]**

- a. Concerned about issues with lighting levels
- b. Concerned about issues with performance (e.g. flickering, slow start)
- c. Concerned about issues in colder building temperature
- d. Contractor didn't recommend them for my buildings
- e. Distributor didn't recommend them for my buildings
- f. Don't believe they are worth the higher per-lamp cost
- g. Happy with the 32W lamps I'm using now
- h. Would rather install a TLED when trying to save energy
- i. Other [RECORD ANSWER]

RWLR5. Approximately what percentage of your total 4-foot T8 sales are 25W and/or 28W lamps?

- a. [RECORD NUMBER]

RWLR6. How would you rate your overall satisfaction using reduced wattage lamps?

- a. Very satisfied
- b. Somewhat satisfied
- c. Not too satisfied
- d. Not at all satisfied

RWLR7. When ballast fails, what percentage of the time do you...

**[RESPOND TO ALL]**

- a. Replace the ballast and maintain the fluorescent system (\_\_\_\_\_ %)
- b. Convert to a new integrated LED fixture (\_\_\_\_\_ %)
- c. Perform a group replacement of all ballasts (\_\_\_\_\_ %)
- d. Other [RECORD ANSWER]

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RWLR8. From where do you typically purchase your T8 4-foot linear fluorescent lamps? Please provide a rough approximation in the table below:

Lamp Source	Percent of Total Purchases
Distributors	____%
Contractors	____%
Retailers (Big Box)	____%
Retailers (Local Hardware)	____%
Online Retailers	____%
<b>Total</b>	<b>100%</b>