

March 25, 2021

REPORT #E21-418

# Televisions Assumptions Planning Review

Prepared For NEEA: Meghan Bean, Sr. MRE Scientist

Prepared by: Jonah Hessels, Senior Associate Sorochukwu Okam, Analyst Rob Carmichael, CEO

Cadeo Group 1660 L Street, NW, Suite 216 Washington, DC 20036

Northwest Energy Efficiency Alliance PHONE 503-688-5400 EMAIL info@neea.org

©2024 Copyright NEEA

# **Televisions Planning Assumptions Review**

Team: Jonah Hessels, Sorochukwu Okam, Rob Carmichael Date: February 18, 2021

.....

Updated February 14, 2024

Project: Retail Products Portfolio Support - Televisions Planning Assumptions Review

# **Executive Summary**

NEEA contracted with Cadeo to review two planning assumptions related to its Retail Products Portfolio (RPP) initiative: the useful lifetime of televisions and the percentage of television sales going to commercial applications.

The Cadeo team found that NEEA's current estimate of a 7-year lifetime for televisions is within the range of current assumptions in the available literature and consistent with NEEA's Residential Building Stock Assessment (RBSA) data. The team recommends that NEEA continue to use the lifetime assumption of seven years and revisit this estimate as necessary when updated RBSA data are available.

In addition, NEEA asked the research team to comment on whether television lifetime differs between application (residential and commercial) and/or definition (ultra-HD and HD). Cadeo did not find any data that would justify different lifetime estimates for televisions in residential and commercial applications. While there is evidence supporting different lifetimes for different *types* of televisions (CRT, LED, LCD, Plasma, Projector, etc.), Cadeo found none showing that Ultra HD and HD versions of the same type (LED) have different lifetimes. Therefore, Cadeo does not recommend that NEEA vary lifetime assumptions by application or definition.<sup>1</sup>

With respect to the percentage of televisions sold into commercial applications, the team employed a three-pronged approach to verify NEEA's current calculation method and their resulting assumption of 7.2%. First, researchers conducted a literature review to identify sources with information about commercial sales data of televisions. Second, the team reached out to the source of NEEA's current estimate, The NPD Group (NPD), to identify areas of uncertainty and assess whether there are opportunities to update NEEA's calculation. Third, the team used RBSA data to calculate the expected number of televisions sold into residential applications and combined that number with regional sales data to deduce the number of televisions sold into commercial applications. The research team concluded that NEEA is using the best available method to estimate commercial sales but recommends that NEEA

<sup>&</sup>lt;sup>1</sup> While the team did not find supporting evidence to warrant different lifetime estimates at this moment, Cadeo acknowledges that literature regarding these questions is not complete and may warrant additional review in future research.

update its calculations to reflect new data from NPD. Using the updated data results in an assumption that 6.1% of televisions are sold into commercial applications.

Table 1 below provides a summary of the team's findings regarding each of NEEA's research objectives.

Research Question	Recommendation/Finding
Television lifetime	Continue to use 7 years
Different lifetimes for Res and Comm?	No evidence found of a difference
Different lifetimes for UHD and HD?	No evidence found of a difference
% Commercial Sales	Change to 6.1% from 7.2%

### Table 1: Concluding Summary of Research Findings

# Background

Currently, NEEA assumes that televisions have a useful life of seven years. This estimate is sourced from a prior model input review<sup>2</sup> and aligns with NEEA's internal stock turnover calculations for the Northwest. Cadeo reviewed each of the elements in this assumption to verify their accuracy. Cadeo also conducted a literature review of alternative data sources to identify potentially useful, or more recent, information regarding television lifetime and use in commercial applications.

# **Research activities**

To verify NEEA's estimates related to television useful life the team performed the following research tasks:

- Review existing literature relevant to NEEA's estimates.
- Verify NEEA's estimate of total television sales in the Northwest.
- Review RBSA stock saturation estimates.

To investigate the share of televisions going into commercial applications the team:

- Reviewed NEEA's current estimates.
- Identified and reviewed additional sources related to television applications.
- Analyzed sales and stock data to calculate an estimate of commercial sales

# Findings

In this section, the team provides more detail on findings related to each of the project's research objectives.

<sup>&</sup>lt;sup>2</sup> Research Into Action. 2012. Market Progress Evaluation Report. ACE Model Review Memo.

## **Television Useful Life**

To analyze NEEA's estimate of television useful life, the Cadeo team verified NEEA's current assumptions from existing data and conducted a literature review to identify other potentially useful sources. These sources included energy efficiency technical resource manuals (TRMs), ENERGY STAR® specifications, market intelligence reports, and Database for Energy Efficient Resources (DEER) workbooks. In general, these sources estimated a EUL between five and ten years (see Table 2). This review uncovered a trend towards decreasing useful life. Older sources, like the 2011 Television Energy Consumption Trends report included below, assumed a 10-year lifetime while more recent studies found useful lifetimes of five to six years. This decrease aligns with current market trends as we see the more durable cathode ray tube (CRT) and Plasma televisions replaced with LED/LCD televisions.

Source	Lifetime Assumption	Weblink
ENERGY STAR specification workbook 9.0	5 years	ENERGY STAR
Mid-Atlantic TRM version 10	6 years	Mid-Atlantic TRM
Hawaii Energy TRM	6 years	<u>Hawaii</u>
DEER workbook	6 years	Page 12, Hawaii TRM
Television Energy Consumption Trends and Energy Improvement options.	10 years	Television Consumption trends

#### Table 2 : Literature review findings on Television lifetime<sup>3</sup>

After investigating these sources, the team determined that NEEA's current estimate of a 7-year lifetime for televisions is within the reasonable range of current assumptions in the available literature and consistent with RBSA data reviewed by the team. Because of the lack of consistency in literature and the absence of a definitive study leveraging primary data collection on television lifetime, the team does not recommend that NEEA change their assumption of seven years. The team recommends that NEEA continue to align their lifetime assumption with the RBSA and revisit this estimate as necessary when updated RBSA data is available.

## Percent of Televisions Sold to Commercial Applications

To verify NEEA's assumption that 7.2% of television sales go into commercial applications, the team conducted a literature review to find existing data about commercial sale percentages, interviewed a subject matter expert (SME) familiar with the television market, and created a basic stock turnover model to validate NEEA's estimate. Each of these three activities provided due diligence confirming that NEEA's

<sup>&</sup>lt;sup>3</sup> A previous version of this memo included an assumed lifetime for televisions from this <u>Fraunhofer CTA</u> <u>Report</u>. Its inclusion was an error because the Fraunhofer report referred to the *average age* of televisions in the installed stock, not the average lifetime of televisions. Cadeo has removed that reference. The correction does not change Cadeo's conclusion that "NEEA's current estimate of a 7-year lifetime for televisions is within the reasonable range of current assumptions in the available literature and consistent with RBSA data reviewed by the team."

current calculation method is the best available method to estimate commercial sales. As the team did not find sufficient evidence to support a change to NEEA's calculation methodology, Cadeo recommends NEEA continue to use the same calculation but update the assumption to 6.1% of sales for commercial applications to reflect the most recent information from NPD. The following sections describe findings from each of the three aforementioned research activities.

## Literature Review

Public information regarding the percentage of televisions sold into commercial applications is sparse. The team did not find any direct sources to inform this estimate. Researchers did find a number of paid market reports<sup>4</sup> but further investigation of these reports revealed that none of them included information on the split of television sales between residential and commercial applications.

## Subject Matter Expert Input

NEEA's current estimate of 7.2% is based on 2012-2015 data from a market research data aggregator (NPD). The team engaged with the SME involved in this estimate to better understand the data sources, assumptions, and potential areas for updates.

The core inputs of this calculation were from the data provider NPD and sourced through consumer panel surveys which estimated that 5% of television sales were categorized as "business use" and 18% were categorized as "unknown use" in the 2012-2015 data. To account for the unknown 18%, NEEA assumed that the proportion of commercial televisions sold into "unknown applications" was larger (2x) than the proportion of commercial televisions in the known sales data. These assumptions result in the equation below and an estimate of 7.2% of sales to commercial applications.

## Equation 1: NEEA Market Data Calculation of Televisions in Commercial Application

% known comm. use +  $\left(\% \text{ unknown use } * \frac{\% \text{ known comm. use}}{\% \text{ known use}} * \text{ unknown use multiplier}\right) = Total \% \text{ comm.}$ 

Terms:

- % Known Commercial Use = 5%
- % Unknown Use= 18%
- % Known Use= 82%
- Unknown Use multiplier = 2

The team reviewed the calculation above with the SME and inquired with the original data provider to source more recent information. NPD was able to provide updated information based on data through May 2020. This information was consistent with the 2012-2015 data showing that "5% of reported sales are for business use and 15-20% are unspecified." However, the data provider stated they did "not think that there would be a different distribution" of residential to commercial applications among unspecified non-respondents. Because of this, the research team recommends that NEEA update their calculation to

<sup>&</sup>lt;sup>4</sup> The team searched for market research reports on this webpage using keywords including "television, lifetime, useful life, consumer television." <u>Link</u>

account for the assumption that known and unknown sales channels now have the same distribution. (that is, change the "2x" multiplier to "1x"), resulting in 6.1% commercial sales.

### Stock Turnover Model

Finally, the team aimed to calculate the percentage of televisions in commercial applications using a stock turnover model of the Northwest. The team calculated the stock of televisions in the residential sector based on RBSA data and then calculated annual shipments based on a 1/lifetime failure rate plus new construction rate. This method is shown in the two equations below:

## Equation 2: Cadeo Stock Turnover Calculation of Televisions in Commercial Applications

TV Sales<sub>Residential</sub> = Average # of TVs Per Household \* Number of NW Households

TV Sales<sub>Commercial</sub> = Total TV Sales - TV Sales<sub>Residential</sub>

The team obtained television saturation averages and the total number of Northwest households from 2016 RBSA reports<sup>5</sup>. Unfortunately, the results of this stock turnover calculation did not provide a high level of confidence regarding the proportion of televisions sold to commercial applications. The stock turnover calculation of *residential* television sales slightly exceeded the *total* number of television sales.<sup>6</sup> This slight discrepancy would indicate that the team's current assumption of the percentage of televisions sold to commercial applications is on the conservative side.

While a full investigation into this discrepancy is outside the scope of current research, the team recommends that NEEA revisit the television stock turnover model as new RBSA data become available. If the small discrepancy between sales data and stock turnover estimates continue, there may be potential for more research to reconcile these two data sources.

#### Lifetime Variance Between Applications

During the team's literature review, they did not find any indication that the useful life of a television varies between residential and commercial applications and recommends that NEEA continue to use the same assumption for both applications. In future work, NEEA may be able to better understand this assumption by interviewing facility managers from the most common commercial consumers of televisions (hotels, hospitals, etc.).

# Additional Research Questions

NEEA also asked Cadeo to investigate additional research questions which impact television planning and modeling. These questions, and the team's findings, are listed on the following page.

<sup>&</sup>lt;sup>5</sup> NEEA Residential Building stock Assessment II, Updated April 2019.

<sup>&</sup>lt;sup>6</sup> For more information on the team's stock turnover results, please contact NEEA to consult the supporting documentation workbook associated with this memo.

#### Are lifetimes different by television size?

The Cadeo team did not find evidence in its literature review to suggest that the lifetime of a television varies proportionally to its size. NEEA should continue to assume the same lifetime for all television sizes. Future research might include interviews with manufacturers to verify this information.

#### Are lifetimes different by definition level or type? Ultra HD vs. HD?

According to the Fraunhofer 2017 consumer electronic report, there were different lifetimes for four of the most used television types: LCD, CRT, PDP, and Projector type as seen in Table 3. Since then, technological advancement has led to the rapid replacement of television stock in the Northwest. While there is evidence to show that lifetime varies across different television types, the team did not find evidence to support the claim that Ultra HD and HD versions of the same type of television (LED) have different lifetimes.

#### Table 3: Literature review findings on Useful lifetime by Television types

Television types	Lifetime
LCD	4 years
PDP	5 years
CRT	6 years
Projector type	9 years

Sourced from Fraunhofer CTA 2017 report:

# Conclusions

As discussed above, the research team found few robust sources and a fair amount of inconsistency among those available related to television lifetime estimates. This left the team with a range of lifetime estimates from five to seven years, and Cadeo suggests that NEEA continue to use seven years as it is consistent with other regional data and within the lifetime range from our literature review.

Concerning the percentage of televisions in commercial applications, the team also did not find much publicly available market information but was able to update NEEA's current calculation with new information from a paid source. This new information changed the estimate in commercial applications from 7.2% to 6.1% to reflect the assumption that televisions sold to unknown applications have the same distribution of commercial sales as those sold into known applications.