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MEMORANDUM

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To: Steve Phoutrides (NEEA)

From: Marian Goebes, Shannon Todd, and Cathy Chappell (TRC)

BATTERY CHARGER STANDARD EVALUATION FOR NEEA'S NON-ADOPTIVE STATES

Executive Summary

On behalf of the Northwest Energy Efficiency Alliance (NEEA), TRC Energy Services (TRC) investigated the question of whether a battery charger appliance standard adopted in California and Oregon[1] affected the battery chargers sold in NEEA's non-adoptive states: Idaho, Montana, and Washington. To investigate this question, TRC:

- Conducted phone interviews with five manufacturers and email correspondence with one manufacturer; and interviewed two industry experts to investigate how manufacturers have adjusted product lines in response to the standards and to discuss NEEA's role in the standard adoption process.
- Conducted a spot check of products in the states served by NEEA and reviewed literature from the U.S. Department of Energy (U.S. DOE) to investigate the level of compliance with the state standard (adopted by Oregon and California) in NEEA's non-adoptive states.

Based on the results, TRC found:

- The majority of battery chargers sold in NEEA's non-adoptive states comply with the California and Oregon standard. The one exception was the battery charger class for golf carts (U.S. DOE class 7).
- Manufacturers typically develop one product line to serve the U.S. (and sometimes one product line globally), and will thus develop a product to meet the most stringent efficiency standard. Because California had adopted the standard one year prior to Oregon, manufacturers reported that Oregon's adoption of the state appliance standard had little or no effect.
- However, manufacturers and industry representatives reported that NEEA was influential in the adoption of the California appliance standard by the California Energy Commission (CEC).

Based on these results, TRC infers that NEEA's efforts towards the adoption of the CEC standard resulted in energy savings for Idaho, Montana, and Washington. TRC recommends that NEEA continue to collaborate with California organizations to develop state appliance standards for adoption in California and/or in the states served by NEEA. In addition, TRC conducted initial investigations to explore why compliance is much lower for golf cart chargers than for other products, and developed some hypotheses based on our findings. We recommend that NEEA conduct further investigations to test these hypotheses, because results could identify additional savings opportunities.

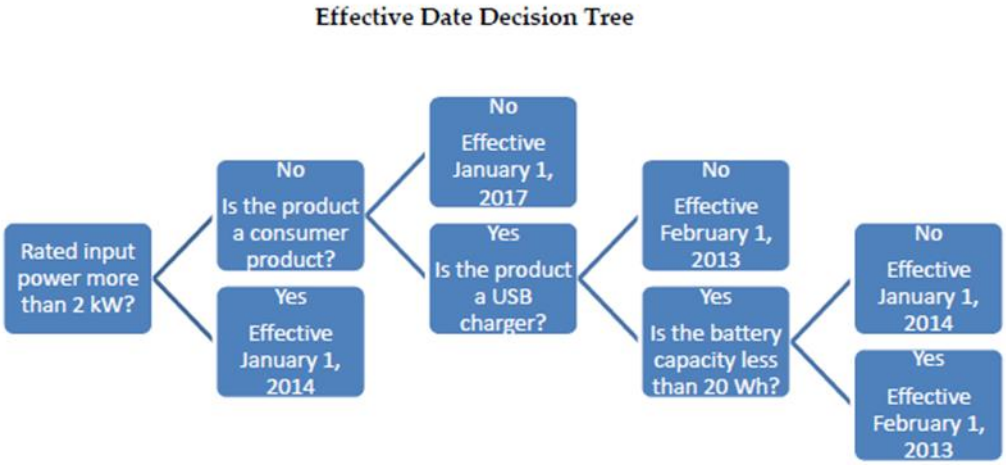
[1] These states adopted the same standard. However, California implemented the standard eleven months prior to Oregon.

Introduction

Battery Charger Standard Overview

NEEA supported the development of legislation in California and Oregon related to battery charger standards. The standard governs a broad range of consumer and non-consumer products. Figure 1 shows the date for which the standard took /will take effect in California by product type. These dates indicate when manufactured systems must meet the standard. Battery charger systems manufactured before the effective dates do not need to meet state energy efficiency requirements.[2] Oregon adopted the same standard, but its effective dates are 11 months after California[3].

Figure 1. Effective Dates for California Standard; Effective Dates are 11 months later in Oregon



Manufacturers must have their battery charger (BC) products tested for compliance by an independent laboratory; compliance products are then listed in a publicly available California Energy Commission (CEC) database.

Purpose and Scope of TRC Investigation

A third party's analysis indicated that NEEA influenced the adoption of the standard in Oregon, and that NEEA can claim savings from its efforts in Oregon[4]. The purpose of TRC's investigation was to investigate how manufacturers respond to state laws regarding battery charger standards in non-adoptive states, and whether savings can be claimed in the states served by NEEA that did not adopt the battery charger standard (i.e., Idaho, Montana, and Washington).

To investigate this question, TRC:

- Interviewed five manufacturers (and communicated with a sixth via email), identified through CEC and DOE rulemaking documentation;

[2] CEC, "Frequently Asked Questions: Battery Charging Systems", 2012. http://www.energy.ca.gov/2012publications/CEC-400-2012-FS/CEC-400-2012-FS-002.pdf
[3] D&R 2015.
[4] D&R International: "Logic Model Review and Savings Estimates of Battery Chargers Standards in Oregon." April 1, 2015.

- Interviewed two industry experts: one author of the Title 20 Codes and Standards Enhancement (CASE) report developed for the CEC[5], and one U.S. Department of Energy (US DOE) staff member;
- Conducted a spot check of battery charger products in the states served by NEEA that did not adopt the standard (Idaho, Montana, and Washington) and reviewed U.S. DOE compliance data;
- Conducted a limited literature review, including a review of the Title 20 CASE report, DOE proposed rulemaking documents, and manufacturer comments on proposed DOE rulemaking.

TRC notes that the data collection for this project was small, so our findings should not be considered conclusive. In particular, we did not investigate non-consumer products, because the standard has not yet taken effect.

The U.S. DOE has begun the rule-making process for a federal standard for battery chargers and classifies battery chargers into seven categories. Because TRC found recent compliance data that was organized according to the DOE battery charger classifications, we present our results according to these classes. Figure 2 shows the battery charger classes, the number of manufacturers that TRC interviewed representing each class, and whether TRC included the class in its product spot check. Some product descriptions appear in multiple classes (e.g., power tools) because possible voltages span two categories. TRC communicated with six manufacturers, but most of these manufacturers produce products in multiple classes. **TRC only interviewed manufacturers and conducted a product spot check for consumer products, because the non-consumer product standard does not take effect until 2018 in Oregon (and 2017 in California)**, as shown in Figure 1. TRC conducted all data collection from November 16, 2015 to December 14, 2015.

Figure 2. Battery Charger Classes and Representative Manufacturers Interviewed by TRC

DOE Class	DOE Product Class Description[6]	Example products	Manufacturers interviewed	TRC product spot check?
1	<0.1 kWh, inductive connection	Rechargeable electric toothbrush, rechargeable water jets	2	Yes
2	<0.1 kWh, <4 V	Smart phones, mobile phones, e-books, answering machines, baby monitors, shavers, MP3 players, digital cameras, can openers	3	Yes
3	<0.1 kWh, 4-10 V	Power tools, blenders and mixers, handheld vacuums, air mattress pumps, portable printers	2	No
4	<0.1 kWh, >10 V	Power tools, professional power tools, notebooks, robotic vacuums, universal battery chargers	2	Yes
5	0.1-3 kWh, < 20 V	Toy ride-on vehicles, RV/marine/ automotive chargers, mobility scooters, wheelchairs	1	No
6	0.1-3 kWh, >= 20 V	Electric scooters, lawn mowers, motorized bicycles, wheelchairs	1	Yes
7	>3 kWh	Golf cart chargers	2 (1 via email)	Yes

[5] Ecos Consulting et al., "Codes and Standards Enhancement (CASE) Initiative Title 20 Standards Development: Analysis of Standards Options for Battery Charger Systems," 2010.
[6] Class description and example products from U.S. DOE, "Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Battery Chargers", 2015.

Results

Below we present results from the manufacturer and industry experts, and from the product compliance check.

Findings from Interviews

Manufacturers reported they do not develop products for one state. Three manufacturers reported they develop products for all U.S. states. Two reported they typically develop products globally or for North America. The last manufacturer, which produces chips that enable power supplies to meet the standards (i.e., does not produce finished products), concurred that manufacturers prefer to produce product lines for at least the U.S.-wide level. Manufacturers reported this is because of how distribution chains operate. Manufacturer quotes include:

- "We don't sell products into one state. The distribution chain doesn't work that way. We sell the same products in Washington and Oregon and California".
- "We produce products for the U.S. If California adopts a standard, everyone benefits."
- "Manufacturers don't want to make one charger for California and one for the rest of states. This is why the manufacturers view the CEC standard procedure as very important."

The industry expert explained that manufacturers ship products to continents or globally, and they distribute products to retail chains that do not want to track separate stock keeping units (SKUs). Consequently, manufacturers generally design products to the most rigorous standard.

TRC then asked manufacturers about the impact of the Oregon appliance standard. **All manufacturers reported the Oregon standard made no difference, because California had previously adopted the standard**. One manufacturer reported that, "If Oregon had got out there first, then we'd be doing it for Oregon." However, two manufacturers reported that they may not have had the same response if Oregon had adopted the standard first, because California is a much larger market. (TRC notes that this conflicts with these manufacturers' statements that they create one product to meet the most stringent standard.) One reported, "The states after California are second tier, because they are smaller." The industry expert noted that compliance with the CEC standard is probably not 100% (which TRC confirmed, as described in Product Compliance Findings), and that adoption by Oregon probably increased U.S. compliance by "helping with the laggards". It was beyond the scope of this project to investigate whether this hypothesis is true. In addition, one manufacturer stated that, while his company had initially opposed the CEC standard, they did not oppose the Oregon standard once Oregon decided to adopt the same standard as California. This statement, and the finding that manufacturers prefer to create one product, underscore the importance of NEEA continuing collaboration with California stakeholders.

TRC asked industry experts and some of the manufacturers[7] about the role that NEEA played in the adoption of the California standard. **Interviewees reported that NEEA actively supported the adoption of the California standard, and that this support helped convince the CEC to adopt the standard**. According to one interview expert, NEEA's testimony to the CEC, including NEEA's pledge to attempt to adopt the same standard states served by NEEA[8], helped balance testimony from manufacturers opposed to the standard. The industry expert reported that NEEA's

[7] The original product scope did not include questions to manufacturers regarding NEEA's role in the adoption of the California standard. TRC added this question later in the data collection, based on preliminary results.

[8] As documented in the transcript of the "Business Meeting before the CEC", January 12, 2011, p. 144, NEEA staff member Charlie Stephens said, "If the Commission adopts these Regulations today, I will take those Regulations northward and I will work with the other members of the Pacific Coast Collaborative to enact those Regulations for the North and other jurisdictions." http://www.energy.ca.gov/business_meetings/2012_transcripts/2012-01-12_transcript.pdf

testimony "helped convince [the California Energy] Commissioners to adopt the standard." A manufacturer reported that the support of organizations such as NEEA, the Appliance Standards Awareness Project (ASAP), and the American Council for an Energy Efficiency Economy (ACEEE) affects Commissioners' decisions.

Product Compliance Findings

Overall Findings for All Battery Charger Classes

TRC reviewed two files from the U.S. DOE that provided data at the U.S. level on compliance with the California – and therefore the Oregon – appliance standard. As described in a U.S. DOE Supplemental Notice of Proposed Rulemaking (SNOPR) document, the U.S. DOE and its contractors investigated compliance using the following approach, with data collected in March 2015:

> *DOE examined the top-selling products for various BC applications at several national online and brick & mortar retailers (with an online portal). These represent products sold not just in California, but available nationally. If the BC model number of a given application was found in the CEC database, it was considered to meet the CEC standard. In some cases it was not possible to identify a BC-specific model number in the online specification (e.g., only the application model number was provided, or only a retailer specific model number). In such cases, DOE determined whether such a product was sold or available for pick-up in a physical store in California. If so, such a product was considered to meet the CEC standard.* [9]

The U.S. DOE also released a SNOPR excel workbook in July 2015, and the U.S. DOE staff member interviewed reported that the DOE used the same approach (and much of the same data) as described in the SNOPR document.

- **The U.S. DOE SNOPR document shows that 90% - 100% of battery chargers in DOE classes 2, 3, 4 and 5 sold in the U.S. were compliant with the CEC (a.k.a., the California) standard.**
- **The US. DOE workbook shows that 91-95% of battery chargers in DOE classes 1-6 sold in the U.S. were compliant with the CEC standard, and that only 20% of battery chargers in DOE class 7 (i.e., golf car chargers) were CEC compliant.**

According to the U.S. DOE staff member interviewed, the DOE does not have data broken out by states or regions; consequently, TRC could not ascertain whether compliance is higher in the states that adopted the standard (California and Oregon), or if compliance is higher in the non-adopting states served by NEEA (Idaho, Montana, and Washington) relative to the U.S.

After reviewing these DOE resources, TRC conducted a spot check of products sold in Idaho, Montana, and Washington, using the following approach. TRC:

1. Selected a sample of products from five U.S. DOE product classes: 1 – electric toothbrushes, 2 – phone chargers, 4 – laptop chargers, 6 – lawnmowers, and 7 – golf cart chargers.
2. Selected one or two product models from each product class from the CEC database.
3. Visited retailer websites (including Target, Best Buy, Home Depot, and EV Drives – a golf cart retailer) and searched for each selected model.
4. Entered zip codes in Boise, Idaho; Billings, Montana; and Bellingham, Washington to check in-store availability of each model. TRC chose zip codes in the two cities with the large population in Idaho and

[9] U.S. DOE "Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Battery Chargers", July 2015.

Montana (Boise and Billings, respectively) and a smaller city in Washington (Bellingham), to account for possible difference in city sizes.

5. Documented the availability of each CEC compliant product in each zip code.
6. Reviewed the retailer's recommended similar or alternative products. TRC then checked the CEC database to see if these similar products were listed in the CEC database.

In many cases, manufacturers package chargers and their associated products together as a bundle (i.e., toothbrush and toothbrush charger, cell phone and cell phone charger). Retailers often list these bundled products under unique model numbers, different than the model numbers of the standalone chargers. Thus, the model number for the bundled products do not always match the model number of the charger listed on the CEC database. To determine which bundled product corresponds to a CEC compliant charger, TRC searched for the charger model number on Amazon.com, which often sells standalone chargers and displays the model number for the corresponding bundled product. TRC matched the model numbers for the bundled item and standalone charger.

Overall, TRC's results from our product spot check for compliance in NEEA's non-adoptive states aligned with the U.S. DOE findings. TRC found:

- **For U.S. DOE battery charger classes 1, 2, 4, and 6, all products in these classes met the California and Oregon standard.** For these classes, TRC found battery chargers (or bundled products that included battery chargers) listed on the CEC database in all three of the zip codes in NEEA's non-adoptive states. In addition, all alternative products for these classes were found in the CEC database.
- **For battery charger class 7 (golf cart chargers), one charger available for sale was compliant with the California and Oregon standard, but two chargers were not compliant**. This mix of compliant and non-compliant chargers were available for shipping to a zip code in Idaho, Montana, and Washington. Because the stand-alone charger was only available on-line for the retailer reviewed, TRC also called one brick-and-mortar retailer in central Washington to ask about product availability. The brick-and-mortar retailer also sold a mix of compliant and non-compliant golf cart charger products.

Golf Cart Charger (Class 7) Compliance

While it was beyond the scope of this project to fully investigate why compliance levels are different for golf cart chargers (i.e., DOE class 7), TRC conducted a few data collection activities to explore this question.

First, **TRC conducted a spot check of golf cart chargers in states that did adopt the standard (i.e., California and Oregon), and found that there was a mix of compliant and non-compliant golf cart chargers for sale in these states.** For example, the on-line retailer website allowed TRC to order non-compliant golf cart chargers models for a zip code in Oregon and California. (TRC did not get to the point of sale, so it is possible the sale may not have been processed.) TRC also called a brick-and-mortar store in Oregon, and this retailer reported selling a mix of golf cart chargers that TRC found to be compliant (one charger) and non-compliant (two chargers).

TRC conducted data collection activities to develop hypotheses for why golf cart charger compliance lags behind other classes. TRC lists these hypotheses in order of likelihood; but given the small scope of this project, there is a small amount of data supporting all of these theories.

1. TRC held an email exchange with the golf cart manufacturer that we had previously interviewed by phone, to discuss why TRC found non-compliant products in adoptive states. **The manufacturer reported that, while original equipment manufacturers (OEMs) comply with the standard, some aftermarket golf cart charger distributors do not.** The manufacturer reported that the CEC regulations have a narrow exemption for service parts, but that these aftermarket distributors are probably still in violation of the state standard. The

manufacturer added, "At some point, CEC will need to take enforcement action". The manufacturer's report aligns with TRC's spot check: At least one of the non-compliant golf cart chargers that TRC found for sale in Oregon was only compatible with model 2014 (or older) golf carts.

2. TRC also reviewed golf cart manufacturers' comments on DOE proposed rulemaking. One manufacturer commented, "Schumacher has discontinued many automotive battery charger units, marine battery charger units, [and] golf cart battery charger units...for sale in California....At this time, our company is concerned with creating two separate products lines for California and the rest of the nation."[10] The two golf cart manufacturers that communicated with TRC (one via email) reported that they produce products at the national or global level. However, **it is possible that some golf cart manufacturers produce multiple product lines for the U.S., to meet different efficiency standards**. TRC hypothesizes that there may be a different distribution system for products sold primarily to commercial and industrial customers (such as golf cart chargers), compared to consumer products (classes 1-6). Because TRC focused our compliance check on consumer products, we do not have data on the distribution of non-consumer products.
3. **It is possible that some of the non-compliant battery charger products found by the U.S. DOE and TRC were manufactured before the standards took effect, and thus did not have to comply**. Since the CEC has classified golf cart chargers as small (< 2kW) consumer products, golf cart chargers have an effective date in California and Oregon of February 1, 2013 and January 1, 2014, respectively (see Figure 1). Products manufactured prior to the effective date do not need to comply.

TRC recommends that NEEA conduct further investigations to understand which of these hypotheses (if any) are correct.

Conclusions

Based on our findings, TRC believes that almost all battery chargers in U.S. DOE classes 1-6, and a portion of battery chargers in U.S. DOE class 7, that are sold in NEEA's non-adoptive states (Idaho, Montana, and Washington) are compliant with the California and Oregon standard. In addition, **TRC believes that NEEA helped achieve this level of compliance in their non-adoptive states, primarily because NEEA influenced the CEC standard adoption process.** Manufacturers report that they generally produce one product line to serve the U.S. or the global market. Consequently**, TRC recommends that NEEA continue to work with stakeholders in California and at the national level (e.g., U.S. DOE) to support the development of appliance standards that are consistent across states**.

TRC also recommends that NEEA more deeply investigate why the compliance rate for golf cart chargers (DOE battery charger class 7) is much lower than for other DOE battery charger classes, because this research could uncover further savings opportunities. For example, if the difference is because some aftermarket chargers are non-compliant, this could represent a need for enforcement of the standard. If the difference is because manufacturers have a different manufacturing and distribution system for products sold primarily to commercial and industrial customers than for products sold primarily to consumers (e.g., if they produce multiple product lines for the U.S. for chargers sold to commercial and industrial customers), this could have a significant impact when the non-consumer product standard takes effect in 2017.

[10] Schumacher Electric comments on DOE proposed rulemaking, submitted May 17, 2013.