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Joint Comments Responding to the Request for Information (RFI) on Dipper Wells

Additional submitted attachment is included below.

Dipper Wells

Codes and Standards Enhancement (CASE) Initiative
For PY 2021: Title 20 Standards Development

Joint Comments Responding to the
Request for Information (RFI) on Dipper Wells

Docket Number: 20-AAER-04

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1. Introduction

The Codes and Standards Enhancement (CASE) initiative presents recommendations to support California Energy Commission's (CEC) efforts to update California's Appliance Efficiency Regulations (Title 20) to include new requirements or to upgrade existing requirements for various technologies. The three California Investor-Owned Utilities (IOUs) – Pacific Gas and Electric Company (PG&E), San Diego Gas and Electric (SDG&E), and Southern California Edison (SCE) – sponsored this effort (herein referred to as the Statewide CASE Team). The program goal is to prepare and submit proposals that will result in cost-effective enhancements to improve the energy and water efficiency of various products sold in California. This response to the CEC's request for information (RFI) on dipper wells presented herein is a part of the effort to develop technical and cost-effectiveness information for potential appliance standards.

Dipper wells are a common technology used to clean serving utensils such as ice cream scoops and mashed potato or butter scoops with a continuous flow of either hot or cold water. They can also represent a large portion of both water and energy consumption in commercial foodservice operations, as some dipper wells can use up to 480 gallons of water per day of operation[1] and can place a load of over a therm per day on the building's water heater.

2. Background

The main industry that uses dipper wells is the commercial food and beverage sector. Common dipper well users include establishments such as coffee shops, ice cream stores, juice bars, full-service restaurants, and fast-food chains. Dipper wells are a critical component of these industries, as they are commonly used to clean small utensils that are vital to food/beverage service. Ice cream scoopers, mixing spoons, and other food service preparation utensils are placed in dipper wells to prevent bacteria growth and to clean the utensil. Dipper wells eliminate the need for food service staff to manually sanitize a utensil or run the utensil through a dishwasher after every use.

In Spring 2020, as part of the Title 20 measure prioritization exercise, the Statewide CASE Team identified dipper wells as a measure with large water savings potential and as one of the Statewide CASE Team's four recommended Title 20 measures along with commercial fryers, electric vehicle supply equipment (EVSE), and variable-frequency drives (VFDs). Dipper wells were included in CEC's July 2021 request for the CASE Team's assistance gathering preliminary information for potential measures, and the team provided answers to specific questions, sources for more information, and a list of industry experts. CEC subsequently reached out again requesting the calculations for the savings estimates on dipper wells. On September 28, 2021, the CASE Team sent CEC staff the underlying research and calculations for the dipper wells claimed impacts, and the following day the CEC opened the docket.

3. Potential Savings

There are several alternative technologies that generate significant cost savings, while delivering the same functionality provided by traditional dipper wells. Outlined below are case studies discussed further later in this report, and the cost savings breakdown from replacing dipper wells with alternative technologies.

[1] Assuming a 16 hour day with the dipper well continuously flowing at 0.5 gpm

- Jamba Juice: installing the iScoop shower at the Jamba Juice location demonstrated a projected annual water savings of $910 over the traditional dipper well it replaced.[2]

- Restaurant in Los Banos[3]: the iScoop shower replacement lowered daily water consumption from 468.5 gpd to 4.9 gpd. When annualized, this lowers total use from 178,000 gallons per year (similar to the Food Service Technology (FSTC) estimate of 175,000[4]) from dipper wells to only 1,800 gallons per year when replaced with an iScoop Shower. When combined with energy savings, this equates to an average savings of $3,066 per year. The iScoopShowers cost $608, retail, and take about an hour to install.

- Restaurant in Madera[5]: the ConserveWell Heated Utensil Holder replacement lowered daily water consumption from 321.4 gpd to 3.8 gpd. When annualized, this lowers total use from 117,300 gallons per year with the dipper wells to only 1,400 gallons per year when replaced with a ConserveWell unit. Additionally hot water energy use was lowered from 2.8 therms per day to 0.1 therms per day. The combined water and energy reductions equate to an average savings of $2,355 per year. ConserveWell Heated Utensil Holders cost $410. They typically take between an hour or two to install depending on whether electrical wiring exists at the desired location in the restaurant or if a new outlet needs to be installed. This can cost anywhere between $100 and $300 in labor costs.

The examples above are savings from dipper wells being replaced by technologies that do not use continuously flowing water. The savings calculations developed by the CASE Team prior to this rulemaking compared continuously flowing dipper wells with an average flow rate of 0.5 gpm to dipper wells with a reduced flow of 0.2 or 0.3 gpm.

As the CASE Team collaborated with experts to develop a response to this RFI, the assumptions used to calculate the original savings estimates were more closely reviewed. Assumptions in the original savings calculations that may be overstated include: the stock estimate of 100,000 dipper wells in California, the average flow rate of dipper wells in the field, and the percentage of hot water dipper wells. Updated assumptions for these inputs are discussed through the report. The Statewide CASE Team looks forward to assisting CEC in determining the most appropriate inputs to calculate energy and water savings for continuously flowing technologies at a reduced flow rate and alternative technologies that do not continuously flow, such as those used in the studies mentioned above.

[2] 2017 / Alliance for Water Efficiency / Commercial Kitchen Guide

[3] 2017 / MWD Frontier Energy / Dipper Well Replacement Field Evaluation Report

[4] The equation for calculating dipper well annual water consumption in gallons per year (gpy): *Dipper Well Water Consumption (gpy) = 0.5 gpm * 60 minutes * number of hours per day * 365 days per year,* where 0.5 gpm is a common flow rate for dipper wells, this value can range from 0.2 to 1.0 gpm depending on the specific appliance, but 0.5 gpm is a commonly cited average.

[5] 2017 / MWD Frontier Energy / Dipper Well Replacement Field Evaluation Report

4. Barriers

Frontier Energy operates the Food Service Technology Center in San Ramon, CA. According to Frontier Energy staff, the biggest barriers to large scale dipper well replacements are:

- Public knowledge of relevant replacement technologies, and
- Potential outdated health department standards that preclude replacement in many cases.

The IOUs appreciate CEC moving forward with this rulemaking. Developing and implementing regulations on continuously flowing dipper wells will educate the industry and health department professionals to overcome these barriers. The below sections of this report address the questions in CEC's RFI document.

5. Definitions and Usage of Dipper Wells (Questions 1-6)

As noted above and by CEC in the RFI, dipper wells are commonly found in juice shops, coffee shops, ice cream shops, and full-service restaurants. Dipper wells can also be found in cafeterias (schools and institutional) including the front of house where patrons serve themselves in a college campus or buffet-style restaurants, although less commonly than restaurants.

The type of food typically dictates the temperature of the water necessary to adequately rinse a utensil using a dipper well. Cold water is necessary for frozen food products because a utensil that is too hot can melt the food. Then, when the food is replaced in the freezer (or in the case of a typical ice cream shop, the freezer lid is closed) the melted food will re-freeze with a different consistency compromising the appearance and texture of the food. Hot water is necessary to melt fat from high fat and high starch foods, so hot water is recommended for butter and mashed potato scoops.

The method of delivering water (continuous, automatic/activation sensor, or pressure rinsing) is largely unrelated to the food product. It was found that manual-fill, heated dipper wells can cook the remains of some food product such as high protein Greek yogurt, resulting in an unsightly, but still sanitary, situation. It was also found that pressure rinsing does not work to clean scoops in buildings with abnormally low water supply pressure.

The original savings calculations performed by the CASE Team and the estimates throughout this report assumed a flow rate of 0.5 gpm, consistent with the rating of a standard dipper well and used in online calculators.[6] However, the ongoing field evaluation study by Frontier Energy found an average flow rate of 0.35 gpm. While this is a small sample, the results align with data from a 2014 FSTC survey where participants reported flow rates between 0.2 and 0.4 gpm. Field experience has exhibited that dipper wells are rarely turned on at full flow, and that 0.35 gpm may be on the high end of typical use. The CASE Team recommends using 0.35 in the updated savings calculation specific to California, with the caveat that more data is be needed to validate this number. The savings reporting throughout this report use to flow rate of 0.5 to be consistent with previous practices in some cases sources of the calculation.

[6] https://server-products.com/ConserveWell-notdipperwell online calculator example

There is one model of a dipper well on the market[7] that recirculates water and cleans utensils by injecting ozone into recirculated water called the RinseWell. An optic turbidity sensor is used to determine when the water has become murky, and at that time, the unit automatically replaces the water in circulation with fresh tap water. This type of equipment may fall into the "automatic/activation sensor" category defined by CEC. This equipment uses cold supply water and is not actively heated. A small amount of energy is used for a pump and an ozone generator as documented in Table 1 below.

Components for dipper wells are unique and not generally shared with other common equipment. Dipper wells generally have two main styles of basin. Cylindrical basins between 6- and 8-inch in diameter are more common than rectangular basins between 12- and 18-inch in length. Cylindrical basins are typically inlaid in a stainless-steel countertop, and rectangular basins typically hang on the side of either a countertop or a chef-base refrigerator/freezer. The size and shape of the basin has more to do with countertop design than it does with the application, although many chain ice cream shops with large numbers of ice cream flavors opt for rectangular basins with continuous running water because they can hold more scoops.

The faucet type with a conventional dipper well is dependent on the basin shape, but faucets typically have one half inch National Pipe Taper (NPT) fittings to connect to the water feed and have a three eighths inch nipple. These components are different from faucets for sinks, which have much larger diameters and aerators to control the flow rate.

The components of modern replacement technologies such as scoop showers are unique to each manufacturer. Below is a list of some alternative approaches to dipper wells:

- Heated wells that can be drained automatically or manually;
- Devices that clean utensils with jets of water activated by a pressure switch;
- Water faucets that allow baristas to press the faucet once to release high-pressure water spray long enough to rinse a spoon;
- Devices that use a pre-timed water spray and a modified rinsing mechanism; and,
- Automatic flow with turbidity sensing units as mentioned above.

Replacing dipper wells with more efficient alternative technologies can yield substantial energy savings. The 2017 Frontier Field Evaluation assessed energy savings for embedded energy in both hot and cold dipper wells, along with direct energy savings in hot dipper wells. The evaluation concluded:

- Per unit energy savings: Replacing a cold-water dipper well with a utensil shower reduced embedded energy use by 650 kWh annually.
- Per unit energy savings: Replacing a hot water dipper well with a heated well reduced embedded energy use by 417 kWh annually and direct energy by 997 therms annually.

The table below summarizes key characteristics for four traditional dipper well alternatives on the market. Embedded energy savings were calculated using the CPUC's 2021 embedded energy

[7] https://static1.squarespace.com/static/60106e8100b3d7693fdadd1c/t/604fd48b4dfe6c5d1b4f9534/1615844492038/RW+Sell+Sheet.pdf, https://www.rinsewell.com/

calculator using a baseline dipper well consumption of 250 gallons of fresh water per day.[8] This energy calculator requires a zip code since embedded energy varies by water municipality. Most dipper wells are likely installed in densely populated urban centers, so a Los Angeles zip code was selected to represent the majority of installations and provide the most relevant savings potential.

Table 1 Savings Estimates of Four Alternative Technologies

Technology	Hot or Cold Water Connection	Annual Direct Energy Savings	Annual Water Embedded Energy Savings	Water Savings (% over baseline)
I.ScoopShower	Cold		481 kWh	97
RinseWell	Cold	-220 kWh device energy consumption	457 kWh	92
ConserveWell	Hot	776 therms/year gas water heater savings	471 kWh	95
Metered Faucet	Cold		422 kWh	85

There are clear alternatives to dipper wells in the commercial food and beverage sector, especially more "specialized" establishments such as coffee shops, ice cream stores, and juice bars. Listed below are the water savings breakdown of three different case studies mentioned above where dipper wells were replaced.

- Jamba Juice replaced a dipper well, which consumed an average of 166 gallons of water per day, with an iScoopShower, a device that cleans utensils with jets of water activated by a pressure switch. iScoopShower device only consumed about 9.6 gallons of water per day. Both metrics were derived from onsite monitoring. This resulted in water savings of over 90 percent.
- Frontier Energy conducted a study with two California restaurants, Los Banos and Madera, by replacing dipper wells with iScoopShowers (Los Banos) and ConserveWell Heated Utensil Holders (Madera). Each restaurant realized water savings of over 90 percent.
- Starbucks replaced dipper wells with new water faucets where baristas can press the faucet once to release a high-pressure water spray that lasts just long enough to rinse a spoon. Starbucks anticipates that it will save over 150 gallons of water per day at each café with these new faucets.[9]

In addition to the replacement technologies in these case studies, other technologies with greater water efficiency than dipper wells are increasing in popularity. For example, a water-conscious dipper well was proposed by Innovate Arkansas[10], where the device uses a pre-timed water spray and a modified rinsing mechanism to reduce water usage by over 80 percent compared to traditional dipper wells. A heated well is another option that can replace dipper wells in some scenarios.

[8] Approximately 8 hours of operation/day at 0.5 gpm
[9] 2009 / Yahoo / Starbucks to No Longer Keep Running Water
[10] https://www.innovatearkansas.org/blog/post/1196/food-control-journal-publishes-ua-study-of-rinsewell-technology-from-rhs

In terms of variation of types of dipper wells between types of establishments, alternatives will be based on the end-use. Dipper wells used for food will use heated alternatives, while ice cream shops will use unheated, and coffee shops could use any option.

In sum, while dipper wells are very critical components of the food and beverage service industry, there are various alternative technologies with proven water saving benefits that can efficiently replace dipper wells.

6. Codes and Standards (Questions 7-9)

For the 2024 code update cycle of the International Association of Plumbing & Mechanical Officials (IAPMO) Uniform Plumbing Code (UPC), there was a proposed change to all of IAPMO, Appendix L on Sustainable Practices, including Section 404.6, *Dipper Well Faucets*, to be consistent with IAPMO Water Efficiency and Sanitation Standard (WE-Stand). The 2021 UPC Report on Proposals (ROP) shows what has been proposed for the 2024 UPC[11].This proposal was initially rejected by the Technical Committee, but, at the time of this report, the submitter had resubmitted for further consideration. IAPMO UPC, Appendix L, is not one of the adopted appendices in current California Plumbing Code.

IAPMO 2020 WE-Stand, Section 407 Commercial Food Service, 407.5 Dipper Well Faucets sets a maximum flow rate at 0.2 gpm at a supply pressure of 60 psi for both continuous flow and metered flow dipper wells. As discussed above, this language has been submitted as a change to the UPC, Appendix L. A screenshot with relevant code language is included in the figure below.

407.5 Dipper Well Faucets. Where dipper wells have a permanent water supply, the faucet shall have metered or sensor activated flow. The volume of water dispensed into a dipper well in each activation cycle of a self-closing fixture fitting shall not exceed the water capacity of the dipper well, and the maximum flow shall not exceed 0.2 gpm (0.8 L/m) at a supply pressure of 60 psi (414 kPa).

Figure 1: Draft IAPMO 2020 WE-Stand

Source: Review draft page 15 https://www.iapmo.org/media/28217/roc-we-stand-202x.pdf

There are standards for dipper wells aside from IAPMO, including ASHRAE, local codes, and health and safety codes.

ASHRAE Standard Project Committee (SPC) 191 published a draft of BSR/ASHRAE/ASPE/AWWA Standard 191P, *Standard for the Efficient Use of Water in Building Mechanical Systems*, for third public review in July 2020. The draft for the voluntary standard states that the water supply to a dipper well must have a shutoff valve and flow control and that both the maximum continuous flow and metered flow shall not exceed 0.25 gpm at a supply pressure of 60

[11] https://codes.iapmo.org/docs/2024/UPC/2021%20UPC%20Report%20on%20Proposals.pdf (Appendix L is on page 496-504, Dipper wells is on page 497)

psi. The SPC is currently addressing comments from the 3rd public review. The figure below includes a screenshot with relevant code language.

6.4.1.2 **Dipper Well Faucets**. Where dipper wells are installed, the water supply to a dipper well shall have a shutoff valve and flow *control*. The flow of water into a dipper well shall be limited by at least one of the following methods:

a. Maximum continuous flow. Water flow shall not exceed the water capacity of the dipper well in one minute at supply pressure of 60 psi (414 kPa), and the maximum flow shall not exceed 0.25 gpm (0.063 L/s) at a supply pressure of 60 psi (414 kPa).

   The water capacity of a dipper well shall be the maximum amount of water that the fixture can hold before water flows into the drain.

b. *Metered* flow. The volume of water dispensed into a dipper well in each activation cycle of a self-closing fixture fitting shall not exceed the water capacity of the dipper well, and the maximum flow shall not exceed 0.25 gpm (0.063 L/s) at a supply pressure of 60 psi (414 kPa).

Figure 2: ASHRAE SPC 191P Draft Language for Public Review

Source: Third Public Review Draft, July 2020

The Marin Water District has local codes for dipper wells: Title 13, Section 13.02.021 Water Conservation: Normal Year Water Conservation, Section C Commercial Equipment Specification, Number 4, Dipper Wells. This local code outlines the commercial equipment specifications for dipper wells in Marin County, CA. The code specifies that a dipper well shall have a flow rate of 0.3 gpm or less. A screenshot with relevant code language is included in the figure below.

4. *Dipper Wells*. A “dipper well” is a basin into which clean tap water flows constantly to provide a fresh supply of water for soaking utensils. The run-off goes down the drain. Dipper well flow rate shall be 0.3 gallon, or less, per minute.

Figure 3: Marin County Codes

Source: https://library.qcode.us/lib/marin_mwd_ca/pub/code/item/title_13-chapter_13_02-13_02_021

California Health and Safety Code, Division 104 Environmental Health, Part 7 California Retail Food Code, Section 114119 (d) – (f) specifies that serving utensils must be stored in running water of sufficient velocity to flush particulates to the drain if used with moist food such as ice cream or mashed potatoes, or in a clean, protected location if the utensils are used with a food that is not potentially hazardous, or in a container of water if the water is maintained at a temperature of at least 135 degrees Fahrenheit. A screenshot with relevant code language is in the figure below.

114119. During pauses in food preparation or dispensing, food preparation and dispensing utensils shall be stored in the following manner:

(a) Except as specified under subdivision (b), in the food with their handles above the top of the food and the container.

(b) In food that is not potentially hazardous, with their handles above the top of the food within containers or equipment that can be closed, such as bins of sugar, flour, or cinnamon.

(c) On a clean portion of the food preparation table or cooking equipment only if the in-use utensil and the food-contact surface of the food preparation table or cooking equipment are cleaned and sanitized at a frequency specified under Section 114117.

(d) In running water of sufficient velocity to flush particulates to the drain, if used with moist food such as ice cream or mashed potatoes.

(e) In a clean, protected location if the utensils, such as ice scoops, are used only with a food that is not potentially hazardous.

(f) In a container of water if the water is maintained at a temperature of at least 135ºF and the container is cleaned at least every 24 hours or at a frequency necessary to preclude the accumulation of soil residues.

(Added by Stats. 2006, Ch. 23, Sec. 2. Effective January 1, 2007. Operative July 1, 2007, by Sec. 3 of Ch. 23.)

Figure 4: California Health and Safety Code

Source:
https://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=HSC&division=104.&title=&part=7.&chapter=5.&article=

There is no existing standard test method for evaluating the efficiency or performance of dipper wells or similar products. A test method could be modeled after ASTM F2324-19, *Standard Test Method for Prerinse Spray Valves*, where average flow rate at a set water inlet temperature is determined. A cleanability test where a standard number of soiled utensils would be performed with time, water temperature, energy consumption and water consumption recorded. A force test from the ASTM test method could be applied to the dipper well alternatives that use spray force to clean utensils to measure spray force. This standardized performance data along with market data could be used to estimate real-world savings and to evaluate new technologies. Programs like ENERGY STAR and WaterSense could require results be reported to be listed, and utilities could implement reporting requirement before including a replacement technology in an efficiency program.

Below is a list of other standards related to dipper wells:

- NSF/ANSI 2, *Food Equipment*, and NSF/ANSI 4, *Commercial Cooking, Rethermalization and Powered Hot Food Holding and Transport Equipment*, have listings relevant to dipper wells. These standards are related to surface geometry to ensure the product is easy to clean and there is not an opportunity for bacterial growth.
- Per some local health codes, if a dipper well is not heated, it must have flowing water, or the water be replaced on a regular basis.
- NSF/ANSI 184, *Residential Dishwasher minimum sanitation requirements,* and NSF/ANSI 3, *Commercial Warewashing Equipment*, use a 5-log reduction of bacteria as a sanitation criterion.

7. Market Information (Questions 10 and 12)

There is almost no information relating to how many dipper wells may be present in the average coffee shop, juice bar, or restaurant. In one study conducted in 2004, it was estimated that there are 2,453 dipper wells at 1,134 food establishments in Las Vegas Valley, which would be an average of 2.16 dipper wells per food establishment. This number is likely overstated for the average dipper well user because foodservice facilities in Las Vegas are dominated by casinos, which are likely to have multiple dipper wells per facility.

Frontier Energy performed a market characterization in 2016 for the 2017 Frontier Field Evaluation study and estimated that there are 100,000 dipper wells in California. This estimate included several assumptions that the team felt could be relaxed with a more thorough market characterization. To develop this estimate approximately ten to fifteen food service sectors were analyzed separately with an assumed percentage within each sector to have dipper well(s) and an average number of dipper well(s) per location.

The CASE Team felt that the 100,000 CA stock estimated was high and performed research and multiple calculations to determine a more appropriate estimate. Various sources for the number of ice cream and coffee shops in California were reviewed as follows:

- 65,410 of coffee & snack shops in the US in 2022[12]
- 37,189 coffee shops in the US[13]
- 4,263 ice cream, fro-yo, and gelato shops in California[14]

The team agreed to assume coffee, ice cream, fro-yo, and gelato shops in California on average would each have approximately one dipper well. Determining the appropriate assumptions for other restaurants was more challenging. CEC's report titled: *Characterizing the Energy Efficiency Potential Of Gas-Fired Commercial Foodservice Equipment* published in October, 2014[15] was reviewed to determine the appropriate number of food service establishments by category that may have a dipper well. The CASE Team reviewed categories of quick-service restaurants, full-service restaurants, and institutional food service establishments assigning a percentage of locations with a dipper well, or multiple dipper wells, to the different categories of restaurants based on collective field experience. This is a similar process that Frontier Energy undertook in 2016, but with additional years of experience and broader expertise. The discussion on the appropriate assumptions varied greatly among the group resulting in a large range of numbers considered for the CA stock estimate. A field or market study on equipment counts could be helpful to inform rulemakings related to other categories of energy and water using food service equipment, particularly sanitation equipment. Two categories of food service establishments with large site counts and little information on equipment counts are Independent Full-Service Restaurants and Educational Services.

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[12] https://www.ibisworld.com/industry-statistics/number-of-businesses/coffee-snack-shops-united-states/

[13] https://www.worldcoffeeportal.com/MediaLibrary/WorldCoffeePortal/WCPExternal/Infographics/WCP-Project-Cafe-USA-2021-Infographic.pdf?ext=.pdf

[14] https://www.yahoo.com/lifestyle/this-state-has-more-ice-cream-shops-per-capita-126113708816.html

[15] https://fdocuments.in/reader/full/characterizing-the-energy-efficiency-potential-characterizing-the-energy-efficiency

Ultimately the CASE Team determined that an appropriate, updated CA stock estimate for dipper wells would be between 50,000 and 60,000, with the consensus that these numbers may still be overstated. Prior to performing a more detailed calculation, team members initial instincts were approximately 30,000 may be an appropriate stock estimate. The CASE Team reiterates that more data is needed to better understand the market and current stock of dipper wells and related products.

A market assessment of the ComEd service area, which covers over 11,400 square miles in northern Illinois[16] including Chicago, was recently completed by Frontier Energy but not available at the time of these comments.[17] The 'Results and Recommendations' subheading from the executive summary of the report was reviewed for these comments. An econometric analysis showed that there are just under 16,000 dipper wells in the ComEd service territory and that there are 4,450 acre-feet of water use per year as well as 40 GWh per year (including water heating energy and embedded energy) in savings potential across the service territory. These are significant savings for a replacement that has a total installed cost around $1,000 per unit. There are also found 5.5 million therms per year of gas savings available for hot water dipper wells fed by a gas water heater assuming 20 percent of the installed dipper wells are heated.

The 2017 Energy Dipper Well Field Evaluation by Frontier (2017 Frontier Field Evaluation) is one of the only studies to discuss hot and cold-water dipper wells separately using the examples of Los Banos and Madera mentioned above. In this study, the full-service restaurant used a hot-water dipper well, while the café used a cold-water dipper well. While no conclusions can be drawn from one example, some industry experts speculate that most dipper wells in California are connected to cold water, and it is relatively rare to see dipper wells running hot water. Since the 2017 report, additional sites have been added to the field evaluation. Frontier currently has publicly available data on ten restaurants with dipper wells in California collected between 2015 and 2019, two with hot water. This is consistent with a recent Frontier study[18] in Northern Illinois where 20 percent of dipper wells were considered to be heated based on the results of an end-user survey. The original savings calculations assumed 50 percent of dipper wells in California were heated; that assumption should be revisited.

8. Installation and operation costs of Dipper Wells (Questions 11, and 13-17)

Below is a summary of purchase cost of dipper wells as of January 4, 2022, including high end alternatives and baseline technologies:

- Alternative technologies
    - DipWell ScoopShower: $629[19]

[16] https://www.mc2energyservices.com/About-Us/Service-Map
[17] https://comedemergingtech.com/project/dipper-wells-market-research
[18] https://comedemergingtech.com/project/dipper-wells-market-research
[19] https://www.centralrestaurant.com/The-Dipwell-D10SS20-Eco-Scoop-Shower-20-Ice-Cream-Dipwell-c99p739448.html?st-t=google_shopping_283-006&utm_source=google&utm_medium=organic&utm_campaign=shopping&utm_content=surfaces_across_google&gclid=Cj0KCQiAoNWOBhCwARIsAAiHnEhwJyZTW-I-3SQwPzSWYtAUzIdhzIET9jgyxlzFOIF2Iqod7lDlYTIaAidPEALw_wcB

- DipWell Ecoscoop: $629[20]
- ConserveWell 87770: $519[21]
- ConserveWell Horizontal: $562[22]
- ConserveWell Drop In: $400[23]

- Baseline Dipper Wells
  - Krowne 16-149 Dipper Well: $160[24]
  - Nemco 77316-7 Ice Cream Spade Cleaning Dipperwell: $151[25]

Based on a prior project in 2013/2014[26], installation costs for dipper wells were about $1,400/unit, excluding incentives. The project was completed by a regional family dining restaurant chain that installed heated wells, a new technology at that time, in place of existing hot and cold-water dipper wells in 49 sites totaling just under 200 dipper wells. The installation costs included the unit, a metered faucet, all electrical (running service and installation of a GFCI outlet) and plumbing work. In this project rollout, the unit cost and installation were high at that time due to the new technology and some travel for a dedicated electrician. The units were approximately $800 and installs approximate $600, which may be more in line with today's costs.

Considering many of the alternative dipper wells require power and appropriate power may not exist in the location of the existing dipper well, electrical work should be considered as part of the installation costs.

A more recent Regional Water Demand and Conservation Projections for the Bay Area Water Supply & Conservation Agency's[27] estimated installation costs of only $510/well for the ConserveWell Dropin model and approximately $565/well for the ConserveWell Wallmount model.

Dipper wells are typically only replaced upon failure. The method of failure is typically related to the faucet no longer turning off resulting in the unit being left on or turned off at the water supply line. CEC has stated a 10-year product life assumption in this RFI. A more appropriate assumption may be 12 years, in line with a dishwasher, which still may be conservative as dishwashers have more moving parts with the potential to fail. Alternative technologies to replace dipper wells are too new to the market to determine an appropriate product lifetime. It is expected that the replacement options for dipper wells may have a shorter lifetime as they are more complex with

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[20] https://www.centralrestaurant.com/The-Dipwell-D10SS2-0-Eco-Scoop-Shower-2-0-Ice-Cream-Dipwell-c99p739448.html
[21] https://www.gofoodservice.com/p/server-products-87770?utm_source=google&utm_medium=cpc&adpos=&scid=scplp60726&sc_intid=60726&gclid=Cj0KCQiAoNWOBhCwARIsAAiHnEjl01bO-MmdFy0LNKOWQdUxsE2bh6B-IXDALLJXI6N9hD06cNa3lK0aAno1EALw_wcB
[22] https://www.centralrestaurant.com/Server-Products-87750-ConserveWell-Utensil-Holder-with-Countdown-Timer-c99p329507.html
[23] https://www.centralrestaurant.com/Server-Products-87760-ConserveWell-Drop-In-Utensil-Holder-c99p329469.html
[24] https://www.centralrestaurant.com/Krowne-Metal-16-149---Dipper-Well---With-Faucet-c99p735059.html
[25] https://www.centralrestaurant.com/Nemco-77316-7-Ice-Cream-Spade-Cleaning-Dipperwell-7-inW-c99p24194.html
[26] https://www.epa.gov/sites/default/files/2017-05/documents/ws-commercial-casestudy-sharis-508.pdf
[27] https://bawsca.org/uploads/pdf/BAWSCA_Regional_Water_Demand_and_Conservation%20Projections%20Report_Final.pdf

pumps, ozone generator, and sensors, or heating elements. Dipper wells are almost never leased due to the low equipment cost. Once installed, it is unlikely that a dipper well would be removed and reused in a different location.

The run time varies by site types but is typically the full operating hours. Assuming a 16-hour workday, an average dipper well consumes roughly 175,000 gallons of water per year.[28] Frontier Energy estimates that this much water consumption can result in over $1,000 in water and sewer charges, and if the dipper well is using hot water, it will cost another $1,000 to heat the water.[29] Frontier Energy uses $0.22/kWh for electricity, $1.10/therm for gas and $13/CCF for water for gross CA rates, though water rates vary significantly by municipality. A 16-hour workday is likely on the long end as coffee and ice cream shops tend to remain open for either breakfast and lunch or lunch and dinner. A worst-case scenario would be for a dipper well faucet to be left on overnight.

Typically, manufacturers who produce dipper wells also provide a full product line of plumbing fixtures. Some plumbing equipment manufacturers with broader offerings will offer one option for dipper wells. Faucet manufacturers will typically sell a basin and faucet separately. Advanced dipper wells are more often offered by a small, specialty company as an only product.

9. Impacts of standards for Dipper Wells (Questions 19 and 20)

Water efficient dipper well alternatives are manufactured outside of California in Arkansas, Wisconsin, Massachusetts, and Germany. Fisher Faucets located in Tulare, CA, produces baseline dipper wells, T&S Brass has a West Coast distribution center in Simi Valley, CA. Both are large manufacturers that produce other faucets and fixtures. Other dipper well manufacturers are located outside of CA. Dipper well regulations are not expected to impact small businesses involved with manufacturing in California.

The CASE Team estimate that small businesses involved with the sale or installation of dipper wells would not be affected by regulations. There may be a need for education on the installation of new technology alternatives to dipper wells; however, this would be a minor impact as these products are not overly complicated.

Outside of businesses involved with manufacturing, sales, or installation of dipper wells, there is the potential for a small coffee or ice cream business to experience a higher first cost to replace existing dipper wells with new technologies. However, the payback period of a more efficient alternative is short and cost savings will be realized over the product lifetime.

10. Conclusions

As noted, the CASE Team appreciates CEC moving forward with this regulation and is available to assist as needed, including working with CEC to update cost-effectiveness calculations using the updated assumptions discussed in this RFI. While there is a savings potential by reducing the maximum flow rate of continuously flowing dipper wells, more significant savings can be realized by reducing run times and/or eliminating continuously flowing dipper wells.

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[28] The equation for calculating dipper well annual water consumption in gallons per year (gpy): *Dipper Well Water Consumption (gpy) = 0.5 gpm * 60 minutes * number of hours per day * 365 days per year,* where 0.5 gpm is a common flow rate for dipper wells, this value can range from 0.2 to 1.0 gpm depending on the specific appliance, but 0.5 GPM is a commonly cited average.

[29] 2005 / FSTC / How to Achieve the Most Efficient Use of Water in Commercial Food Service Facilities