

FINAL REPORT:
**Heat Pump Water Heater Permit
Requirements and Costs in San Mateo
County**

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Context/Background/Methodology:

The purpose of this research report is to document the costs and requirements for heat pump water heater (HPWH) building permits in San Mateo County jurisdictions. The information presented is intended to support future policy efforts to simplify the permit process for residents to convert from non-renewable energy sources (such as natural gas) to renewable energy, specifically electric, powered appliances in their homes. The research scope is focused on permits to install a HPWH in place of a natural gas appliance and is limited to existing single-family homes.

During a Permitting Reforms Meeting on March 24th, 2021,¹ attendees mentioned a project that had compared the overall costs for all-electric versus natural gas installations and equipment in a single-family home without an electrical service upgrade included. On average, it was found that the cost for going all-electric is twice as much as natural gas. The total cost for a home with electric equipment was \$18,350 and the total cost of the home with gas equipment was \$9,000, a difference of \$9,350 dollars. This difference makes it difficult to convert a home to all-electric. Right now, the most affordable option for water heaters is natural gas, which is a roadblock to San Mateo County's goal of achieving carbon neutrality before the State's goal of 2045. If electricity is to become the primary source of energy in the county within the next twenty-five years, then there needs to be some form of subsidy or decrease in the overall cost of conversion to all-electric, so that it is the same price or less than natural gas. This would make it a more competitive option for the average resident. Jurisdictions have the opportunity to explore options to make it easier and cheaper to obtain necessary permits, in order to bring down overall project costs.

The methodology used for data collection for this report is as follows:

1. Contacted city and county building departments of all 21 jurisdictions within San Mateo County to gather HPWH permit information through a six-question survey, using informational resources such as: city websites, phone numbers, and city staff email addresses.
2. Recorded contact information and survey responses in an Excel spreadsheet.
3. Included recommendations from persons who have undergone the permit process.
4. Participated in conversations to coordinate recommendations with regional and state entities.
5. Compiled information into a report, with summations of the findings and recommendations for making HPWH permit requirements and costs more uniform across San Mateo County.

Addendums to Methodology

Throughout this research process, there were a few factors that contributed to the scope of permit information gathered. The cities of Brisbane and Menlo Park, and the County of San Mateo did not participate in the initial survey. The County of San Mateo Office of Sustainability

(OOS) is continuing to try to gather information from these jurisdictions; any updates to the report will be posted on the following website: smcsustainability.org/energy-water/home-electrification. While in contact with city building department permit staff members, not all chose to answer all the questions on the survey, leaving some pieces of data unknown. What was not gathered through outreach was assembled through data found on individual city websites insofar as that was feasible, although there are still some questions left unanswered for specific cities. The data metrics that were intended to be collected for this report include: the number of jurisdictions that provided permit data for the research project, the number of additional stakeholders reached in interviews, average amount of time it takes for permit applications to be pulled and finalized, average cost for permit processing, and how much time and money jurisdictions in San Mateo County could save if they adopted the best practice of simplifying the permit process for HPWHs.

Summary of Findings:

Throughout the course of the research, various findings from eighteen building departments within San Mateo County have been compiled on their respective HPWH permit processes, while also factoring in recommendations from building permit officials around the county and a couple of regional energy entities. These entities included the Bay Area Regional Energy Network (BayREN) and Silicon Valley Clean Energy (SVCE). Many recommendations were drawn from the SVCE Guide and supplemented with information gained specifically through this research process. During this period, interesting findings were made that identified sections of the permit process which could use adjustments to support both the residents and the building department staff members. Overall, the different building departments of the 18 jurisdictions of San Mateo County who answered the survey have varied permit processes that make, on average, the consumer's undertaking more complicated when attempting to get an electric HPWH installed into a single-family home in a quick, safe, and hassle-free way.

Section 1 Findings: Permit, Fee, and Document Requirements

These first two survey questions that were posed to building departments for this project pertain to the different documents and permits required by each jurisdiction to begin the HPWH permit process. Patterns, averages, and new directions were analyzed to determine whether these requirements could be made to be more effective.

Survey Question 1: What permit(s) are required to replace a residential gas water heater w/ an electric heat pump water heater?

Results: Each jurisdiction has different types of building permits required for HPWHs, and overall a variety of permits are used, including electrical, plumbing, and mechanical permits. A few building departments had combination permits available, which means that all three types of permits are combined into one application, reducing the number of permits needed for that particular electrification project. Specifically for HPWHs, San Carlos has a combination permit

that is made for water heaters and electrical panel projects. This creates a separate permit process specifically for water heaters but allows for less nuance with general electrification projects in single-family homes.

Survey Question 2: What documents are required for submittal? How much do those documents cost? Can calculations & specifications be provided on drawings or must they be separate?

Results: The documents required with each permit also varied from city to city. While reviewing the data, the most common documents required for HPWH permits throughout 18 jurisdictions include: a full site plan, load calculations, equipment manufacturer specifications, energy compliance forms, the permit application itself, and a contractor declaration or owner/builder form.

Another detail that cities differ on is the average permit application fee, which can range from \$50-250 just for applying. There are some outliers however, which include Hillsborough, with a range between \$240-1000, and Woodside, with a range of \$350-500. Both ranges depend on the scope of work of the application. Additionally, during a remote conversation with SVCE representatives about their permit streamlining efforts on March 29, 2021, they discussed that they had been working on a Best Practices Guide for Streamlining Electrification Permitting, which is partially based on the results of interviews and roundtable discussions with local building officials in the thirteen SVCE member agencies, as well as contractors, industry advocates, and other practitioners. They revealed that most contractors will give a quote based on the city with the most expensive permit fees and complicated process. This is another reason for standardizing the prices across the county, so that applicants have a relatively uniform experience across the county and are not charged based on another city's expensive fees. While this premium is an indirect effect of the permit process, it still holds a lot of power when consumers are making the decision to pursue these electrification projects. While some cities do rely on permit fees as a source of revenue, a standardized fee across all jurisdictions in the county would help maintain that revenue and ensure the city or county can use the application fee to appeal to residents. In addition, Millbrae has created a system that waives the second or third fee for different types of building permits for the same project. Taking this a step further, these fee waivers could be applicable specifically to electrification projects, appealing to even more residents. This added waiver benefit could potentially aid residents with large homes or multiple single-family properties; or even perhaps residents that have large electrification projects that cover different permit requirements. Furthermore, contractors would be more inclined to have affordable prices because of decreased permit fees for additional permits in one project and would encourage more applicants for electrification projects as a result.

Furthermore, most building departments did not provide an answer for the types of documents required and how they need to be submitted. None of the six building departments that did answer had a preference; it is up to the applicant which way they choose to present the required documents (e.g., load calculations and manufacturers specifications).

Additionally, an Environmental Quality Commissioner with the City of Menlo Park, who has personally experienced the electrification permit process for a home, noted that permit application requirements such as plans and drawings are not always clear to residents when they apply initially. This creates more time and hassle because the additional documents must be drawn up and then added into the process for review. It would be more productive to communicate these requirements earlier, clearly, and concisely in a pre-application checklist or fact sheet to decrease the uncertainty around requirements for applicants.

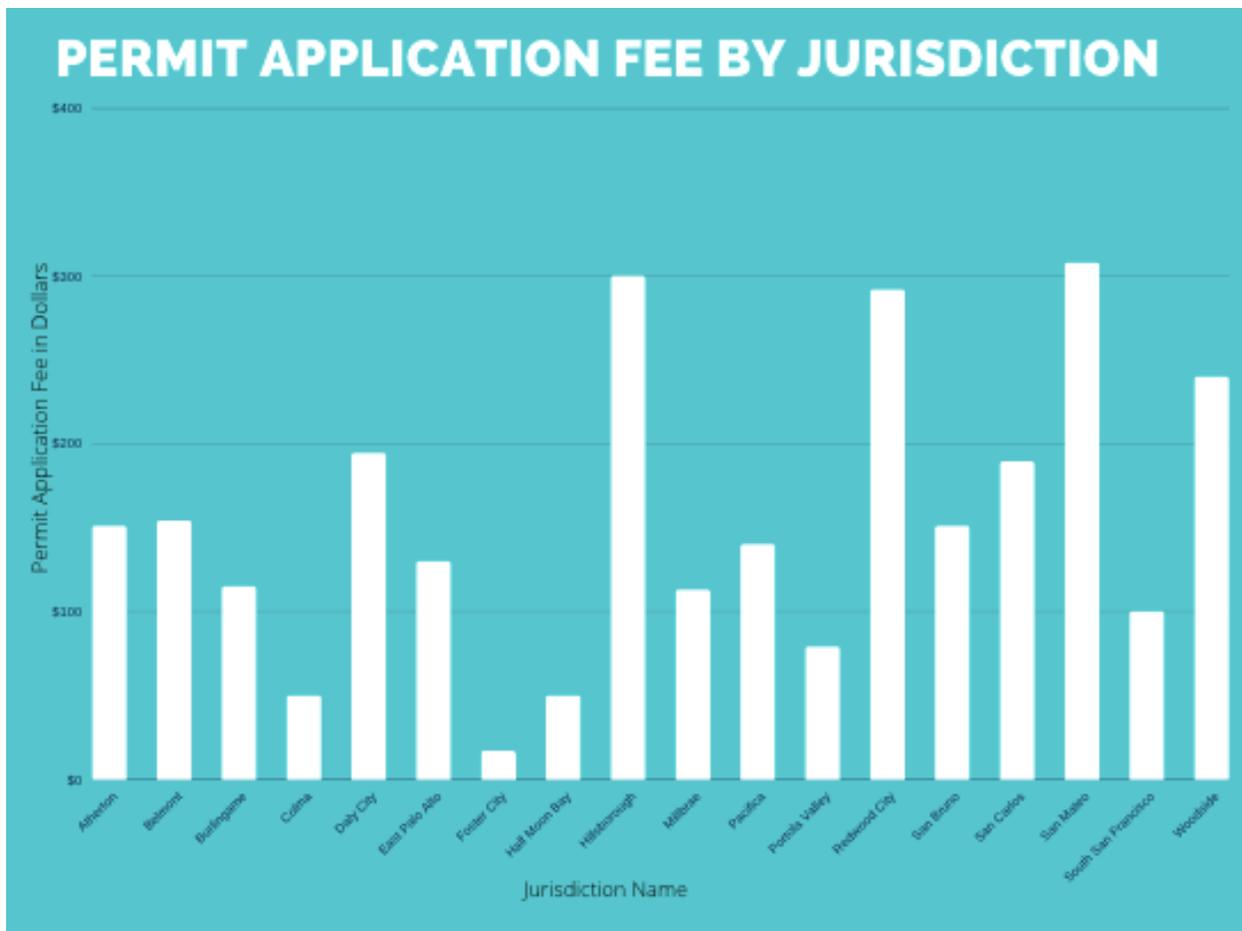
According to the Commissioner, many aspects of the HPWH permit process make it less appealing and more complex to deal with than natural gas equipment. One of the most noticeable aspects of the process that places a burden on the applicant is the premiums that installers charge to apply for any electrical appliance permit and undergo the process as a stand-in for the consumer. The Commissioner was quoted a premium of \$1,000 for the permits for a \$4,000 electrification project, which is a significant sum just for the contractor to deal with the complicated permit process on her behalf. This large fee is a symptom of a larger issue of the inefficiency of the process and is a sunk cost to the applicant. This makes the undertaking of converting a home to all-electric a privileged process that only the select few can afford to do.

Recommendations for permits, fees, and documents required for permitting:

- Create a combined permit (e.g., mechanical, electrical, and plumbing) that charges a flat rate for up to three items. While some cities and the County of Santa Clara already do this, it is recommended that all jurisdictions adopt the 3-in-1 model, in order to make the process more uniform around the county and create a universal and simpler format for permitting projects in general.²
- For jurisdictions that can make up the funding in other areas or have some form of subsidy, offer discounted/cheaper permits for electrification projects to promote electric appliances over natural gas.³ On a baseline level, making the process of conversion to all-electric cheaper will make it more competitive in the market, and more appealing to those who wish to spend less money on their home appliances.
- Provide pre-application resources. Develop a local jurisdiction-specific submission requirement checklist and prioritize permit applications that meet all items on the agency's checklist.⁴ In addition, list the details of permit process checklists and fact sheets specifically for electrification online, potentially separating checklists even further into different appliances and their respective settings. For example, provide a HPWH checklist for single-family homes. This method proactively engages applicants who are potentially interested and communicates to the applicants the best way to design the project, in order to make sure they do not activate additional review and increase the timeline, while also decreasing the number of incorrectly filled out applications in the review process.
- Create an all-electric home conversion booklet/pamphlet.⁵ An overarching guidebook will help residents understand and consider the benefits of electrification throughout

their home and the long-term financial benefits associated with that process. A visual and simple guide with all information in one place will decrease the confusion residents would have trying to understand each process individually.

- Create a bundled discount service if a resident chooses to upgrade their entire home to an all-electric home at once; this will make renewables more competitive.
- Investigate the presence of potential hidden fees in the permit process. During the research process there were many interesting findings that came up. One of them was that of hidden fees placed along the permit process that are not revealed up front. When inspections are not able to be completed correctly or are not passed, often another fee is charged and the timeline is pushed back. More research is needed to determine how these fees affect potential applicants, and how these additional fees affect the rest of the permit process.



The chart above shows the permit application fee per city that participated in the survey. There is a wide range of fees charged depending on the city, as illustrated in the graph. The highest fee range was in Hillsborough with an average of \$300-500 per HPWH permit application. The lowest fee was in Foster City with a baseline fee of \$16.

Section 2 Findings: General Permitting Process

This section focuses on the nuanced permit processes of the various jurisdictions around the county, how they differ and what they have in common, as well as recommendations for improving the overall process.

Survey Question 3: Can this be an over-the-counter process? If not, how long would it (generally) take for plan review?

Results: Throughout the cities, there is a mixed bag when it comes to the over-the-counter process. Some building departments can provide over-the-counter services for HPWH permits, while others cannot because of specific documents that must be properly vetted before giving the application to the consumer. The average timeline for plan review is between 2 and 20 days, with the longest review times dependent on the complexity of the project. Additionally, on average, the plan review increases in time by 10-15 days if an electrical panel upgrade is required as well.

Survey Question 5: What is the process for finalizing a permit, and how long does it take (including the final inspection)? Can the homeowner use the new water heater prior to inspection?

Results: The cities also had different preferences for using the water heater before final inspection. Some stated it was fine to use beforehand, while others reiterated the importance of the final inspection for the health and safety of those in the home as the priority. The majority of building departments were able to accommodate next-day final inspections if the applications are submitted by a certain time, while other departments needed to schedule the inspection a week out because staff are so busy already. The final inspections themselves take, on average, about 30 minutes to an hour, with some outliers. The timeline of the process also depends on whether each step is correctly completed. If not, then “redos” add an extra few days to a week depending on which step in the process the applicant is on. Overall, the timeline for the entire permit process was rarely noted in the responses received. Some departments also noted the timeline of the permit process was dependent on the contractor and their pace of work. Another response received from East Palo Alto permit staff stated that the entire process really depends on the pace of the workers. This may indicate that the priority for building department staff is, on average, the nuance of the process and making sure all the steps are correctly completed, rather than how long the permit process takes.

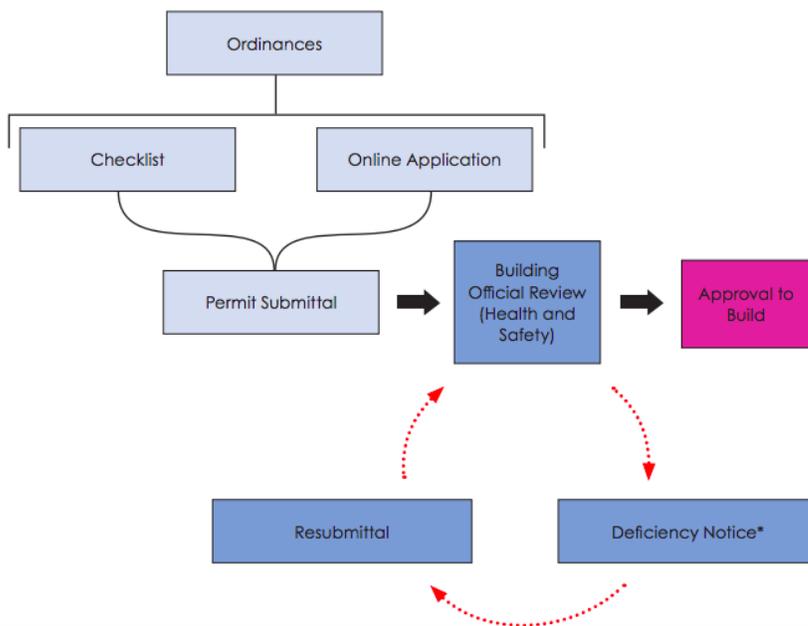
Recommendations for the General Permitting Process:

- Standardize application requirements, application processes, plan check processes, inspection guidelines, inspection protocols, and internal plan review for common electrification technologies such as HPWHs that combine previously unrelated permit processes (in this case, water heater replacement, and new electrical receptacle/circuit) to help ensure applicants are providing pertinent information in the permit application,

which will help accelerate the plan review process.⁶ In addition, create a standard version for all the protocols associated with electrification technology for respective jurisdictions. This will decrease the workload for permit staff trying to create a whole new process for each specific piece of electrification technology and instead only require tailored processes for special circumstances or scopes of work.

- Keep track of *all* electrification permit data and note trends.⁷ Also keep track of *all* electrification permit application and inspection errors data.⁸ Keeping track of this data provides a base understanding of the most commonly missed, inefficient, or misunderstood aspects of the electrification permit process. This data can be analyzed to improve processes to minimize confusion and avoid extensive timelines.
- Ensure that the permit processes (inspection, plan review, requirements, procedures) are relatively uniform across the county.⁹ Of all the recommendations, this may be the most difficult to coordinate on the local level but will significantly increase the likelihood of participation from more residents in the county for electrification technology. Contractors will be able to reduce their premium for undergoing the permit process, and, because the new standard process around the county will be easier, many applicants may be the residents themselves.
- Strongly encourage pre-application meetings for large projects being pursued in communities that have not yet established a streamlined permit process and/or for projects that might trigger additional review.¹⁰ The EV Guidebook suggests using pre-application meetings as a way to advise more complex or larger electrification projects and in order to help avoid additional review during the permit process as well as extra work for both the applicant and staff members. This would be especially helpful for when a HPWH is part of a larger electrification remodel. For special circumstances, the additional time spent during the pre-application process saves time down the line, because the details of that project are agreed upon and clarified within that meeting so that the applicant understands the necessary requirements for that undertaking.
- Another recommendation from the EV Guidebook is that successful implementation requires clear communication about how project applicants can design their project to avoid special review. For example, the City of Sacramento tells applicants up front to design projects to avoid impacts to heritage trees and bio-swales in order not to complicate the review process.¹¹ This recommendation would be extremely helpful to simplify the permit process for HPWHs, electrification, and the general process the building departments use. For example, by explicitly stating in HPWH general guidelines to be aware of off-limit zones to place a water heater in the home to avoid special or additional review, applicants can be aware of this ahead of time and avoid those complicated processes all together.
- Provide training opportunities for building department staff to help them stay up to date on new technologies, building systems, and mandates around electrification. This will help the staff feel confident in being prepared to deal with the processes surrounding those technologies and will also improve plan review and inspection

processes.¹² Additionally, this training could be from third parties. BayREN already provides HPWH training for building department staff, so they are well-positioned to support this recommendation. Similarly, a staff member from SVCE said this about working with building department staff for improving electrification permit processes: “Hold space for building department staff around their understanding of electrification tech, and how they feel about future energy transitions, their experience with these processes, and if they have any recommendations from their perspective”.¹³ It is imperative that the staff is given a say in how these processes are formulated and their level of comfort with the technology that will be used for these processes. They are the people on the ground, using online technology and procedures daily, and will have the most interactions with it. If the technology does not work for them, then a compromise or training will be needed.

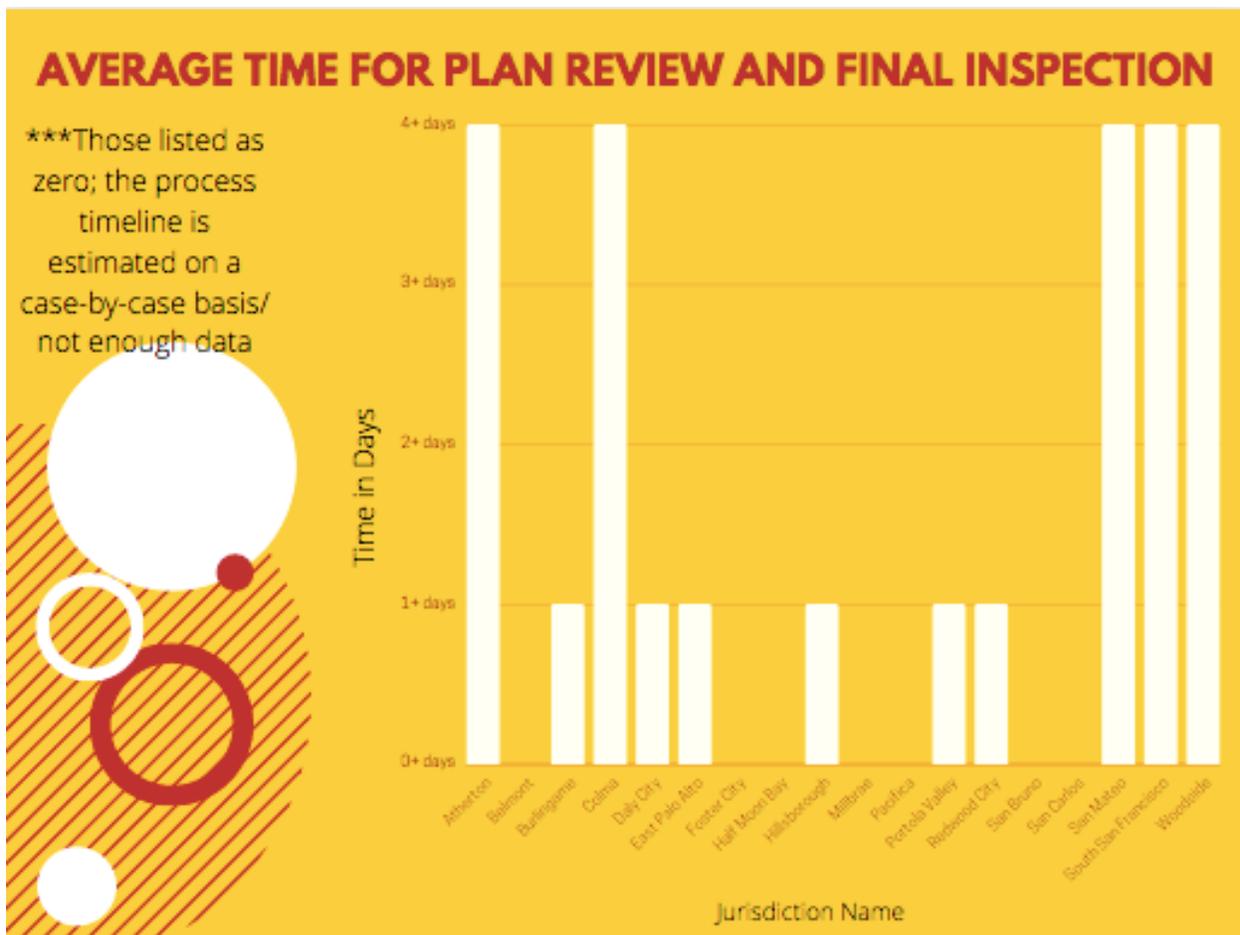


This infographic was part of the EV Guidebook³ and exemplifies what could be done to simplify the electrification permit process as an overall best practice. Most permit processes include some version of the process illustrated above, but the biggest difference between the jurisdictions is the beginning of the process, prior to permit submittal. First, ordinances from the municipal authority inform what goes on the pre-application checklist and the online application tool and process. The online application and checklist already take most of the confusion out of the permit process, by sorting the permit application processes into their respective sections, such as renewable or non-renewable, or automatically kick back those applications that do not meet the base requirements, such as calculations, or have blank spaces in the application. Both options lead to the permit being submitted and processed by permit staff, then sent to the building official for review. If the application does not meet all the requirements, a deficiency notice is sent to the applicant, and then it is resubmitted by the

applicant with the missing information and sent back to the building official who gives the approval to build.

Opportunities to conduct additional research on the following questions that arose during this study:

- What do residents who have undergone the electrification permit process have to say about it? While there are some studies and guides done with input from these residents, perhaps a research focus group comparing old processes with new potential processes could create a better understanding of what works and what does not for average residents. Moreover, should there be a position/team created to reevaluate/restructure the permit process in the county? This team would be able to explicitly be responsible for improving the process and would coordinate with entities and jurisdictions about what the next plan of action could be.
- How does the HPWH process differ from that of the electrification of other appliances? Are there any other differences that change how the process works? More research is needed to understand the full scope of work around electrification technology in the permit process.
- What is the best term to use for improving the permit process? While in communication with SVCE and building department staff, it was suggested to change “streamlining” to another word, potentially, “simplifying.” Building officials/staff do not like the use of the word “streamlining,” as it creates a negative connotation around existing permit processes. Instead, language and practices need to reflect collaboration and understanding of building departments’ existing expertise and staff capacity.



This chart illustrates the relationship between the cities and their average plan review and final inspection timelines combined into a single number. The longest plan review and final inspection timeline came from Woodside with an average of 33 days or a little over a month. The shortest came from Belmont with an estimated average of two days.

Section 3 Findings: Online Permit Process

The following sections contain information around the transition to and the nuance of online processing, how it differs around the county, and where there are similarities.

Survey Question 4: Is an online permit available?

Results: Due to COVID-19, almost all cities have a form of online permit available in order to ensure health safety for staff members and applicants. These online processes are extremely varied in nature. Some are non-automated, meaning permit staff sends a PDF file to applicants through email, it is printed/filled in by the applicants and sent back through email. The staff then sends a secure link for credit card transactions. Others are completely automated and have their own webpage/sites for permit applications. These automated forms vary as well;

some are more complicated than others. The Town of Colma is the only jurisdiction that currently requires applicants to print, fill out, and go in person to drop off or sign the application.

Recommendations for the Online Permit Process:

- Create a comprehensive web-based system that supports all steps in the permit process for respective jurisdictions: from application to submittal, through plan review and inspection coordination, etc.¹⁴ Each jurisdiction has nuanced requirements for their process. By creating an online database with these respective nuances in mind, the process will be sped up by the quick automated responses provided by the online software. This will significantly change the way that the process can be accessed and viewed not only by the permit staff, but also the applicant who wishes to know where they are in the process. These tools will help organize the information into a single database, creating less paperwork and confusion.
- Create a uniform online secure system and test it in a few jurisdictions with similar procedures to test the efficiencies and the bugs of the online process. According to an Environmental Quality Commissioner for the City of Menlo Park, online processes can be more complex, with queuing at each step, and be more difficult than over the counter in some cases.

Opportunities to conduct additional research on the following question that arose during this study:

- What platforms (online or otherwise) do building departments use for these processes? While looking at the responses for survey question #4, it became clear that not every building department uses an online system to track their permit processes. More research should be done to address the current systems that staff use to maintain and keep track of the timelines and the permit process in general, as well as assess staff comfort level with online platforms for permit process.

Section 4 Findings: Electrical Panel Upgrades

This final section surrounds the HPWH permit process when an electrical panel upgrade is required; and if there are any patterns, averages, or new directions that allow these requirements to be more effective and concise.

Survey Question 6: How would the permit requirements, cost, and wait times change if someone needed an electric panel upgrade to accommodate the water heater, and would it require a separate permit? If so, what additional documents are required, how much do they cost, and how much more time would the process take?

Results: The permit requirements, documents, costs, and wait times do change with an electrical panel upgrade depending on the building department. Most cities also require a

licensed electrician or electric contractor. Additional fees ranging from \$50-600 for an electric panel upgrade are also required. According to the 18 cities providing responses, most require an additional electrical permit application with the upgrade, even if the applicant already has an electrical permit for the HPWH. According to staff at Portola Valley, East Palo Alto, and Foster City, the wait times may change because staff may need extra time to process the new addition or because of the difficulty in coordinating a PG&E inspection with the respective jurisdiction on the same day for the upgrade. Some (e.g., Foster City) also have longer plan review timelines due to the nature of the upgrade (size and type of service), and the level of information given to staff, as well as the technical competency of the electrical contractor.

Otherwise, the panel upgrade and the HPWH permit are processed simultaneously. The most common documents that are required in addition include: full site plans and load calculations, as well as an updated project valuation. It is also important to note that the upgrade requirements change depending on the size of the new electrical panel. For example, in the Town of Atherton, installing a panel above 600 amps requires installing underground service cables. Moreover, the biggest roadblock for wait times and additional fees is coordinating PG&E and the building department to complete the upgrade on the same day.

Recommendations for the Electric Panel Upgrade Permit Process:

- According to a Green Building/Recycling Specialist with the City of Burlingame, in order to increase efficiency with electric panel upgrades, the recommendation that would make the most significant difference would be to: “create a document or a standardized process for PG&E when dealing with electrification construction projects, for example, when wanting to upgrade to an electric water heater – detail standard process for PG&E work requirements for that electrification scenario.” Having an electronic/online document or standardized process within each building department for interactions with PG&E on electrification projects would greatly simplify the confusion that applicants and staff face around the nuances of each project. It would save time, because there would already be a standard permit process for that project, and the staff would not have to formulate a plan of action for that specific project, unless it required additional review or was more complex. This could be available online on a city website as well as potentially in the database that permit staff use, to provide both parties with clarity.

Opportunities to conduct additional research on the following question that arose during this study:

- What are the relationships between PG&E, the respective jurisdictions and permit processing? There was little information about the relationship between PG&E and the permit process both in the research questions and responses, and so more research should be done to understand that complex relationship, and steps in the permit process, specifically with electrification and panel upgrades in mind.

Conclusion

In conclusion, there are numerous recommendations that can be made to improve and simplify the various HPWH permit processes throughout the county in order to encourage residents to convert from non-renewable energy sources to renewable, specifically electric, appliances in their homes. The simplification of the process also brings an added benefit to the permit staff, making their jobs less complicated and more hassle-free. While these recommendations do not include how much time and money jurisdictions in San Mateo County could save if they adopted the best practices, it is important to note that all these recommendations working together in tandem will save permit staff members around the county more time and energy while working through the process. Overall, by encouraging cities to create a uniform standard for electrification permit processes around the county, the average resident will be able to access and install an electric HPWH in a single-family home in a quick, safe, and hassle-free way.

Appendix

- SMC Building Jurisdiction Permit Survey Raw Data Spreadsheet is available [here](#)
- SVCE Electrification Permit Best Practices Guide can be found [here](#)
- California Governor's Office of Business and Economic Development: EV Charging Station Permitting Guidebook can be found [here](#)
- Green Building/Recycling Specialist, City of Burlingame
- Environmental Quality Commissioner, City of Menlo Park

¹ Attendees' organizations at the meeting in alphabetical order: BayREN, County of San Mateo Office of Sustainability, Menlo Park Environmental Quality Commission, Menlo Spark

² From the SVCE Electrification Permit Best Practices Guide

³ From the SVCE Electrification Permit Best Practices Guide

⁴ From the SVCE Electrification Permit Best Practices Guide

⁵ From the SVCE Electrification Permit Best Practices Guide

⁶ From the SVCE Electrification Permit Best Practices Guide

⁷ From the SVCE Electrification Permit Best Practices Guide

⁸ From the SVCE Electrification Permit Best Practices Guide

⁹ From the SVCE Electrification Permit Best Practices Guide

¹⁰ From the California Governor's Office of Business and Economic Development's EV Charging Station Permitting Guidebook

¹¹ From the California Governor's Office of Business and Economic Development's EV Charging Station Permitting Guidebook

¹² From the SVCE Electrification Permit Best Practices Guide

¹³ From the SVCE Simplifying Permitting Meeting on April 8, 2021.

¹⁴ From the SVCE Electrification Permit Best Practices Guide