

Improving Residential Electrification Access and Affordability through Permitting Reforms

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ABSTRACT

Achieving widespread residential electrification requires the deployment of electric technologies like heat pumps and accessible, affordable, and efficient adoption pathways that reduce soft costs and administrative friction. One common barrier to electrification is permitting, which can vary significantly across jurisdictions and create administrative hurdles for contractors and homeowners. Compounding permit fees, such as separate charges for building, electrical, plumbing, and mechanical approvals, further increase costs and discourage adoption. To understand and address these challenges, Cadmus conducted a comprehensive study of residential permitting practices across multiple municipalities in MCE's service territory, drawing on surveys and one-on-one interviews with contractors and permitting authorities.

The study assessed permit fee ranges, permitting timelines, procedural complexity, and pain points experienced by contractors, and identified municipalities that have adopted streamlined approaches. We explored innovative solutions with stakeholders, such as online permitting, combined permits, reduced fees, self-attestation options, and standardized procedures to reduce barriers and encourage broader participation in electrification projects. Engaging permitting officials provided insights into operational limitations, procedural constraints, and opportunities for streamlining permitting processes.

Findings highlight opportunities to improve permitting efficiency, strengthen contractor engagement, and reduce administrative burden, creating a more seamless process for homeowners to adopt beneficial electrification technologies. The study identifies actionable improvements that consider contractor and permit authority perspectives, supporting equitable access to residential electrification and helping overcome economic adoption barriers. These findings demonstrate how strategic engagement with municipalities and contractors can promote broader adoption of electrification measures that serve all communities.

Introduction

Residential electrification is widely recognized as a cornerstone strategy for achieving decarbonization in the building sector, reducing greenhouse gas emissions, improving indoor air quality, and enhancing long-term energy affordability. Heat pump technologies are commercially mature and increasingly cost-competitive because of declining equipment costs, particularly when paired with incentives. However, the pace of adoption of these technologies has lagged behind policy ambition, especially in existing residential buildings.

While much of the relevant literature (e.g., TECH Clean California 2025; Cohen et al. 2025; Less et al. 2021; Vine et al. 2016) focuses on equipment performance, upfront costs, workforce readiness, and consumer awareness, less attention has been paid to the administrative systems that govern technology adoption. Among these, local permitting processes play a critical but often underestimated role. Permitting requirements for residential electrification projects

vary widely across jurisdictions, creating administrative complexity, unpredictable timelines, and additional costs for contractors and homeowners. In some cases, permitting-related delays and fees can materially affect project feasibility, particularly for low- and moderate-income households.

California offers a useful lens through which to examine these challenges. The state's advanced building energy codes and aggressive climate targets have accelerated electrification efforts but also introduced layers of documentation, compliance, and verification that interact unevenly with local permitting practices. Differences in municipal staffing, digital infrastructure, fee structures, and interpretation of state codes result in a fragmented permitting landscape that can inhibit consistent market growth.

This paper presents findings from a comprehensive study of residential electrification permitting practices across four counties in California: Solano, Napa, Contra Costa, and Marin. These counties were selected because they fall within MCE's service territory and collectively span a range of urban, suburban, and rural contexts with diverse permitting practices and varying levels of electrification activity, allowing for meaningful cross-jurisdictional comparison. Drawing on literature review, contractor surveys, and in-depth interviews with both contractors and permitting authorities, the study evaluates how permitting fees, timelines, procedural complexity, and jurisdictional variation affect the deployment of residential heat pumps and heat pump water heaters (HPWHs). The analysis focuses not on any single utility or program, but on systemic barriers and opportunities relevant to jurisdictions nationwide.

By examining permitting practices from both the contractor and permitting authority perspectives, this paper identifies actionable reforms that can reduce administrative burden while maintaining safety and code compliance. The findings contribute to a growing body of evidence that permitting reform is a critical lever for improving access, affordability, and equity in residential electrification.

Study Approach

The study employed a mixed-methods approach to capture both structural patterns and lived experience within residential electrification permitting systems. Each phase of the research was designed to build on the prior one: findings from the literature review informed the development of contractor survey questions and interview guides, while survey results in turn shaped the focus areas explored in depth through qualitative interviews with contractors and permitting authorities. Research included the following activities:

- Targeted literature review of permitting practices related to heat pumps
- Compilation and analysis of permit fee and timeline data from municipal sources
- A contractor survey distributed to 202 contractors across the four counties, yielding 44 partially completed and 34 fully completed responses
- Qualitative interviews with six contractors and permitting authorities from nine jurisdictions

Contractor engagement focused on firms actively installing residential heat pumps and HPWHs, capturing variation in business size, service offerings, and geographic coverage. Survey responses provided quantitative insight into common barriers to adoption of these technologies, while interviews allowed for deeper exploration of recurring pain points, jurisdictional inconsistencies, and adaptive strategies used by contractors.

Permitting authority interviews explored internal workflows; staffing constraints; review practices; inspection scheduling; and the feasibility of streamlining options, such as online permitting, express permits, and standardized documentation. These interview topics were drawn from recurring themes identified in the literature review and validated by preliminary contractor survey responses. This dual-perspective approach enabled the study to distinguish between issues driven by administrative structure versus those arising from incomplete applications or knowledge gaps.

Findings

Literature Review

California's residential permitting and inspection framework for heat pump HVAC systems and HPWHs is more administratively complex than national standards, largely due to Title 24 documentation requirements and HERS¹ verification process (CEC 2025; U.S. DOE 2026). Projects frequently require multiple certificates,² along with prescriptive forms for additions, alterations, electric-ready provisions, and variable-capacity heat pump credits (CEC 2025). At the national level, federal appliance standards such as 10 CFR 430.32 focus on minimum efficiency requirements for heat pumps and water heaters (U.S. DOE 2026), and are implemented alongside model codes such as the National Electrical Code (NEC), International Residential Code (IRC), and International Energy Conservation Code (IECC), which establish electrical safety, building safety, and energy conservation requirements, respectively.

Studies of permitting pilots and regional initiatives highlight that low HPWH penetration, estimated at roughly 1.25% to 1.5% of water heating systems in California, limits staff familiarity with these systems and constrains opportunities for iterative process improvement, particularly in lower-resource jurisdictions (TECH 2024). This low volume contributes to inconsistent interpretations of code requirements and, in some cases, incorrect or overly conservative conditions, such as misapplied combustion-based condensate requirements for HPWHs (TECH 2024). The literature also documents substantial jurisdictional variability in how heat pumps and HPWHs are categorized and processed, with some jurisdictions issuing same-day permits and others requiring extensive plan reviews and multiple permits for similar work. As noted in Fishman (2024), "Perhaps the thorniest permitting issue is jurisdictional variance across the Bay Area. Each of the area's 101 cities interprets and applies state building codes differently." The BayREN and TECH Clean California TECH Permitting Pilot for residential HPWH conversions cited varying rules and the lack of a standardized permitting process (along with building departments' lack of familiarity with heat pump technology) as the top challenges facing contractors statewide performing residential installations (TECH 2024).

At the same time, several studies and pilots identify concrete best practices for streamlined permitting, including standardized permit templates, online portals, fast-track processing for like-for-like replacements, consolidated multi-trade permits, coordinated regional guidance, and self-certification for qualified contractors (BayREN 2022; Fishman 2024). Case studies of rooftop solar permitting show that simplification and digitalization can dramatically

¹ HERS stands for Home Energy Rating System, which is a standardized method for measuring and rating a home's energy efficiency.

² In California's Title 24 Building Energy Efficiency Standards, Certificate of Compliance (CF1R), Certificate of Installation (CF2R) and Certificate Verification (CF3R) are used to document energy code requirements at different stages of a project.

increase permit approvals, citing, for example, a 600% increase in San José after simplifying solar permitting processes (Sustainable San Mateo County 2025). These reforms show that such changes can yield large increases in approved permits without compromising safety, suggesting analogous potential for permitting heat pump technology.

Jurisdictional Variation is a Primary Barrier

Across all data sources, jurisdictional variation emerged as the most significant permitting-related barrier to residential electrification. To better understand which aspects of the heat pump permitting process create the most delays or challenges, contractors were asked to reflect on their project experience and indicate how frequently eight common permitting-related issues delayed or interfered with their heat pump installations by selecting *never*, *sometimes*, *often*, *always*, or *not applicable*. Of the 34 respondents, 47% cited “local city rules” as the highest recurring pain point.

Similarly, as shown in Figure 1, when asked to rate various permitting barriers for heat pump technologies based on how common these barriers are in their experience, “different rules for cities” was cited by the largest percentage of contractors (43%) as *very common*, outweighing concerns related to technology complexity or code compliance.

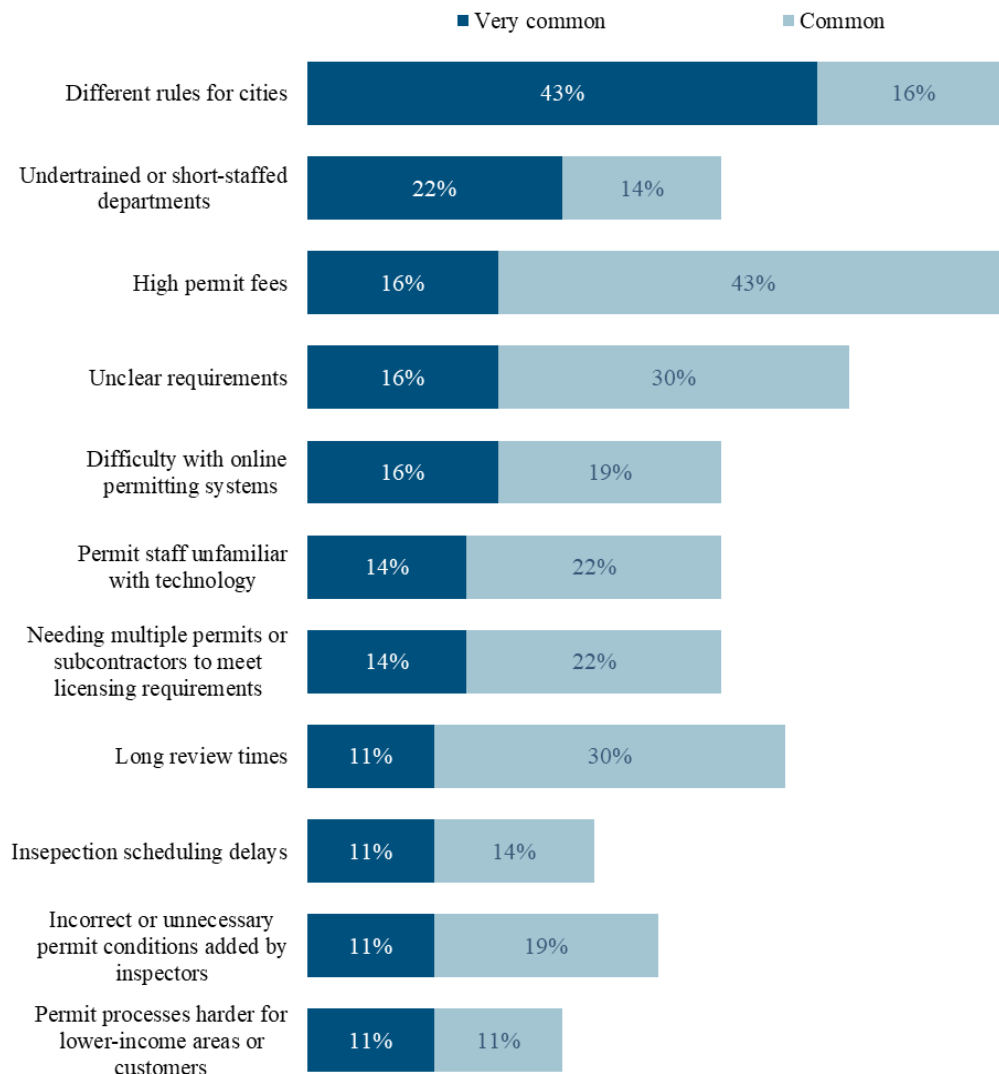


Figure 1. Permitting Barriers Ranked by Share of Respondents Rating Them as Very Common.
Source: MCE Contractor Experience Survey Question 3.16. “Please rate the following permitting barriers for heat pump technologies based on how common they are in your experience?” (n=37)

Qualitative responses from contractors describe substantial differences in documentation requirements, review processes, inspection practices, and fee structures across cities, even within the same county, which create uncertainty and inefficiency. Identical installations may require markedly different submissions depending on location, forcing contractors to customize workflows for each jurisdiction. Respondents noted that some jurisdictions request full electrical line diagrams, while others require panel schedules, load calculations, specification sheets, site photos, or supporting structural documentation. A few respondents said that they frequently “over-submit” documentation to avoid rejection.

Permitting authorities acknowledged this fragmentation and attributed it to local autonomy, differing interpretations of state code requirements, and historical permitting practices. Several jurisdictions noted that permitting workflows were developed incrementally over time, often in response to past safety incidents or staffing changes, rather than through intentional system design. As a result, electrification technologies often must fit into legacy

permitting structures originally designed for gas appliances or large-scale remodels. This variability increases administrative time and raises soft costs, disproportionately affecting small contractors that lack dedicated permitting staff. Contractors reported that inconsistent permitting expectations discourage them from operating in certain jurisdictions altogether, limiting consumer choice and slowing market development.

Administrative Factors Drive Permitting Delays

Contrary to assumptions that heat pumps and HPWHs pose unique technical permitting challenges, contractors and permitting authorities consistently identified administrative factors as the primary source of delays.

Incomplete applications dominate correction cycles. Permitting authorities across all nine jurisdictions, from Oakland and Richmond to Pinole and Hercules, unanimously cited incomplete or incorrect applications as the dominant cause of permitting delays. Common issues included missing CF1R/CF2R/CF3R forms, incomplete project descriptions, outdated documentation, invalid business licenses, and deficient load calculations. Staff expressed frustration that contractors, permit runners, and third-party administrative service providers, who often lack technical expertise or jurisdictional familiarity, frequently overlook portal instructions and submittal guides. Pinole staff noted that “many applications would be approved the same day if contractors simply followed the instructions already written on the portal,” while staff in Hercules emphasized routine same-day issuance for complete submissions.

Digital tools and administrative standardization. Online permitting systems were strongly associated with faster approvals and fewer submission errors. Jurisdictions offering fully digital portals allowing electronic submission, fee payment, and automated routing were frequently cited by contractors as easier and faster to work with.

Jurisdictions without online submissions experience turnaround times that can increase from 10 to 60 days due to delays from document delivery and revisions. Portals that enable digital submission, fee payment, and instant issuance, combined with clear checklists, significantly improve speed and accuracy. Contractors noted that third-party platforms like SolarAPP+ could standardize applications across multiple jurisdictions and reduce repetitive administrative work.³

However, the lack of standardization across platforms presents a new challenge: contractors must navigate multiple systems with different interfaces and requirements, offsetting efficiency gains from digitization. Permitting authorities agreed that differences in permitting experience arise from administrative implementation rather than from underlying code requirements. These differences include the software platform used (for instance, eTRAKiT in Pinole, Accela or transitioning systems in Richmond and Oakland, and email-based intake and in-person applications in Hercules), the presence or absence of express permits, inspection scheduling rules, and document uploading workflows. Richmond and San Anselmo staff described how cross-city differences in portal navigation create unnecessary friction for contractors, while Contra Costa County staff highlighted how each department operates semi-independently despite sharing a regional code framework. For contractors working across MCE’s

³ SolarAPP+ (Solar Automated Permit Processing Plus) is a national online platform that automates and standardizes solar permit approval for residential rooftop solar PV and battery storage systems.

service areas, this administrative variability, rather than code interpretation, is the primary source of confusion and error. Permitting authorities expressed openness to regional coordination or shared tools, provided implementation costs and staffing impacts are addressed.

Staffing and workload fluctuations. Smaller jurisdictions such as Hercules and San Anselmo often process complete electrification permits within 24 hours due to direct intake management and modest volumes. Larger jurisdictions like Oakland and parts of Contra Costa County face slower processing during submittal surges, as staffing cannot scale with demand. Oakland staff identified “fluctuation in submittals” as their biggest delay factor, while Contra Costa inspectors reported completing 11 to 12 inspections daily, limiting time for thorough site coordination.

However, contractors noted that process design matters more than staffing levels alone. Contractors reported that undertrained or short-staffed permitting departments create barriers primarily through unclear submittal requirements and described the process as “subjective,” “inconsistent,” and “dependent on the individual reviewer,” leading to multiple correction cycles that add days or weeks to project timelines.

Jurisdictions with clear documentation checklists, predictable workflows, and digital intake systems process permits faster and require fewer resubmittals. Conversely, those lacking a standardized process experience persistent backlogs. Clear guidance, digital standardization, and complete initial submissions consistently yield faster outcomes.

Permit Costs Create Uncertainty and Equity Concerns

Reviewing online fee schedules from 36 permitting authorities and supplementing this research with email and phone outreach, Cadmus found that HPWH permit fees typically range from \$100 to \$200 when no electrical permit is required, while HVAC heat pump permits generally range from \$100 to \$300 without electrical work, although some cities charge substantially higher fees. When an electrical permit is required, total costs typically increase by an additional \$100 to \$200. Higher overall permit costs are often driven by the requirement for multiple separate permits, including electrical, plumbing, mechanical, and building permits, as well as additional plan review or inspection requirements.

Interviewed contractors widely cited permit fees as a key contributor to higher project costs and customer hesitation. Contractors surveyed reported fees of \$250 to \$500 in some jurisdictions, with low-to-moderate income (LMI) households particularly sensitive to these upfront costs that are not eligible for rebates. Fees varied substantially across jurisdictions, and contractors noted that homeowners are often surprised by permitting costs that appear disconnected from project scope. Several contractors described situations in which permit fees approached or exceeded the cost of labor for smaller installations. As shown in Figure 2, 39% of contractors (n=31) reported typically seeing permit fees in the range of \$250 to \$500 for heat pump installations in the areas where they have worked.

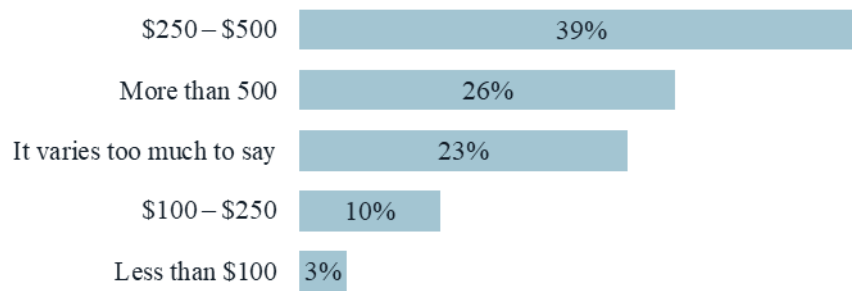


Figure 2. Permit Fee Range based on Contractor Survey Responses. *Source:* MCE Contractor Experience Survey Question 3.19. “What is the typical permit fee you see for heat pump installations in the jurisdictions you work in?” (n=31)

Multiple permits across trades and iterative correction cycles compound these impacts, creating geographic inequities where certain cities become effectively inaccessible to small contractors serving affordability markets.

To address these inconsistencies, Senate Bill 282, the Heat Pump Access Act, proposed to standardize permitting by directing the California Energy Commission (CEC) to develop standardized permitting checklists for residential HPWHs and heat pump HVAC systems, limiting these checklists to two pages, requiring local jurisdictions to use them, and capping residential permit fees at \$50 for HPWH and \$150 for heat pump HVAC systems. The bill, if passed, would have allowed licensed contractors to self-certify certain requirements to reduce reliance on in-person inspections and mandated online, automated permitting systems capable of real-time permit issuance (California Senate Bill 282 2025). However, the bill failed to advance in the 2025–2026 session after being returned to the Secretary of the Senate pursuant to Joint Rule 56 on February 2, 2026 (CalMatters Digital Democracy 2025).

Inspection practices create hidden costs. Inspection-related delays emerged as a significant but often overlooked barrier. Contractors frequently noted the indirect financial impacts caused by inspection delays. Of 40 respondents, 35% indicated that inspection delays increase costs and disrupt workflow. Inspection delays impose measurable financial burdens on contractors through both lost productivity and additional labor costs and are a systemic operational barrier rather than an isolated regulatory issue. Contractors reported that wide inspection windows leading to idle time, inconsistent inspector interpretations, and the need for multiple site visits add labor costs and disrupt scheduling. These issues increase soft costs without improving safety outcomes. Contractors reported these challenges across multiple counties, suggesting that the issue stems largely from regional workforce and staffing limitations rather than local policy differences.

Both contractors and permitting authorities identified opportunities to improve inspection efficiency through narrower scheduling windows, automated notifications, and better alignment between plan review and field inspections. Staff from Pinole and San Anselmo said they allow contractors to call inspectors on the day of inspection to estimate arrival order, improving jobsite planning. Contra Costa County staff said they maintain a 24-hour turnaround goal for final inspections, emphasizing predictable scheduling over procedural uniformity. These operational reforms could yield immediate benefits in other jurisdictions without requiring code changes.

Contractor-Identified Strategies and Permitting Authority Best Practices

Survey responses revealed that contractors' primary strategies for navigating residential heat pump and HPWH permitting and installation center on ensuring compliance and completeness (Figure 3, n=34, multiple responses allowed). Most prioritize adherence to Title 24 forms (62%) and HPWH-specific installation guidelines (56%), followed closely by submitting complete permit packages up front (47%), a finding that may reflect the challenge of meeting highly variable and sometimes unclear submittal requirements across jurisdictions, rather than a lack of intention to comply. Interview respondents noted that even experienced contractors often cannot determine in advance exactly what a given jurisdiction will require, making truly "complete" initial submission difficult to achieve consistently and proactively planning for electrical capacity or panel upgrades (38%). These practices aim to minimize correction cycles and delays by addressing common rejection triggers before submission.

Fewer contractors (24%) reported pursuing early coordination with authorities having jurisdiction (AHJs) or joint permitting across trades. One respondent explained, "We found that contacting the AHJ ahead of time to clarify code or project-specific situations is often the most burdensome step," citing vague responses, unresponsiveness, or requests for additional work beyond code requirements. This aversion to pre-submittal communication highlights opportunities to improve permitting efficiency through clearer guidance, standardized documentation, and more predictable interactions with AHJs.

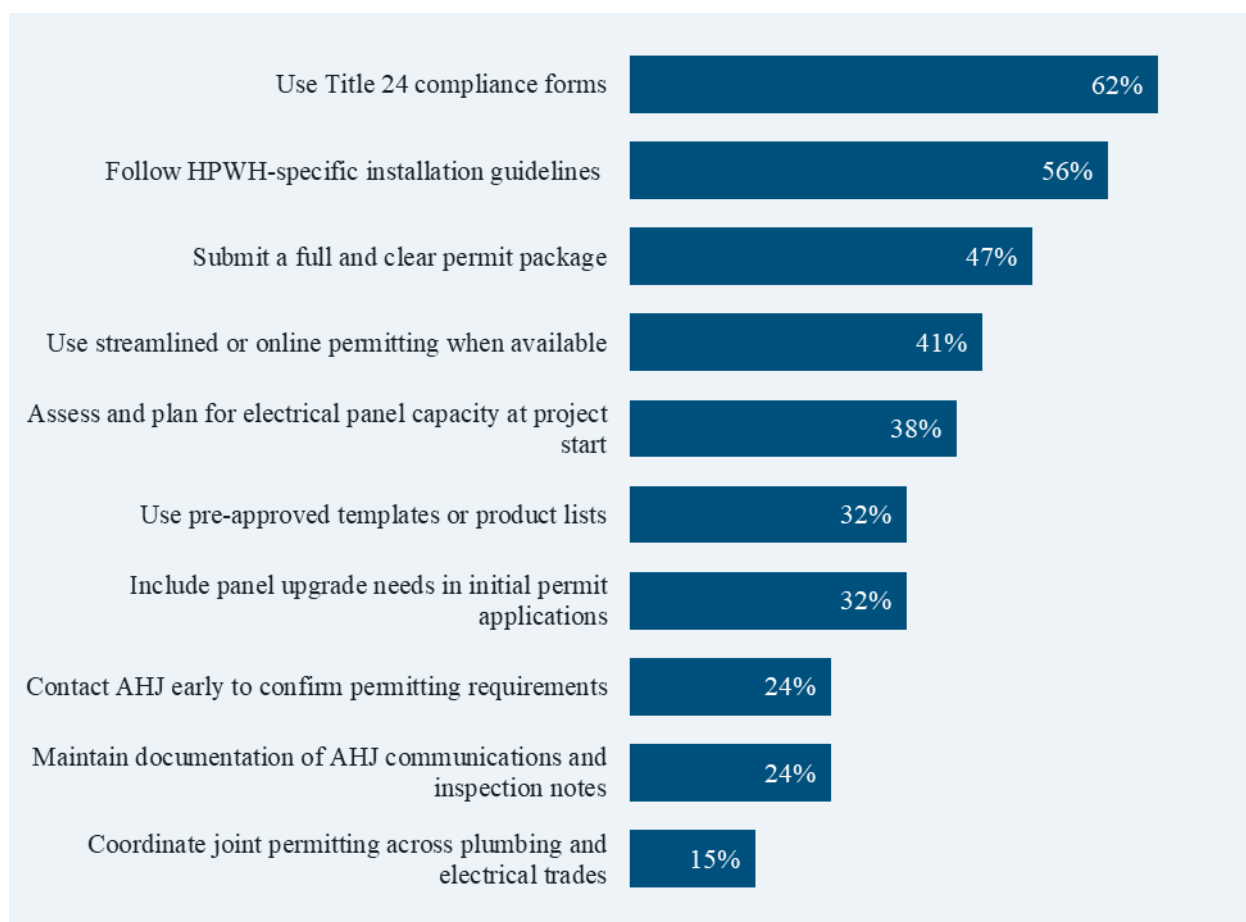


Figure 3. Contractor-Identified Top Priorities for Improving the Permitting Process *Source:* MCE Contractor Experience Survey Question. “Which of the following practices do you typically follow when permitting and installing residential heat pump or heat pump water heater (HPWH) systems?” (n=34, multiple responses allowed)

When asked which changes would most improve the permitting process, interviewed contractors ranked their top three priorities from a provided list (priorities are ordered below by the frequency with which each was selected as the first-ranked choice). Clear, standardized permit checklists and documentation templates emerged as the most frequently selected priority. Lower or waived permit fees for heat pumps ranked as contractors’ second priority, reflecting widespread recognition that current fee structures create affordability barriers, particularly with low-income customers for whom permitting costs represent a larger share of total project expense. This is particularly true where income-based incentive programs reduce or cover equipment and installation costs, leaving non-rebate-eligible permit fees as a proportionally larger out-of-pocket burden. Reducing the number of required permits or allowing applicants to apply for multiple permits simultaneously ranked third. Other commonly selected improvements included dedicated points of contact, online support portals, opportunities to provide input during the permit design process, and better jurisdictional guidance.

Strikingly, permitting authorities identified nearly identical practices to those that contractors cited as their most effective tools for reducing delays. Across interviews, permitting authorities highlighted low-cost measures that align directly with contractor requests. While contractor and permitting authority interviews used separate, tailored question guides rather than identical lists, both groups were asked open-ended questions about effective practices and

barriers, and the high degree of convergence in their responses was a notable finding. The practices listed below reflect the most frequently identified measures from interviews with permitting authorities.

- Clear, accessible permit guidance posted online, including checklists, sample diagrams, and detailed requirements for common electrification projects (HPWH, service upgrades, panel work, HVAC).
- Pre-application guidance channels, such as phone lines, counter hours, and email support, that allow contractors to clarify requirements before submitting permit applications.
- Internal front-end screening systems that direct electrification-related applications to staff with relevant expertise to reduce back-and-forth communication for corrections.
- Standardize review practices and templates within departments to minimize reviewer-to-reviewer variability.
- Consistent same-day or next-day inspection scheduling when staffing allows to help keep projects moving without long field delays.
- Training and refreshers for staff and inspectors on emerging technologies, especially HPWHs and electrical upgrades, to reduce inconsistent comments.
- Use of digital permitting platforms that let applicants track status and upload corrections quickly to reduce miscommunication and missing files.

Implications for Policy and Practice

The findings from this study point to actionable opportunities for utilities, Community Choice Aggregators (CCAs), regional energy organizations, permitting authorities, and policymakers to reduce administrative barriers and improve the efficiency of residential electrification permitting. The recommendations below are framed to support broad applicability across jurisdictions and governance contexts.

Near- to Medium-Term Opportunities for Improvement

Several practical actions can be pursued in the near term to improve coordination, consistency, and predictability in residential electrification permitting without requiring statutory or code changes. First, regional energy organizations and utilities engaged in electrification efforts can help improve coordination between contractors and permitting departments by developing and disseminating centralized informational resources. These may include guidance documents, frequently asked questions, contact directories, and summaries of common permitting requirements. Making training materials and documentation guidance easily accessible can help reduce application errors and improve communication consistency across jurisdictions.

Convening forums such as permitting authority roundtables can provide structured opportunities for jurisdictions to share experiences, discuss operational challenges, and exchange best practices. Facilitated discussions across cities and counties can help identify common pain points and highlight approaches that have successfully reduced review timelines or inspection delays. Jurisdictions may also benefit from examining inspection scheduling practices, including the use of predictable inspection windows and advance notifications. Sharing case studies or examples from jurisdictions that have implemented more predictable inspection practices can help others assess feasibility within existing staffing constraints.

Promoting the use of online permitting systems and express permit pathways can improve efficiency for both contractors and permitting staff. Regional entities can play a supporting role by documenting successful digital permitting models and sharing implementation lessons learned across jurisdictions. Finally, findings suggest value in collaborative efforts to improve standardization. Utilities, CCAs, and regional partners can work with contractors and permitting authorities to develop shared permitting checklists, templates, and step-by-step guidance materials. Targeted contractor training focused on permit application requirements designed to reinforce, rather than replace, local authority processes can further reduce preventable errors and administrative rework.

Long-Term Strategic and Policy-Oriented Considerations

In addition to near-term actions, the study highlights longer-term structural opportunities to address persistent permitting challenges and support sustained improvements in residential electrification adoption. One strategic opportunity is the exploration of regional or statewide permitting platforms for residential electrification equipment, including heat pump HVAC systems and HPWHs. Coordinated portals developed in collaboration with regional energy networks and state agencies could reduce fragmentation while preserving local authority oversight. Another long-term consideration involves greater consistency in siting-related requirements, such as noise and setback standards. Variation in these requirements was identified as a source of design revisions and permitting delays. State and regional policy discussions may help clarify acceptable ranges or provide guidance that local jurisdictions can adopt.

Sustained engagement between regional energy organizations and municipalities also emerged as a critical factor for long-term improvement. Ongoing outreach, technical assistance, and knowledge-sharing can support institutional learning within permitting departments and help align operational practices with broader electrification goals. Finally, permitting improvement may be most effective when treated as an iterative, ongoing process rather than a one-time initiative. Encouraging jurisdictions to regularly revisit permitting workflows, incorporate feedback from contractors and staff, and track progress over time can support continuous improvement as electrification technologies and policies evolve.

Conclusion

Permitting systems play a decisive role in shaping the accessibility and affordability of residential electrification. Findings from this four-county study demonstrate that permitting-related barriers are not driven by the technical complexity of heat pumps or HPWHs, but by fragmented administrative practices, inconsistent requirements, and capacity constraints at the local level. Permitting reform is essential not only to accelerate decarbonization but also to ensure equitable access and affordability. By reducing administrative friction and fee burdens, jurisdictions can expand contractor service areas, lower soft costs, and make residential electrification accessible to the LMI households that stand to gain the most from long-term energy savings and health benefits.

Importantly, the study also highlights that solutions are within reach. Jurisdictions that have implemented streamlined, digital, and standardized permitting processes offer clear models for reform. Engaging contractors and permitting authorities together reveals shared goals: reducing rework, improving clarity, and maintaining safety while accelerating adoption.

For policymakers, utilities, and local governments seeking to scale residential electrification, permitting reform should be treated as a core strategy rather than a peripheral concern. Targeted interventions such as standardized checklists, combined permits, reduced fees, digital platforms, and improved inspection coordination can lower costs, shorten timelines, and expand access.

As states and municipalities pursue ambitious building goals to achieve decarbonization goals, aligning permitting systems with those objectives will be essential. Streamlined, predictable, and equitable permitting processes can help translate policy intent into technology adoption, ensuring that the benefits of residential electrification are accessible to all communities.

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