



San José & Berkeley Supply Chain Assessment and Research Review

Completed July 2020

Supply Chain Assessment & Research Review

Background and Summary of Project

San José has been working with BEI since 2019 to better understand the opportunities and challenges of electrifying its building stock. As San José began evaluating strategies for electrifying its buildings, the City understood that it would be critical to assess the existing regional supply chain for heat pump technologies and plan for potential impacts to the regional workforce—including HVAC contractors, plumbers, and electricians.

To support these goals, BEI reviewed existing supply chain research and interviewed key stakeholders in the Bay Area to better understand the landscape, assess potential impacts and opportunities, and evaluate best practices for creating high road jobs through building electrification. For this project, BEI sought to answer questions developed by both San José and Berkeley, another BEI city located in the Bay Area.



Image: Downtown San José

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Reports reviewed:

- **Contractor Trade Ally Marketplace Market Assessment** for Building Decarbonization Coalition
 - Contractor Trade Ally Marketplace Market Assessment Memorandum
 - Contractor Trade Ally Marketplace Design Summary
- **California Building Decarbonization Workforce Needs**, report by UCLA and Inclusive Economics
- **San Francisco's Residential Building Equity & Decarbonization Initiative**
- **San Francisco's Building All-electric Affordable Housing Forum**
- **Contractor Needs Assessment** for the Building Decarbonization Coalition (*research to be completed by the end of 2020*)
 - Final Research Plan
 - Interview Guide for General Contractors and HVAC Contractors, Plumbers & Electricians
 - Consumer Inspiration Campaign
 - Decoding Grid Integrated Buildings Report
- **Building Efficient All-Electric Affordable Housing Forum**
- **Silicon Valley Dichotomy II Summary Report** for Work2Future by Keen Independent Research

Reports not yet available at the time of this research:

- **BayREN/Stopwaste HPWH incentive program design research** for Alameda County (*research not yet released*)
- **Upcoming Paper on Central HPWHs**, co-authored by Redwood Energy and RMI (*report to be released by the end of 2020*)

Completed Interviews

- Barry Cinnamon, Cinnamon Energy Systems
- Betony Jones, Inclusive Economics
- Francois Lebrasseur, A.O. Smith
- Jake Baker, Air Treatment Corporation
- Jennifer West, StopWaste
- John Supp, Silicon Valley Clean Energy
- Nate Kinsey, CPUC
- Ron Yaffe, Norman S. Wright
- Scott Blunk, SMUD

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Questions from San José and Berkeley

1. What do the air source heat pump (ASHP) and heat pump water heater (HPWH) supply chains look like in Berkeley and San José?
2. What is the availability of this equipment at the distributor level? Is the equipment harder to stock and access?
3. How quickly is the ASHP/HPWH market growing in Berkeley, San José, and the surrounding region?
4. Are there roadblocks to growing this market? If so, what do you see as the most critical roadblocks to address?
5. Are there specific permitting requirements that are different city to city? How does this affect the supply chain and contractors' willingness to install?
6. How do contractors get trained? Which accreditations or certifications are most widely used and what are the benefits?
7. What types of programs/incentives would encourage contractors to do more ASHP/HPWH installations?
8. How do HVAC and water heating contractors find and hire new employees?
9. Are there any contractors already doing substantial numbers of ASHP or HPWH installations? If so, who are they? What is their main motivation?
10. How often are installations of ASHPs done for cooling? Are air conditioning contractors doing these sales?

Unable to answer these questions based on existing research and interviews

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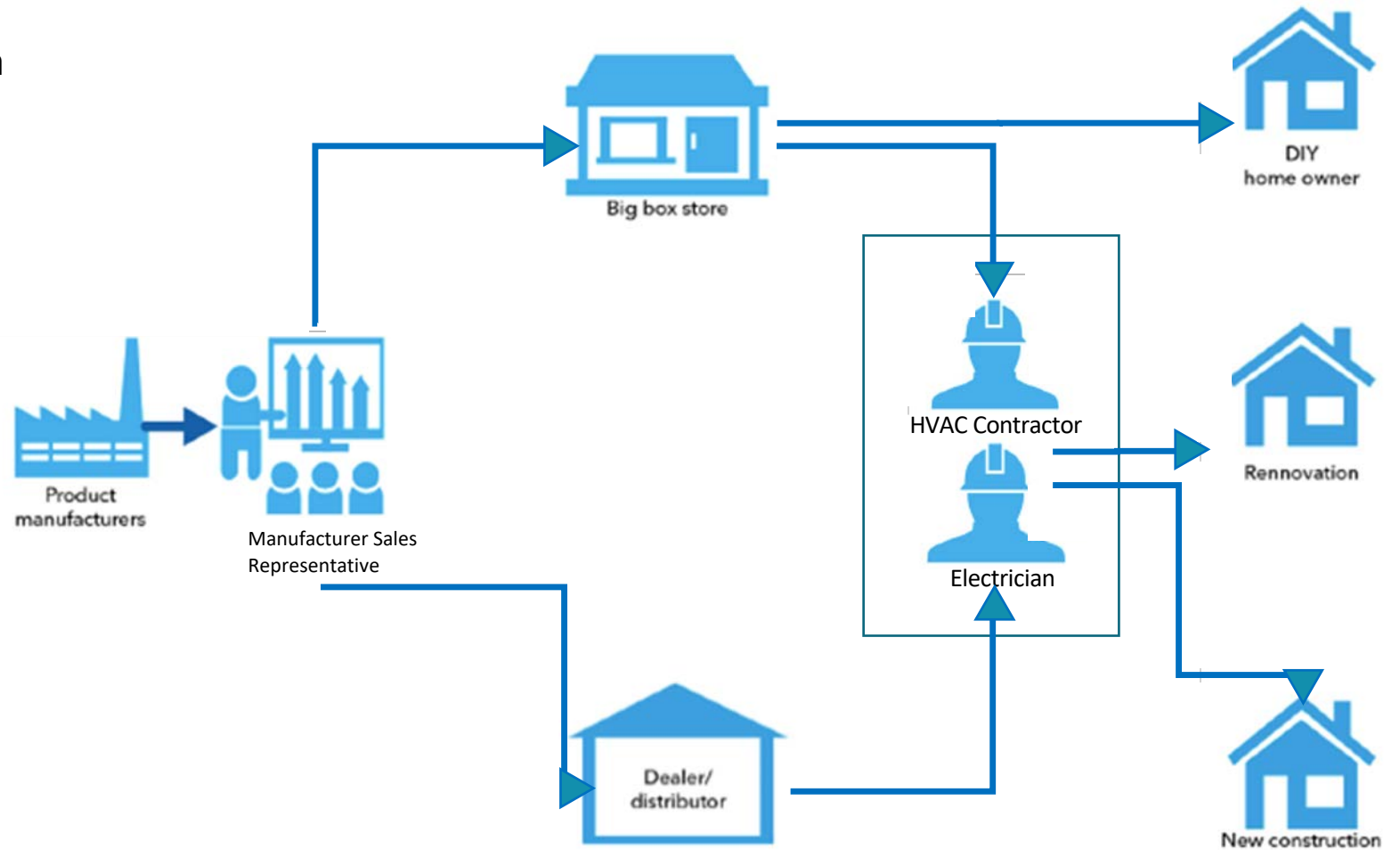
1. What do the supply chains look like in San José and Berkeley?

Typical Residential ASHP Supply Chain

Distributors maintain close relationships with both manufacturers and contractors.

- Manufacturers rely on distributors to promote equipment, and in some cases, recommend or provide training for contractors.
- Contractors work closely with distributors, reporting trust in equipment recommendations.

Contractors also have the potential to provide education to customers.

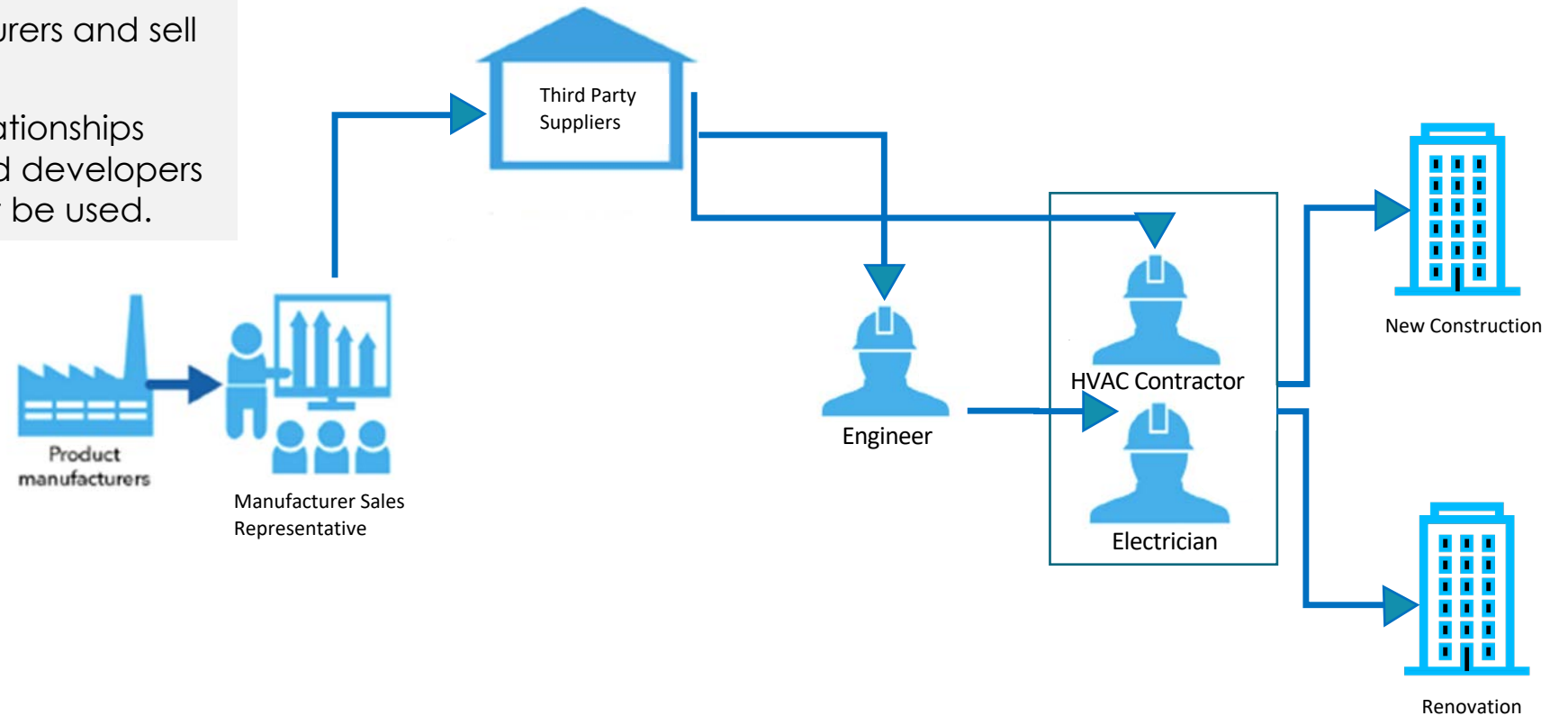


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1. What do the supply chains look like in San José and Berkeley?

Typical Commercial ASHP Supply Chain

- Suppliers represent manufacturers and sell non-competing equipment.
- Suppliers leverage existing relationships with engineers, architects, and developers to influence that their product be used.

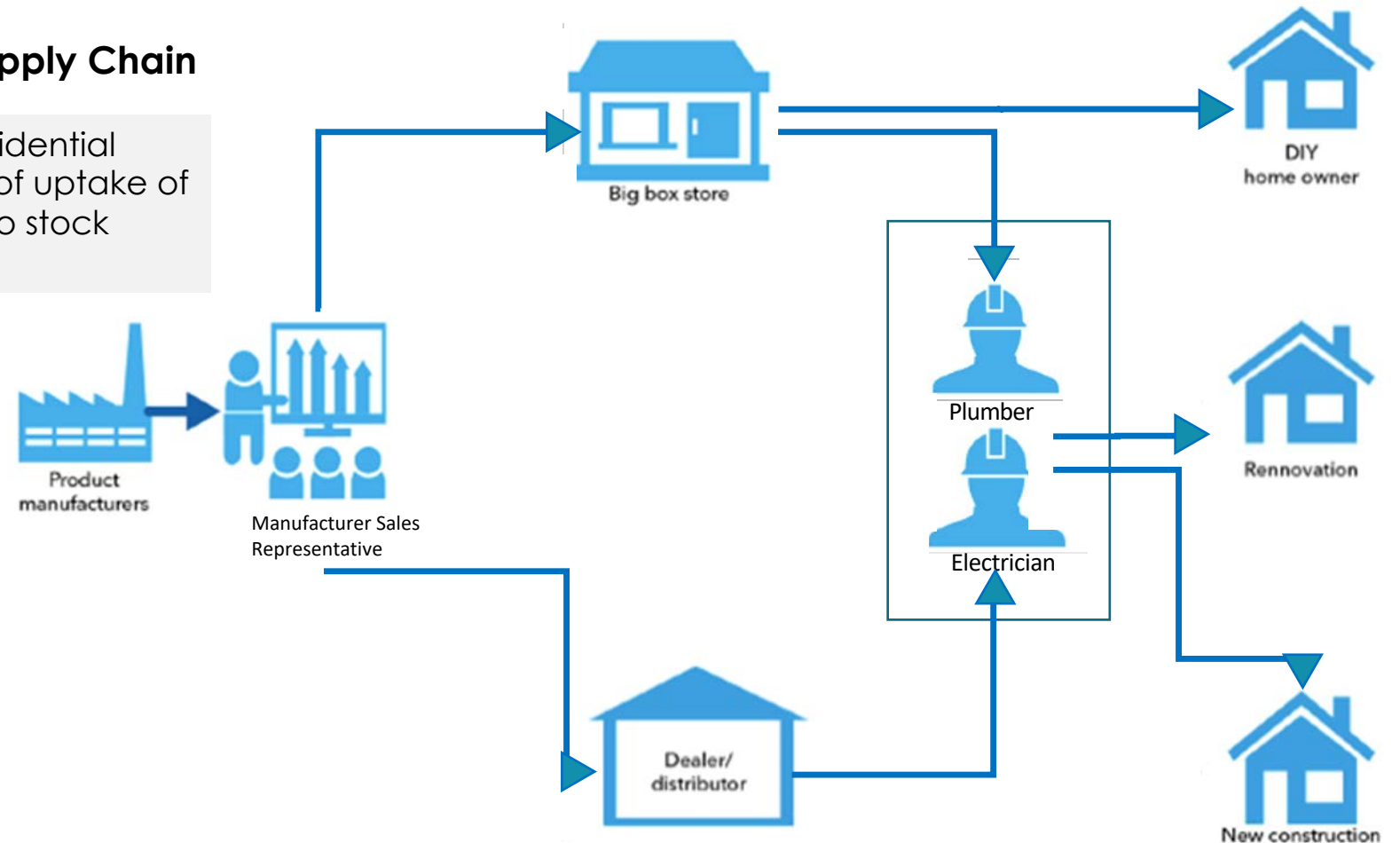


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1. What do the supply chains look like in San José and Berkeley?

Typical Residential Water Heating Supply Chain

This is the same structure as the ASHP residential supply chain. However, due to the lack of uptake of HPWHs, distributors have been hesitant to stock significant numbers of products.



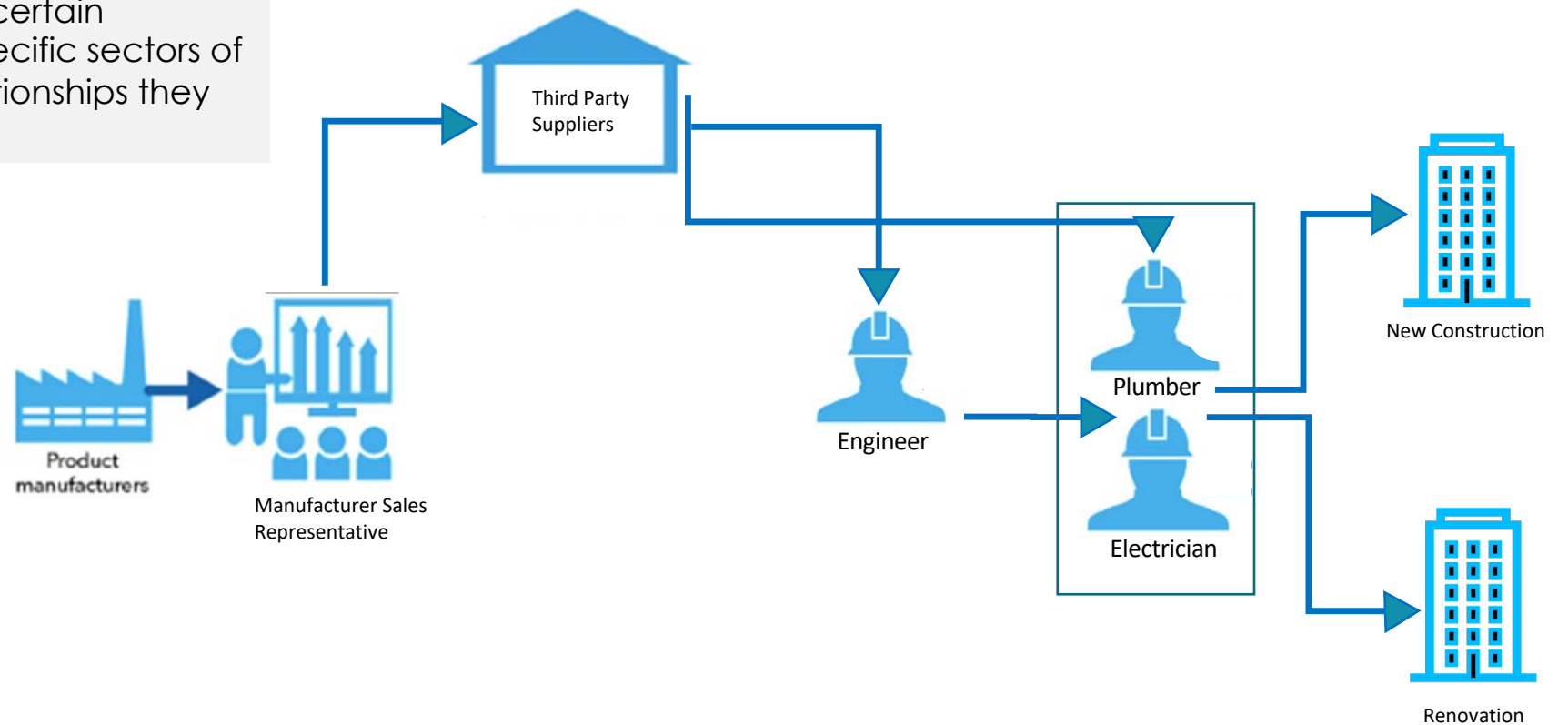
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1. What do the supply chains look like in San José and Berkeley?

Typical Commercial HPWH Supply Chain

Similar to the ASHP supply chain, certain manufacturers may dominate specific sectors of the HPWH market due to the relationships they hold with developers.

- In Sacramento, the new construction market has been mostly installing Bradford White HPWHs, while the retrofit market has been installing Rheem HPWHs.



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2. What is the availability of this equipment at the distributor level? Is the equipment harder to stock and access?

- In general, **access to HPWHs and ASHPs does not differ compared to their gas counterparts** at the distributor level.
- However, **distributors who do not see the demand will not carry a substantial number of the appliances**, and if distributors do not have a product, contractors will not be able to buy it.

One interviewee mentioned that he knows of a small distributor who stocks two HPWHs at a time, compared to 100 gas water heaters.

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3. How quickly is the ASHP/HPWH market growing in San José, Berkeley, and the region?

- **In the residential market, uptake for ASHPs and HPWHs is lagging**, according to many interviewees.
- However, **in the commercial and multifamily market, suppliers say there has been an increase even before local governments began enacting Reach Codes**, because consulting engineers have been pushing for these retrofits for a while.
- **Now with Reach Codes in place for new construction, the ASHP market is growing even faster** in the commercial and multifamily space, according to suppliers.

“[The market for ASHPs and HPHWs is] growing leaps and bounds because of the mandates.” – Industry Representative

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4. Are there roadblocks to growing this market? If so, what do you see as the most critical roadblocks to address?

- **Most contractor businesses are not currently structured to offer whole home electrification.**
- **Given the variety of trades that must be involved in projects, the value proposition for electrification is challenging** because specialty contractors are not legally allowed to subcontract in California.
- **To provide whole-home electrification upgrades, contractors will likely need to invest in new business models or partnerships**, such as:
 - Creating partnerships with companies with complementary skillsets (e.g., plumbers and electricians).
 - Developing new skills in-house.
 - Acquiring a company that has staff with the needed skills.
- **Facilitating the necessary contractor business changes would require sustained commitment to policies and incentives** from policymakers and program administrators.
- **Electrical panel upgrades are also often required** for upgrades, and these can be extremely costly.

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4. Are there roadblocks to growing this market? If so, what do you see as the most critical roadblocks to address?

- **There is a lack of familiarity with electrification technologies and providers are not offering sufficient training for the market.**
 - The Building Decarbonization Coalition conducted interviews with 40 contractors and found that they were not aware of a single vocational school in California that offers courses on building electrification.
- **HVAC contractors often have a salesforce, but HPWH contractors typically do not.**
 - This means that the same person doing the HPWH installation is often required to do the sale. Often, these contractors don't have sales training, nor do they have confidence in the equipment.
- **To address the labor shortage and ensure an equitable transition, there is an opportunity through policy to ensure that electrification jobs are "high road" jobs.**
 - High road jobs ensure living wages and benefits for employees, typically in return for higher skill levels.
 - This can help ensure better quality installations, attract more talented workers, and address ongoing equity issues in cities.

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5. Are there specific permitting requirements that are different city to city? How does this affect the supply chain and contractors' willingness to install?

- **Typically, there is a permit needed from both the the city and the utility for ASHPs and HPWHs, which can be difficult to coordinate** because both the city and utility need to be present at the same time for the inspection.
- **Permitting and compliance can increase installation costs and delay the timelines, but this is also critical to ensure high quality installations.** Current levels of compliance vary city to city, potentially significantly.

Many interviewees stated that they think permit non-compliance for gas heaters could be as low as 10%, while compliance for HPWHs is required for rebates/ incentives. This issue can lead contractors to push gas heaters over HPWHs.

"The retail price for a permit is \$250 let's say, but to file for a permit/inspection they will add that time spent as a cost to the project so this \$250 permit cost will end up costing closer to \$600 to cover the time spent. This \$600 always shows up in HPWH install but not always in gas." - Government Representative

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6. How do contractors get trained? Which accreditations or certifications are most widely used and what are the benefits?

- The HVAC industry has significant education, training, and certifications, but the water heating industry does not have comparable industry offerings.
- It appears that **there are no vocational schools in California that currently offer courses on building electrification.**
- **There are proposed solutions for California**, such as the Building Decarbonization Coalition's proposed "Marketplace," which would leverage the efforts of utilities and others to fill gaps in training and help customers find qualified contractors and service providers.

"[Refrigerants] are not a barrier at the install phase, but there will be a growing need [for training] when HPWHs become a larger part of the maintenance and repair market." – Government Representative

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7. What types of programs/incentives would encourage contractors to do more ASHP and HPWH installations?

- **Address the permitting process and compliance requirements**, for example by:
 - **Train local building department staff on ASHP and HPWH systems** so that permitting for electrification is easier and more streamlined.
 - **Have ASHP and HPWH manufacturers promote their products in local building department offices** to familiarize the contractors with the equipment, since contractors are often there to get permits.
 - **Increase compliance across all gas HVAC and plumbing permits** to ensure that the lack of permitting enforcement for gas appliances is not a reason contractors avoid ASHP and HPWH installations.

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8. What types of programs/incentives would encourage contractors to do more ASHP and HPWH installations?

- **Implement programs to ensure electrical panel upgrades are not a barrier to ASHP and HPWH installations**, for example by:
 - **Grouping together homes to do electrical panel upgrades at the same time**, which would significantly decrease the costs. One way to start could be to collect information about panel upgrade needs across the city to help prioritize neighborhoods.
 - **Providing incentives for electrical service upgrades before the time of replacement**, which can help ensure electric appliances will be an option even during emergency replacements of heating and hot water systems.

“If you do one home with a simple [panel] upgrade it can cost \$7k, if you have to add more wire underground it can cost \$15k, but if you do 20 homes it could [reduce the costs to] about \$5k each.” - Industry Representative

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8. What types of programs/incentives would encourage contractors to do more ASHP and HPWH installations?

- **Increase the skilled workforce**, for example by:
 - **Start by creating demand for ASHPs and HPWHs** so that contractors hear from their customers that they want these technologies.
 - **Increase wages for residential contractors** to attract sufficient skilled labor to the sector.
 - Create partnerships between contractors and manufacturers where manufactures help supplement wages so that heat pump installers become a more desirable role.
 - **Look for partners who are already investing in training, such as East Bay Community Energy**, which is considering the potential to collaborate with labor organizations on an apprenticeship program to advance a skilled electrical workforce.

"This is something we can work on as an industry – I would like to participate in an ideation session to tell contractor firms “hey hire new kids and we will help you train and pay them at least in the beginning”, it could be a combo of marketing and supplemental income.” - Industry Representative

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8. What types of programs/incentives would encourage contractors to do more ASHP and HPWH installations?

- **Set strong policy goals for building electrification** that will send a clear market signal to every player involved. For example, this could include:
 - Setting targets for building emissions reductions and electrification.
 - Investing in incentive programs at sustained levels over multiple years.
 - Developing requirements for both new and existing buildings to electrify their systems and providing the needed technical assistance and financial support to customers.

Key Takeaways about the Regional Supply Chain

- **Electrification benefits are unclear to both contractors and customers.**
 - Any newly developed trainings should include a focus on helping contractors build a business case around electrification.
- **Building electrification will require an evolved contractor sales process and message**, particularly to encourage proactive replacement of heating and hot water systems.
- **Incentives can be major motivators for contractors to invest in trainings and business model changes, but programs and incentives need to be guaranteed for years.**
 - Long-term incentives help contractors overcome the perceived risks of modifying existing business practices.
 - Incentives can also help jumpstart the customer market and motivate utilities to better coordinate with market actors.
- **Quality installations, both ensured by training and vetted by inspection, are crucial for success. Trainers also need to be held accountable.**
 - Establishing minimum installation requirements at multiple levels can ensure quality and mitigate risk.
- **Ensuring that jobs are accessible to all workers and lead to high paying career tracks is critical to an equitable transition and would help improve the quality of installations.**

Key Takeaways on Job Quality

- **Without customer demand, investing in trainings alone could flood markets with an over-supply of workers.**
 - This can have an adverse effect by putting downward pressure on wages.
- **The creation of high road jobs for workers is dependent on policies, not markets.**
 - Policies can include skill standards and requirements for benefits and fair wages.
- **The additional costs of higher wages can be offset by increased productivity, more accurate estimates, and other cost reductions that come from a more skilled workforce.**
 - For example, cost reductions can be realized from improved bids, customer service, reduced needs for callbacks, lower installation times, and total overall costs.
- **The true costs of low-paying jobs are often externalized, and therefore often ignored.**
 - At a program level, this includes higher customer service cost due to long-term equipment performance problems and failure to deliver benefits.
 - At a city level, this includes increased costs of social service programs.
- **A labor shortage is often actually a pay gap.**
 - The large building construction industry, which pays significantly more than the small residential HVAC sector, does not have as much difficulty with recruitment.
 - The costs of the pay gap are felt by the system as a whole by reducing installation efficiency and quality.

Recommendations

BEI's Recommendations

- **Set clear policy goals and invest in programs to increase the demand for ASHPs and HPWHs** to ensure contractors see the value of investing in business model changes and trainings. Include labor standards for any public investments to support high road jobs.
- **Engage with the local building department** to hold trainings on electrification systems for staff and promote appliances with flyers, fact sheets, or other resources for contractors to see while obtaining permits.
- **Partner with organizations to create standards and certifications** for whole home electrification and appliance installations. Partners could include the Northwest Energy Efficiency Alliance (NEEA) or local California-based nonprofits.
- **Partner with vocational schools and manufacturers to update existing curricula** to include whole home electrification upgrades and technologies and cover relevant local policies.
- **Partner with ASHP/HPWH manufacturers and/or local community workforce groups** to provide trainings and supplement salaries for contractors and/or apprenticeship programs, with a focus on serving priority populations.
- **Collect residential electrical panel information** (including panel age and size) to identify neighborhoods for sequencing and/or for bulk purchasing for electrical panel upgrade opportunities.
- **Increase compliance and enforcement on all jobs requiring permits** to level the playing field between gas and electric installations and help ensure higher quality installations.

An aerial photograph of a city, likely San Francisco, featuring a prominent clock tower (the Transamerica Pyramid) on the right side. The sky is a mix of blue and orange, suggesting a sunset or sunrise. The city buildings are visible in the foreground and middle ground, with a body of water in the distance.

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