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Deploying a Practical, HVAC Compliance Reconciliation System for California

An Initiative of the California Energy Alliance

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[Compliance Reconciliation System Summary](#)

The intent of the Compliance Reconciliation System (CRS) is to increase compliance with California's Building Energy Efficiency Standards (Energy Standards) HERS testing for retrofit installations of heating, ventilation, and air conditioning (HVAC) equipment per Title 24, Part 6, Residential Appendix 3 (RA3).

The CRS increases compliance by identifying projects for which HVAC equipment has been purchased, but HERS testing has not been performed, and/or building permits have not been procured. Such projects are identified by recording, compiling, and reconciling HVAC equipment purchases with registered HERS forms and building permit records.

The CRS should be paired with a cloud-based permitting system to be most effective. Online permitting provides ease and cost savings that encourages compliance, while compliance reconciliation provides the enforcement tools to ensure proper permitting and HERS testing. (See CEA Docket Submittal # 17-EBP-01, TN # 224725 for recommendations on establishing cloud-based permitting system standards.)

While the CEA believes that embedded evaluation, monitoring and verification (EM&V) is the best long-term solution for improving and sustaining HVAC system energy efficiency, in the short-term, we believe that cloud-based permitting paired with compliance reconciliation is the most cost-effective and acceptable solution.

Tracking sales data or equipment serial numbers is not required nor included in the CRS. However, the HERS system does have the capability of tracking equipment from sale to installation. Enforcement agencies may choose to request such records from equipment sellers as part of their enforcement processes.

The CRS is unique compared to other proposed programs, because the CRS uses the existing HERS infrastructure to increase compliance rather than require the development of an entirely new program. While certain statutory changes, code modifications or other updates will be required, we believe the CRS requires fewer such changes than other proposed systems¹. In addition, the CRS process mirrors the new-construction permit process by requiring a prescriptive energy plan form (CF-1R-ALT-HVAC) prior to permit procurement.

¹ Determination of the extent of such changes is beyond the scope of this document.

The CRS recognizes that neither government nor industry alone can ensure compliance. The CRS complements basic requirements with both legal and social enforcement mechanisms. An automated letter to a homeowner regarding the lack of permit records for their new HVAC system will complement the enforcement mechanisms available to the Contractors State License Board (CSLB). The goal of the CRS is to establish a new operating paradigm for the HVAC industry, one where obeying the law and consequent quality workmanship becomes the norm. A norm where disobeying the law, poor workmanship, and inefficient HVAC systems become socially unacceptable amongst HVAC professionals.

The CRS is the practical outcome stemming from distillation of more than two decades of industry discussions, studies, surveys, field trials, and even failed attempts at compliance improvement. The Western HVAC Performance Alliance (WHPA) deserves credit for much of the background work that led to our proposed CRS. The various concepts we present have been discussed at the California Energy Commission (Energy Commission) and debated by professionals with decades of experience in the HVAC industry.

This document is written with the intent that it become a public comment (Docket No. 2017-EPB-01) to the Energy Commission's SB 1414 compliance improvement plan currently under development. We believe the CRS is the best viable alternative for helping to self-right the HVAC industry; however, we acknowledge this document is not a definitive study on the proposed CRS. We do not attempt to answer all of the relevant questions regarding the CRS strategy. Instead, we encourage the Energy Commission to invest in a meaningful field trial to vet the key concepts and identify practical revisions and improvements.

A System for Now and the Future

The original design of the California HERS system, which was first adopted under the 2005 Energy Standards, contains several steps. First, it requires the contractor to complete the plan for energy code compliance (CF-1R-ALT-HVAC (Certificate of Compliance,)) and have the form inspected and approved before a permit is issued and prior to installation. This process mirrors the residential new construction permit process. Then the CF-2R (Certificate of Installation), which includes the required system testing performed by the contractor, is submitted following installation. The CF-2R provides proof that the system meets code requirements. Finally, the CF-3R is completed by a state-certified HERS Rater indicating that the system was independently tested and complies with California's codes and standards, or was included in a sample group of two or more tested projects.

In practice, not every job proceeds according to this sequence. It is not uncommon for contractors to leave the testing and completion of the CF-2R and CF-3R forms to HERS raters. HERS raters often coach contractors or test jobs several times during one visit. These scenarios are legal as long as the same Rater does not perform the testing required for the CF-3R form when the job represents a sample group. When sampling is not used, a Rater can perform all the testing and/or perform tests multiple times.

The procedures included in the CRS are intended to be adaptable to these real-world situations and to the expanded roles both HERS Raters and HVAC contractors are expected to take in the future (See pages 3 through 7 of CEA Docket Submittal # 17-EBP-01, TN # 224725).

Third Party Quality Control Programs (TPQCPs) and "acceptance testing," both allow a degree of contractor self-certification. The TPQCP, which requires the use of diagnostic tools and oversight by a certified TPQCP administrator, represents an established system that has

provided quality installations while lowering HERS testing costs in California for over a decade. Unfortunately, providing jurisdictions the option of refusing to accept the TPQCP has prevented wide-scale adoption. The CEA strongly recommends that the same safeguards that made the TPQCP successful, the use of diagnostic tools and oversight by a certified administrator, be applied to acceptance testing programs proposed for the HVAC industry. The future success of both TPQCPs and acceptance testing will also require mandatory acceptance of associated test results by all jurisdictions.

Overview of the Compliance Reconciliation System

1. The CRS limits the sale of a “qualifying piece of equipment” (QPE.) The code defines QPEs as: furnace, coil, condenser, FAU, air handler or heat exchanger (and possibly compressors.) Under the CRS, sale of QPEs are limited to people who can provide to the equipment distributor (seller) both of the following:
 - a. An EPA license to handle refrigerant (License #608), which all CSLB licensed HVAC contractors with C20 or higher are required to have if they are working with refrigerant.
 - b. A unique identifying number from a California HERS Form CF-1R-ALT-HVAC which is procured by the buyer from one of the state’s HERS Providers. (The seller will have to use the CRS app to access the CRS platform to confirm the CF-1R-ALT-HVAC number is authentic.) Both processes will be as easy as using your smart phone to get a boarding pass for your flight on a commercial airline.
2. Evidence of this documentation must be presented at the time QPEs are ordered or sold (or be on file with the seller as is already the case with anyone buying Freon.) Home or building owners are not excluded from purchasing equipment as long as they can provide the required documentation. (The CEA favors restricting QPE sales to licensed C20 HVAC contractors, but that need not be a requirement for the CRS.) Sale of QPEs by distributors to HVAC contractors or building owners who have not provided both an EPA license and a CF-1R-ALT-HVAC form number is prohibited.
3. The EPA license number is documented in the seller’s sales records. (Distributors already have information about contractors with whom they work regularly including EPA card, CSLB license number, credit information, and other business information required for warrantee purposes, so the only additional information required is a CF-1R-ALT-HVAC number.) (While it is not the purpose of the CRS to build an audit trail, the requirement for CF-1R-ALT-HVAC numbers provides a complete and transparent audit trail from the manufacturer to the building or home owner.)
4. Distributors located outside of California who intend to ship QPEs into California will have to comply with the same regulations as in-state distributors. (Online sales are reputed to be less than 1% of HVAC equipment currently sold in California. QPE’s will be added to the list of products that California already regulates the importation of such as guns and vehicles.)
5. The CRS will require the development of a Compliance Reconciliation System Application (CRSA) to perform reconciliations. The CRSA will work in conjunction with the CEC’s HERS Provider databases. A mobile CRS app will also be developed.
6. The intent of the CRS is to shift responsibility for HERS testing and permit procurement (compliance) to the contractor and, ultimately, to the home or building owner. All

contracts between licensed HVAC contractors and building or home owners to purchase and/or install QPEs shall include language in large bold print indicating it is illegal to install said equipment without procuring proper building permits and HERS documentation. Contracts will also include language that makes clear it is ultimately the responsibility of the home or building owner to make sure these documents are obtained. The contracts will also warn the home or building owner that proper permits and HERS documentation may have to be produced for code affected equipment at the time the building or home is sold. Such changes may require changes to the Business and Professions Code.

7. The primary function of the CRS is to reconcile equipment purchases with HERS testing documents. While the system also reconciles purchases and HERS documents with building permits, permit procurement is secondary to HERS testing in terms of ensuring high HVAC system energy efficiency.

The Compliance Reconciliation Software Application

A new software application, referred to here as the Compliance Reconciliation Software Application (CRSA), will be created to perform the data analyses required to reconcile four data sets:

1. CF-1R-ALT-HVAC (purchasing) data;
2. CF-2R and CF-3R (installation and verification) data;
3. Building permit records issued by cloud-based, permitting companies;
4. Records indicating the intended place of purchase as recorded when CF-1R-ALT-HVAC forms are registered with HERS Providers.

This CRSA will access the CEC's centralized HERS database. The primary functions performed by the CRSA are:

1. Comparison of CF-1R-ALT-HVAC forms with CF-2R forms. An aging process indicates which CF-1R-ALT-HVAC forms have been in the system for a certain amount of time (typically six months) without a corresponding CF-2R form. These orphaned CF-1R-ALT-HVAC forms could have resulted from one of four situations:
 - a. The CF-1R-ALT-HVAC forms were registered and then abandoned by the registering contractors without buying equipment.
 - b. The equipment purchased with a CF-1R-ALT-HVAC number is still in the purchasing contractor's inventory. (CF-1R-ALT-HVACs registered for equipment purchased for inventory will have the contractor's business address rather than the address where it is to be installed). (Alternatively, the CEC could develop a new form, CF-1R INV to be used specifically when equipment is purchased for inventory.)
 - c. The equipment purchased was installed without registering CF-2R and CF-3R forms or procuring building permits.
 - d. The purchasing contractor, building owner or home owner used fake CF-1R-ALT-HVAC numbers or made a mistake in entering the numbers.

The CRSA will automatically detect an unusually high number of orphan CF-1R-ALT-HVAC forms registered by a single contractor. The CRSA will automatically send alerts to one or more of the municipalities where the contractor worked, and to building or home owners if installation addresses are available. Jurisdictions can use the CRSA to check on equipment purchased and CF-1R-ALT-HVACs issued in their compliance

areas (through ZIP codes.) For orphan CF-1R-ALT-HVACS with installation addresses, the municipality could inquire with the contractor or home or building owner about those particular jobs.

For CF-1R-ALT-HVACs that were registered for inventory (using the contractor's business address rather than installation address,) the investigating authority could check the contractor's physical inventory. The total number of orphan CF-1R-ALT-HVAC forms will have to equal the number of pieces of equipment in inventory plus the number of second CF-1R-ALT-HVAC forms issued with an installation address.

2. Comparison of projects where CF-1R-ALT-HVAC and CF-2R forms have been registered but CF-3R forms have not. This combination of forms could have resulted from the following situations:
 - a. The contractor was participating in a TPQCP, so the permit was closed and a permit issued based on the CF-2R form. (A CF-3R form is to be issued within three months.)
 - b. The project was abandoned, and the equipment was not installed;
 - c. The equipment purchased was installed but never HERS tested;
 - d. The project is taking an unusually long time to complete;
 - e. The purchasing contractor or home or building owner made a mistake in entering CF-1R-ALT-HVAC numbers.
 - f. The CF-1R-ALT-HVAC and CF-2R forms were abandoned and the equipment was installed in a different location than indicated on the forms.

As in situation 1, above, the CRSA will automatically detect a missing CF-3R form and generate an alert to alert to the contractor, the building/home owner, and the municipalities where the targeted contractors work. The municipalities could easily follow up on the alert since both the project address and the contractor were identified on the CF-2R.

3. Matching of CF-1R-ALT-HVAC, CF-2R, and CF-3R forms, comparison to building permits pulled through any cloud-based permitting companies and identification of unmatched forms (missing permits). Note, CF-2R forms require building permit numbers. This scenario may result from three situations:
 - a. The projects were completed but the building permit information on the CF-2R-ALT-HVAC form was falsified, and no building permit was procured;
 - b. The projects were completed, and a building permit was procured by someone appearing at the municipal building department in person.
 - c. The wrong building permit information was entered on the CF-2R.

The CRS will automatically generate an alert for projects with complete sets of HERS forms but no matching records of building permits from one of the cloud-based permitting systems. The alerts will be sent to the municipalities where the jobs were located (identified by ZIP code.) If, after reviewing their own record of permits, it still appears that no permit was issued or the building permit number was not valid, the municipalities could inquire of the contractor or homeowner as both addresses appear on the HERS forms. In cases involving high numbers of violations for a particular contractor, the Contractor State License Board (CSLB) could be informed.

Purchase Process for Qualifying Pieces of Equipment

There are only two reasons why HVAC contractors purchase qualifying pieces of equipment (QPEs.) Either the contractor is buying equipment to keep in inventory, or buying equipment for a specific project. We will examine both cases below.

The process for purchasing equipment for inventory will be much the same as purchasing equipment for a specific job. The primary difference will be that the address on the CF-1R-ALT-HVAC form will be the contractor's place of business rather than the address where the equipment will be installed.

We can foresee two options for the CF-1R forms used to purchase equipment intended for Inventory. The simplest method would be for the Commission to create a new CF-1R-INV form to be used when buying equipment for inventory. A standard CF-1R-ALT-HVAC form would then be issued when the equipment was pulled from inventory to be installed. The CF-1R-INV and the CF-1R-ALT-HVAC forms could use the same number for consistency.

If the Commission was reluctant to create a new CF-1R-INV form, a contractor could simply create two CF-1R-ALT-HVAC forms for the same piece of equipment – one when the equipment was purchased and placed into inventory, and another when the equipment was removed from inventory and installed. The second CF-1R number will record the installation address. If an investigation takes place, the contractor will have to match the number of CF-1R-ALT-HVACs recorded for inventory with the number of units in inventory plus the number of CF-1R-ALT-HVACs generated for units removed from inventory.

Two other situations to be accounted for are when equipment is purchased to be installed in either a different country (equipment purchases for installations in Mexico are common) or a different state. In either case, the contractor would obtain a CF-1R-ALT-HVAC and would use the same process as he or she would if buying for inventory. The contractor would simply maintain a list of equipment exported to another country or state in case of an audit or investigation. Purchase orders, export documentation, or installation contracts would confirm these transactions.

Except for the possible use of a CF-1R INV form, and the address on the forms, the purchase and installation processes would be the same whether a piece of equipment was purchased for a specific job or pulled from inventory for a specific job. That process is described below.

1. In most cases, the contractor will sign a contract with a home or building owner prior to purchasing replacement HVAC equipment. (In-home contracts are regulated by the Business and Professions Code.) Under the Compliance Reconciliation System (CRS), California law will require that all contracts to purchase or install QPEs include language in large bold print indicating it is illegal to install said equipment without procuring a building permit and the proper HERS documentation. The contract will also make clear that the home or building owner is ultimately responsible for procurement of the permit and the required HERS documents. The contract shall also state the minimum potential penalty for failing to procure the required documentation. The contract for sale and/or installation of QPEs will not include a CF-1R-ALT-HVAC number because the equipment along with the form will most often be procured after the contract is signed.
2. A contractor (or home or building owner) desiring to purchase a QPE, whether for a specific project or for inventory, first accesses a HERS Providership registry online, generates CF-

1R-ALT-HVAC forms for the pieces of equipment to be purchased, and records the unique numbers of the resultant CF-1R-ALT-HVAC forms. (Providerships may or may not charge for providing CF-1R-ALT-HVAC forms because issuance of these forms will usually lead to registration of CF-2R and CF-3R forms, for which Providerships do charge.)

3. Information required to request a CF-1R-ALT-HVAC form includes the following:
 - a. name and license number of the contractor, or the name of the home or building owner who requested the forms;
 - b. The address where the equipment will be installed, or business address of the contractor if the equipment is purchased for inventory.
4. A CF-1R-ALT-HVAC form can be easily generated by Providerships in a few minutes, anytime, day or night, using any type of internet-connected device including a cell phone. The forms do not have to be printed to purchase equipment. All that is necessary is to provide the unique number from the CF-1R-ALT-HVAC form. A home or building owner can purchase QPEs as long as they have an EPA certification and the unique number from a CF-1R-ALT-HVAC form. (The CEA supports limiting purchases of QPEs to C20 contractors in the future.)
5. At the time of purchase, the contractor or homeowner provides evidence to the equipment distributor of an EPA license and the unique numbers from the CF-1R-ALT-HVAC forms for all equipment purchased. The distributors confirm that CF-1R-ALT-HVAC numbers are valid at the time of sale by using the CRS app to access the CRS system. (The CRSA has access to the CEC HERS database where data from HERS Providerships is compiled.)
6. At some point in the purchase and installation process prior to the registration of the CF-2R form (which requires a permit number), the contractor applies for a permit either through a cloud-based permitting service or by appearing in person at the local building department. The contractor provides all the information required for a permit and, in addition, provides a CF-1R-ALT-HVAC number. Issuing permits for HVAC change outs without an applicant providing a valid CF-1R-ALT-HVAC number will be prohibited by law. The agency issuing the permit checks to make sure the CF-1R-ALT-HERS number is valid by accessing the CRSA directly or by using the CRS app. If the CF-1R number is found to be valid, a permit is issued.

Equipment Installation and Testing Procedure

1. Prior to start of work, the contractor is required to apply for a building permit for installation of the QPE. However, currently, permits are procured for between 8% and 30% of residential retrofits², and they are rarely procured prior to installation. The purpose of the CRS is to provide an auditable trail that links the sale of equipment to the issuance of the CF-1R-ALT-HVAC form and the procurement of a building permit. In reality, whether the building permit is procured before or after equipment installation is unimportant. However, a CF-2R cannot be registered without a building permit number.
2. A common reason contractors give for not pulling permits is that some equipment must be installed on an emergency basis, either for health reasons or because customers demand

² Watkins, Amber W. Metoyer, Jarred. Gruending, DNV GL, Paula. CPUC, Scofflaw State: Quantifying HVAC Permit Rates and Energy Efficiency for Residential Changeouts in California, 2018, ACEEE Summer Study on Energy Efficiency in Buildings

their comfort.³ In many such cases in the past, this was a reasonable argument because permits were not obtainable on weekends and holidays when many building departments were closed. This will not be a legitimate reason for not procuring a CF-1R-ALT-HVAC because Providerships, where contractors must go to register CF-1R-ALT-HVAC forms necessary to purchase equipment, are online and available 24 hours a day, seven days a week. Once a contractor registers a CF-1R-ALT-HVAC form, they are trackable by the CRS system, and can be held accountable if they fail to procure HERS tests or a permit. (When cloud-based permitting becomes available, procuring permits will also be possible 24/7.)

3. After the installation of the equipment by the contractor, the system is performance tested as required by California Codes and Standards, and a CF-2R (Certificate of Installation) is registered with the Providership. The required HERS testing can take place one of four ways:
 - i. The contractor can perform the tests and submit the CF-2R form, after which a HERS rater retests the system (or includes the job as one of seven in a tested sample group) and submits a CF3R (Certificate of Verification);
 - ii. A HERS Rater can perform the tests (as a 1 in 1 – no sampling) and submit both the CF-2R and the CF-3R;
 - iii. A consistently compliant contractor who is trained and certified by a Third Party Quality Control Program (TPQCP) and uses diagnostic tools (that submit data electronically to the TPQCP which is unalterable by the contractor) can essentially self-certify a job and close a permit with a CF-2R. Within six months, a TPQCP HERS Rater will test the job or include it as one of thirty in a sample group and issue a CF-3R.)
 - iv. A contractor who is certified to do acceptance testing, can test the system. (The CEA strongly supports a requirement for the use CEC-certified diagnostic tools and the administrative oversight of a Third Party Quality Control Program (TPQCP) in all HVAC acceptance testing programs.) (When TPQCPs are used, permits can be closed with a CF-2R.) The job will then be included as one of one hundred jobs in a sample group of which one job will be reviewed.

Using one of the four HERS testing methods described above, a CF-3R is produced and registered with the Providership within six months.

4. As they are generated, the records of the CF-1R-ALT-HVAC, the CF-2R, and the CF-3R are transferred from the Providerships to the CEC HERS database. Building permit information from on-line permitting systems are collected by the CRS. While all records are available to building departments through access to the CRS, notification of installations can automatically be generated by the CRS and sent to the municipality in which the installation took place. (Ideally, a municipality will be able to specify the parameters of the notifications they receive.) If jurisdictions would upload records of their HVAC permits to the CRS, or if HVAC permitting were limited to cloud-based services, the circle would be complete and purchases, permits, and HERS forms could be reconciled for every job.
5. Once a CF-2R (for projects conducted under TPQCPs) or a CF-3R (for projects inspected under 1-in-1 or 1-in-7 programs) is registered with the Provider, the contractor can apply to close the building permit for the project either through the jurisdiction or through a cloud-based permitting system. The availability of cloud-based permitting systems will make the

³ Understanding the Residential HVAC Compliance Shortfall, Western HVAC Performance Alliance, Compliance Committee, August 2017

procurement of building permits much easier and save the contractor and homeowner hundreds of dollars in expense. (Obviously, the codes and standards that the CEC develops in order to certify cloud-based permitting systems must include a provision that all jurisdictions must accept permits generated through cloud-based systems.)

Enforcement

As with every code compliance improvement proposal, enforcement responsibility is one of the most challenging issues to resolve. The enforcement strategy behind the CRS is twofold. The first element is to present enforcement agencies with a narrow target group of non-compliant contractors along with the clear evidence trail to justify their selection. In doing so, a relatively minimum amount of work is required of the enforcement agency to identify actual offenders and enforce penalties.

The second strategy is to stimulate corrective measure from those who have the responsibility and authority to take action. Alerts of noncompliance will be sent to AHJDs, because they have authority to enforce regulations with building and homeowners. In addition, alerts will be sent to building and homeowners because they are ultimately responsible for their properties, and because they have authority over contractors. Receiving a letter from the municipality or the CEC that states their new HVAC system is unlawful may well motivate most to contact their contractors. Just these self-policing actions may change the course of the industry. But, for intransigent contractors, the responsibility will fall on the CSLB.

While there are four agencies who may play an enforcement role: the Energy Commission, the CSLB, the local building departments (AHJD) and local district attorneys, the CSLB is the logical agency to lead the enforcement effort, especially against repeat offenders (contractors). However, as anyone who has spoken with representatives of the CSLB knows, the CSLB is understaffed and underfunded. We would like to see the CSLB better funded, but understand this requires legislation. In lieu of additional funding, we believe that providing narrowly targeted cases of potential misconduct along with supporting evidence may reduce the cost of pursuing cases against contractors and thereby increase the efficacy of the CSLB in the HVAC industry.

Noticeably absent from this proposal is a mechanism to compel distributors to obey the law and require a CF-1R ALT HERS number prior to selling QPE's. We believe that if we build the legal and logistical framework described here, HVAC distributors will be supportive and willingly participate. For those who question the integrity of distributors, we suggest that these large businesses have far too much to lose to risk their business license by "selling out the back door." If we are wrong, punitive measures, such as preventing distributors from participating in HVAC utility or state rebate programs could be implemented as a probationary, corrective action to encourage compliance prior to last-resort legal prosecution.

Where Do We Go from Here?

The compliance issue has been under discussion for over two decades and so have potential solutions. The CRS is the end product of these deliberations. The CRS appears to CEA membership to represent a practical, potentially acceptable solution to the HVAC compliance dilemma. In this plan, we have eliminated any administrative burden on the distributors other than confirming the validity of a client's CF-1R ALT HVAC number prior to a sale. We have also taken care not to increase the workload or responsibilities shouldered by the jurisdictions. The jurisdictions should benefit from revenues from additional HVAC permits. The CRS can make the work of the CSLB more efficient and effective. In a 2017 WHPA survey, 25 out of 28 contractors responded positively when asked the question of whether they ". . . see any value

for either contractors or customers in pulling permits for HVAC add-ons or replacements?”⁴ And, of course, the long-suffering building and home owners, and ratepayers have the most to gain in that they will finally get full value for their investment in HVAC systems, their energy bills, and their tax dollars.

The mandates of SB1414 and SB 350 leave no doubt that we must take action on the compliance issue. While the CEA supports continued data gathering and analysis to further validate and refine the CRS system, we strongly believe that such study should take place concurrently with a pilot of the CRS system. Judging from prior discussions with many industry stakeholders including contractors, distributors, utility program administrators, HERS Raters, and others, we believe that a pilot of the CRS will be widely supported.

Summary

The CEA understands that the ultimate solution to the installation of inefficient HVAC systems is embedded EM&V – 24/7 monitoring of HVAC system performance. However, even if embedded EM&V was mandated, implementation would take at least five years, and more likely ten. Current legislation demands faster action. While we have considered many proposed variations of enforcement tools including serial number tracking and equipment registration, we support the Compliance Reconciliation System described here. It requires development of a relatively simple software program; is consistent with existing CEC processes and procedures; puts the responsibility for acquiring permits and HERS documentation on the contractor and, ultimately on the building or home owner; and, perhaps most importantly, will be least objectionable to industry stakeholders.

This document does not address questions regarding costs, code language redlines, or legislation changes required to implement this or any plan to improve compliance or compliance enforcement. Our options at this point are to initiate more studies to try to answer these questions in the hypothetical, or to initiate pilot programs that can answer these and other questions in real time. Given the legislative mandates we are under, and the real environmental crisis created by carbon emissions, we can no longer afford to spend more decades, or even more years doing theoretical studies on compliance improvement options. We need to take action now. For these reasons, the CEA supports the immediate initiation of a CRS pilot project combining cloud-based permitting with compliance reconciliation to validate concepts and demonstrate this viable, near-term solution.

⁴ WHPA, *Memorandum 2017, WHPA Online Permitting Contractor Survey*, August 28, 2017