


HVAC2HP or HP2HVAC?



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Chandler von Schrader, CvS Consulting, LLC
Jamie Clark, Synergy Home, LLC

Agenda of sorts

- Who are you? Who are your speakers
- Setting the stage – HVAC
- Emergency replacements leave little room for quality installations
- Setting the stage - HP



Who am I ? Who is Jamie?

- ▶ Chandler's story – I've seen it all, forgotten a bunch – but know the rigors of being both a HVAC and HP contractor
- ▶ Done the audits, done the sales (solar, HP, windows, siding, roofing, remodeling and HVAC) done the installs, lead the crews, done the QC, managed national HPwES and launched ESVI program
- ▶ Got rooftop 7.2 KW rooftop PV system – haven't paid for electricity for 25 consecutive months!
- ▶ Got a 3 yr old grand daughter – she's a big consumer of resources in a world of diminishing resources. I'm afraid the planet she will inherit will be less beautiful, less fair and painfully more warm. Chanpa will have some "splaining" to do...
- ▶ Jamie – who are you?



Who are you?

- HVAC contractors?
- HP contractors?
- Anyone doing both as a consistent business?
- Program managers? Utility folks?
- Any auditors/raters?



Setting the HVAC stage

- ▶ HVAC rules – it's a huge industry
- ▶ 2018 AHRI shipping reports:
 - ▶ 5,399,760 Central AC (or 15,167 per day!)
 - ▶ 2,940,502 Heat pumps (8056 per day)
 - ▶ 3,416,571 Gas furnaces (9597 per day)
 - ▶ 4,521,373 Gas DHW (12,700 per day)
 - ▶ 4,229,912 Electric DHW (11,881 per day)
- ▶ Multi billion dollar industry
- ▶ Appx 267,000 mechanics and installers in US
- ▶ Over 60,000 firms



Setting the HVAC stage

- Of all the trades – HVAC is the one most called on
- Homeowners most likely to have a “relationship” with a HVAC company that visits home 2x year for pre-season check ups
- Homeowners roll the dice playing the repair or replace game and service techs can often keep systems running – when the smart play is to replace
- Consequently the majority of replacements are driven by emergencies and guess when these emergencies occur!
- Quality installation goes out the window – and the homeowner does not realize the importance/complexity of properly installing a new system
- Homeowners pay for this lack of knowledge as their quickly replaced system will under perform for years to come



Performance of “Typical” HVAC Systems

- Nationally:
 - 50–70% of HVAC systems are improperly installed
 - 10–50% less efficient than if they received quality design, specification and installation
 - National Comfort Institute discovered that the average delivered efficiency of an installed system was less than 60%
 - So you ordered a large pizza....

Emergency replacements leave little room for quality installations

- Contractors will respond to homeowner's cry for heating or cooling with little time or regard for doing a quality job
- Design is out the window, systems are generally replaced with same size – or worse larger, no time for doing a load calculation (ie energy audit)
- Even less likely is a review of the distribution system or air flow
- Little regard or time to follow industry standards – just flat out box replacements
- House as a system is not part of conversation



What contractors say...

“When asked about barriers to implementing high quality installation services, 62% of the contractors indicated that their customers simply did not want to pay for it.”

“...customers have two primary priorities: making sure their system is functioning (however effectively) and spending as little money as possible.”



HVAC industry has own hurdles

- ▶ National studies indicate 70% of system installation has at least one fault, often more than one
- ▶ Efforts to promote QI have fallen short – have seen it first hand...
- ▶ Interviewed top shelf contractors on why QI is not readily followed
 - ▶ They think their installations are pretty damn good
 - ▶ They sell alot high efficiency (ENERGY STAR)
 - ▶ Follow some ACCA standards – even occasionally do block loads
 - ▶ Offer zoning as solution to uncomfortable rooms
 - ▶ But ultimately say – they'd do QI if homeowners asked for it...



Setting the HP stage

- ▶ Basically an outgrowth of weatherization – in the Utilities pressured to provide efficiency measures to residential customers
 - ▶ Clipboard audits / direct install of efficient lighting
 - ▶ Wrapping water heaters, weatherstripping, etc
- ▶ 1990s saw states and utilities start to go deeper with insulation, window and HVAC replacements – rebates key motivator
- ▶ By 2003 – national programs get seeded delivering diagnostic audits and “house as a system” remediation (Home Performance with ENERGY STAR)
- ▶ Supporting certification orgs (BPI/RESNET) bring technician competency
- ▶ 2018 E4theFuture’s Jobs in America Report – there are over 350,000 folks employed in “energy efficiency businesses”



Setting the HP stage

- ▶ HP is still an emerging option for homeowners – they don't know
- ▶ Getting homeowner's attention even with utility, state and local incentives is not automatic
- ▶ Homeowners will call HVAC company first, maybe look to add insulation or replacement windows for comfort issues
- ▶ And then there's the audit challenge – with good intentions HP contractors sell the audit – making this a science experience, way more than what the homeowner was expecting
- ▶ Envelope and duct issues are addressed – often the source of comfort failures – but most HP folks lack confidence with HVAC systems.
- ▶ **HP remediation without addressing HVAC performance is a job half done**

70%

Percent of houses in 2030 are here today! Yet what will investments will be made to this house?

Windows, HVAC, roofing, DHW system and maybe a new kitchen or bath – all likely home improvements before 2030.... These are point of sales events that *will happen* – do you think our HP industry should be there??

How much \$ will this homeowner spend on improvements through 2030???

Home Improvement	Average Cost
HVAC Replacement (2)	\$10,000+
Windows and Doors	\$3100
Insulation	\$1500
DHW	\$800
Roof /Siding	\$5200
New Kitchen	\$15,000
New Bath ¹⁴	\$8000

Misc Home Improvement	Average Cost
White Appliances (4)	\$4000
Misc Painting	\$2000
Misc Plumbing & Electrical	\$2000
Computers / TVs	\$5000
Landscaping	\$3000
Driveway, fence, shed	\$8000
ROUGH GRAND TOTAL	\$65,000



What is Holding HP Back?

- ✓ Layered program requirements, challenging cost effectiveness tests
- ✓ Complexity of CHA – maybe emphasis should be on a Comprehensive Work Order! We know what needs to be done (air seal, insulate, fix ducts) Just do it! - and test out....
- ✓ Multiple & competing trainings & standards that add programmatic confusion and contractor entry costs
- ✓ Little coordination HP industry with enormous volume of energy efficiency work being done by HI industry
- ✓ Homeowner's failure to connect comprehensiveness as best strategy – and HI contractor is reluctant to change (savings small, couple pizzas a month!)
- ✓ Down economy narrows vision/budgets across the board
- ✓ Continued tweaking of incentives structures
- ✓ Historically focused on modeling, modeling, modeling... not work, work, work - if we can't streamline approach we will stay boutique
- ✓ ¹⁵ HVAC Industry just getting HP traction (about time!)

Approaches and

Home Performance

HVAC

- ▶ **Home Performance Assessment**
 - ▶ Evaluate windows
 - ▶ Evaluate insulation levels
 - ▶ Evaluate air infiltration
 - ▶ Ask questions about hot and cold rooms and about energy bills
- ▶ **General recommendations**
 - ▶ Air seal and insulate
 - ▶ Duct sealing
- ▶ **Typical assessment and recommendation for a bonus room**
 - ▶ Room has a lot of surface area exposed to unconditioned/exterior spaces. To fix comfort issues, air

Biases of Different Industries

- Manual J
 - Evaluate windows
 - Evaluate insulation levels
 - Evaluate air infiltration
 - Ask questions about hot and cold rooms and about energy bills
- **General recommendations**
 - Purchase bigger equipment and / or
 - Purchase newer equipment
- **Typical assessment and recommendation for a bonus room**
 - Room is at the end of the duct run. You need a bigger system, a separate system, or (perhaps) some duct modifications for increase airflow.

Bottom Line:

Both approaches have some justification. Both approaches have weaknesses.

But you don't want to sell a \$2500 shell job, not recommend \$200 duct modification, and still have an uncomfortable room!

Abstract

You can't call yourself a home performance contractor or building scientist if you don't understand the basics of HVAC design, quality installation, and verification. Whether you are assessing existing homes, designing new homes, or verifying HVAC equipment installation in either a new homes or an existing home, understanding the basics of HVAC systems is critical. Proper equipment sizing, having matching equipment, ensuring proper air flow, and performing appropriate diagnostics are concepts every HP contractor should know and any "whole house" program should recognize. The ENERGY STAR Certified Home program and the ENERGY STAR Verified HVAC Installation program acknowledge these issues and key components of both programs are based on core HVAC concepts.