Heat Pump Coalition

Workgroup Update

June 9, 2020

Agenda

Request #1 ---- Join a Workgroup

General Information — 20 minutes
- What is the Advanced HP Coalition
- Draft Timeline
- Documents Under Development

Workgroup Report Out — 40 minutes
- WG #1 – Improved Test Procedure and QPL
- WG #2 – Roadmap Specification and Manufacturer Engagement
- WG #3 – Design & Install Best Practices

Collaboration Discussion — 20 minutes

Intention: Update people on what has been accomplished

Objective: Increase participation in workgroups and collaboration

A Coalition of the Willing

Goal

To increase research collaboration among energy efficiency organizations that are working to accelerate market adoption of advanced heat pumps

Membership

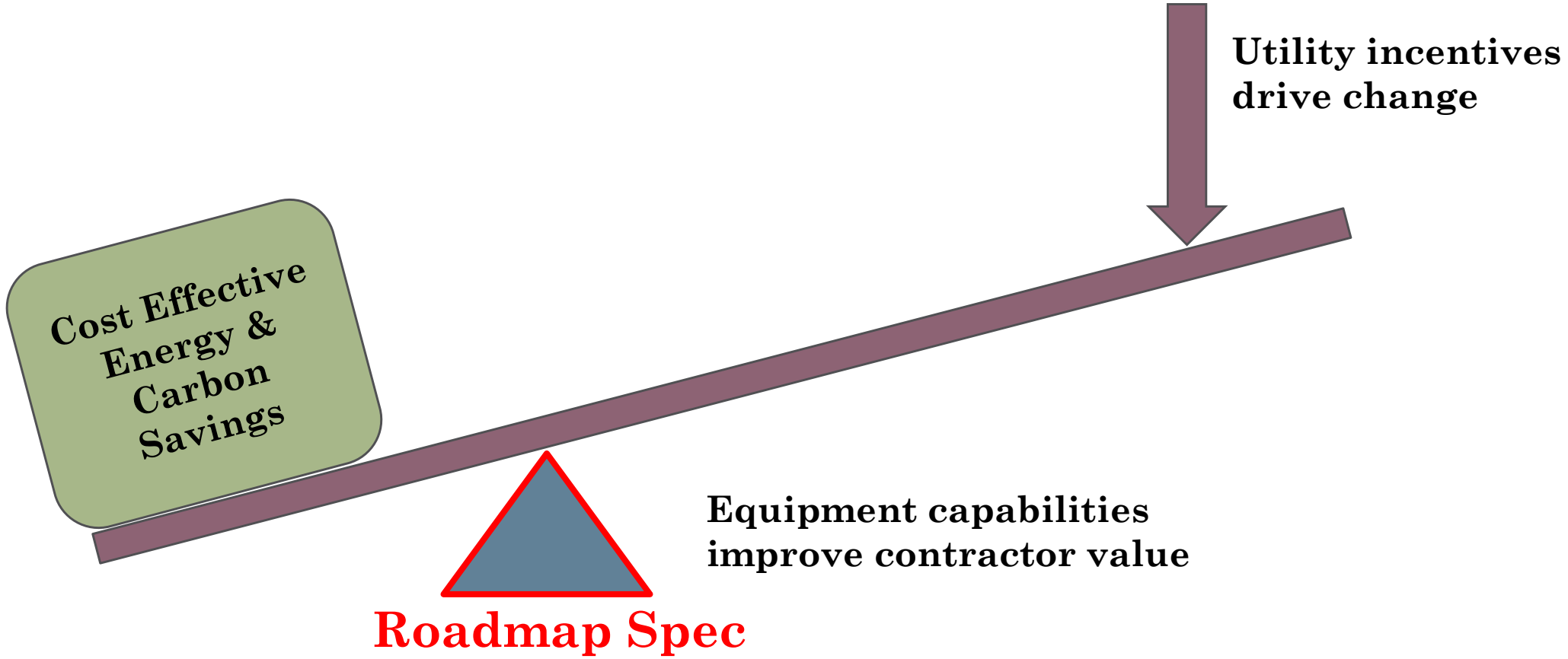
- ACTIVE = Fund and Guide collaborative activities
- PASSIVE = attend webinars, provide feedback

Committees

- Steering Committee (NEEA, NEEP, MEEA, CEC, NRCan, EPA)
- WG #1 – Improved Test Procedure and QPL
- WG #2 – Roadmap Specification and Mfr Engagement
- WG #3 – Best Practices
  (Design, Adaptation, Installation and Operation)

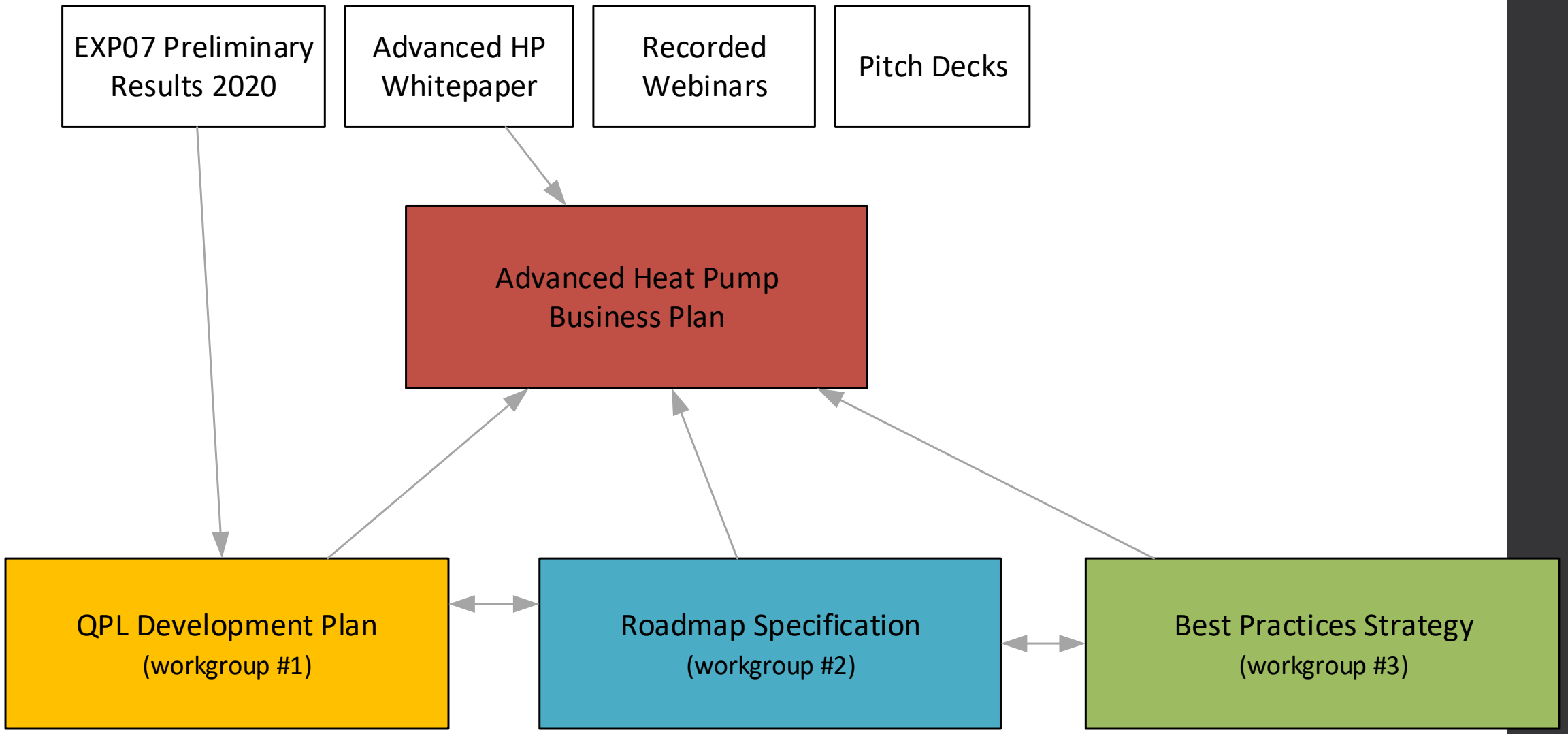
Brightest heat pump minds
from organizations such as these:

Creating an “MT Fulcrum”

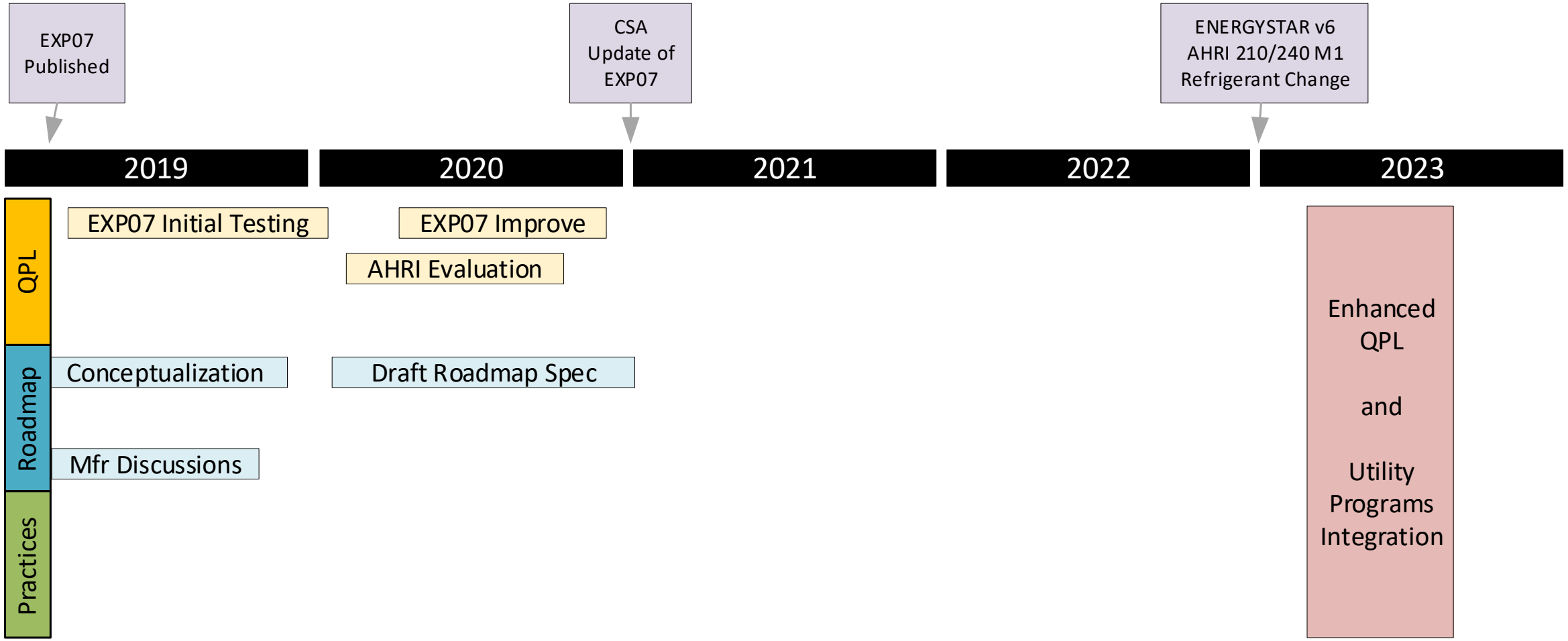


The roadmap specification is intended to align Utility and Manufacture efforts

Coalition Documents



Draft Timeline



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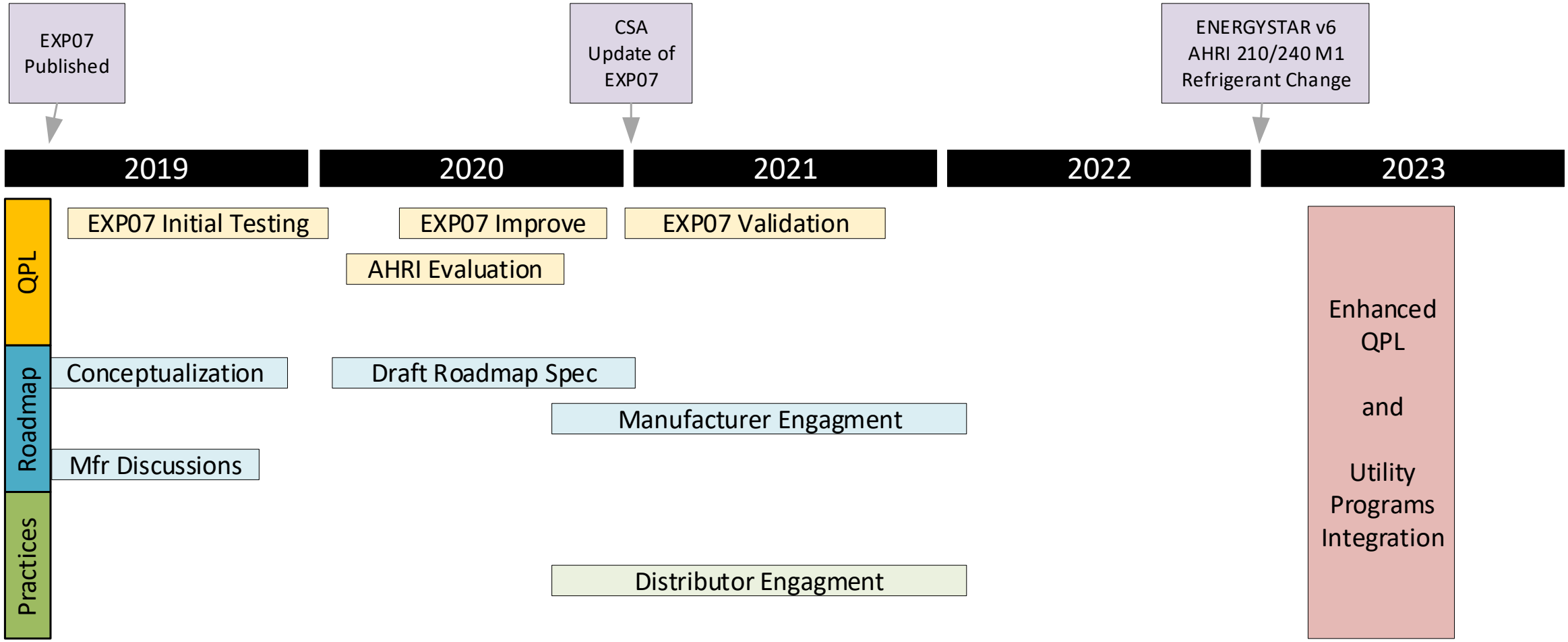

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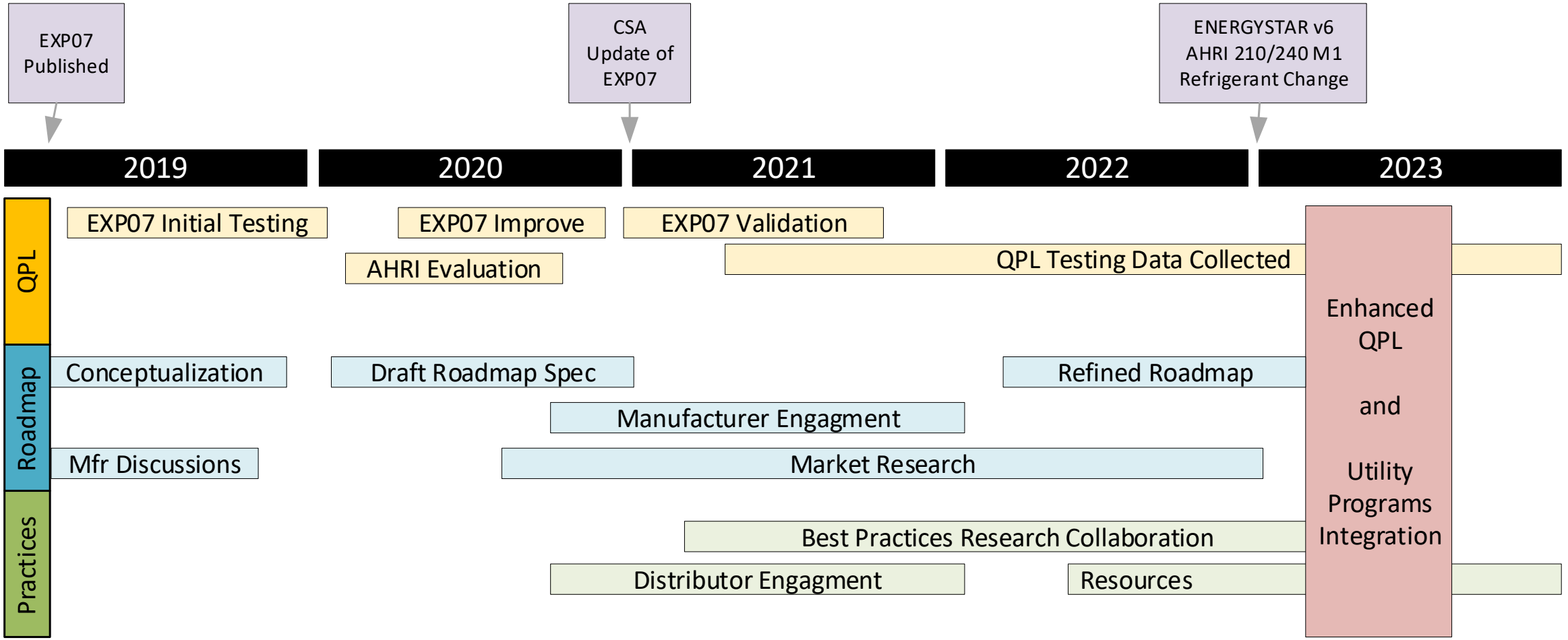


Workgroup 1 – Improved Test Procedure & QPL

Vision

- The marketplace (Efficiency Programs/manufacturers/contractors) can identify ASHP products that will deliver *actual* performance

Desired Outcomes

- An improved test procedure is developed and validated to show enhanced representativeness of ASHPs
- An Advanced ASHP Qualified Product List (QPL), based on the results of an improved test procedure, is built
- Efficiency Programs use QPL to incentivize adoption of advanced ASHPs that deliver real world performance, increasing savings
- Long term- Federal Standards program ultimately adopts EXP07, or similar, as its next test procedure

Mechanism employed

- Improved Test Procedure
- Qualified Products List

WG 1 – Where have we been?

EXP07 Testing done so far

- 19 units (15 ductless and 4 ducted units)

Findings report forthcoming

- Efficiency results diverge from current ratings
- Further validation research is needed, particularly for representativeness

AHRI

- Currently, conducting repeatability and reproducibility research on EXP07, to inform comments to CSA (~October)

WG 1 – Where are we going?

Suggested steps to QPL

- *Streamline EXP07* – (2020)
- *Strengthen confidence in EXP07* – Evaluate 3R (2020-2021)
- *Build a QPL based on EXP07 Results* – (2022-2025)
- *Voluntary Programs link incentives to QPL* – (2023?-)

3R Research

Conduct In-Field *Representativeness* Monitoring

- 10 different models across North America climate regions, at least 2 sites for each model

Reproducibility and Repeatability Lab Testing

- Conduct two (2) tests on all 10 models according to EXP07 in LAB #1 and LAB #2
- Conduct one (1) test on all 10 models according to M1 with CVP, in LAB #1 and LAB #2
- UL and ATS Labs are potential testing locations

3R Research cost estimate

- $1,740,000

3R Research 2020 Timeline

		Jun	Jul	Aug	Sept	Oct	Nov	Dec
Finalize funding request and solicit partners								
Finalize group of funding organizations								
Develop RFP for contractor/ Select firm								
Launch 3R Research Project								

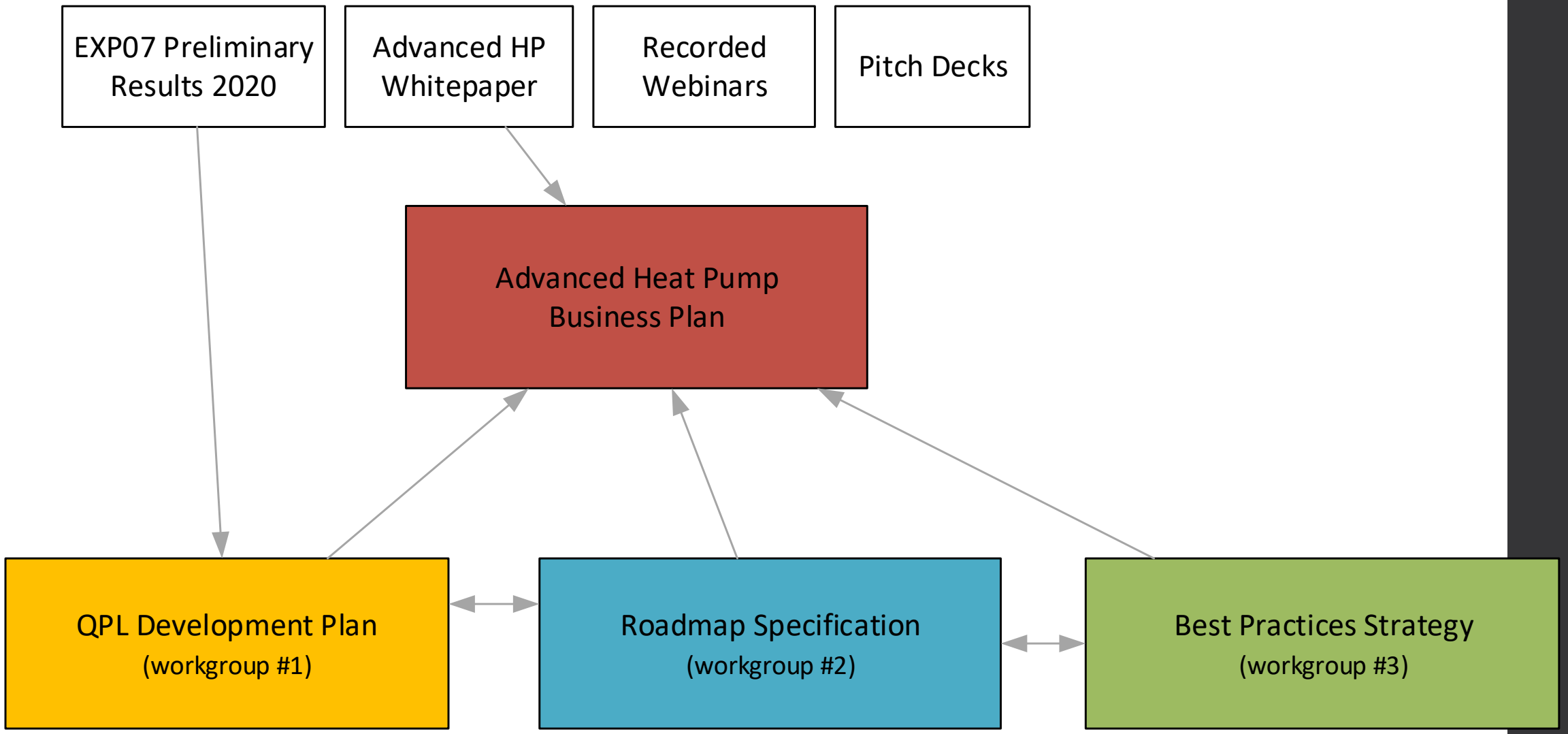
In-field data collection window is February 2021 through August 2021

WG 1 – Next Steps

1. Review Draft 3R research proposal — June 17th
2. Finalize and circulate research proposal — July
3. Potential funding organizations convene — August
   - Determine budget
   - Adjust scope

Request #2 ---- Co-fund 3R Research

Coalition Documents



Workgroup 2 – Roadmap Specification

Coalition formed because people recognized a need for common description of high performance and future heat pump

A “Roadmap Specification”

- It is not program specification
- It includes MT fulcrum items
- It leverages industry direction

WG 2 – Where we are going

Vision

- Heat pump capabilities that enhance in-field performance are well supported by utility programs and provide additional value to the HVAC industry

Desired Outcomes

- Manufacturers have clear understanding of what Utilities need
- Widespread utility program support exists for the features specified

Mechanisms Employed

- Improved performance (e.g. load based testing, capacity data, low GWP refrigerants)
- Connected controls (e.g. DR, Scheduling, Geofencing, Efficient recovery)
- Data based feedback loop (e.g. performance bonus)

Roadmap Spec – Structure

	Today	Soon	Future
Performance Ratings			
Hardware Features			
Controls Capabilities			
Design & Installation			
User Amenity			

SCOP, Capacity

Hardware & Refrigerants

Integration, DR

In-field Performance

Control, Comfort, IAQ

Draft Roadmap

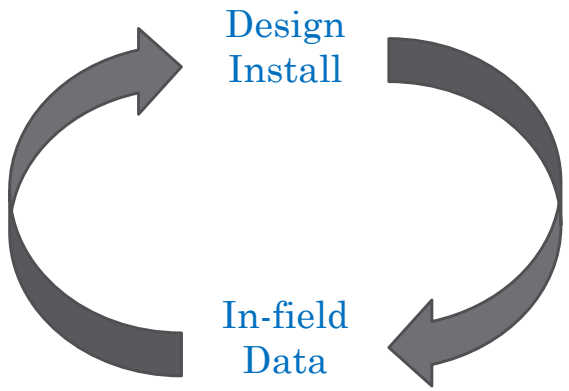
In-field performance

CRITERIA	TODAY	SOON	FUTURE
PERFORMANCE RATING & CAPACITY	• ENERGY STAR Certification (based on HSPF and SEER)	• Climate specific minimum SCOP ratings, ~ 10% more efficient than ENERGYSTAR v6 • Published Max and Min Capacity Values across full operating temperature range	• Climate specific minimum SCOP ratings ~ 20% more efficient than ENERGYSTAR v6 • Min capacity values are less than 1/4th max capacity values •
HARDWARE FEATURES	• Variable speed compressors and fans • Internet connection capability	• Refrigerant with GWP not greater than 750 • CTA 2045 port or equivalent • System provides data to support commissioning and baseline performance	• Refrigerant with GWP not greater than 150 • Integrated energy storage, allowing for load flexibility without consumer impact • System calculates real time COP and Capacity based on onboard sensors & input
CONTROLS CAPABILITIES (HARDWARE + SERVICE)	• Controls allows integration with other htg/clg system. • Minimizes recovery energy from setback • ENERGY STAR certified controls • Geofencing occupancy • AHRI 1380 capability	• Ability to access 24hr ahead weather data to optimize comfort, performance and DR response • Ability to read external RSS for utility DR condition information	• DR hardware automatically connects to utility DR system (user chooses level of DR responsiveness) • Confirmation of demand response actions taken
SYSTEM DESIGN, INSTALLATION, MONITORING	• Design follows ACCA design manuals • Installer has manufacturer certification of current product knowledge • Confirmation of installation to utility	• Data confirms system basic operational via Key Performance Indicators (KPIs) • Ongoing data provides installers with alerts and diagnostic recommendation • Baseline performance captured	• Complete integration of design tools with post installation verification data • Ongoing data for performance monitoring
USER AMENITIES	• Capable of remote operation via connected devices • Comfort and IAQ - TBD	• System provides user with energy efficiency and demand response prioritization options • Automatic ASHRAE 62.2 verification of system (for ducted systems)	• CO and VOC sensors provide optimized performance

The Roadmap Focuses Our Research

Example Hypothesis:

In-field performance data can improve design/install



Research Questions:

- Will contractors welcome this?
- What do utilities need in order to provide performance based incentives?
- What data structures/agreements need to be in place for this to work?
- What data is already available? What else is needed?
- How much savings will result from performance based incentives?
- What is the path of least resistance?

WG 2 – Next Steps

1.	Finish draft	Sept 1
2.	Get manufacturer feedback	EOY
3.	Conduct market research to refine the MT fulcrum	2021+
4.	Prepare utility capabilities to take advantage of features	2022+
5.	Help HVAC industry add “soon” and “future” capabilities	2022+

Workgroup 3 – Best Practices

Vision

- HVAC designers/installers have the knowledge and tools that improve the business case for recommending advanced heat pumps to their customers.

Desired Outcomes

- We understand how to optimize performance
- It is easy and profitable for contractor

Mechanisms Employed

- Field research
- Manufacturer training for contractors
- Online tools and connected system data

Workgroup 3 – Call for Members

Request #2

Join a Workgroup

Potential Collaboration Projects

	When	Estimate
EXP07 Test Procedure Validation	2020-21	$1.7 million
VCHP Product Assessment	2020	TBD
Quantifying Savings from Connected Data	2021	TBD
HVAC Contractor Value Proposition Research	?	

Other Ideas?

Request #3 ---- Co-fund A Project

Thank You

Special thanks to Theo Keeley-LeClaire for enabling our collaboration