Emerging Technologies

Central Heat Pump Water Heating April 2020

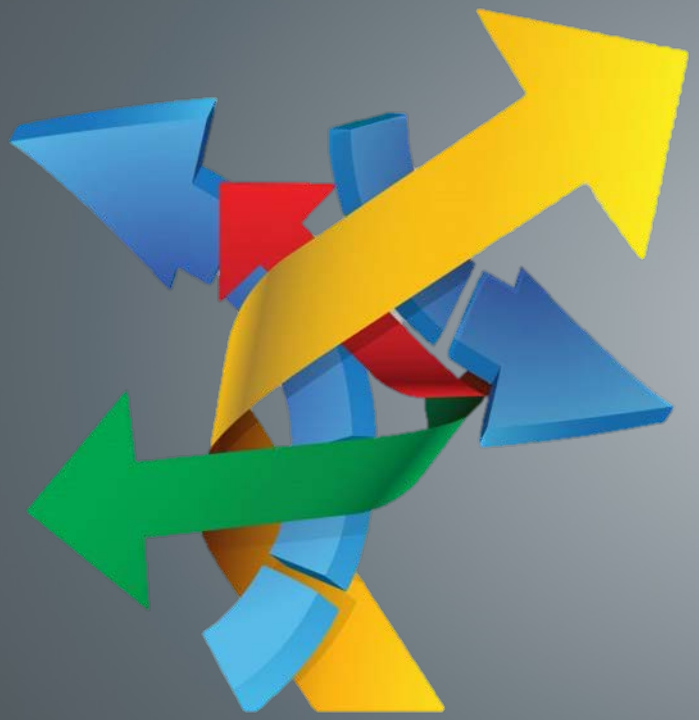
Keshmira McVey & Robert Weber (Bonneville Power)

Jon Heller & Mark Frankel (Ecotope)

BPA

- Background
  - Federal Agency serving 140+ public utilities
  - Service territory 8 states
  - Almost exclusively hydro based system – low carbon
  - Multi-family water heating is top research priority
- Millions invested CHPWH market for over 10 years:
  - Research
  - Pilot Projects
  - Manufacturer Engagement
  - Technical Development

Central Water Heater Market Environment



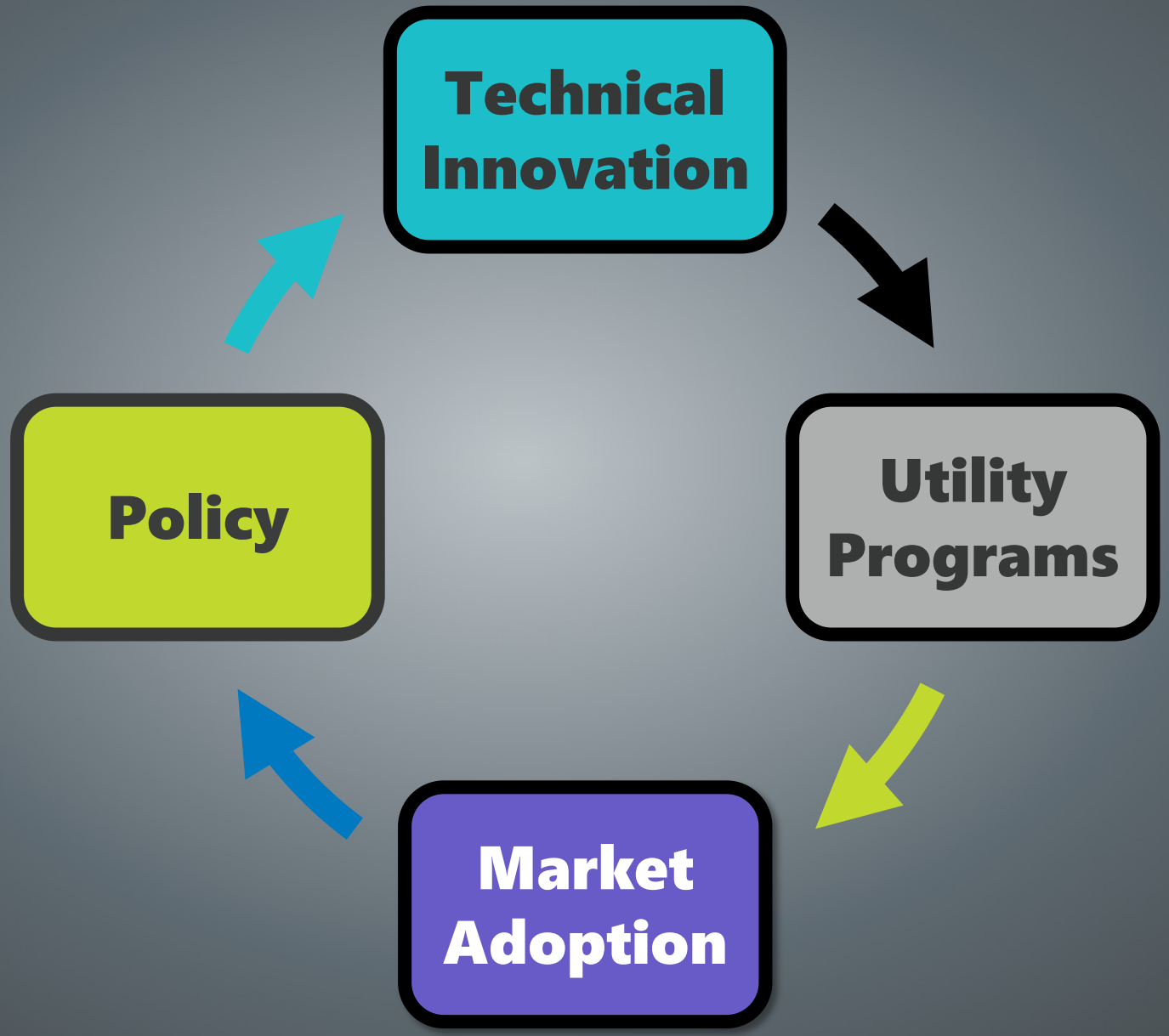
- **Provide support for and address**
  - Policy Requirements
  - Utility Program Support
  - Market Adoption/Deployment
- **A perspective and approach to align**
  - Technology Innovation Model Framework (TIM)

Emerging Technologies

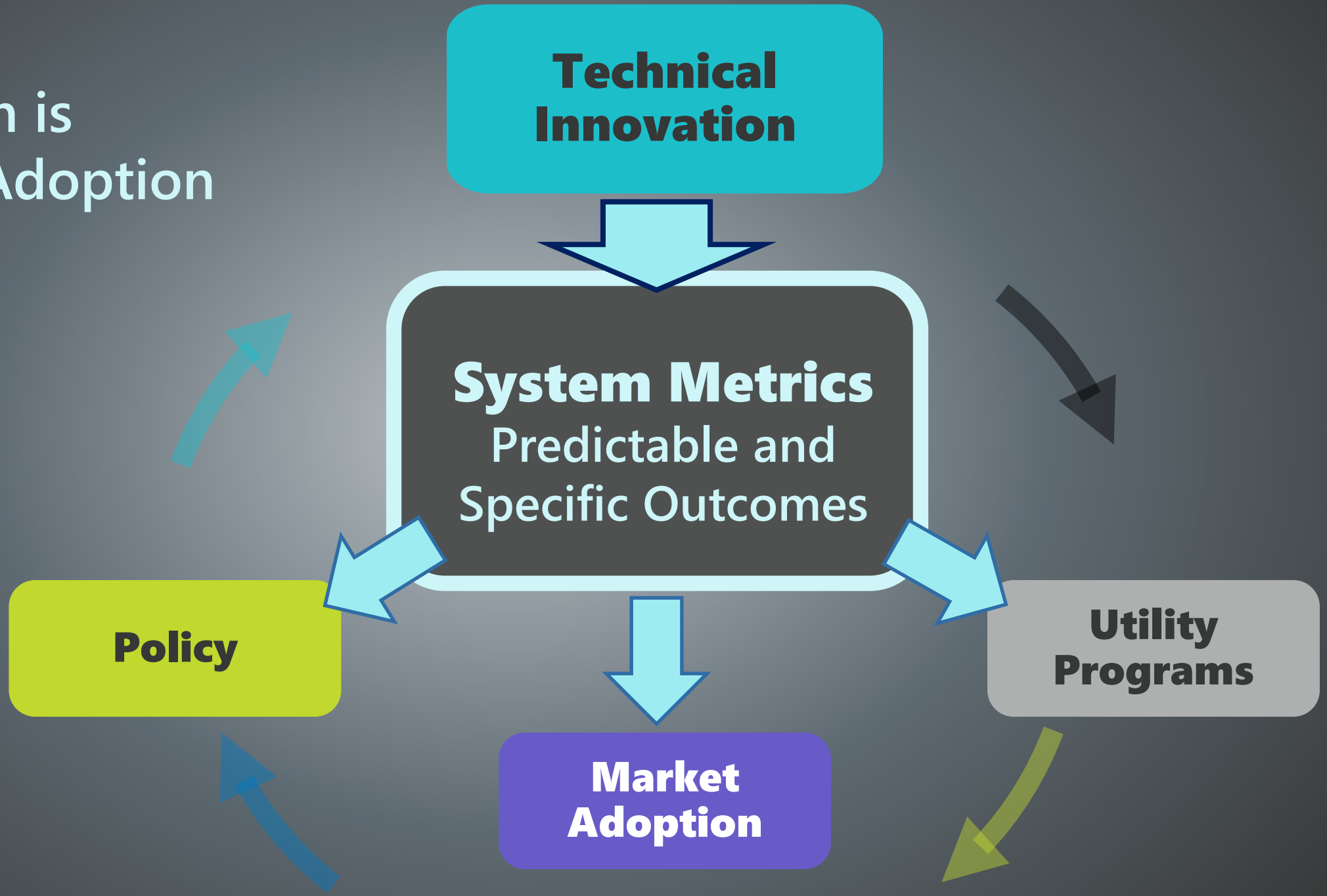
GOAL: Advance the development and adoption of HPWH Technologies faster together

- HPWH are standard practice in new construction and retrofit
- COP ~ 3
- Low-GWP refrigerants
- Plug-and-play packaged systems
- Cost-effective
- Reliable
- Ability for load shift

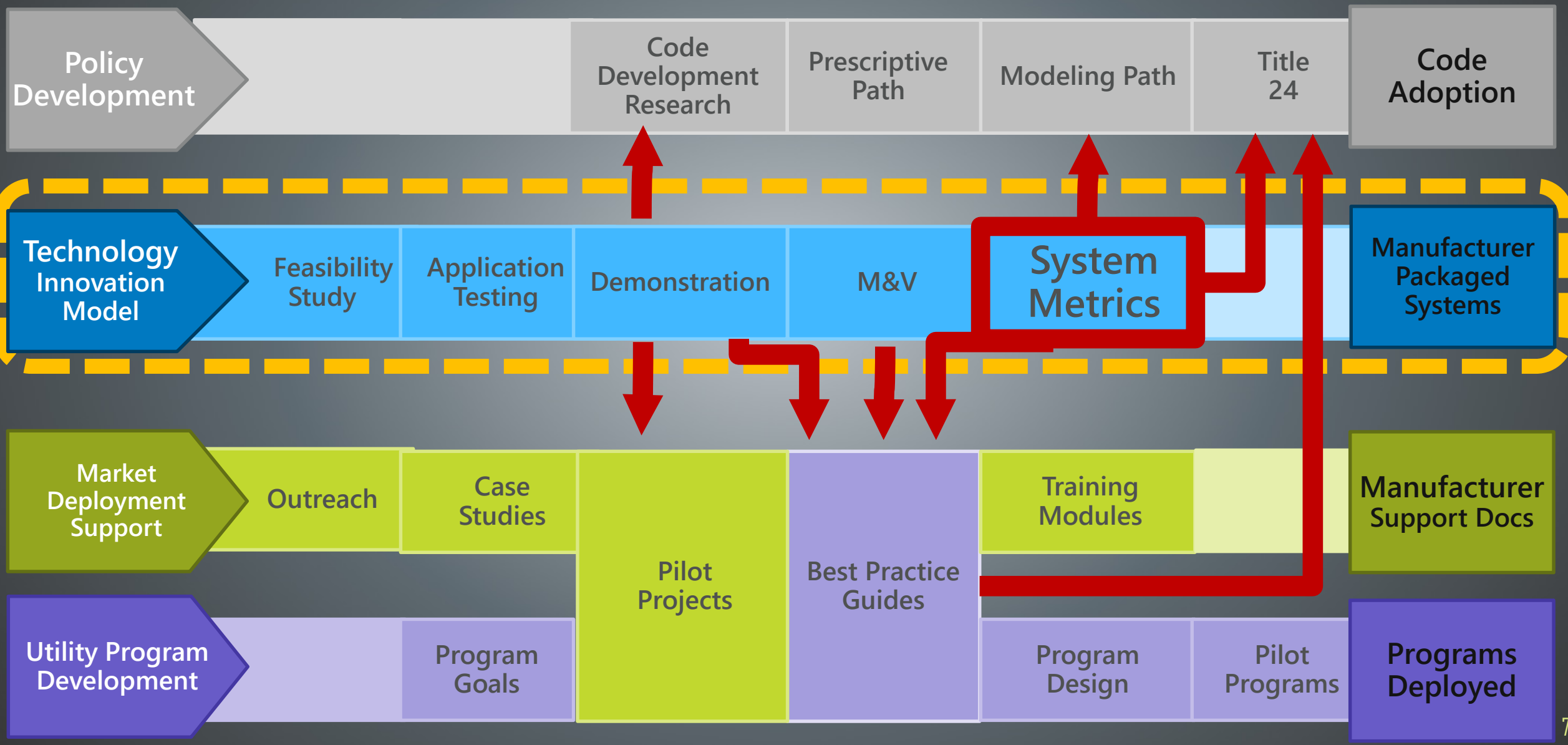
Technical Innovation in Market Context



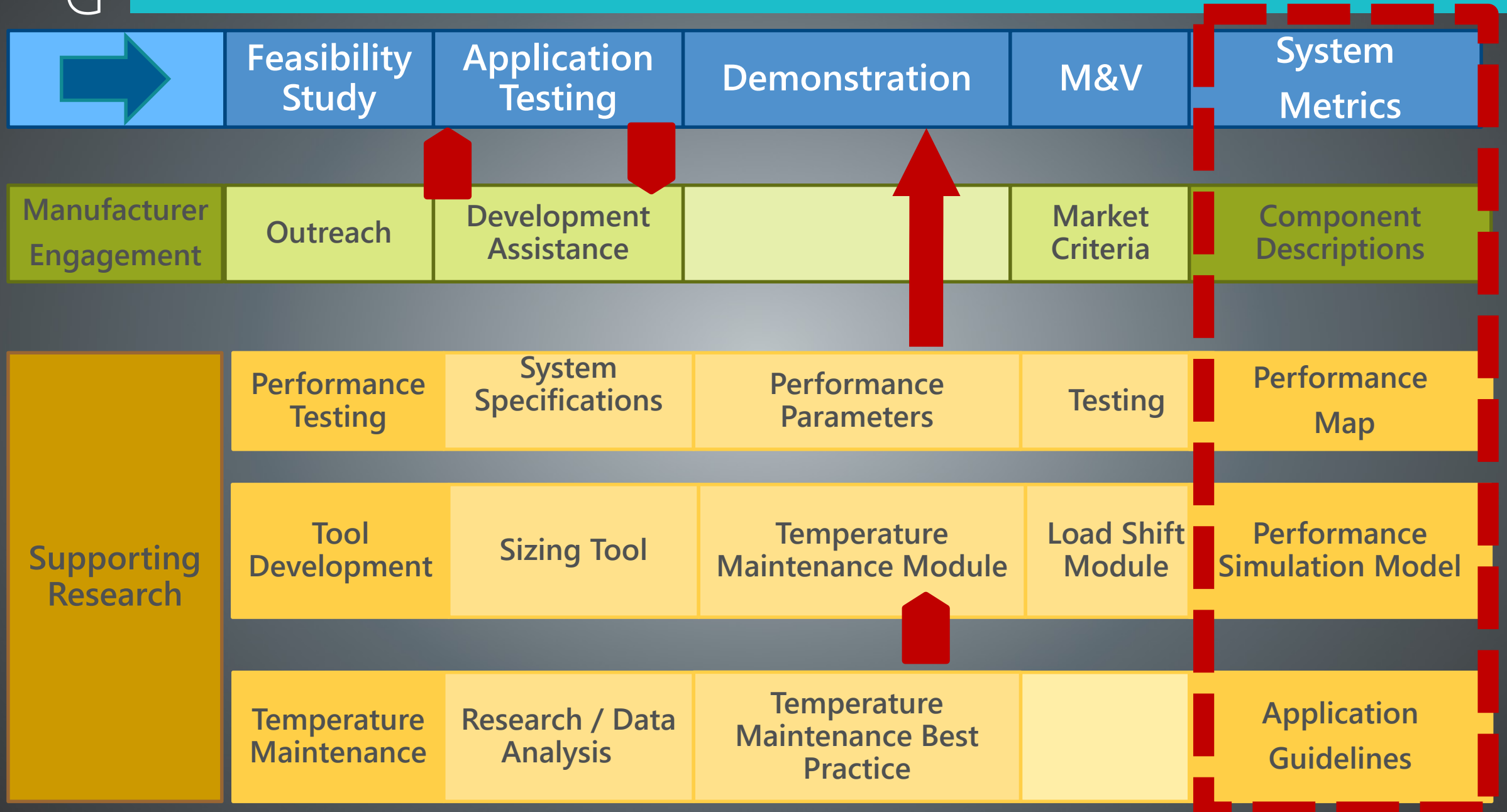
Technical Information is Critical to Adoption Pathways



Parallel Development Paths



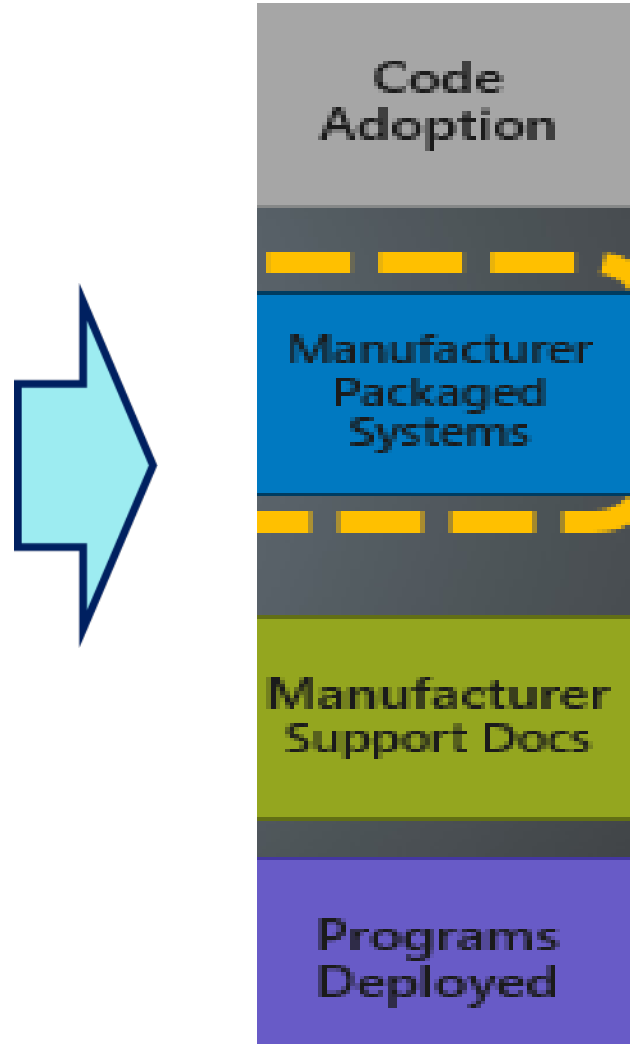
Technology Innovation Model (TIM)



Driving Market Outcomes

- Feasibility Study
- Application Testing
- Demonstration
- Measurement and Verification

System Metrics
Predictable and Specific Outcomes



Feasibility Study

- Engineering documentation review to identify patent defects
- Provide code, market, constructability feedback to manufacturer
- Prep for Applications Testing
- Provide 3rd Party assessment for funders and developers

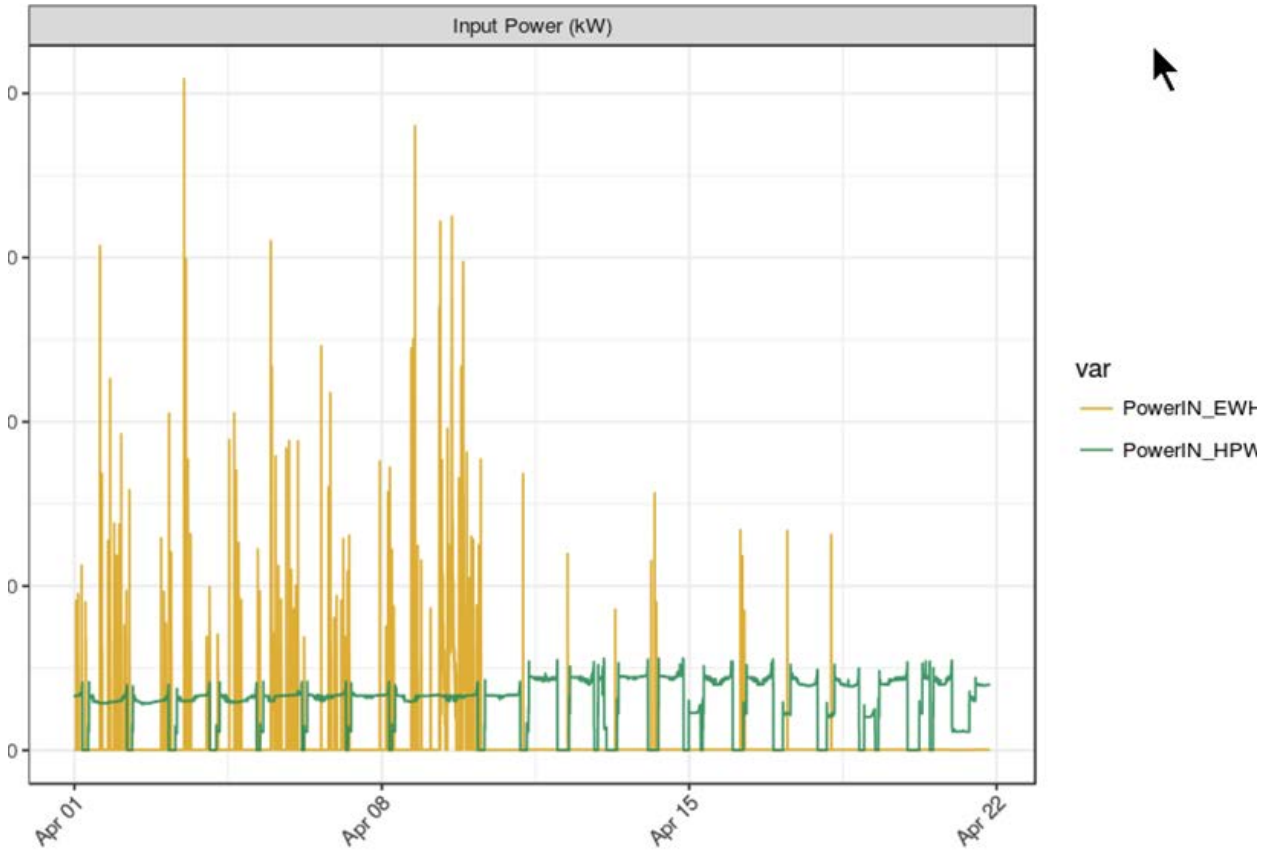
Application Testing

- Identify and demonstrate a complete package of equipment necessary for product to perform in the field
- Can be completed in factory, lab or bench test
- Can be used to collect range of data needed to complete Performance Map
- Develop schematic of proposed engineered applications

Field Demonstration

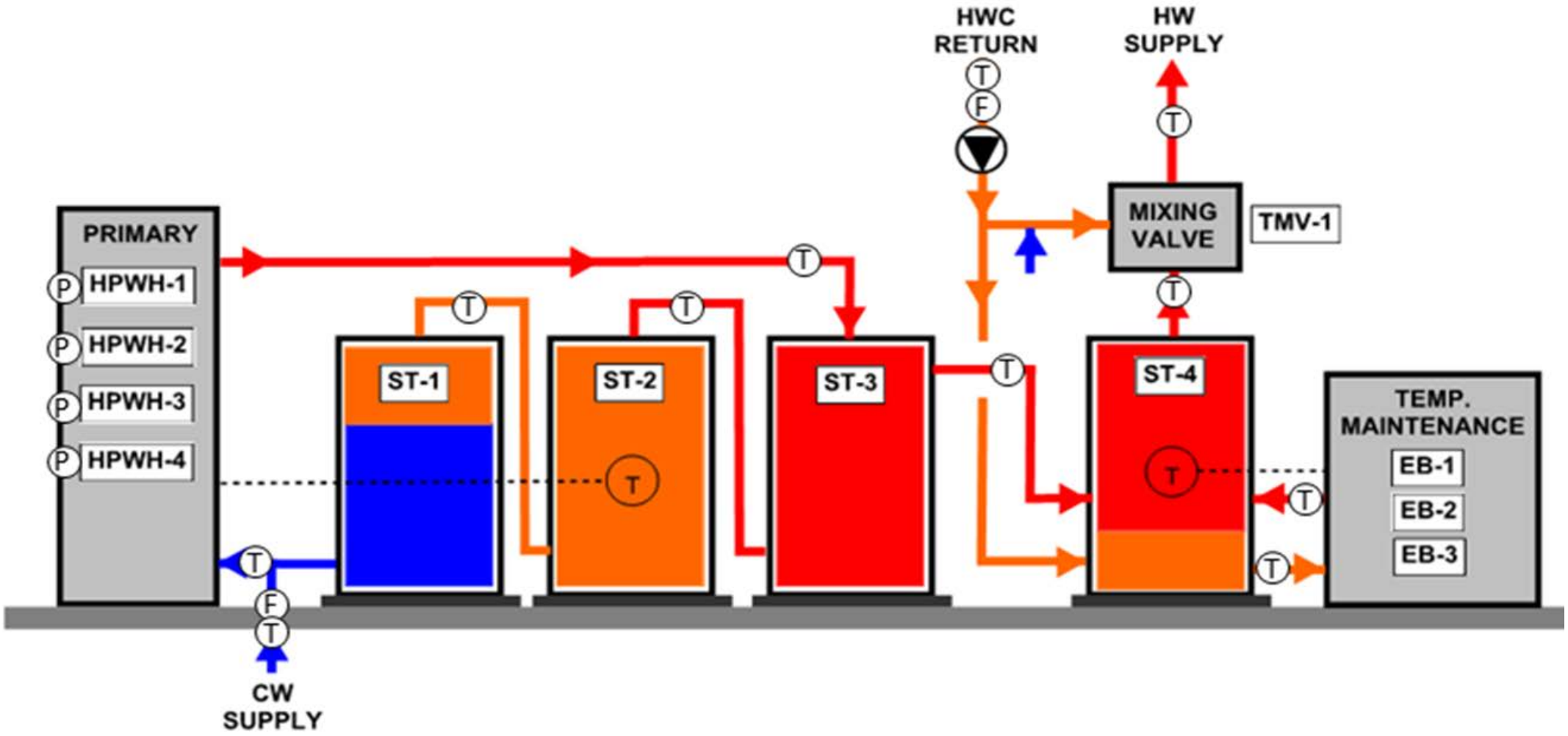
- Validate performance, design strategies, seasonal effects, and user interactions
- Develop installation drawings and specifications aligned with manufacturer's guidelines and emerging code and best practice requirements
- Demonstrate product readiness
- Establish supply chain readiness
- Account for full system actual costs

Measurement & Verification

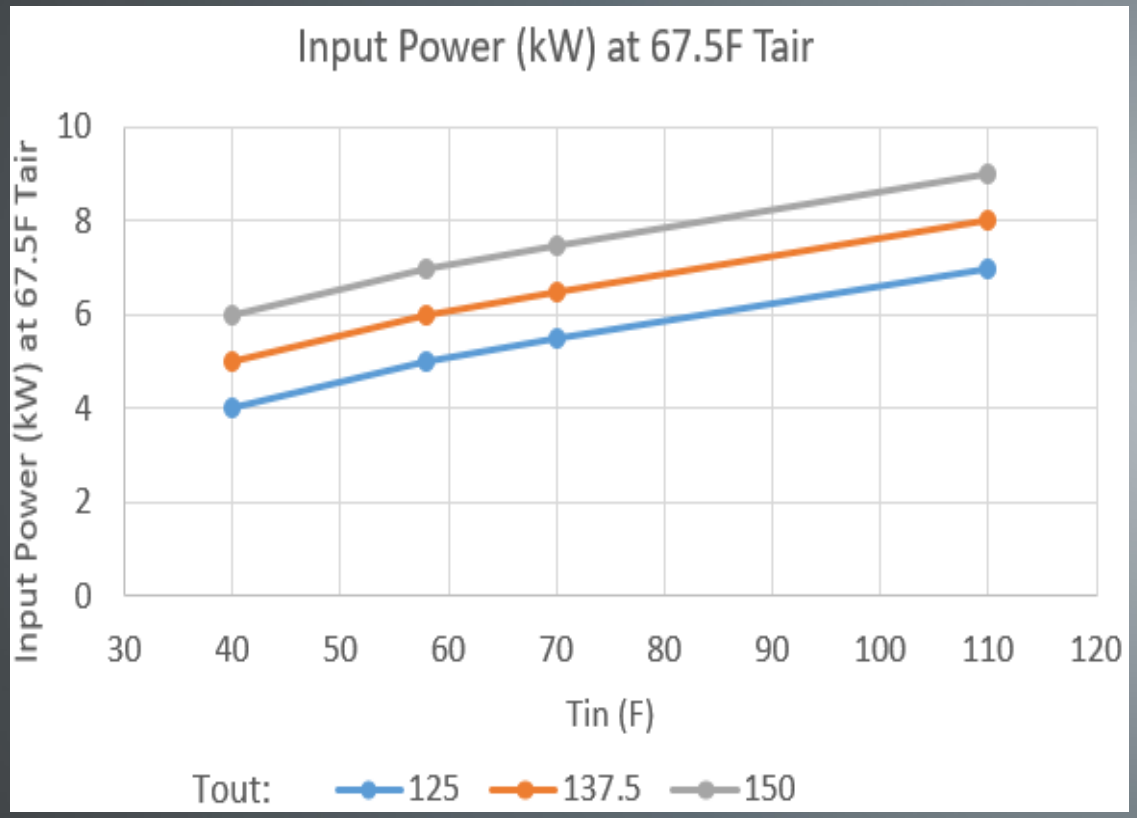


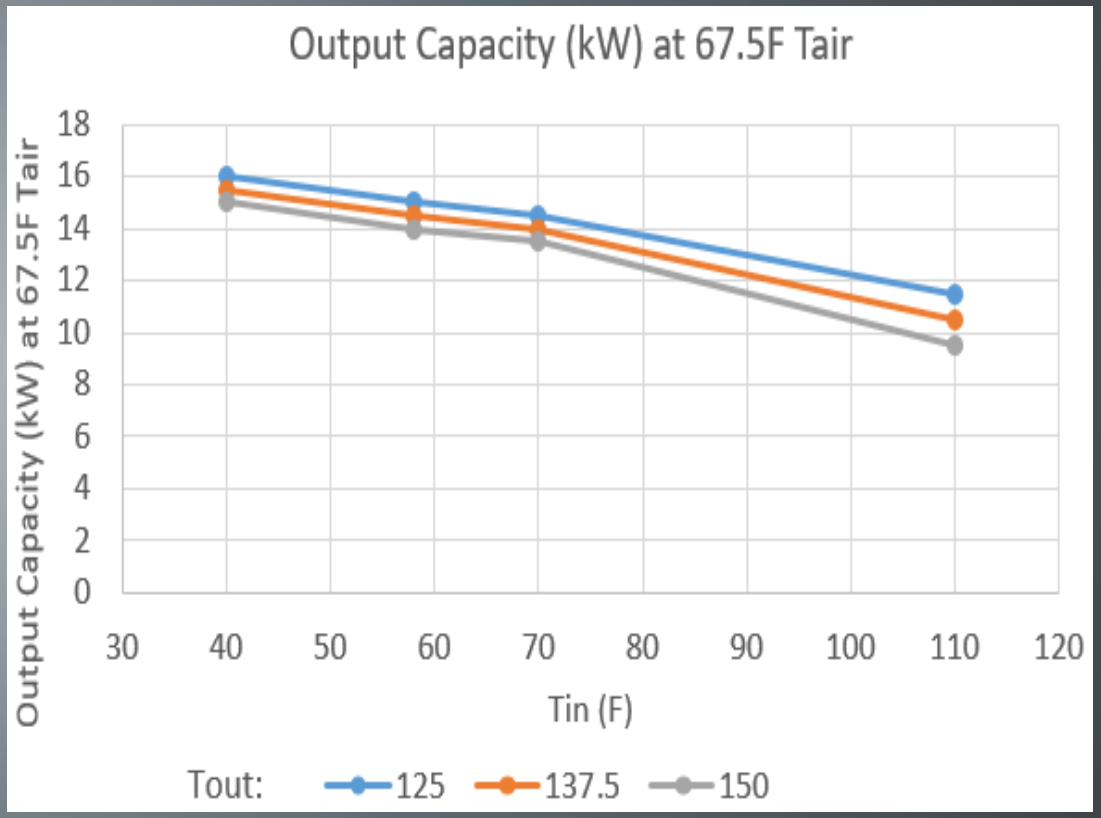
- True performance in situ integrated performance over course of a year with real loads
- Two purposes
  - Short-term optimization
  - Long-term monitoring and persistence savings
- Provides for Performance Map

Component Description



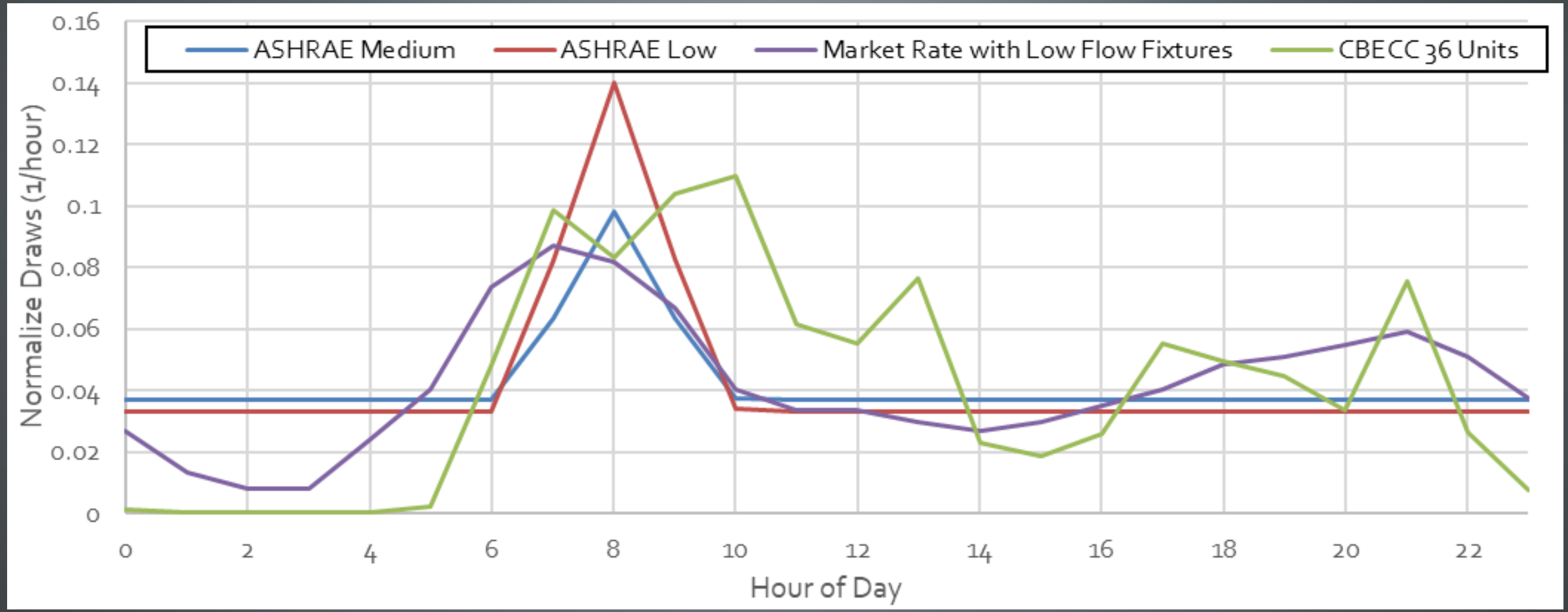
Performance Map





Completed by utilities, manufacturers or with M&V data from a controlled demonstration

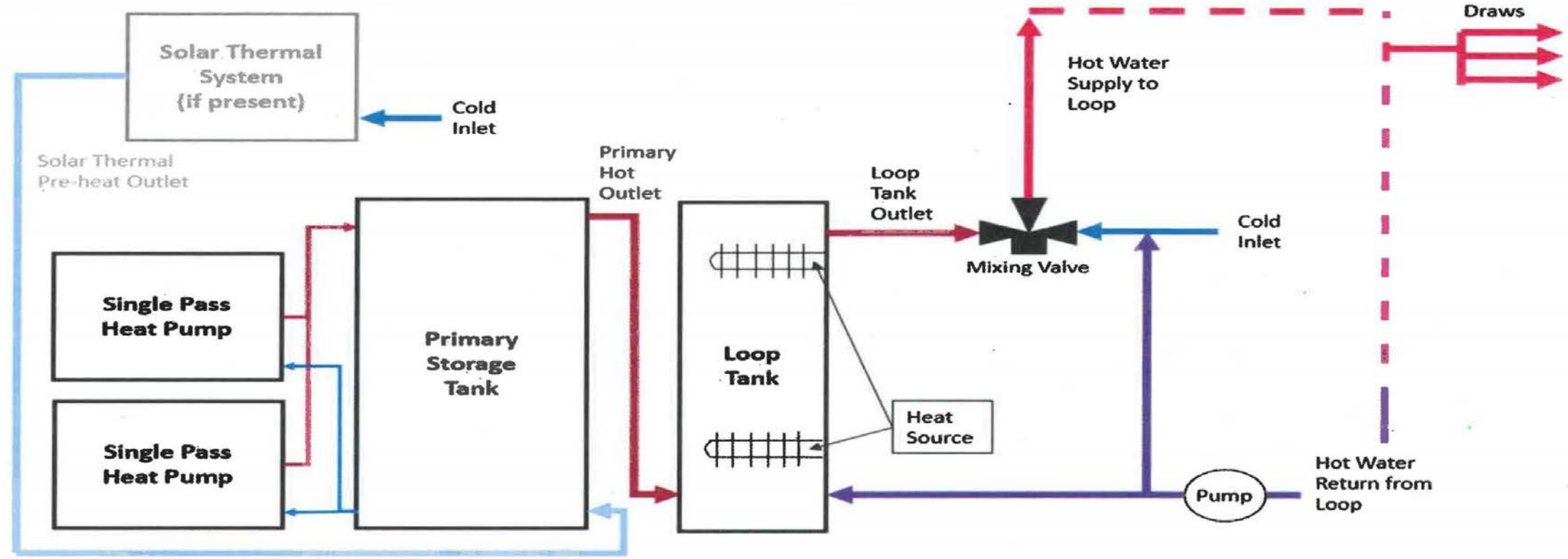
Performance Simulation Model



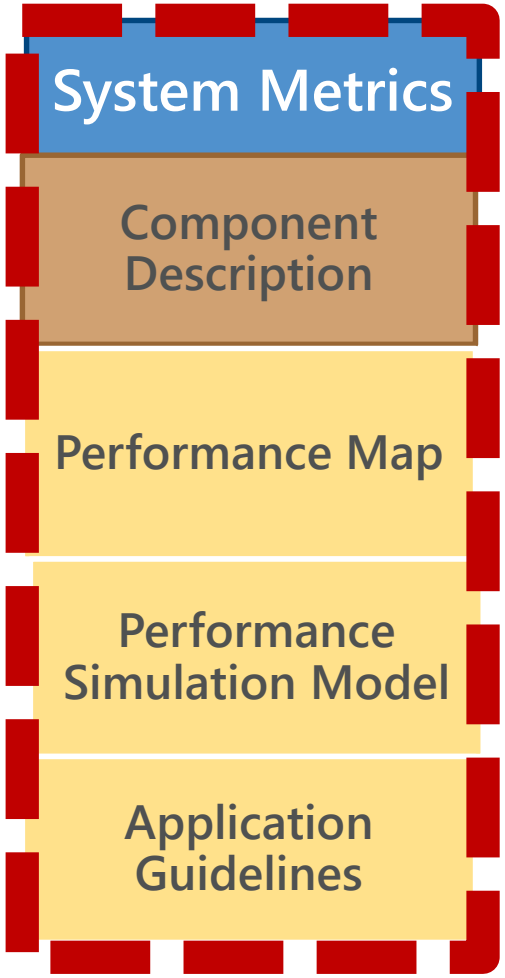
Application Guidelines

Prescriptive Sizing and Layout Requirements for Central Heat Pump Water Heaters for Multifamily Buildings

System Schematic



System Metrics



- Proven
- Demonstrated
- Documented complete system
- Performance Measurements
- Reliable Results

Allied Objective

- Use the Technology Innovation Model to structure our work and drive to System Metrics
- Use System Metrics to align and advance Policy, Utility Programs and Market Adoption
- Provide consistent messaging to manufacturers about path to market
- Standardize minimum code requirements and self certification
- Complete supporting research and leverage funding research
- Flexible participation
- Discrete supporting research projects
- Support collaborative initiative

Conceptual Funding Model

Task	Description	Funding		
		Alliance	Manufacturers	Utilities
Feasibility Study	50-50 Split between Manufacturer and Alliance	x	x	
Application Testing	Costs for design and oversight funded by Alliance. Equipment and set-up costs funded by manufacturer	x	x	
Demonstration	Various funding streams including owner/developer, local utility, Alliance, manufacturer	x	x	x
Measurement and Verification (M&V)	Alliance to fund collection, analysis, reporting of performance data and lessons learned	x		
Design Guidelines	Manufacturer literature and guidance funded by manufacturer			
	Design requirements for Code funded by regulators or Alliance	x	x	x
	Design requirements for utility programs funded by utilities			
Performance Map	Performance Map: May derive from applications testing, third party lab, or Demonstration M&V	x	x	x
Codes and Programs	Code language and tools	x	x	x

What's Next

- Seek alignment around the Technology Innovation Model
- Seek participation in funding additional supporting research

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THANK YOU!

ECOTOPE

nbi new buildings institute

Seattle City Light

SMUD

neea

PG&E

Energy Program
WASHINGTON STATE UNIVERSITY