Air Source Heat Pumps (ASHPs):

Indirect Coverage and Right Sizing while Maintaining Thermal Comfort

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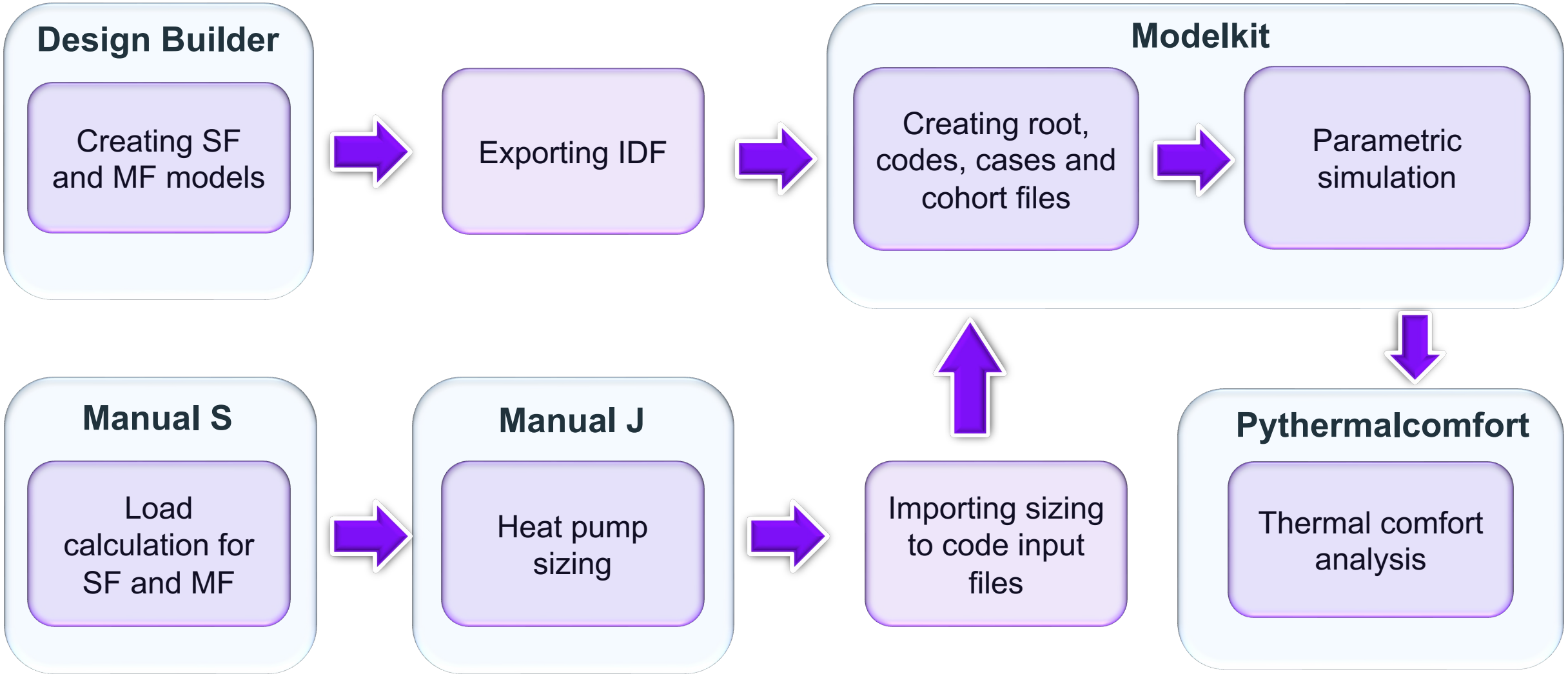
Downsizing ASPHs maintains occupant comfort and lowers upfront cost.
(Especially for low-to-moderate income households in California climates)

Homeowners who downsized ASHPs remained comfy, even in colder conditions.
(70–90% of the Manual J design load, New York Field Study)

What We Did: Energy Simulation



Permutations Tested

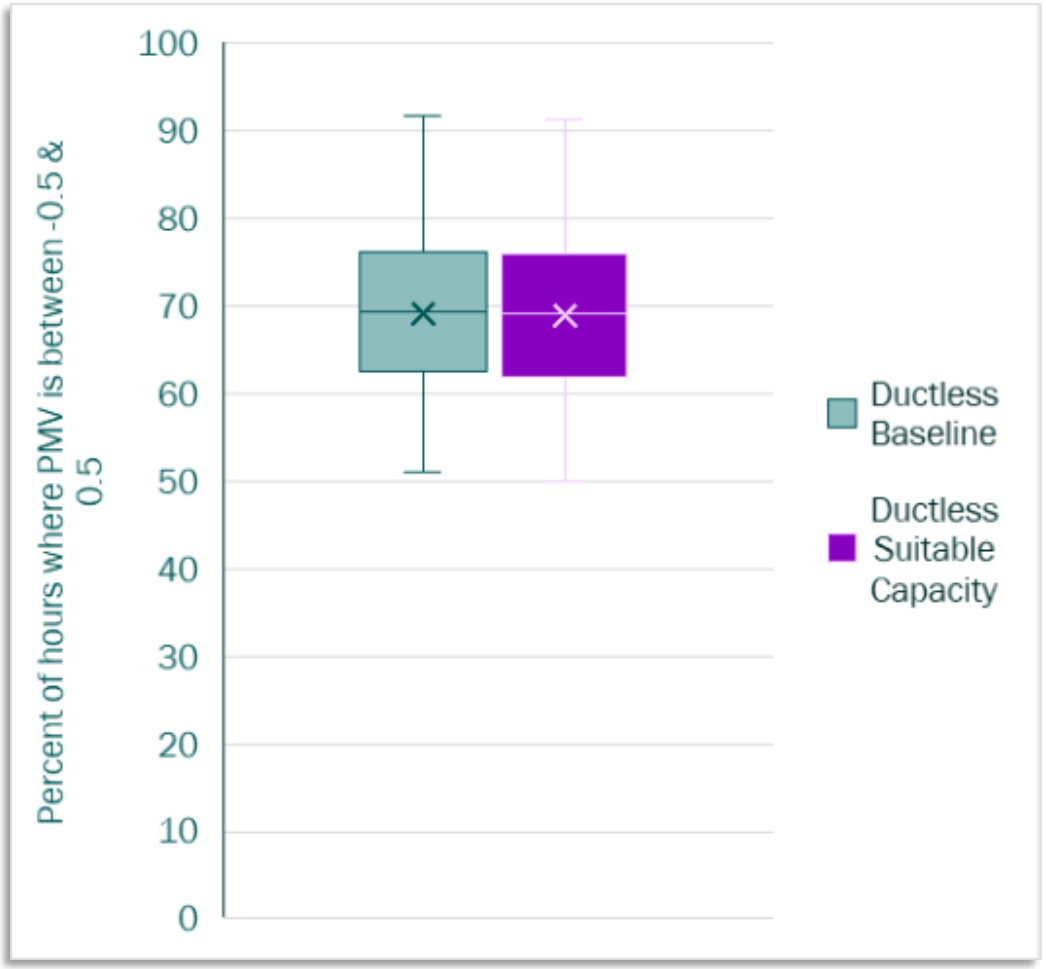
Simulation Parameters

Parameter	Number of Variations	Description of Variations
Building type	2	SF, MF
Climate Zone	16	California Climate Zones
Orientation	4	North, South, East, West
MF Adjacency (No Adjacency for SF)	4	Center, Corner, Middle, Top
Vintage	3	Pre-1978, 1992-1998, 2022
Configuration	3	Baseline Indirect Coverage Suitable Capacity
Ducting	2	Ductless, Ducted
Air Flow	2	Door Open, Door Closed

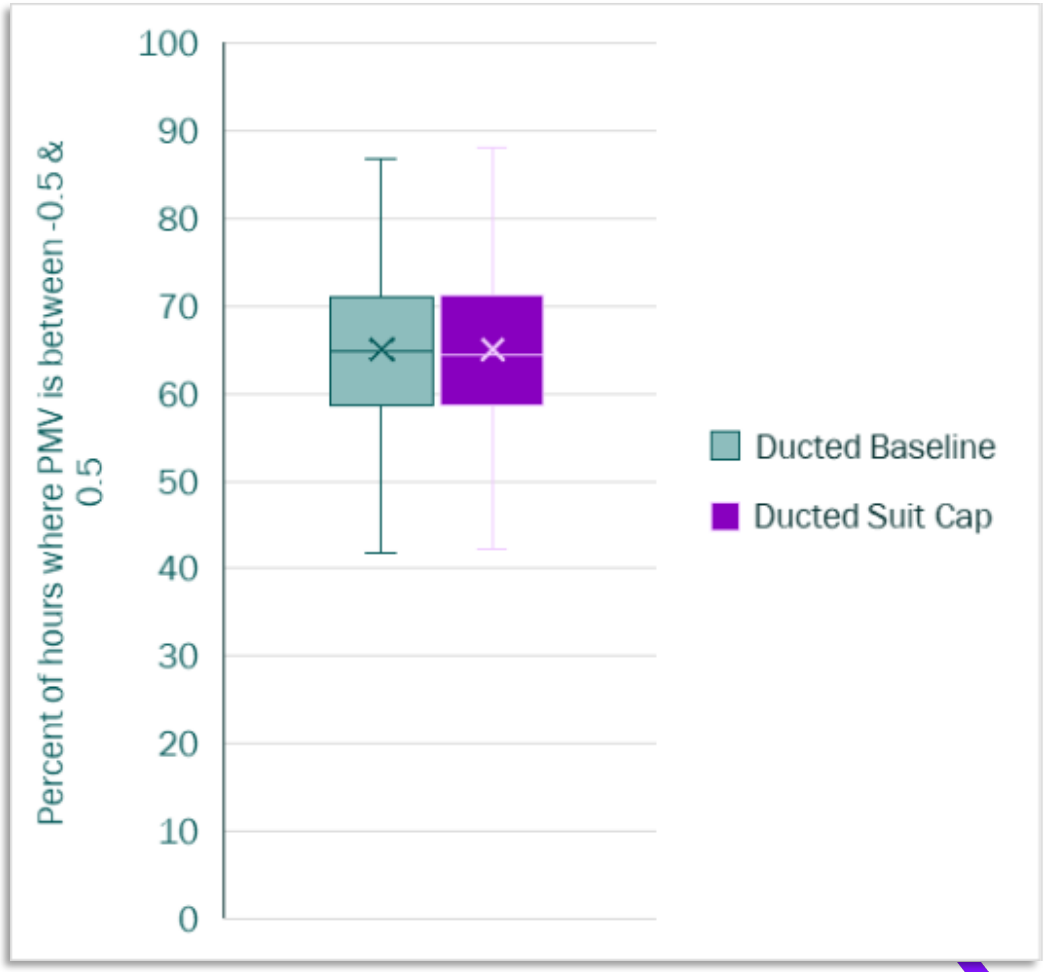
Modeling Thermal Comfort: Suitable Capacity

Multi Family

Ductless



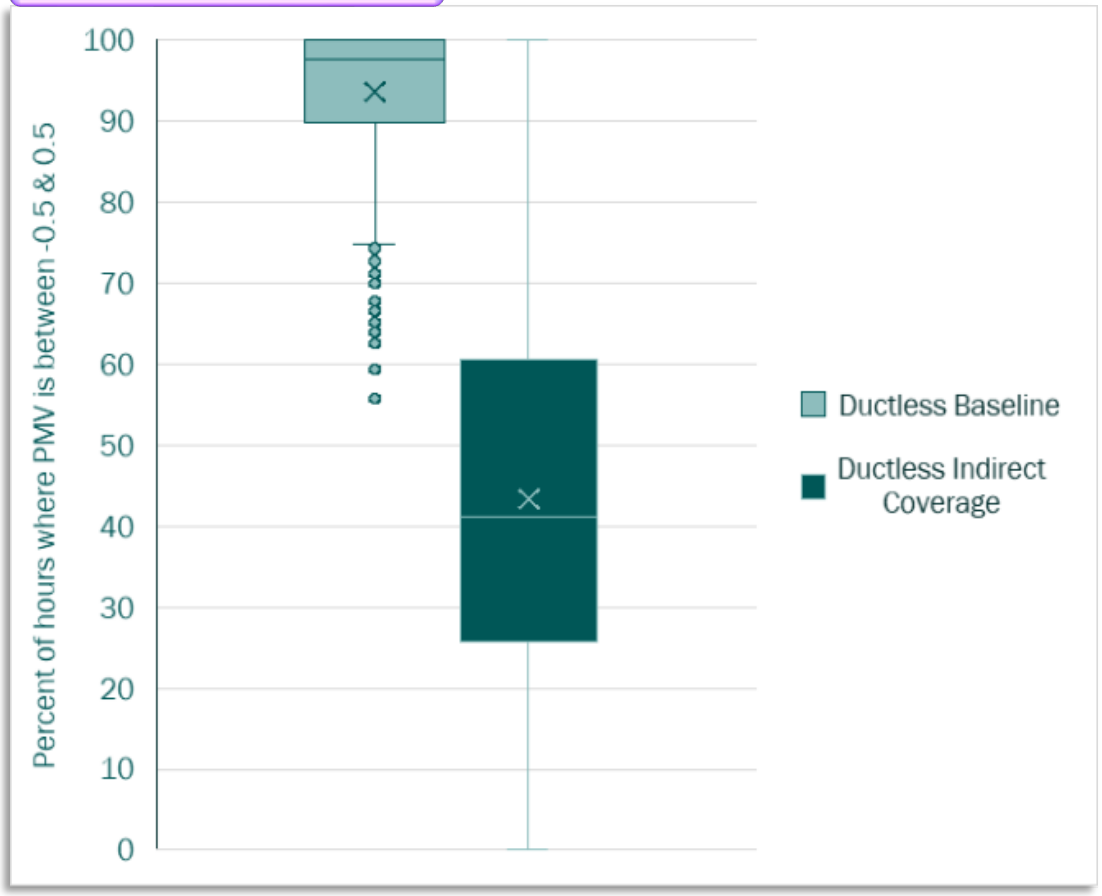
Ducted



Modeling Thermal Comfort: Indirect Coverage

Single Family

Ductless



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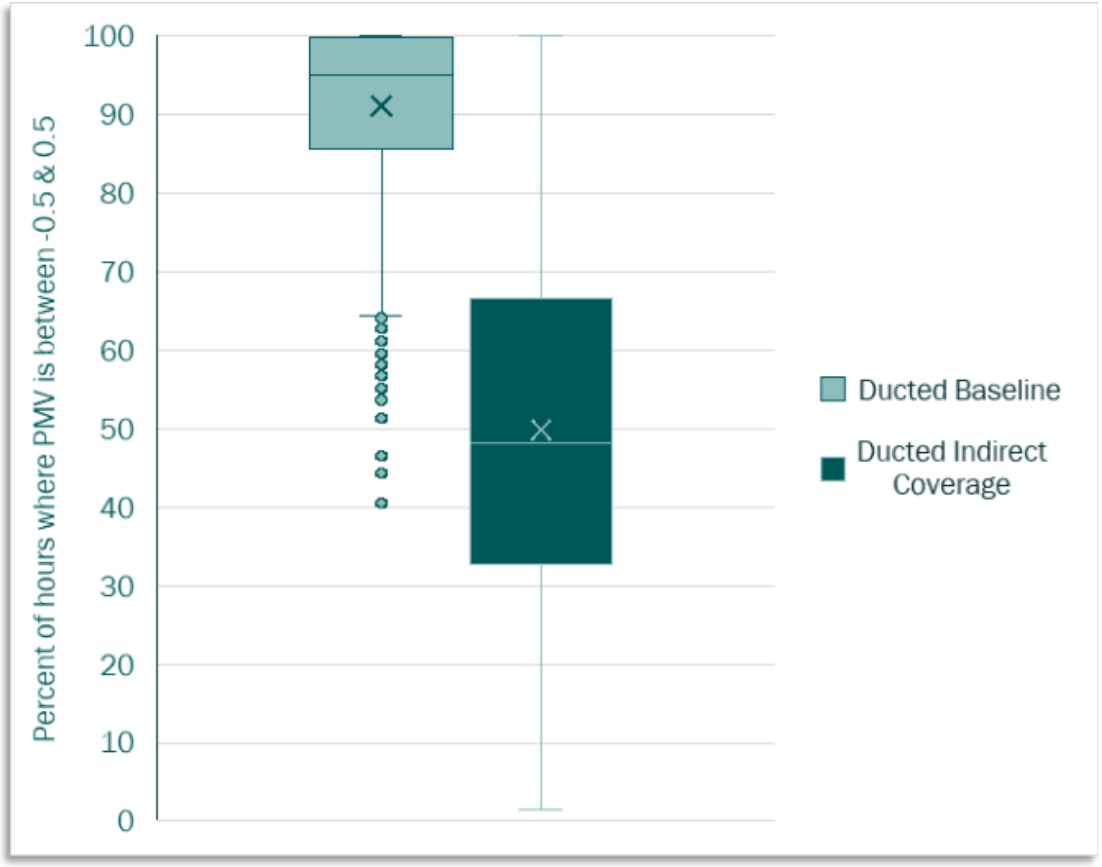

In Conclusion...

- Suitable Capacity ASHPs (sized for ~80% of design load); **similar thermal comfort to full-sized systems** across California climates; $600–$1,550 savings in upfront costs.

- Indirect Coverage ASHPs: **Lower first costs** by reducing conditioned rooms or system heads; potential comfort impacts in unconditioned spaces; improved comfort with **transfer fans** or occupant clothing adjustments.

- Recommendations: **Downsize ASHPs** to 70–90% of design load; further research needed on long-term energy and maintenance costs.

Thank You!