
The Hidden Architecture of Comfort
Harnessing the Unseen Energy of Night and Day
Zomeworks Corporation
NotebookLM

We Are Blind to Half of the Energy Story

“Our eyes work almost exclusively by light reflected from, not emitted by, objects. We owe our ignorance about subtle flows of heat to the dominance of the sun.”

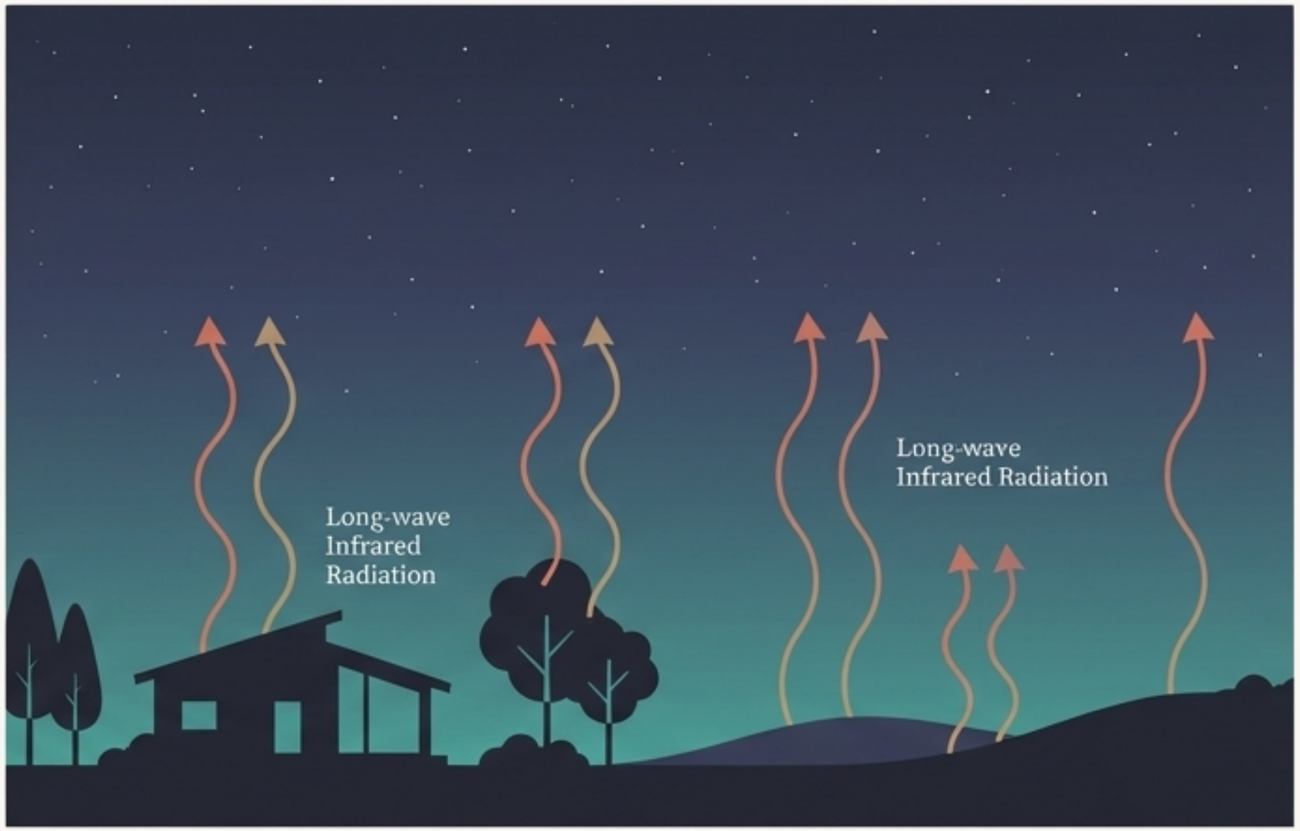
An infrared camera finds objects are already red hot at room temperature. The mysteries of cooling would quickly disappear if our eyes could see in the dark as today's infrared cameras do.



NotebookLM

The Night Sky is a Powerful Cooling Engine

At night, the earth doesn't just "get cold." It actively shines heat into the deep cold of space. This is an immense, silent, and overlooked natural resource. The ground, trees, and grass cool themselves first, and then cool the atmosphere. Air provides only "second hand cooling."



NotebookLM

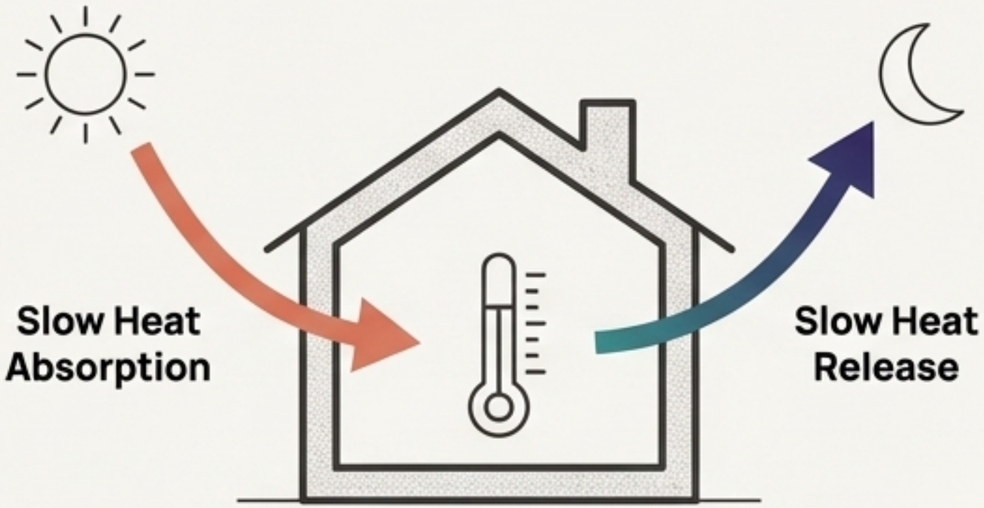
Our Efficient Buildings Have Lost Their Thermal Memory.

"Heat storage is urgent today because we have gotten so good at constructing lightweight well-insulated efficient buildings that their one deficiency, lack of thermal mass, becomes apparent."

Unlike older masonry buildings which had plenty of heat storage, modern construction is prone to rapid temperature swings. This creates a complete dependence on constant mechanical heating and cooling to maintain comfort.



Modern Lightweight House

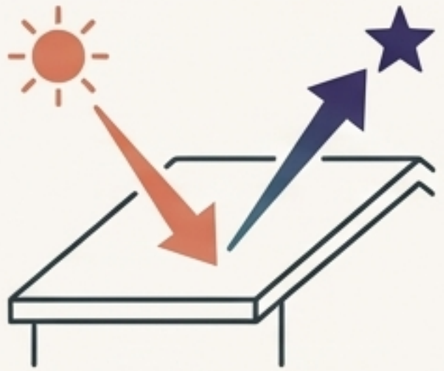


Older Masonry House

NotebookLM

The Solution Requires a Dynamic Surface and a Stable Core

The Dynamic Surface



A building needs an outer surface that can serve two functions: absorb solar heat during a winter day and radiate the building's excess heat to the night sky in the summer.

The Stable Core (Thermal Battery)



The building needs an internal "thermal battery" to store the energy collected or shed by the surface. This storage provides heating through cold nights and cooling through hot days.

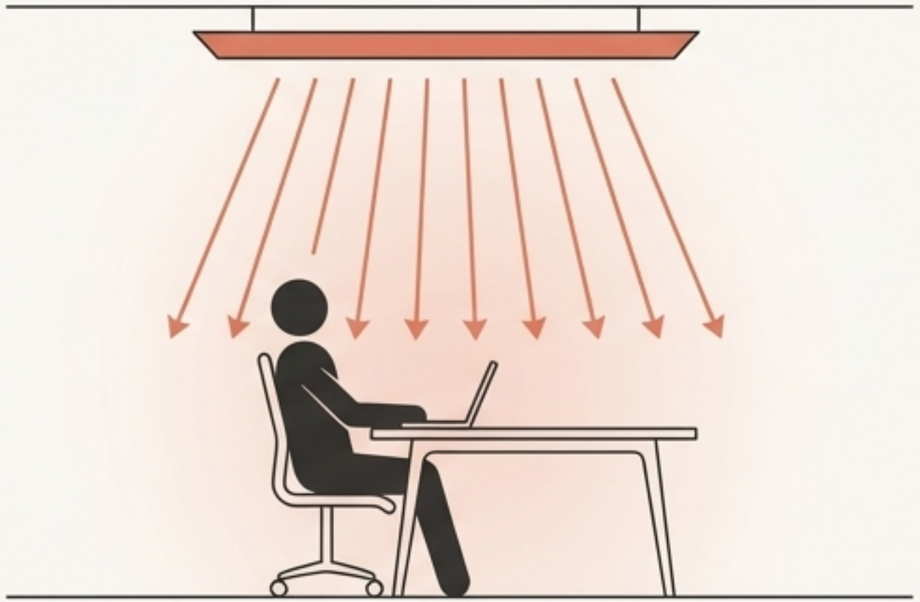
Key Insight: Water is the perfect thermal battery. It is cheap, safe, and has a very high heat capacity. Just 3 gallons of water can absorb the 250 BTUs of heat generated by people, lights, and appliances per square foot of floor with only a 10°F temperature rise.

NotebookLM

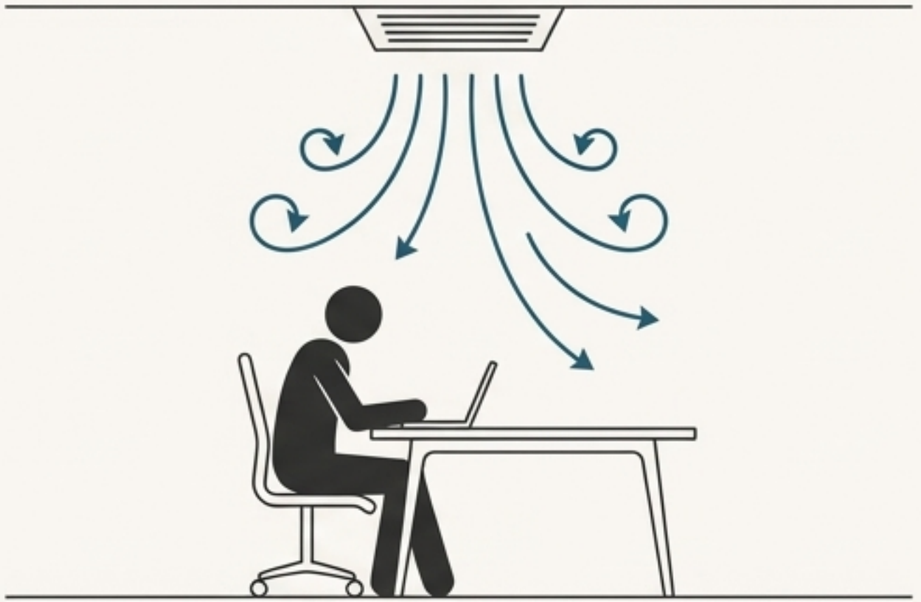
We Don’t Have to Condition the Air. We Can Condition the Surfaces.

The most comfortable form of heating and cooling is radiant. Conventional forced-air systems are noisy, create drafts, and heat unevenly. Radiant systems transfer energy directly to and from the objects and people in a space, creating a silent, stable, and deeply pleasant environment.
"Radiant heating and cooling is always pleasant.”

Ed Allen, *How Buildings Work*: “Ceiling systems… can run at high temperatures because people seldom come in contact with ceilings.” He also notes that ceiling repairs are far easier than tearing up a concrete floor slab.



Radiant Comfort



Forced-Air Discomfort

NotebookLM

The Innovation: The Di-Thermal Roof

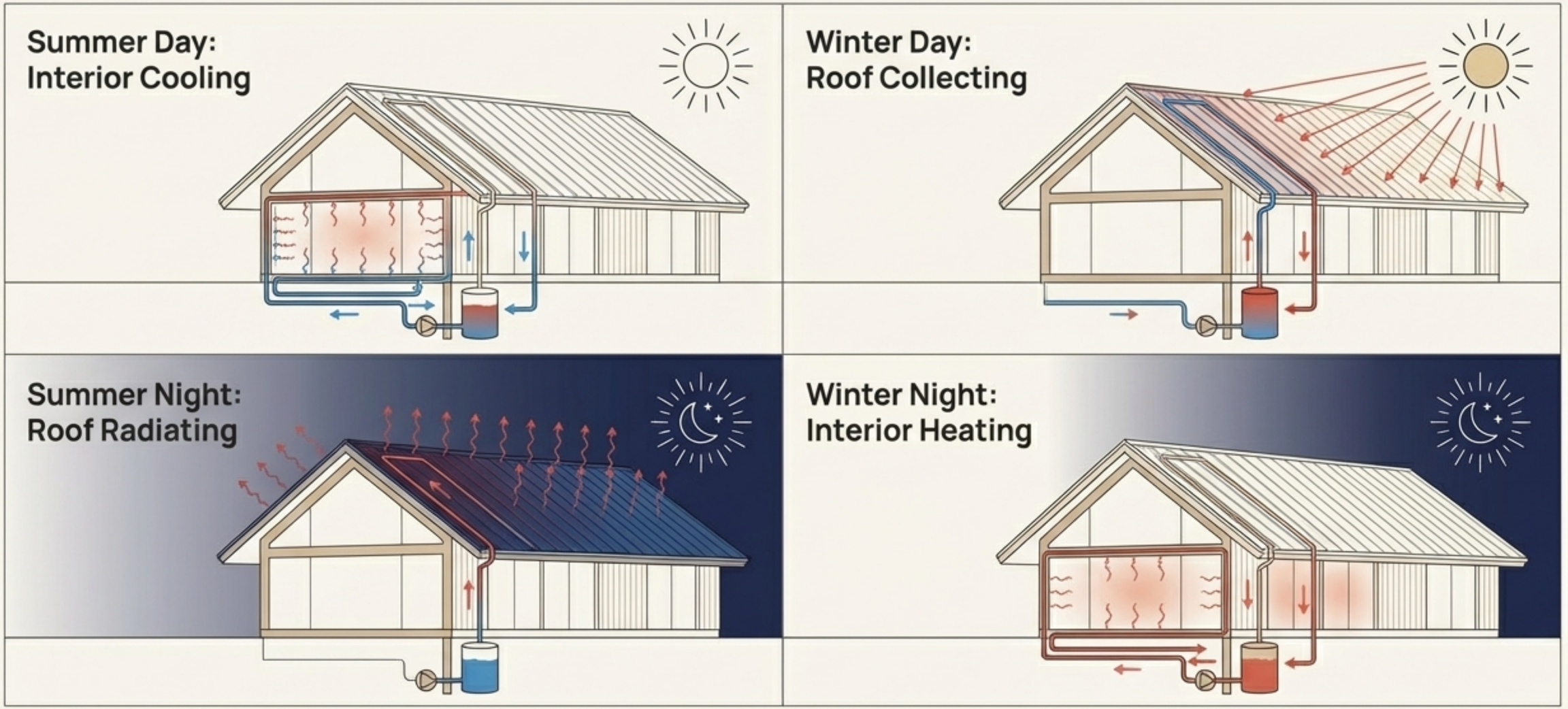
Zomeworks' Di-Thermal Roof is an integrated, unglazed radiator/absorber system. It is the building's dynamic surface, designed to collect solar heat in winter and dispose of heat to the clear summer night sky.

It plumbs directly to water storage tanks and inner radiant heat exchangers, operating with low temperature differences to provide unparalleled comfort.



NotebookLM

A Year in the Life of a Di-Thermal Roof.

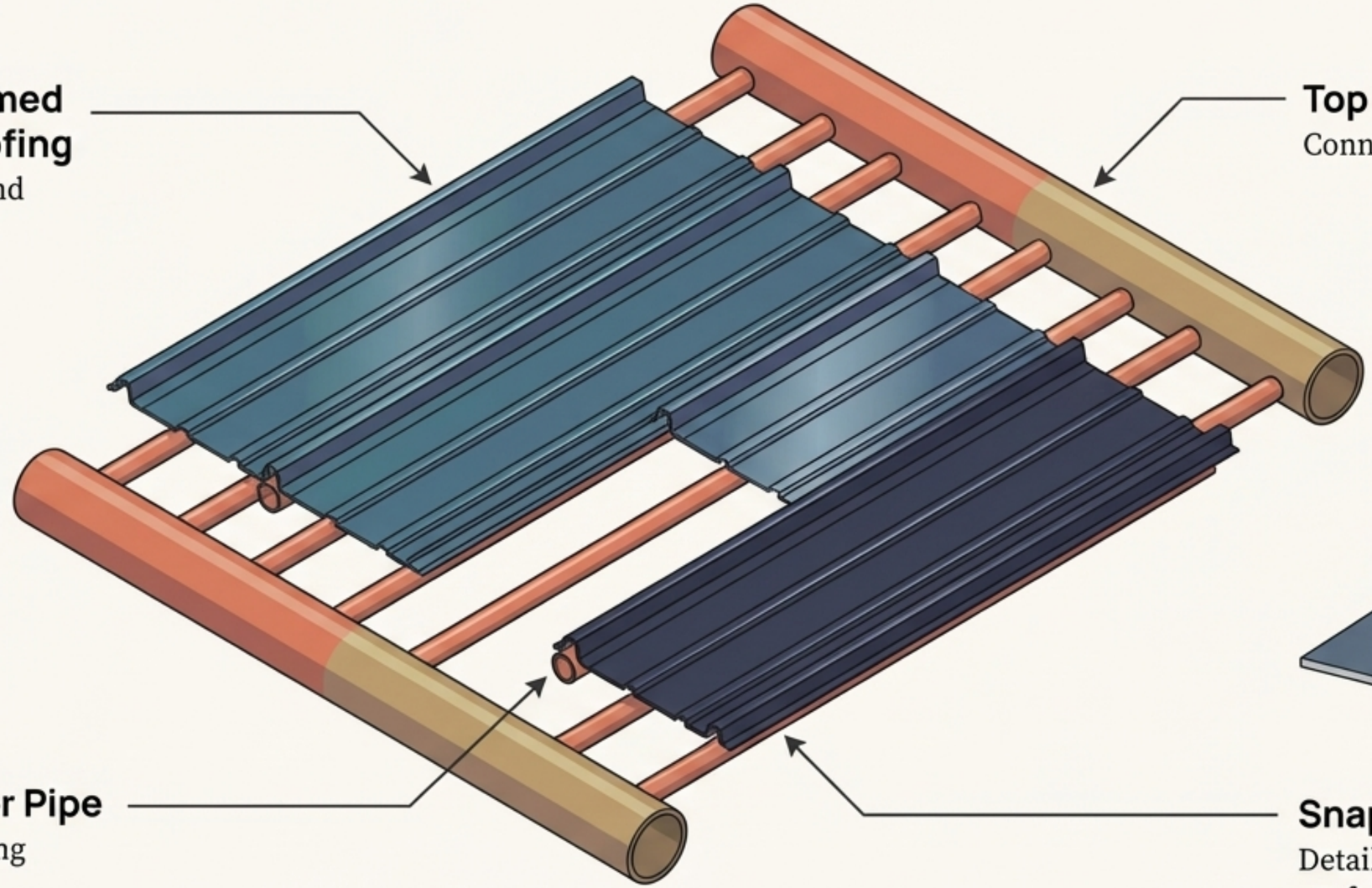


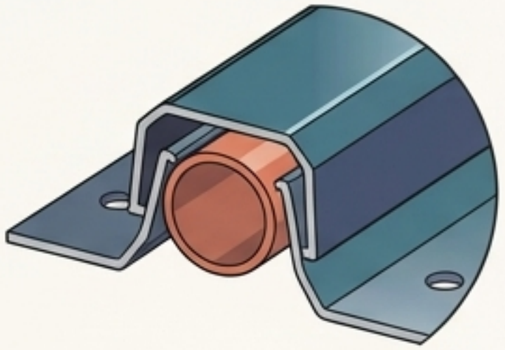
NotebookLM

Engineered Elegance: Simple, Robust, and Effective

180°+ Roll Formed Aluminum Roofing
Primary radiator and absorber surface

Top & Bottom Manifolds
Connect array of smaller pipes





¾" O.D. Copper Pipe
8" on-center spacing

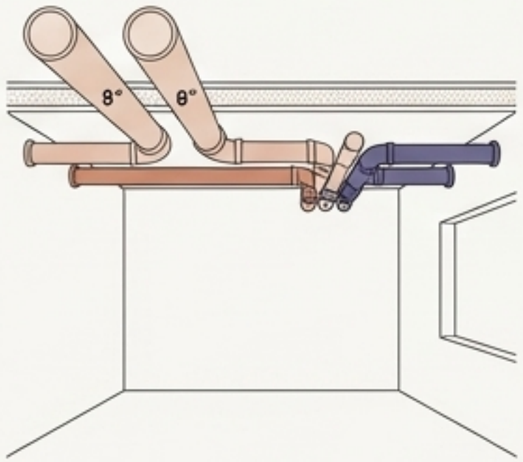
Snap Fit & Nailing Flange
Detailed view of snap fit and roof attachment

NotebookLM

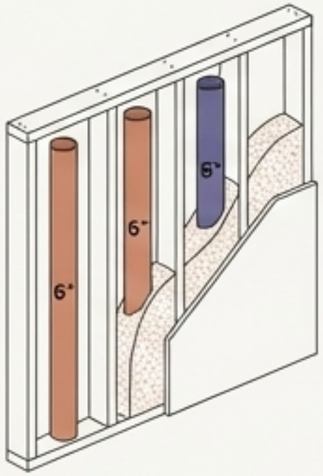
The Roof is the Engine; Water Storage is the Fuel Tank.

The success of the system depends on an intimate thermal coupling between the house and the storage. Storing heat for cloudy winter days is aloe is essential, as the sun is not always reliable. Storing “coolth” is also needed to get through hot summer days, but can be recharged every night.

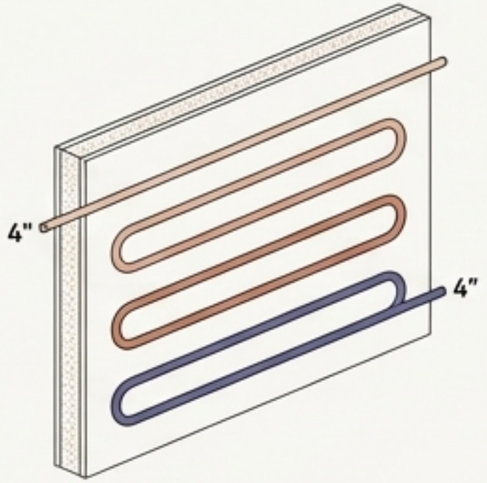
Ceiling Pipes



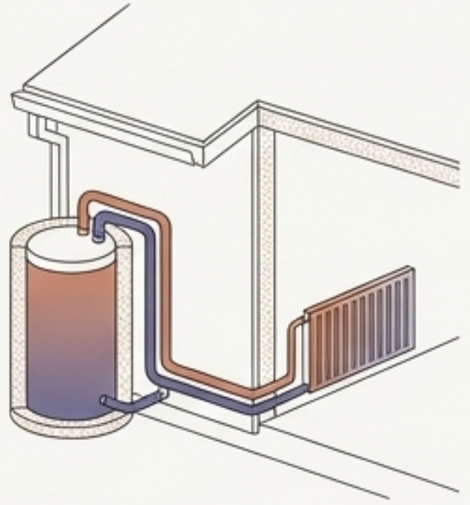
Vertical Wall Pipes



Flattened Helix Wall



External Tank



NotebookLM

Superior Comfort That Pays for Itself.

Heating Performance



40k-100k

BTUs / sq. ft. saved annually

Equivalent to **$1.20 - $3.00 / sq. ft.** per year vs. electric heat.

Cooling Performance



~2 kWh

per sq. ft. saved annually

Equivalent to **$0.20 / sq. ft.** per year.

The Critical Benefit



More important, **replaces the entire capital cost** of a compressor.

All data from Zomeworks "Di-Thermal Roofs" memo (2002).

NotebookLM

Don’t Have a Di-Thermal Roof? You May Already Have a Radiator.

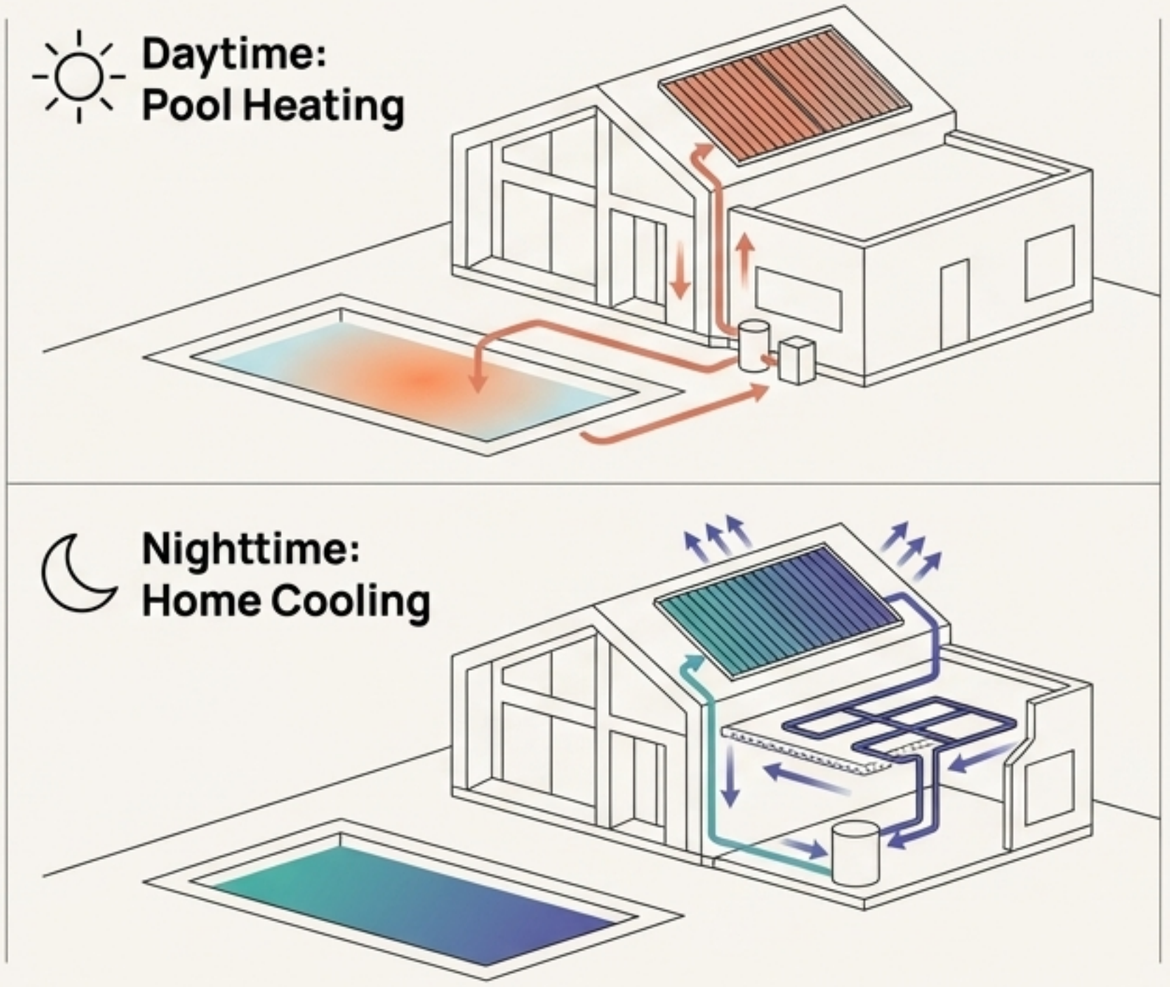
The Opportunity

Tens of thousands of homes with solar swimming pool heaters already own the most expensive component of a night-sky cooling system: the radiator.

“He’s getting something for nothing, he is harvesting a second crop off his solar pool heater.”

How it Works

By running the pool heater at night and adding a thermal storage system, homeowners can cool their homes. A 400 sq. ft. radiator provides 60,000 BTUs of cooling—the same as a 1-ton A.C. unit running for 5 hours.



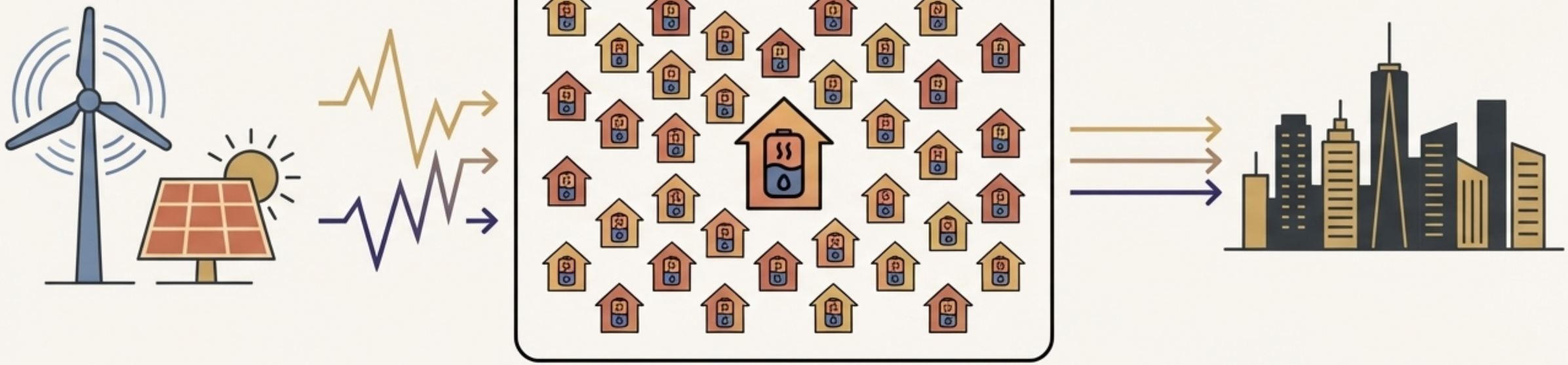
NotebookLM

The Same Problem at a National Scale. The Same Solution.

Fluctuating Renewable Supply

Distributed Thermal Storage

Consistent Energy Demand



The Grid's Dilemma

A grid fed by fluctuating renewables like wind and solar creates a massive need for energy storage to balance supply and demand.

The Building's Dilemma

Buildings need thermal storage to buffer against the daily cycle of day and night.

The Vision

By integrating thermal storage into millions of buildings, we create a distributed network that serves both occupants and the grid.

Whatever suits natural heating and cooling will also suit the electric grid.

NotebookLM



Comfort is Not a Machine. It’s a State of Balance.

The ultimate goal is to create systems that are so fundamentally comfortable and pleasant that they become the desired choice for their own sake.

The success of the Di-thermal roof will likely depend on marketing the luxury of radiant heating and cooling as a necessity to save energy.

NotebookLM

Listen to the Gentle Forces.



Zomeworks Corporation
PO Box 25805
Albuquerque, New Mexico 87125

Phone: [505] 242-5354
Fax: [505] 243-5187

NotebookLM