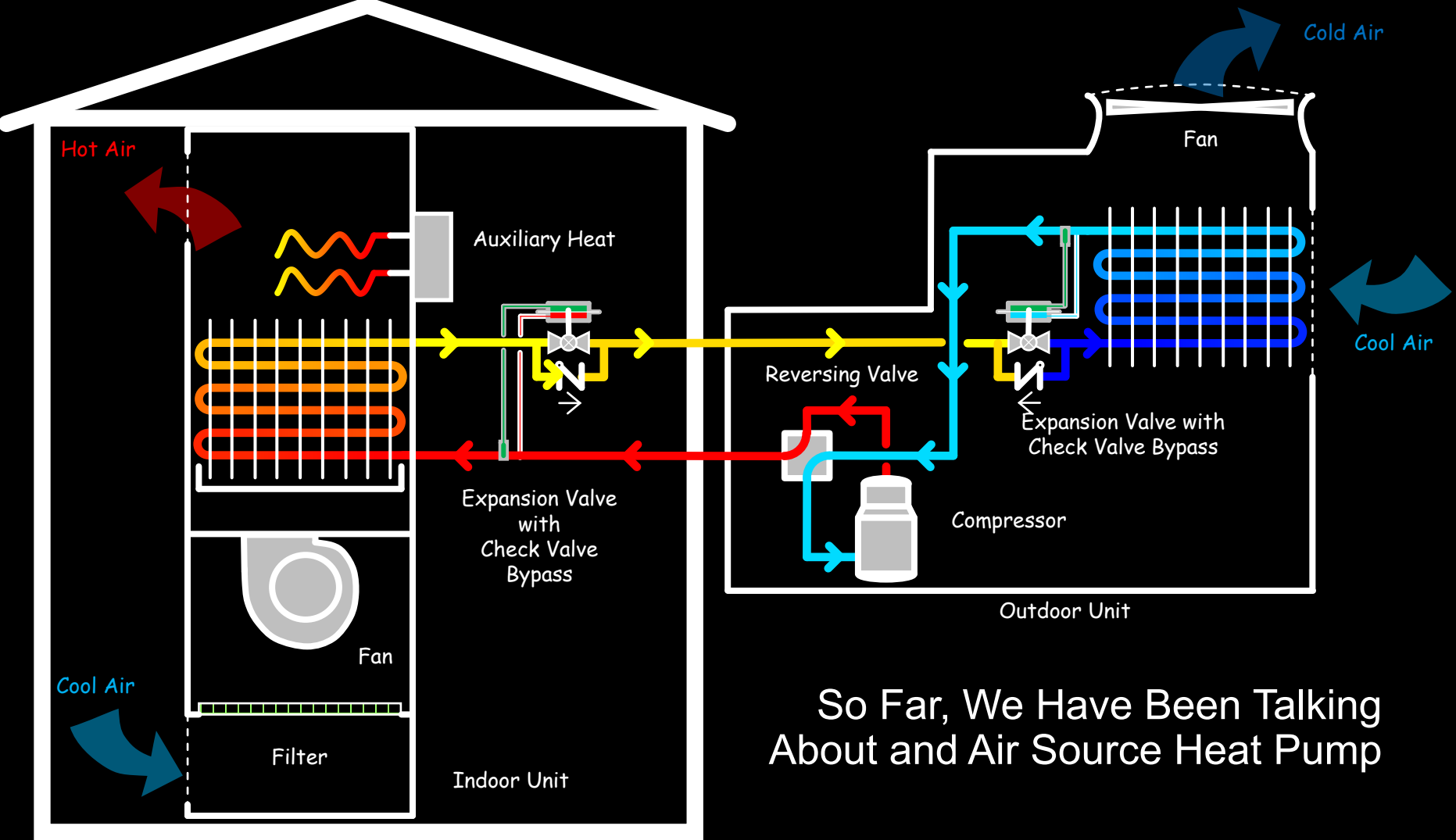




# Heat Pump System Types

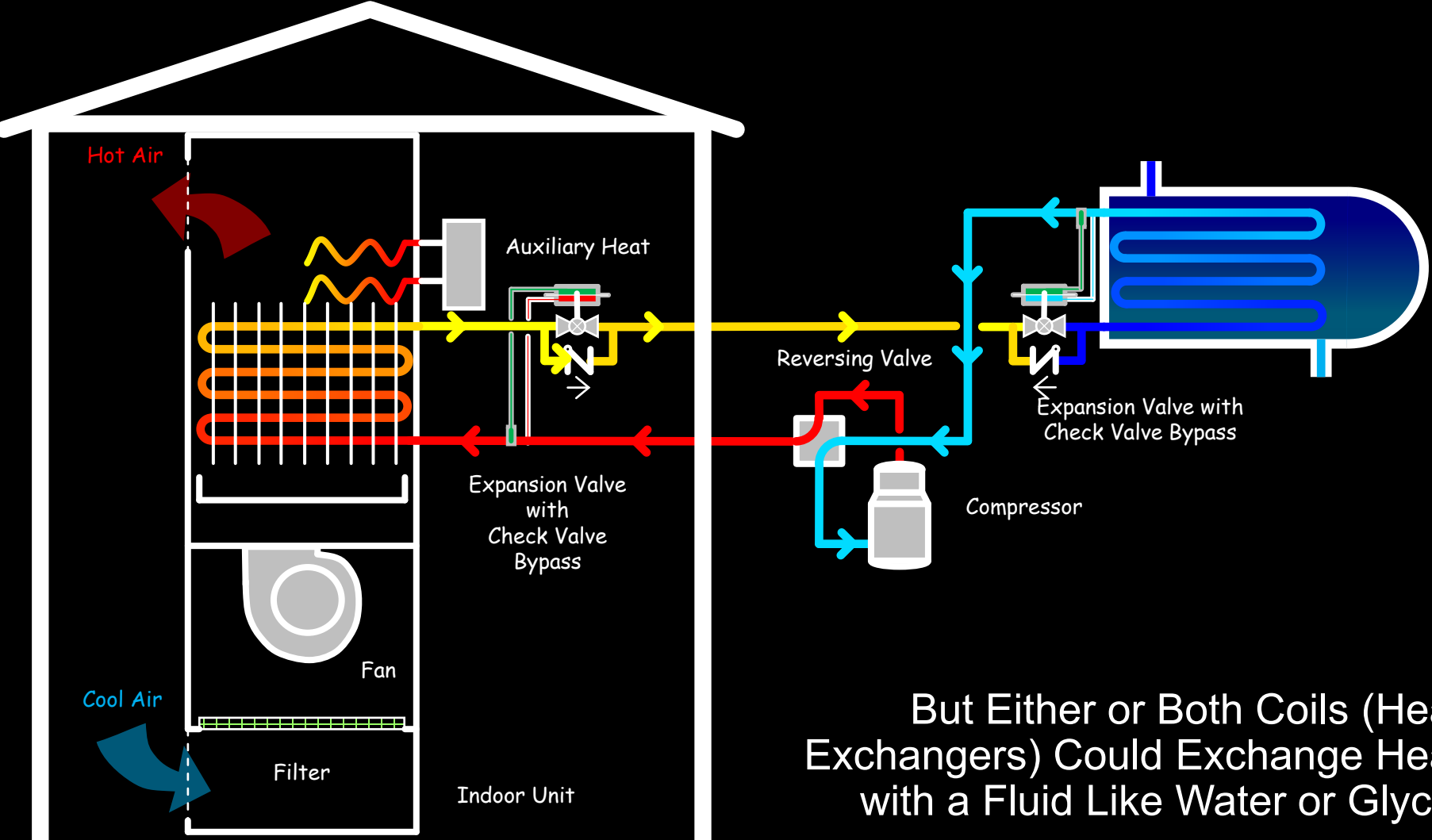


So Far, We Have Been Talking About and Air Source Heat Pump

# Heat Pump System Types

## Air to Air

- What we have focused on so far
- Examples
  - Residential and Commercial Heat Pumps
  - PTAC (Packaged Terminal Air Conditioners)
  - Variable Refrigeration Flow (VRF) Systems

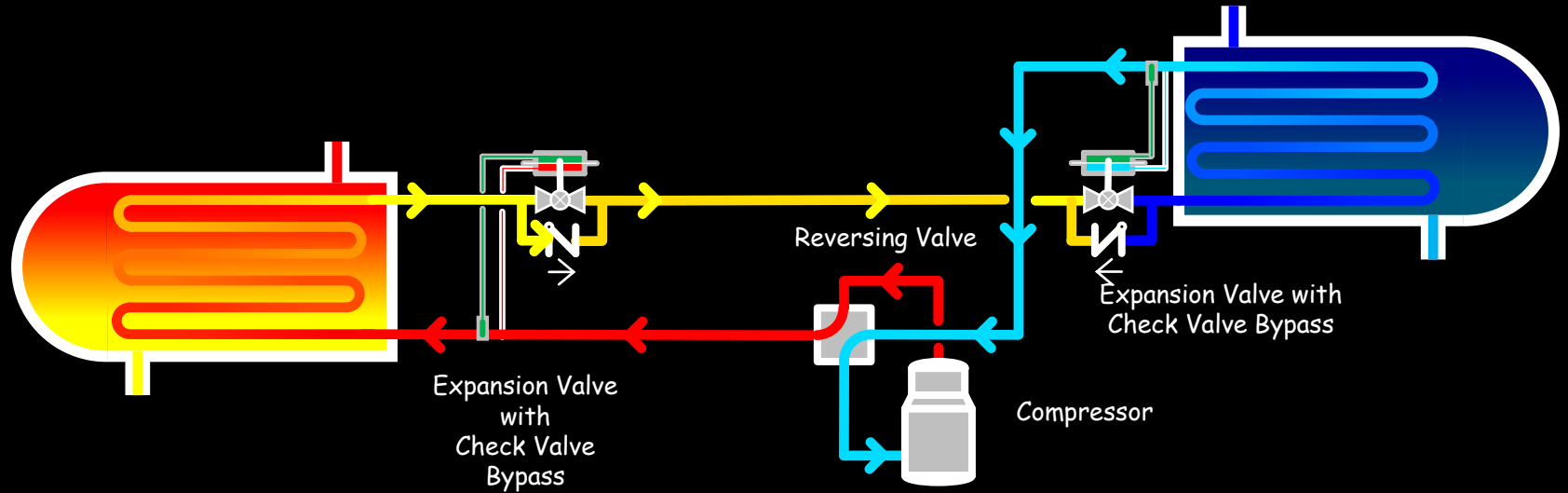


But Either or Both Coils (Heat Exchangers) Could Exchange Heat with a Fluid Like Water or Glycol

# Heat Pump System Types

## Air to Water/Heat Transfer Fluid

- Examples
  - Ground Source Systems
  - Water Source Systems
    - Closed Loop
    - Open Loop



But Either or Both Coils (Heat Exchangers) Could Exchange Heat with a Fluid Like Water or Glycol

# Heat Pump System Types

## Water to Water/Heat Transfer Fluid

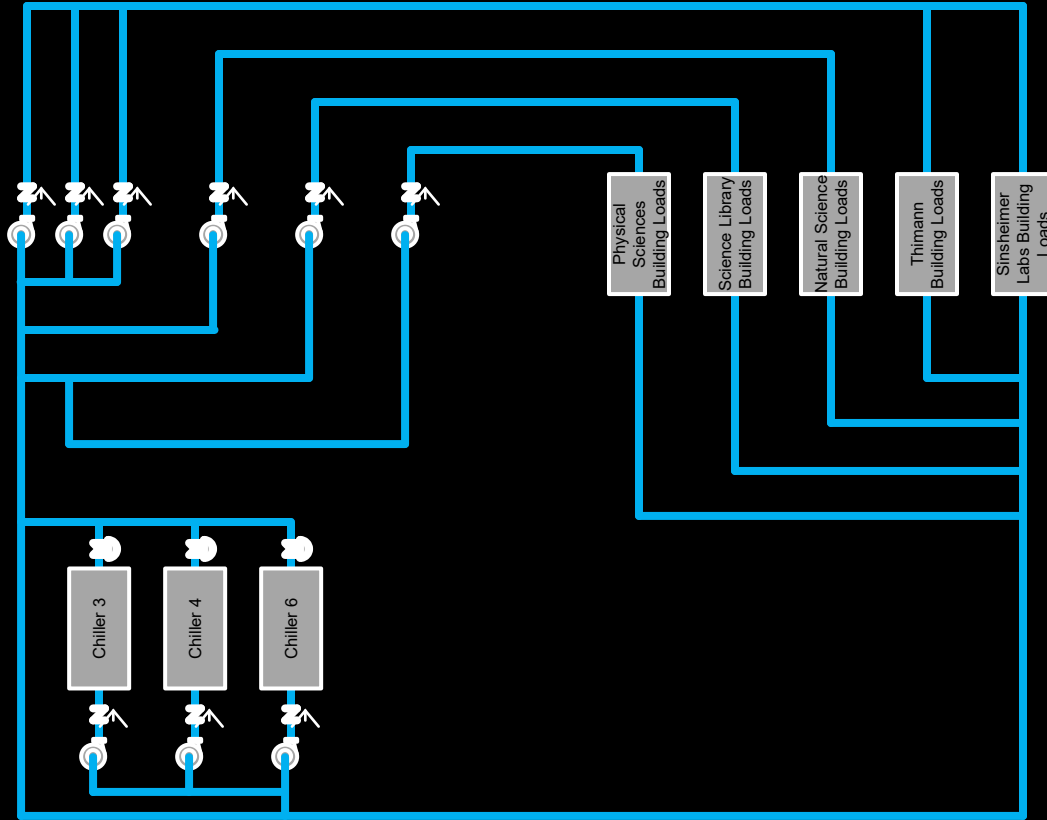
- Examples
  - Heat Recovery Chillers
  - Ground Source Systems
  - Water Source Systems
    - Closed Loop
    - Open Loop
  - Innovative Approaches

# Heat Pump System Types

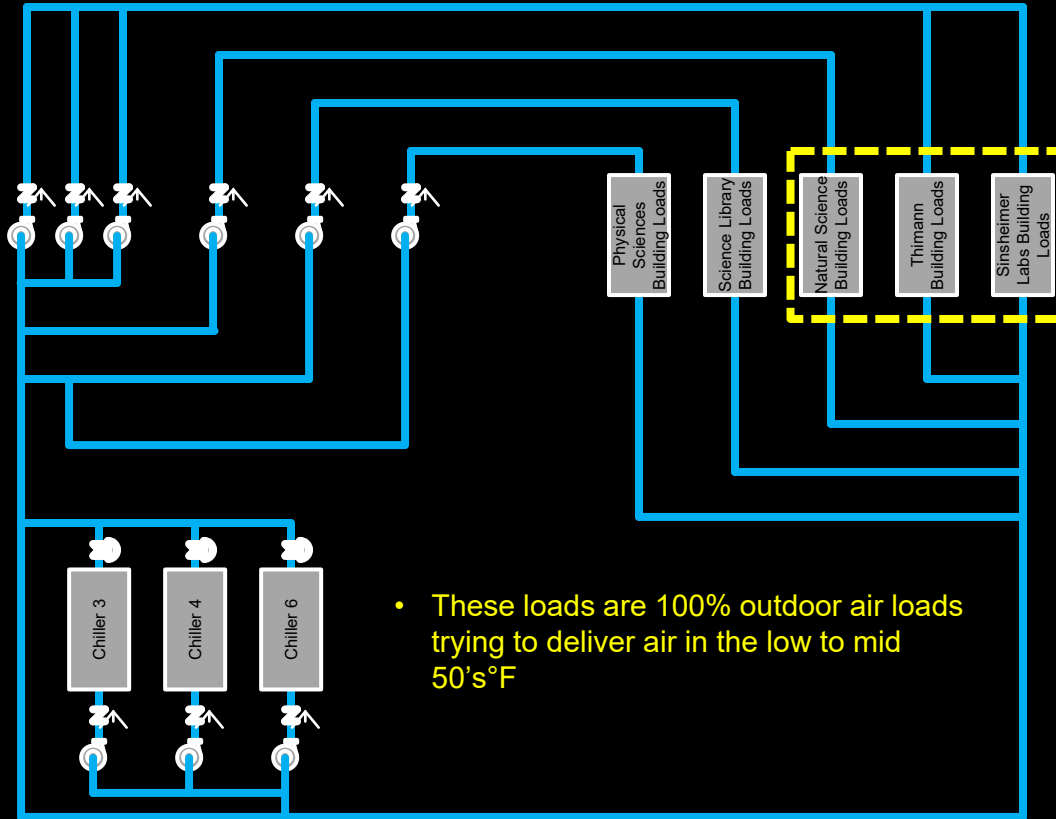
Innovative Approaches



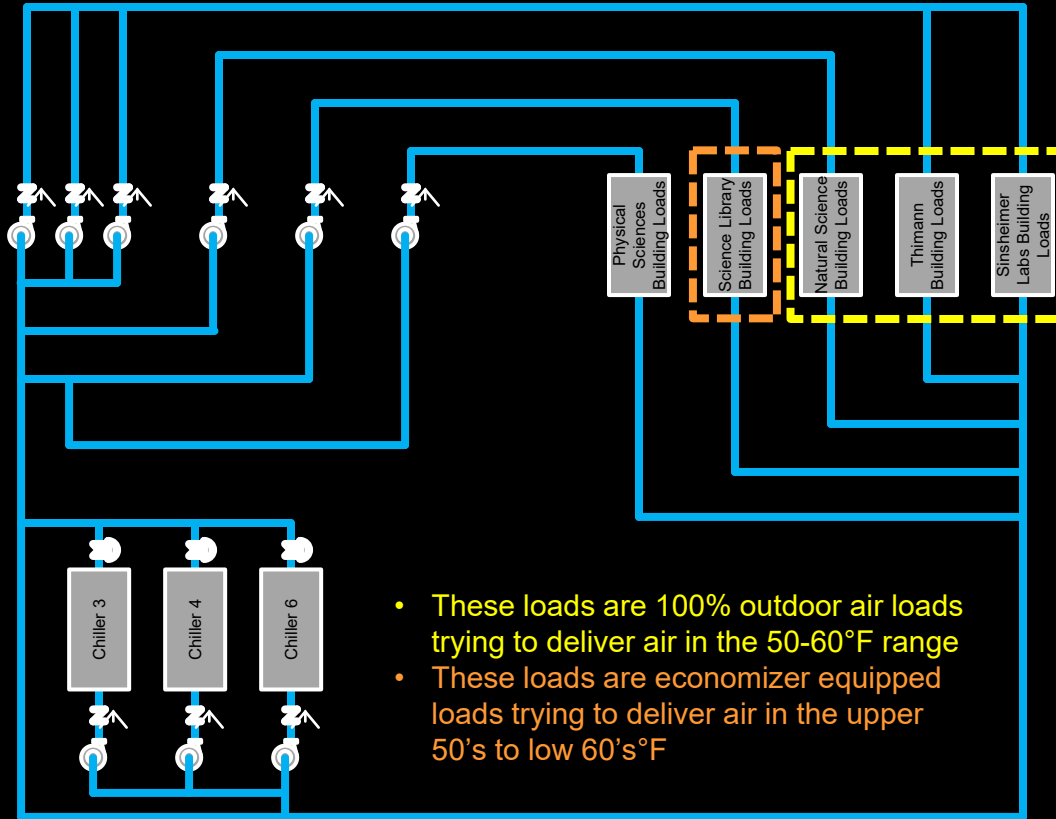




## The Untangled System Diagram

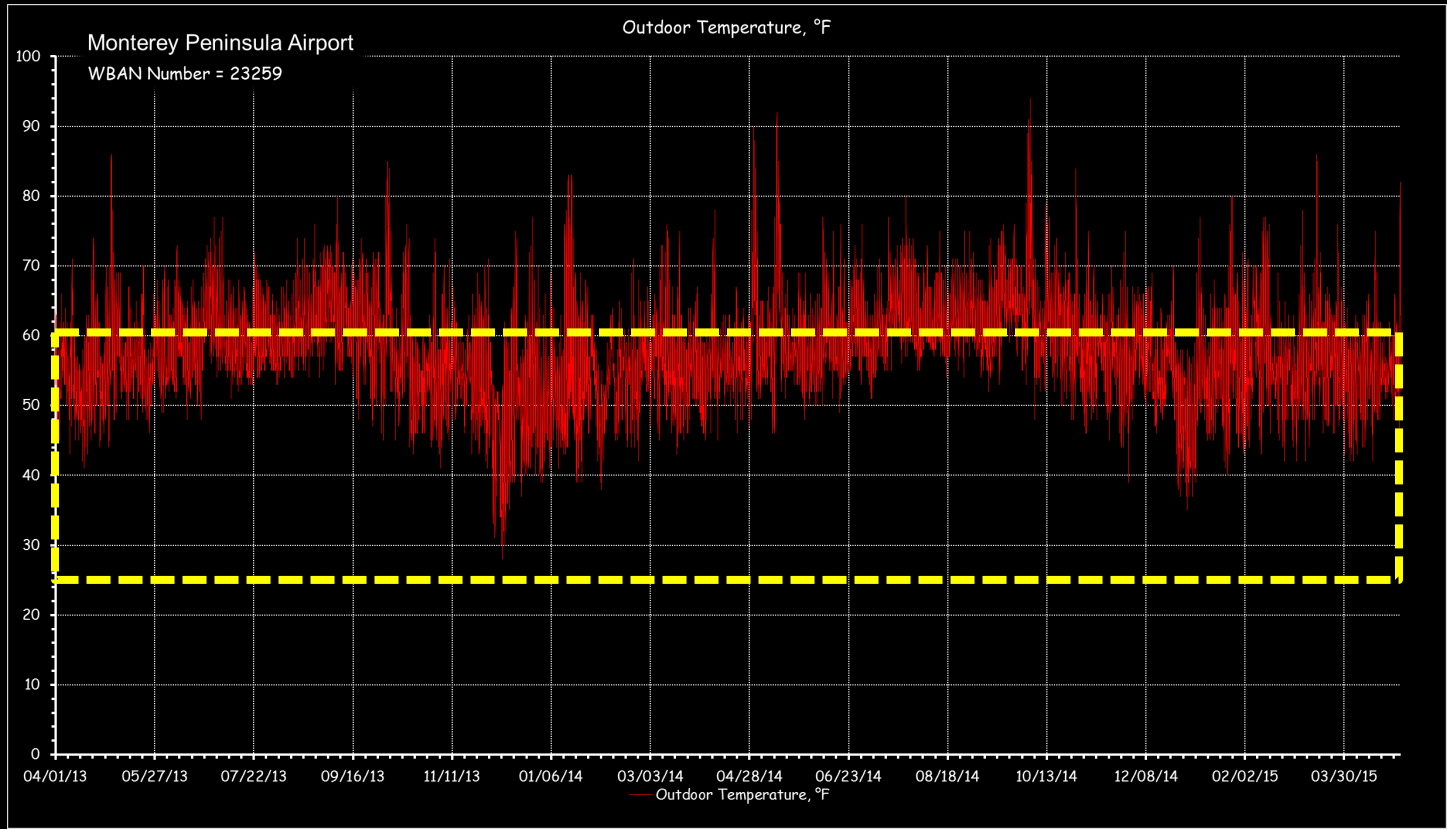


## The Original Plant Configuration

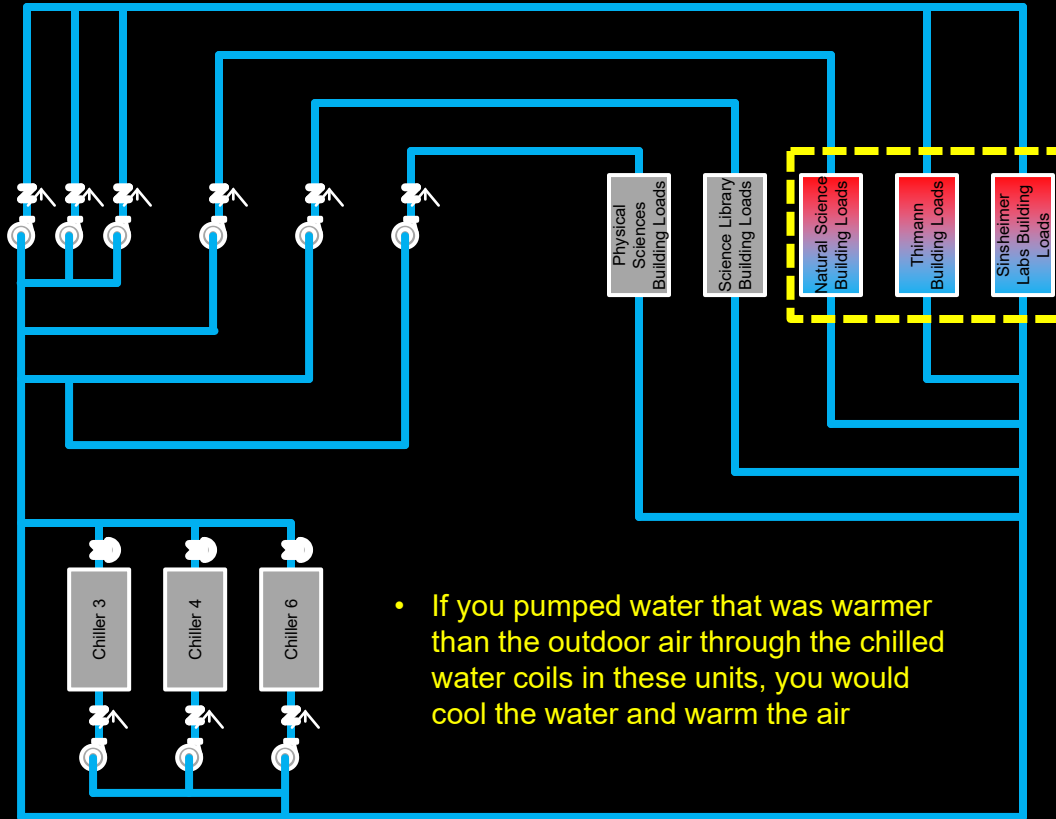


- These loads are 100% outdoor air loads trying to deliver air in the 50-60°F range
- These loads are economizer equipped loads trying to deliver air in the upper 50's to low 60's°F

## The Original Plant Configuration

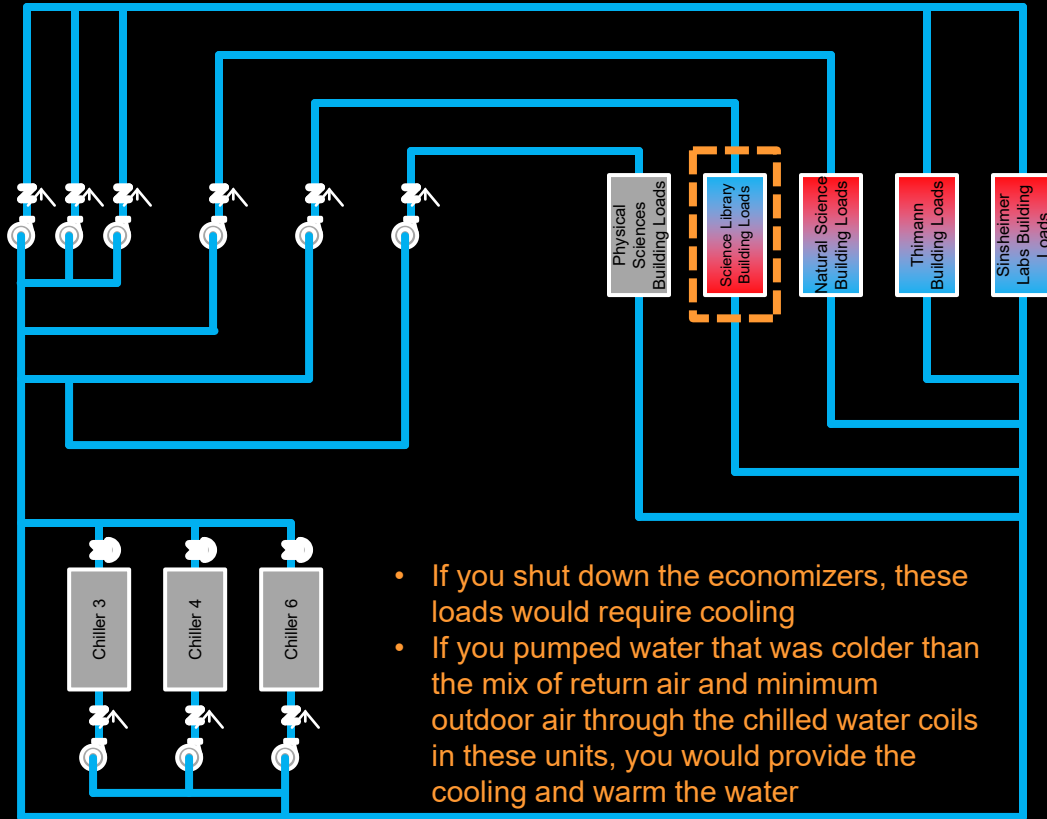


There Are A Lot of Hours When 100% Outdoor Air Systems Delivering 50-60°F Air will Need Preheat

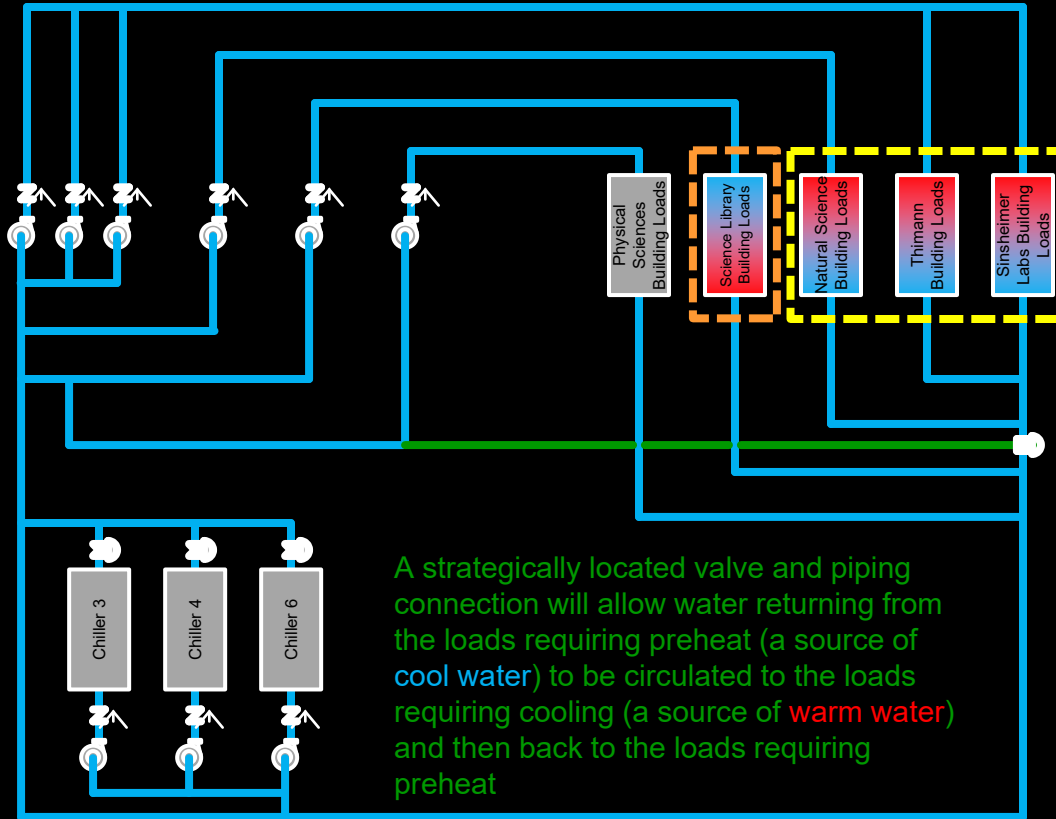


- If you pumped water that was warmer than the outdoor air through the chilled water coils in these units, you would cool the water and warm the air

## The Original Plant Configuration

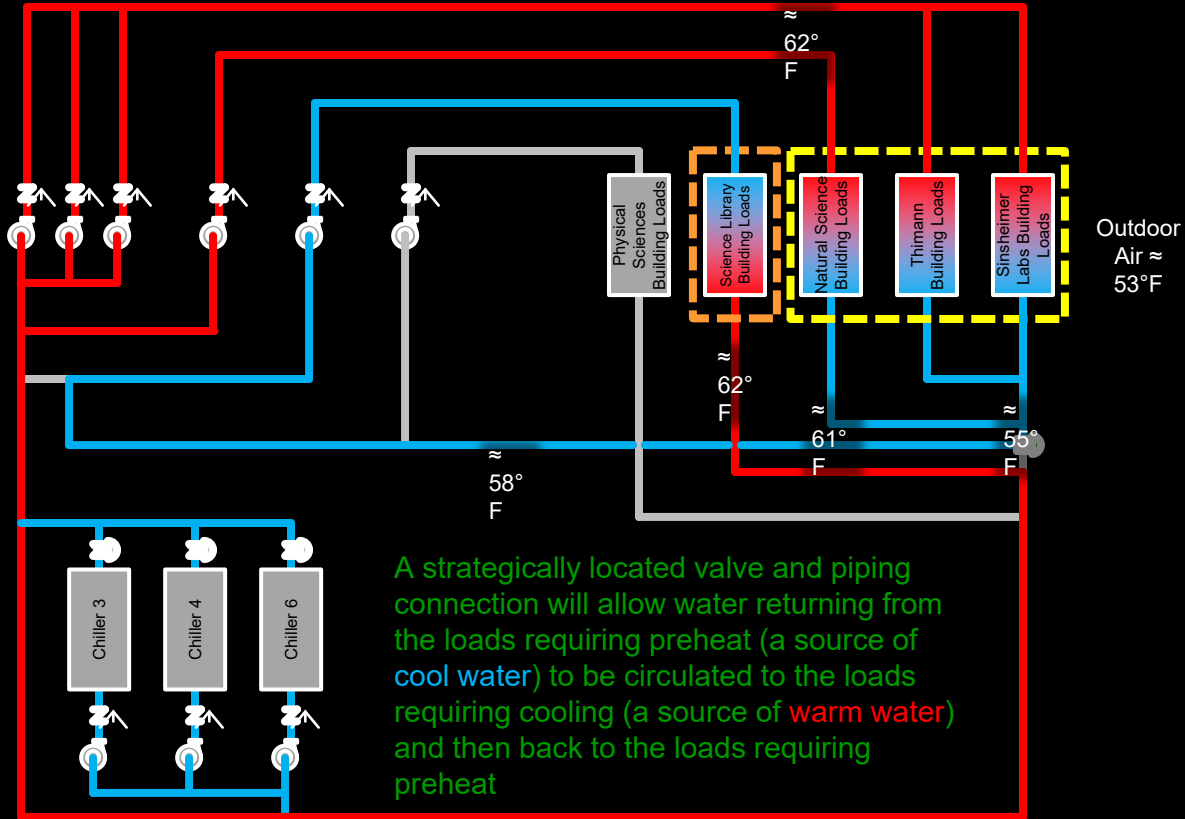


## The Original Plant Configuration



## The Modification to Make the Wet Economizer





## The Wet Economizer in Operation



# Question?



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a Better California



# See You Thursday!



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a Better California