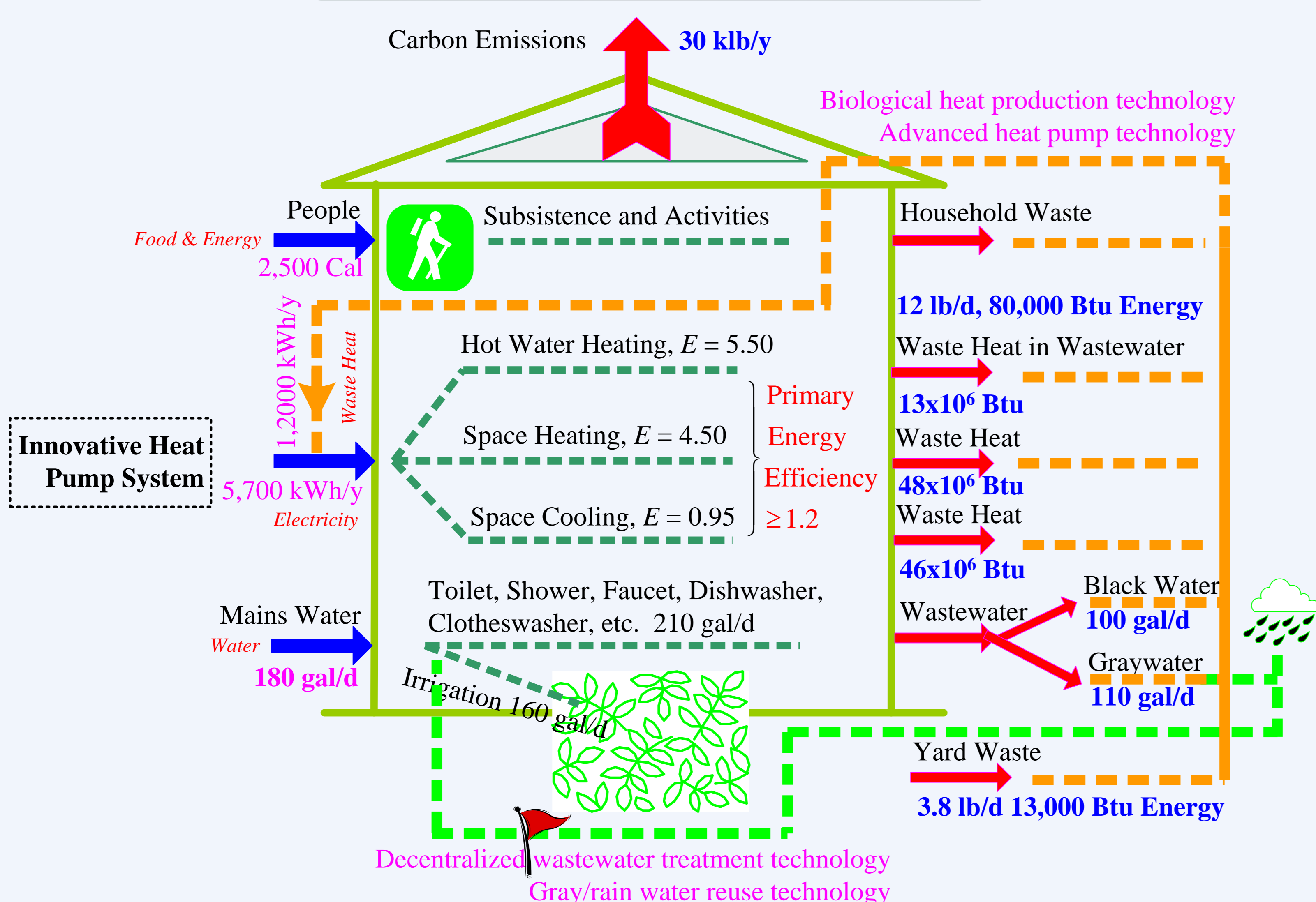


# Innovative Wastewater Energy Recovery System

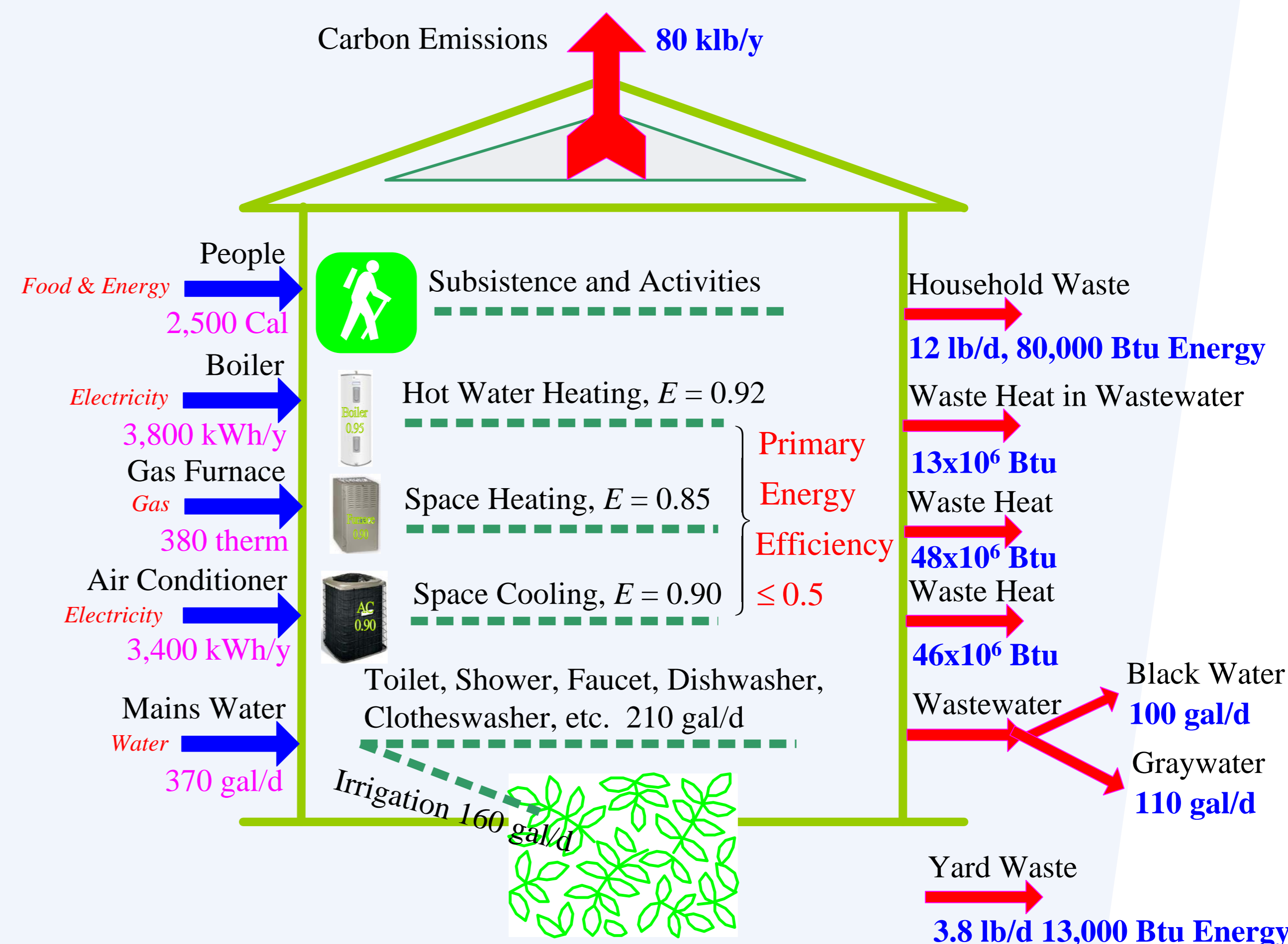
## Objectives

- Establish an **optimal and recycling building energy / water system** to maximize the efficiency of resources' usage and to recycle most of energy and water.
- Explore the feasibility of **biological heat production** from sacchariferous waste.
- Develop a **combined heat pump / low-temperature absorbent refrigerating system** for hot water heating, space heating and cooling.
- Integrate **decentralized waste water treatment / reclamation technologies** with building thermal energy system to formulate a comprehensive energy/water strategy

## Things Will Be Different

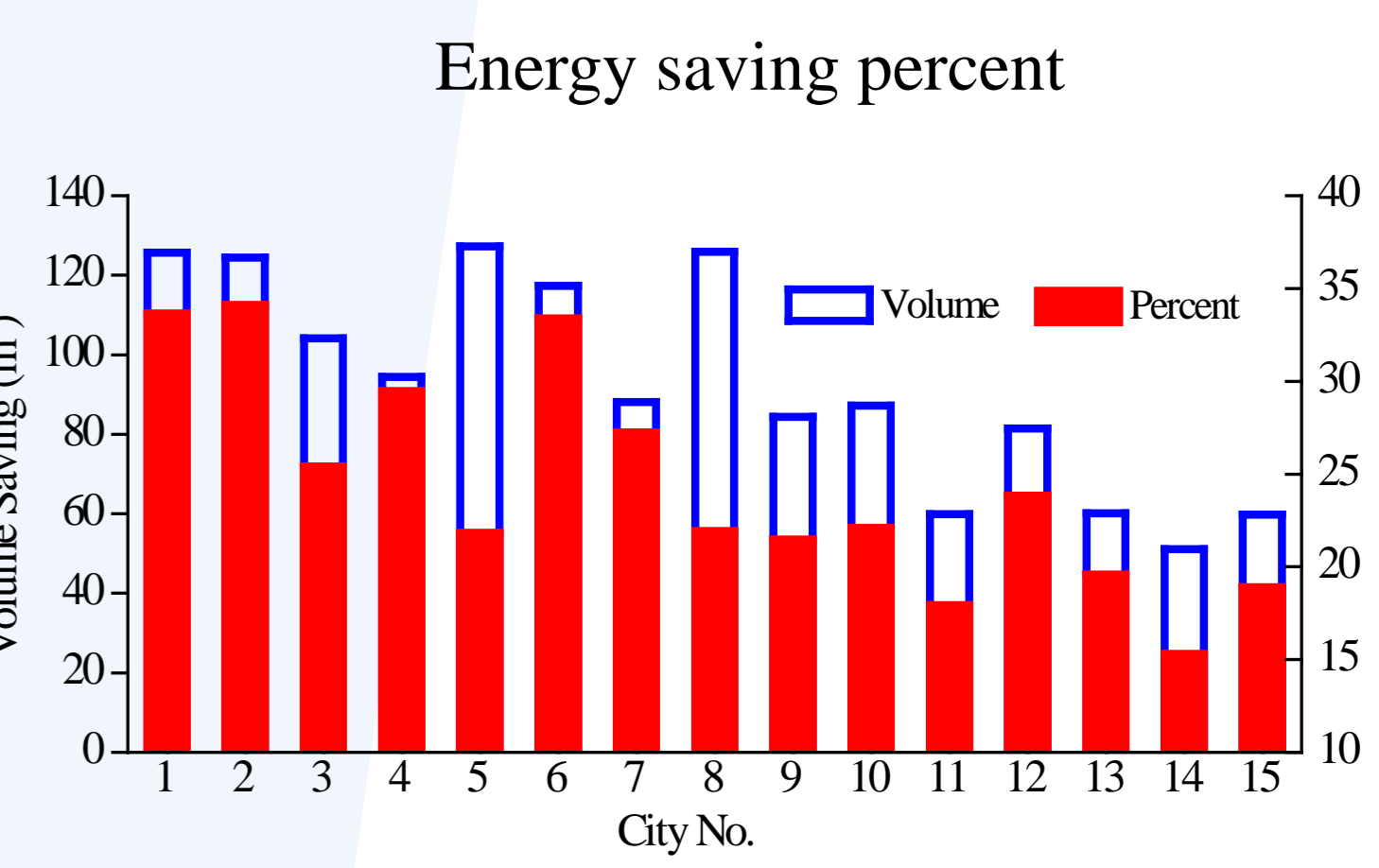
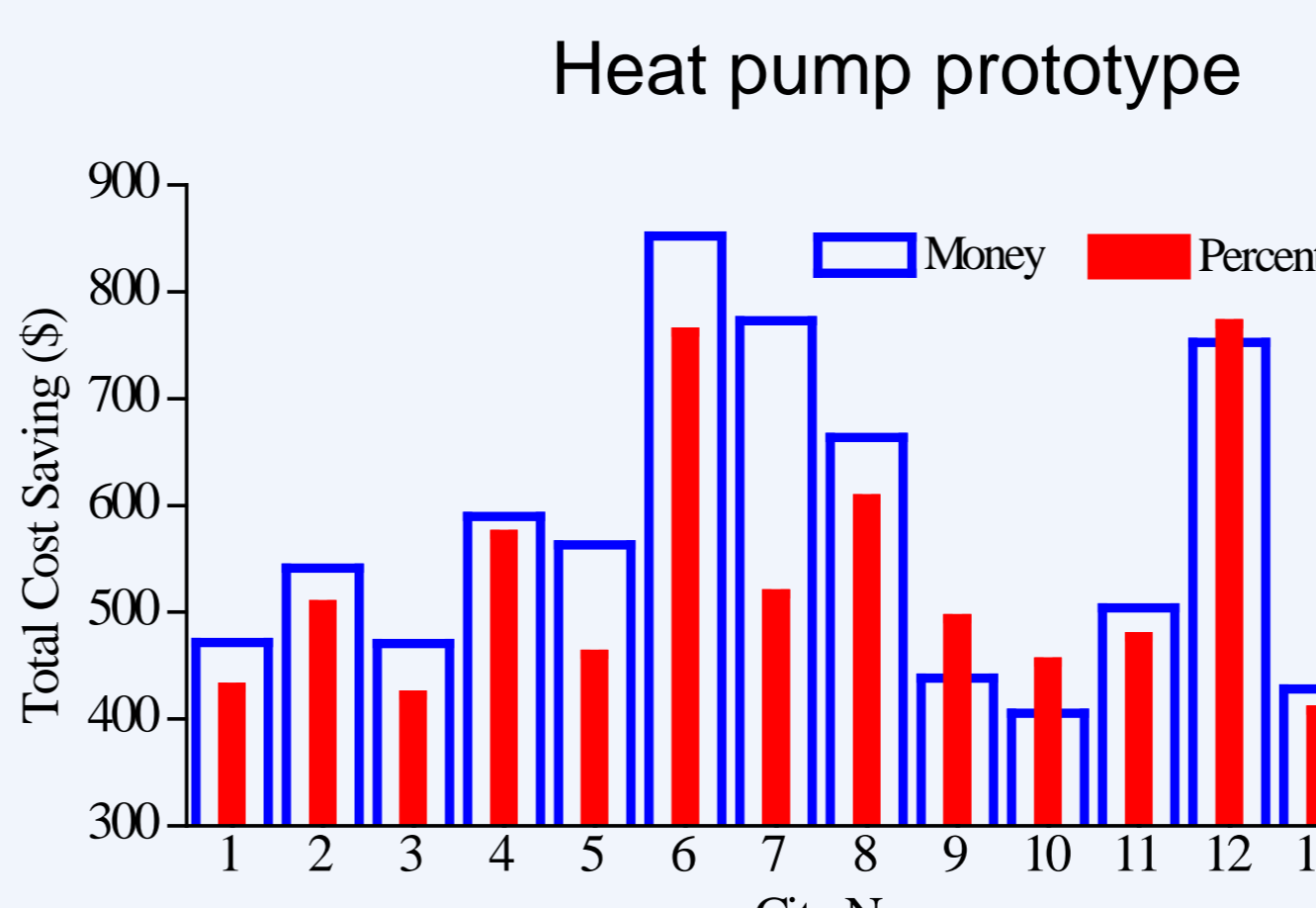
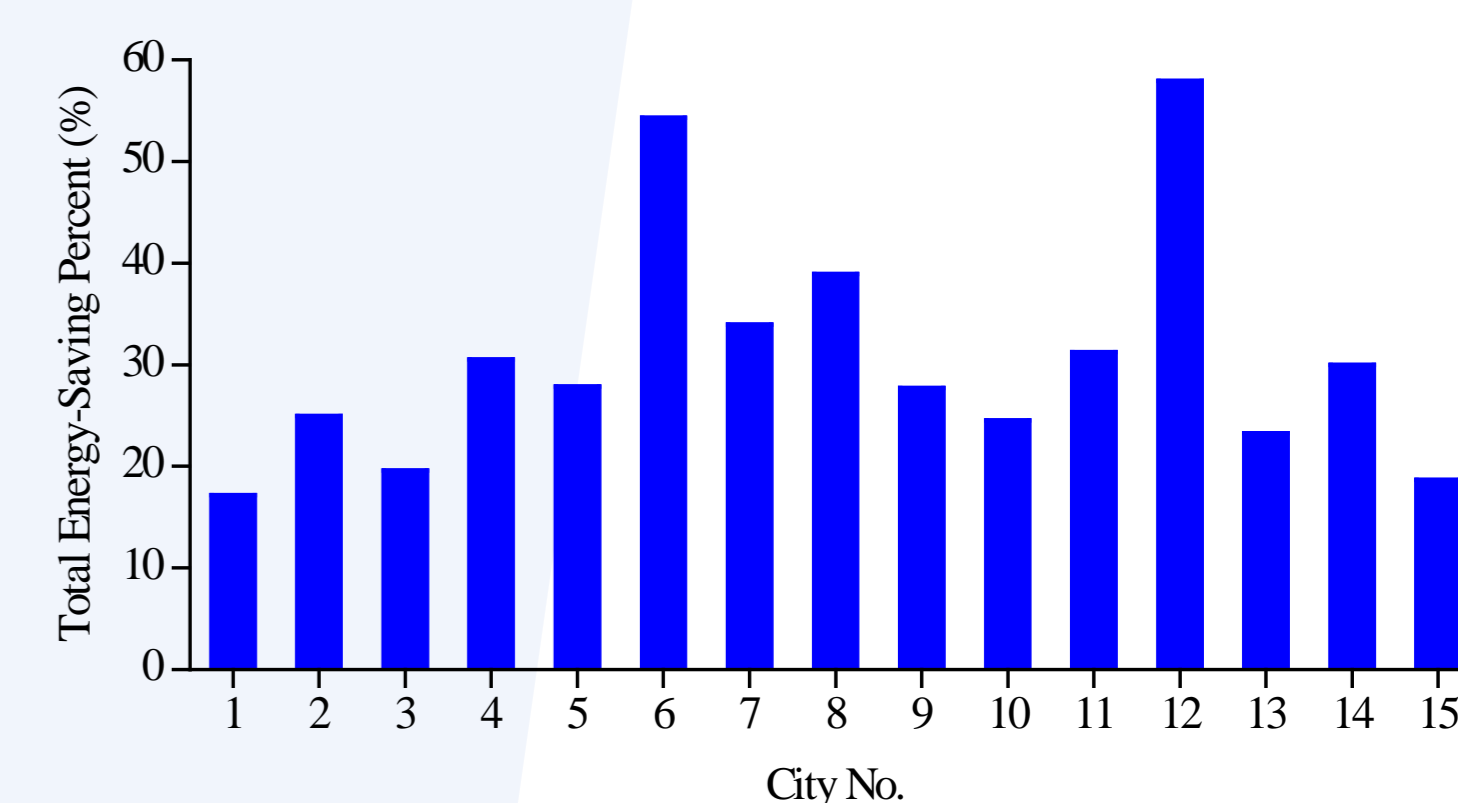
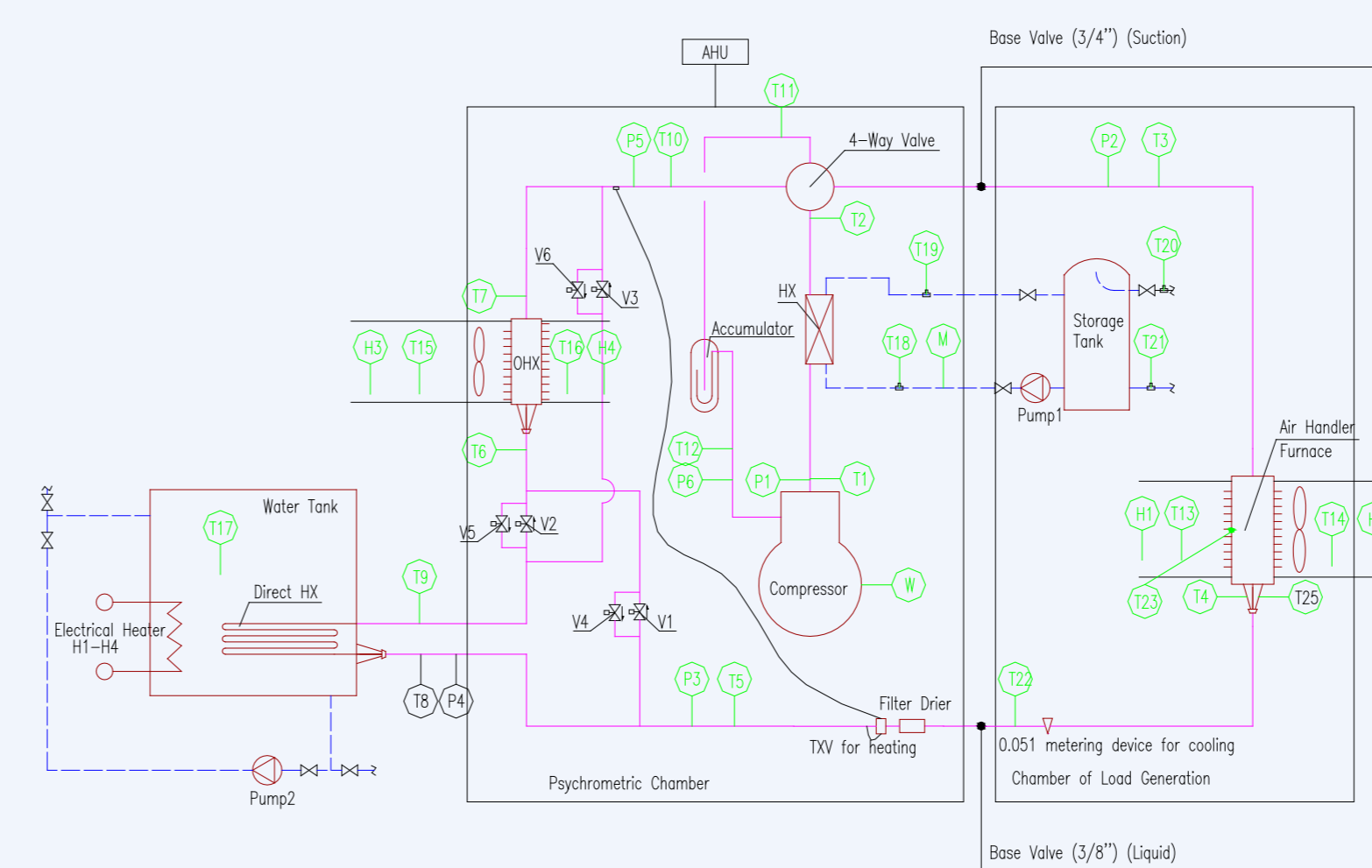


## What Things Be



- Buildings represent about **40%** of primary energy, **70%** of electricity consumption and **38%** of carbon emissions.
- The existing building thermal energy systems are designed to use **three separate systems to serve three functions**.
  - A boiler for hot water heating
  - A furnace for space heating
  - An air conditioner for cooling
- Water usage is very wasteful**
  - Drink water for toilet flushing
  - Drink water for garden irrigation and fire protection
- A huge amount of **energy residing in trash and wastewater** is discharged without being used.
  - Wastewater with heat in winter and cooling in summer
  - Waste food, grass, leaves and biomass with sugar

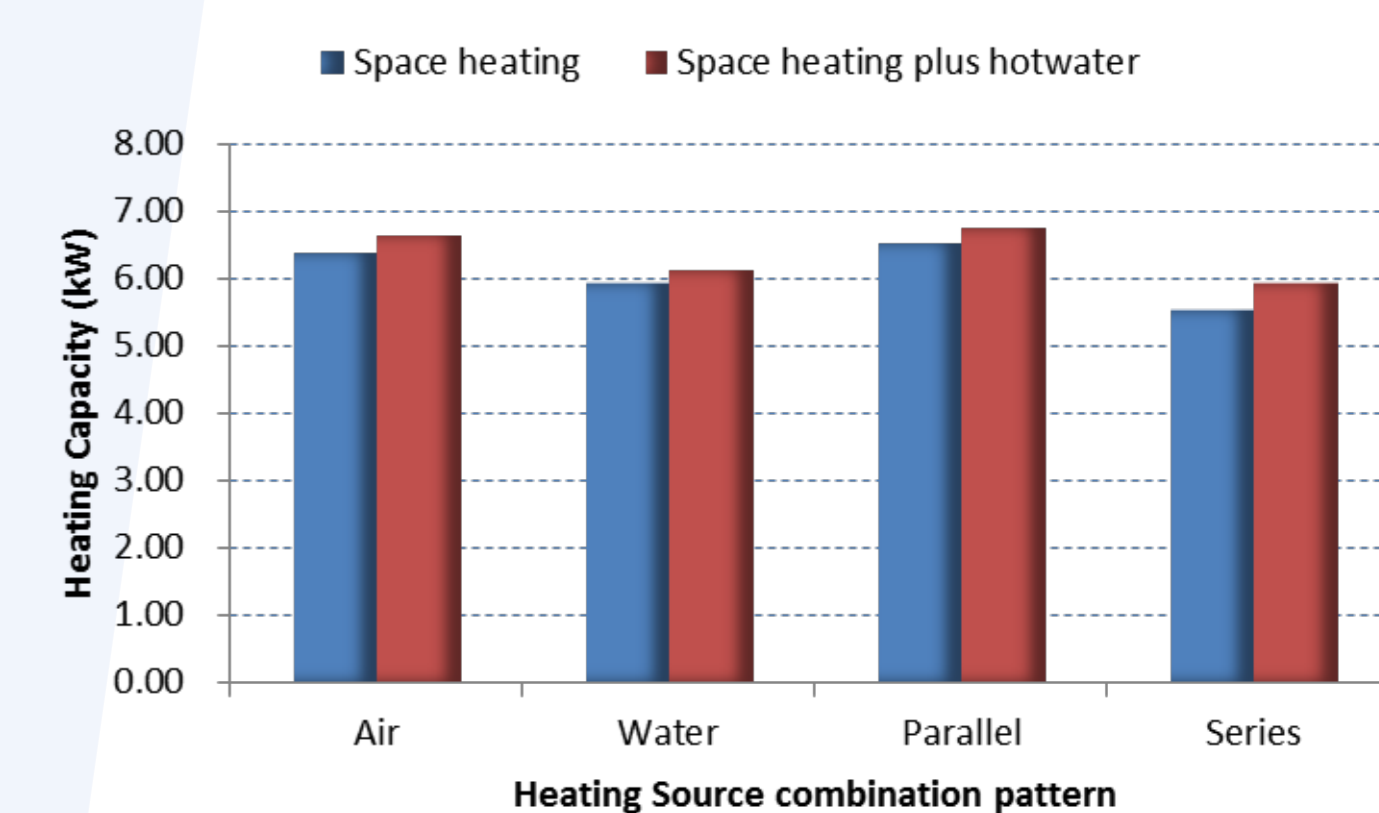
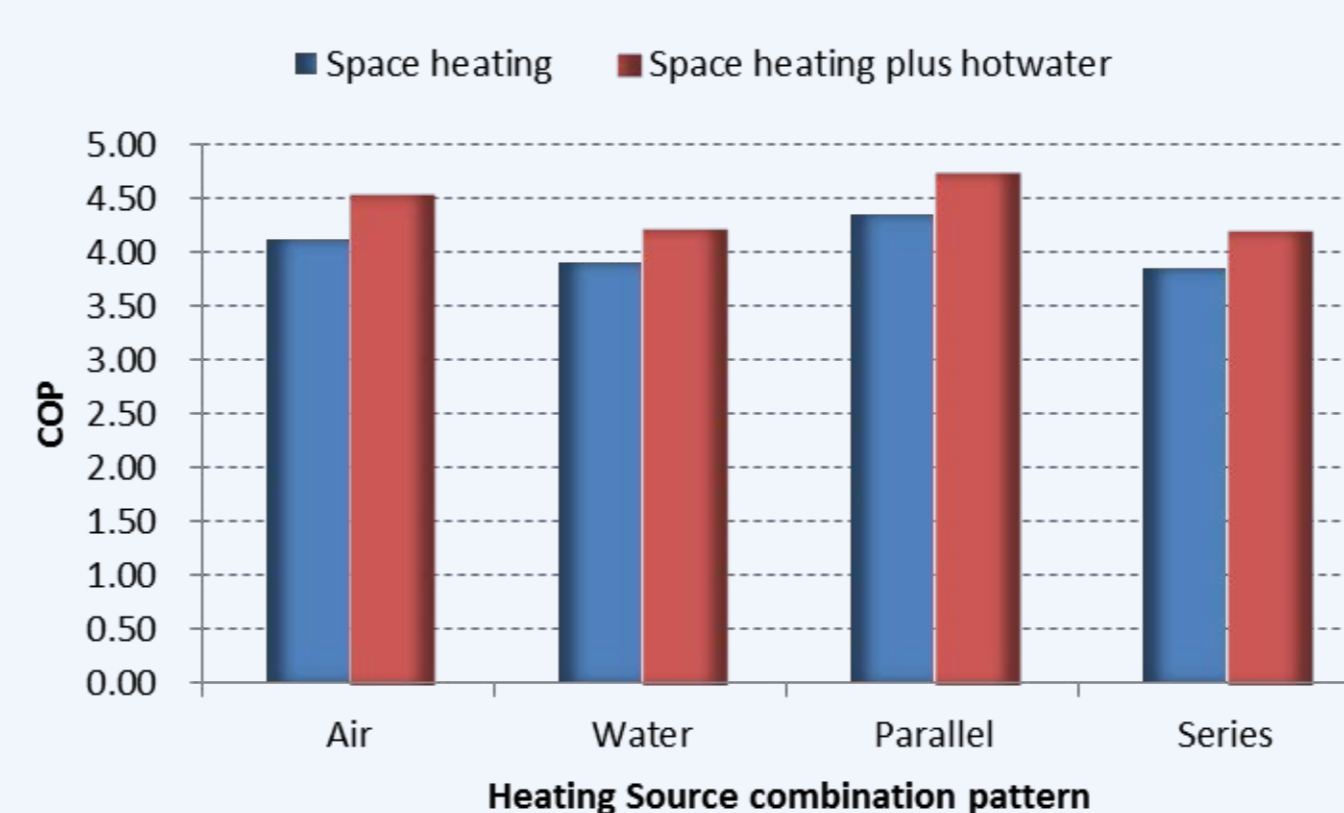
## Simulation and Experiments



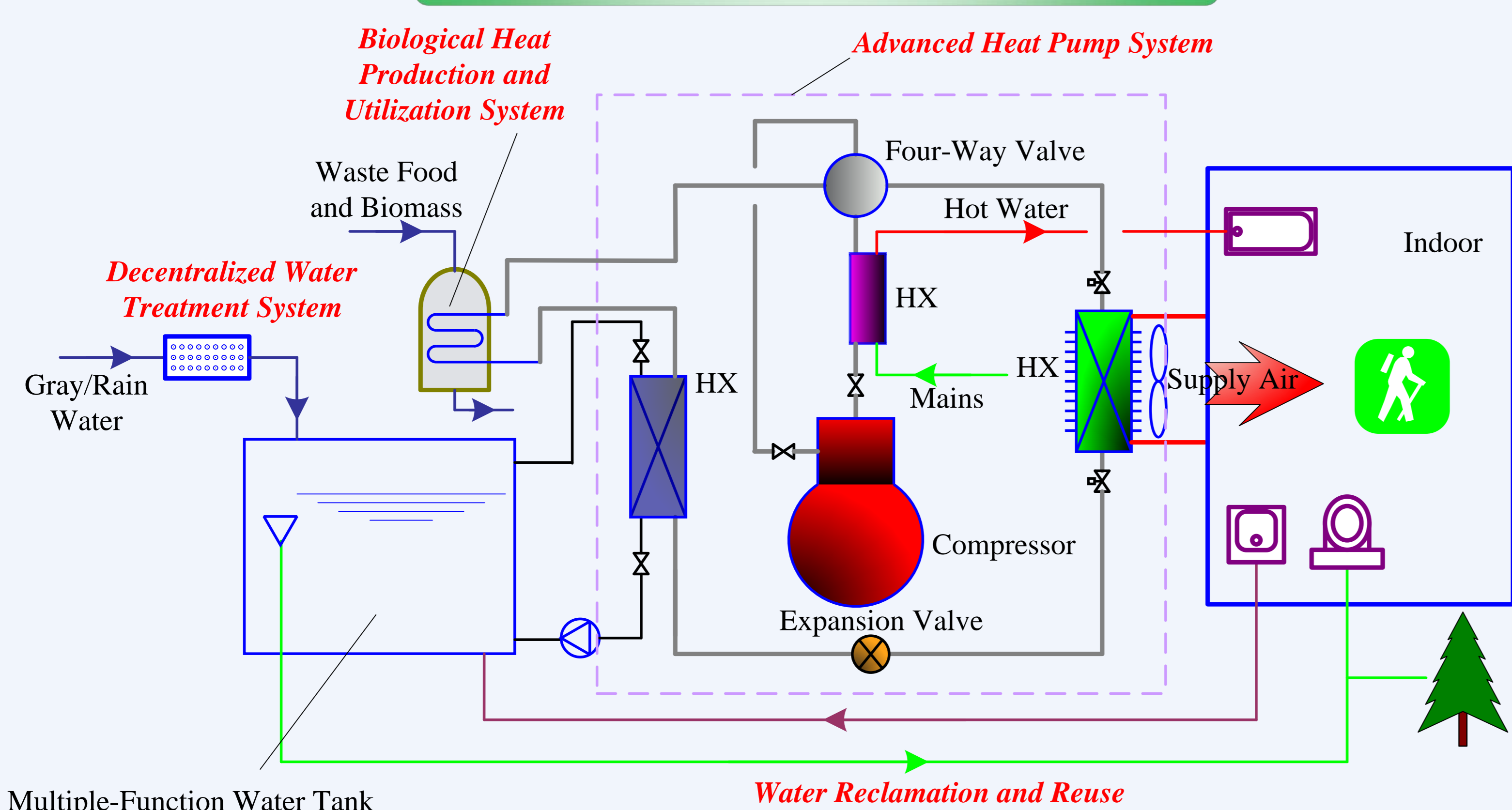
### Cost saving

### Water saving

1 = FL\_Miami; 2 = TX\_Houston; 3 = AZ\_Tucson; 4 = GA\_Atlanta; 5 = CA\_Lancaster; 6 = CA\_San. Francisco; 7 = NY\_New.York; 8 = NV\_Las.Vegas; 9 = OK\_Oklahoma; 10 = NE\_Omaha; 11 = CO\_Denver; 12 = WA\_Bellingham; 13 = MN\_Minneapolis; 14 = MT\_Helena; and 15 = ND\_Jamestown



## Innovative Technologies



- Biological heat production technology
- Advanced heat pump technology
- Low-temperature absorbent refrigerating technology
- Decentralized wastewater treatment technology
- Gray/rain water reuse technology
- Integrated design and installation method
- Optimal thermal energy/water commissioning and control strategy

## What Can We Do

- Reduce total **energy usage** for hot water heating, space heating and cooling by **50%**
- Reduce **water usage** in buildings by **50%**
- Reduce **electricity peak demand** by **30%**
- Reduce **total costs** for equipment/installation/maintenance and save the habitable by **50%**