

# The Cost of Comfort in your Home: Energy and Cost Savings from Setpoint Adjustment of Space Heating and Cooling

M. Blonsky<sup>1,2</sup>, J. Maguire<sup>2</sup>, T. Vincent<sup>1</sup>

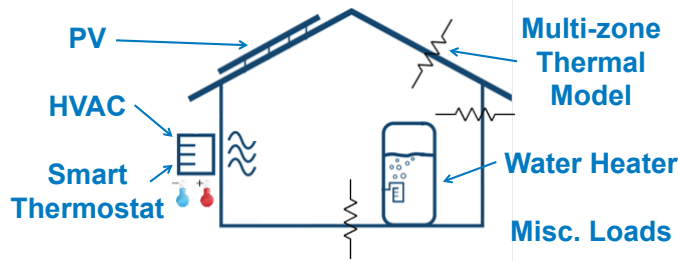
<sup>1</sup>Colorado School of Mines, <sup>2</sup>National Renewable Energy Laboratory

## Research Question

What impact does the HVAC thermostat setpoint have on energy and cost savings for a home?

## Background

- HVAC accounts for over 30% of residential energy use (EIA)
- Thermal building models assess the impact of HVAC and other equipment on temperature and energy consumption

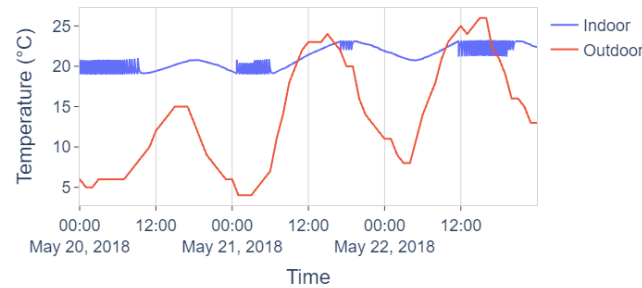


## Simulation Methods

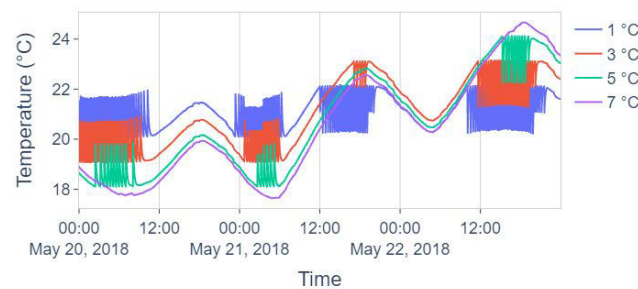
- Raised/lowered the cooling/heating setpoints to achieve a temperature difference of 1-7 degC
- Simulated 5 climate zones with local utility rates
- Code-compliant, 1900 sqft. single family homes
- Buildings include an air-source heat pump, electric water heater, PV, and other loads
- Used the Dwelling Object-Oriented Model
- Simulated for 1 year at 1-minute time resolution

## Results

### Sample Scenario

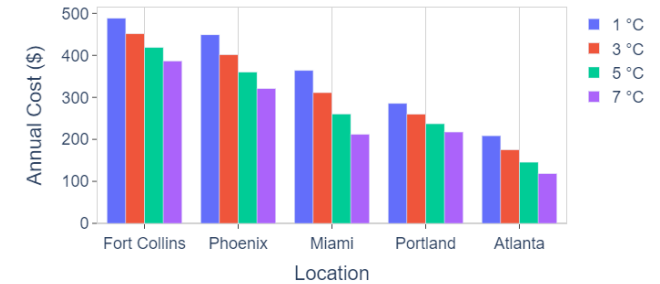


### Indoor Temperature Comparison



## Results

### Energy Cost by Difference in Temperature Setpoint



## Findings

- Adjusting the thermostat setpoint can lower energy costs by about \$100/year in all regions
- Climates with larger HVAC loads (hot and/or cold) tend to have more cost savings

## Future Work

- Impacts on grid benefits, e.g. load flexibility and voltage regulation
- New and improved equipment models
  - Variable-speed HVAC equipment
  - Occupancy-based schedules
  - Electric vehicles
- Advanced control architectures
  - Home energy management systems
  - Distributed energy resource aggregators