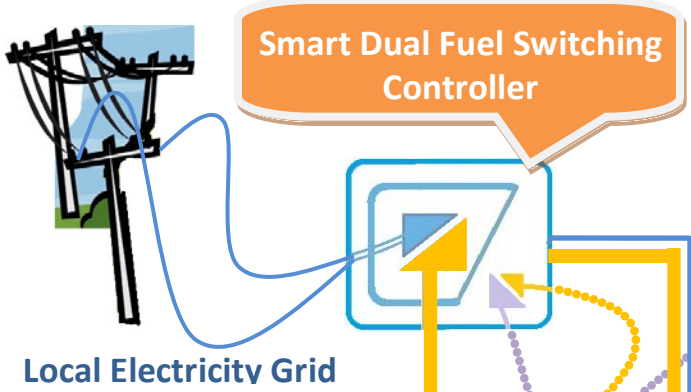
Smart Dual Fuel Switching System

A Heuristic Approach For Residential Energy Cost/GHG Emission Reduction

RYERSON UNIVERSITY



Assumptions

- ASHP COP: Varies with outdoor temperature
- Natural Gas Mini Boiler Eff: 80%
- NG GHG Emission Factor: 1.856 kg/m^3
- NG Cost: \$0.4/m^3
- Electricity Cost: TOU
- Electricity GHG Emission Factor: Hourly

Weather Forecasting

Team members

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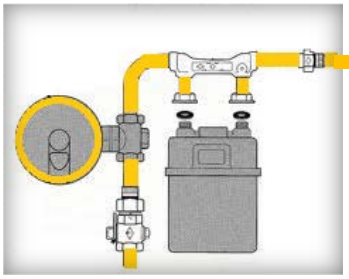
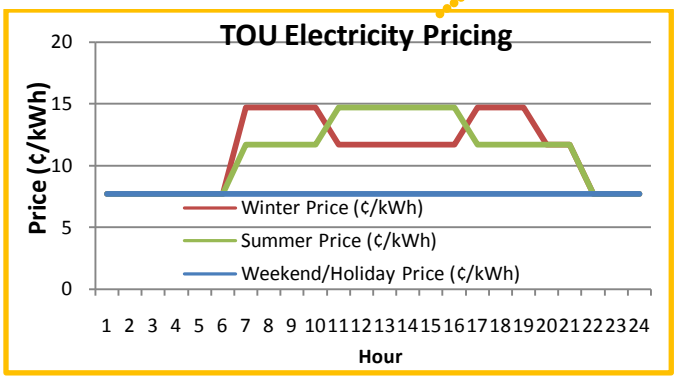
Natural Gas Network





Project Scope

This Smart Controller can:

- Potentially reduce incremental costs between ASHP and central A/C
- Reduce energy costs and GHG emissions (use of off-peak electricity while utilizing gas in peak hours)
- Provide a flexible choice for homeowners
- Provide a mechanism for utilities to control dispatchable demand
- Potentially optimize energy supply and its infrastructure

Results

Annual heating demand is analyzed:

Total heating load (kWh)	17595
ASHP electricity (kWh)	6421
ASHP electricity cost (\$)	680
NG cost (\$)	854
Smart switching energy cost (Minimizing cost) (\$)	525
ASHP electricity GHG (kg)	1155
NG GHG (kg)	3963

Conclusion

New variable capacity ASHP is very efficient in providing relatively low cost space heating for houses. A smart dual fuel switching system could reduce the cost and emission by 23% from purely electric ASHP system and by 52% from purely natural gas boiler system.

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