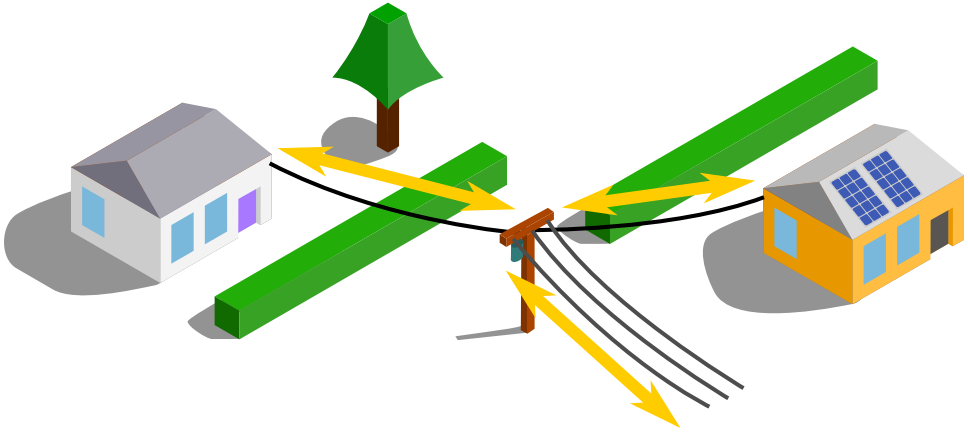
# DISTRIBUTED RESIDENTIAL DEMAND RESPONSE

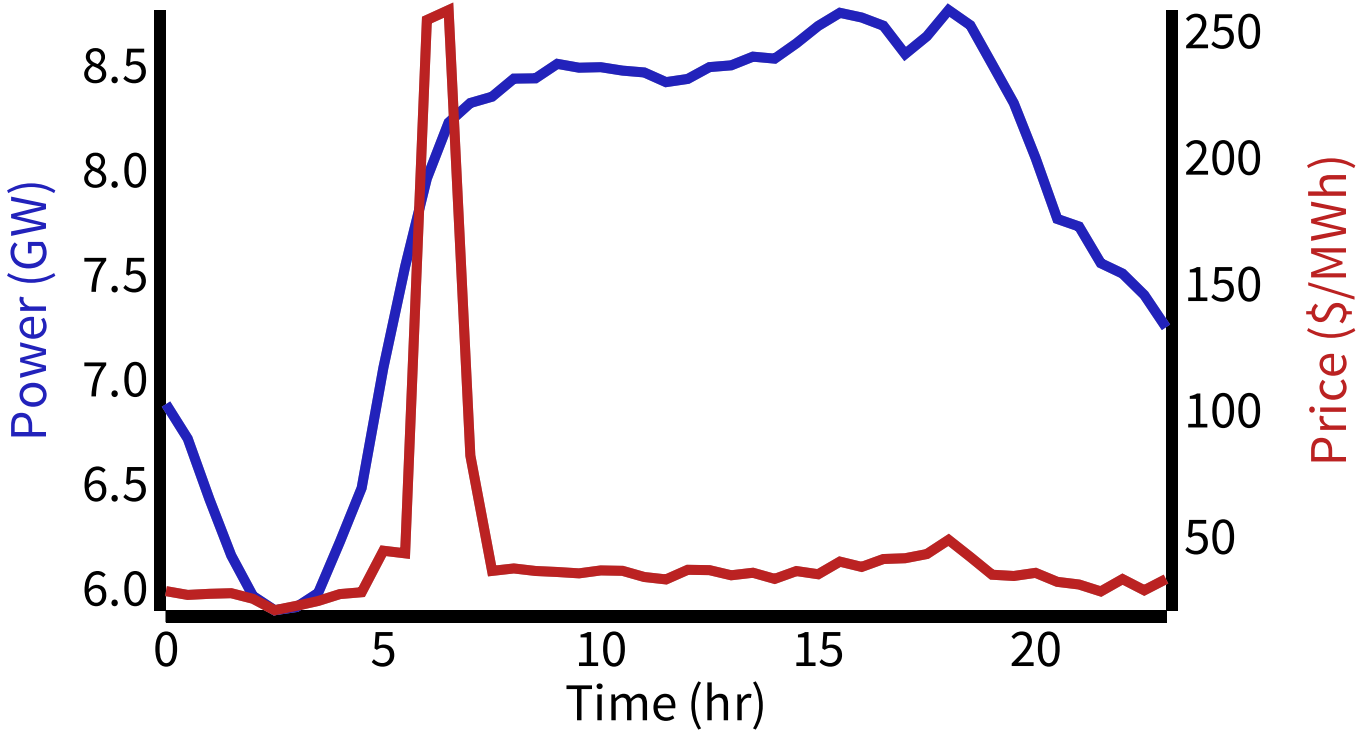
## ANU / NICTA / ECI

Paul Scott

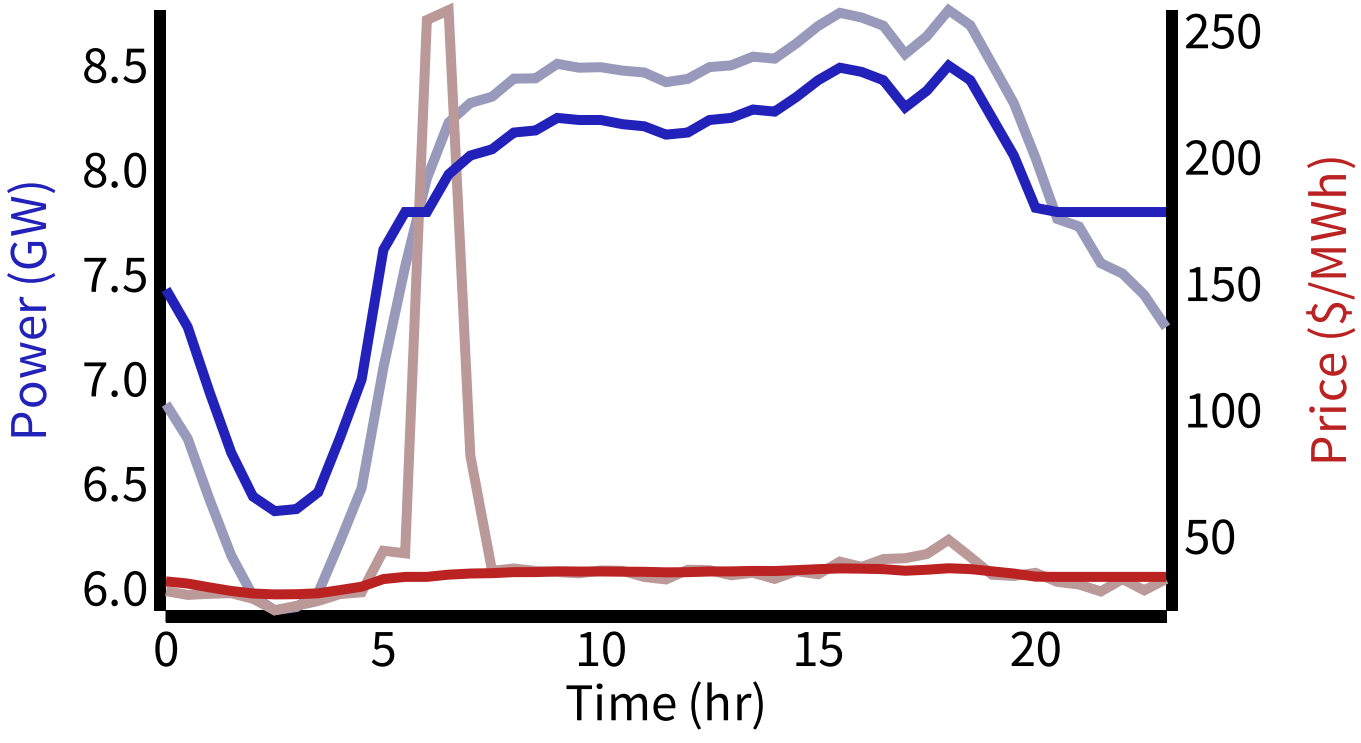
Sylvie Thiebaux



# DEMAND RESPONSE



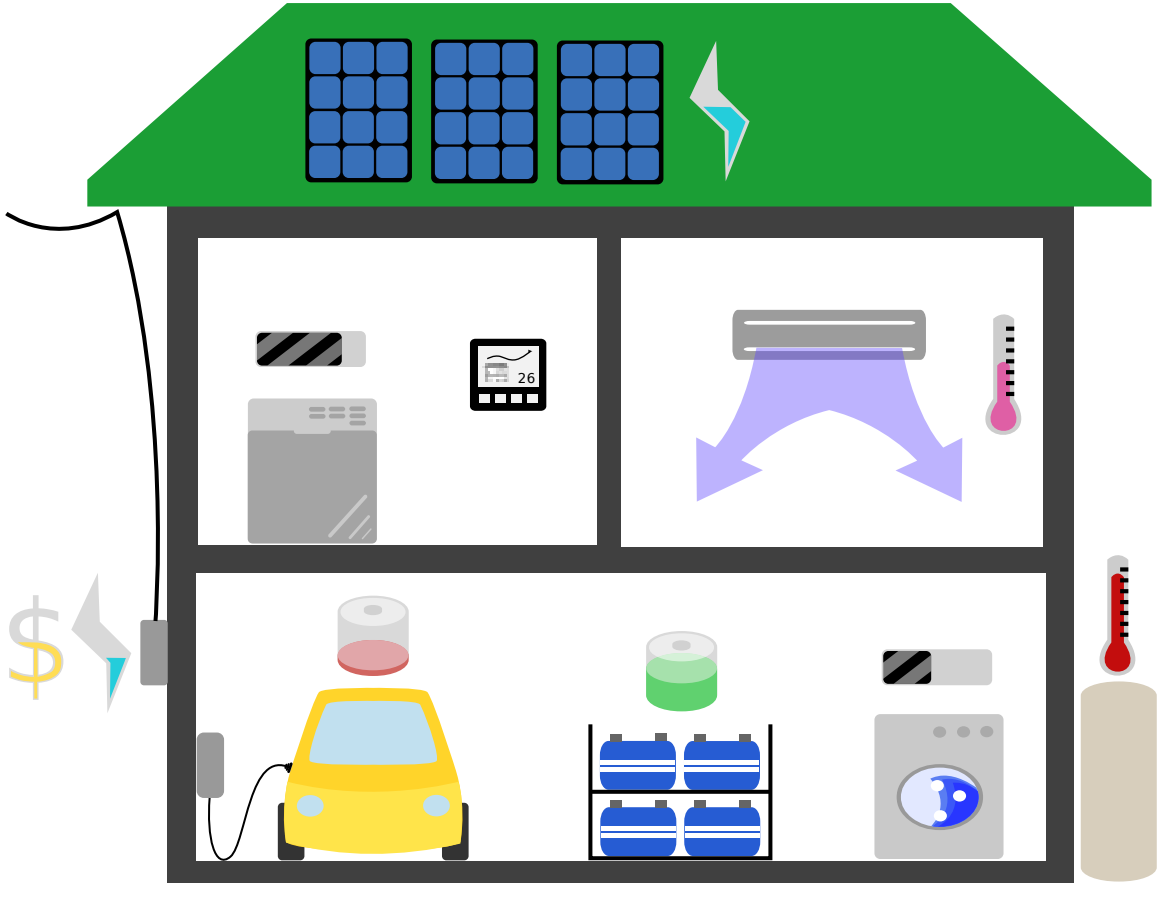
# DEMAND RESPONSE



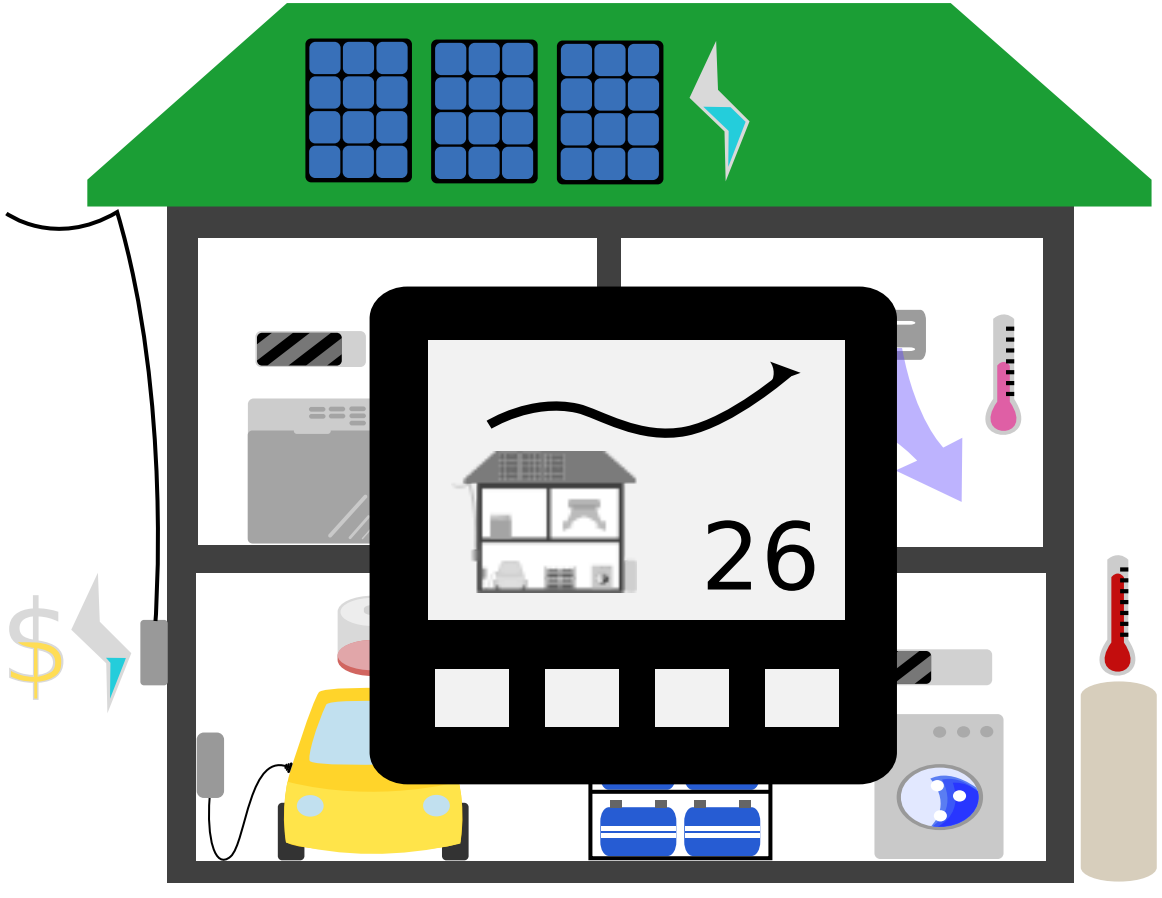
# DEMAND RESPONSE

- Reduce network peaks
- Balance renewable supply
- Provide network support

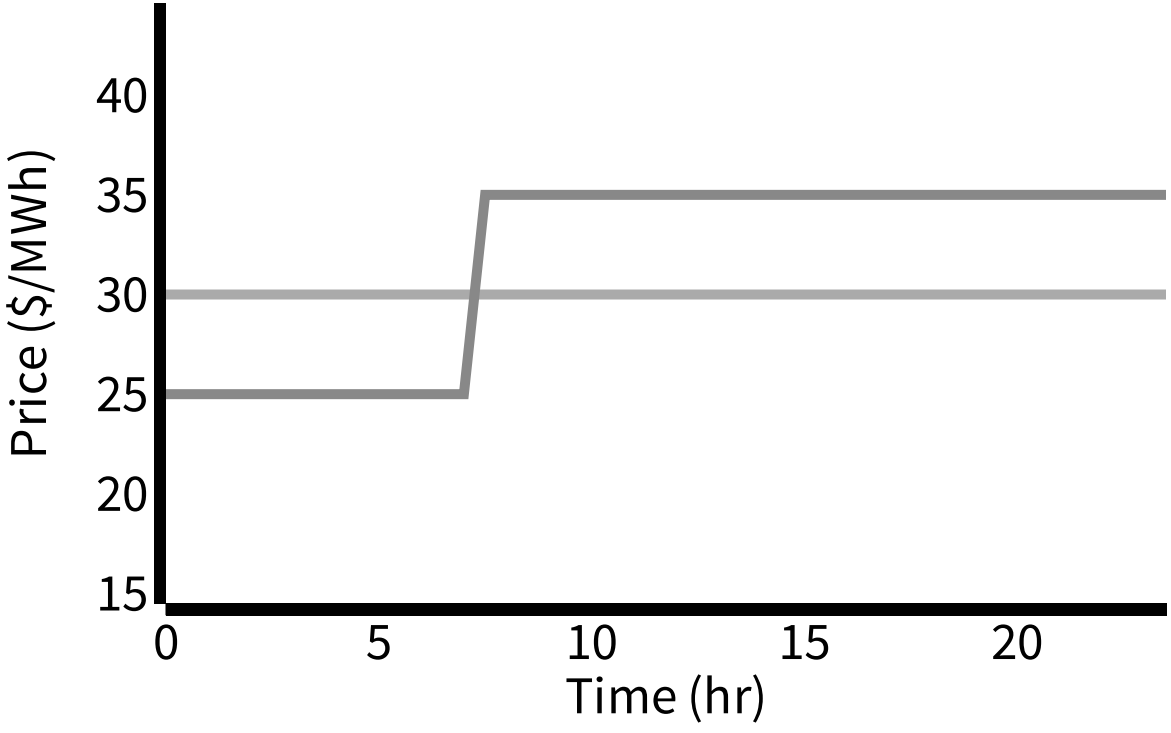
# HOME AUTOMATION



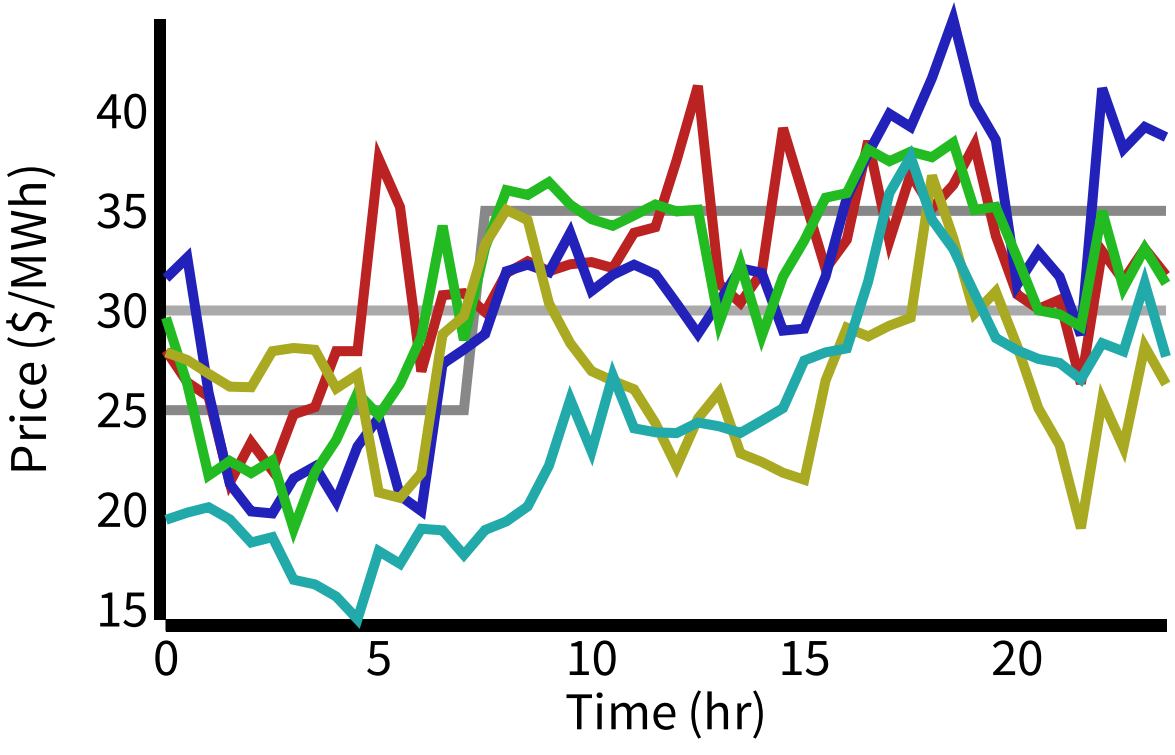
# HOME AUTOMATION



# RETAIL PRICES



# RETAIL PRICES



# OUR FOCUS

A demand response mechanism that incentivises participation and coordinates activity whilst satisfying network constraints.

# CONSIDERATIONS

- Ease of use ← Automated
- Privacy ← Aggregate consumption
- Incentives ← Market prices
- Quality of outcomes ← Near optimal
- Scalability ← Distributed computation

# OPTIMISATION PROBLEM

Minimise total cost of serving power, whilst preserving network and participant constraints.

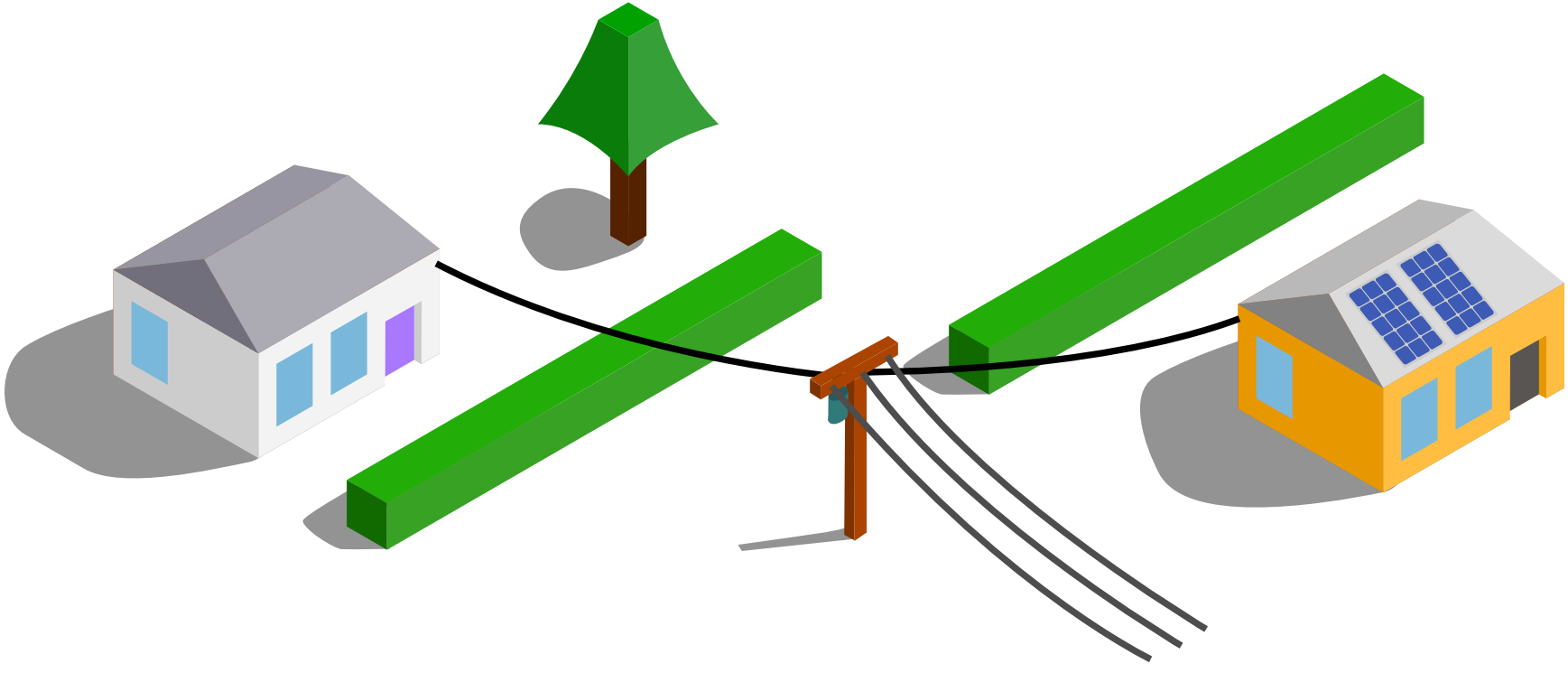
# DISTRIBUTED

- Real-time prices at every bus
- Participants predict needs
- Participants solve subproblems
- Results communicated

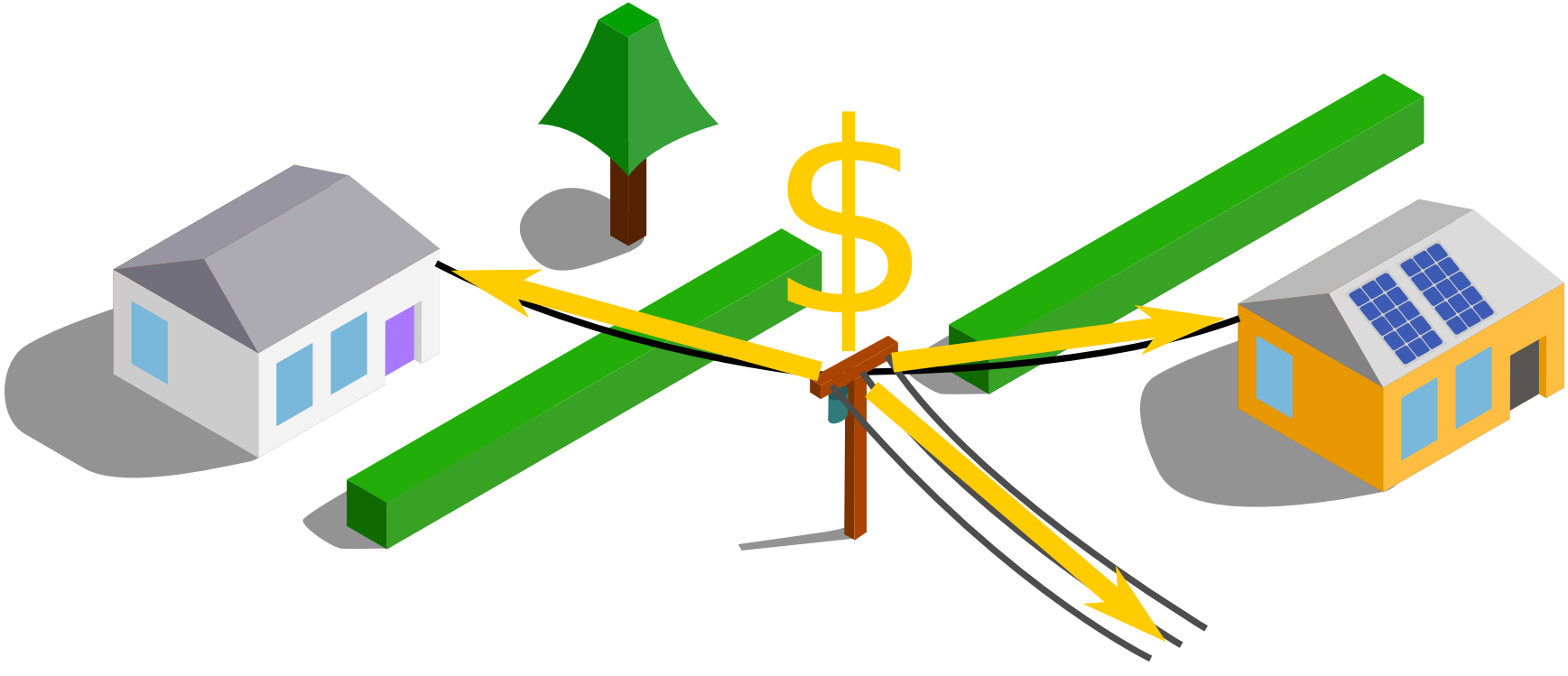
# ALGORITHM OVERVIEW

1. Participant determines best response
2. Power profile communicated to bus
3. Bus determines best response
4. Prices updated
5. Repeat 1-4 until prices converge
6. Power can then be exchanged

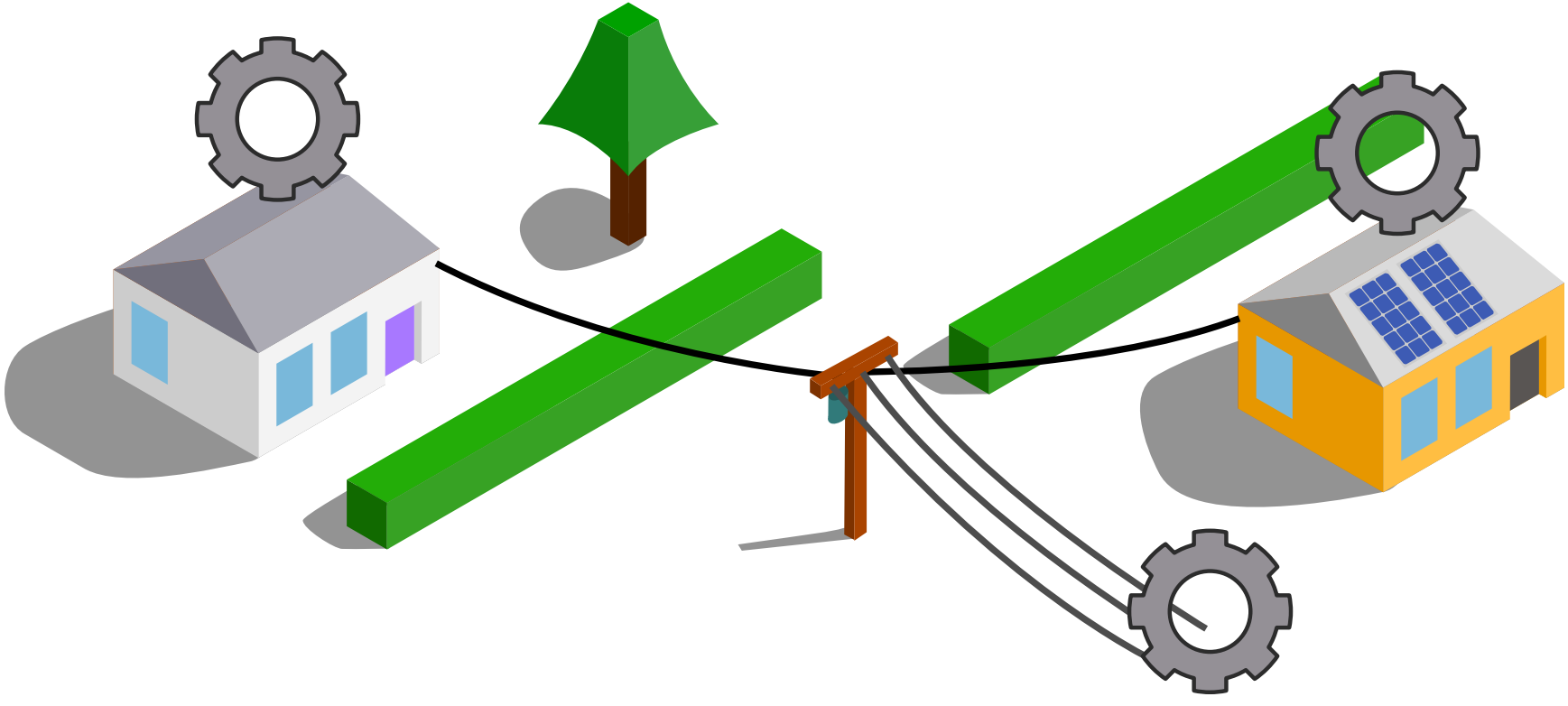
# VISUALISATION OF ALGORITHM



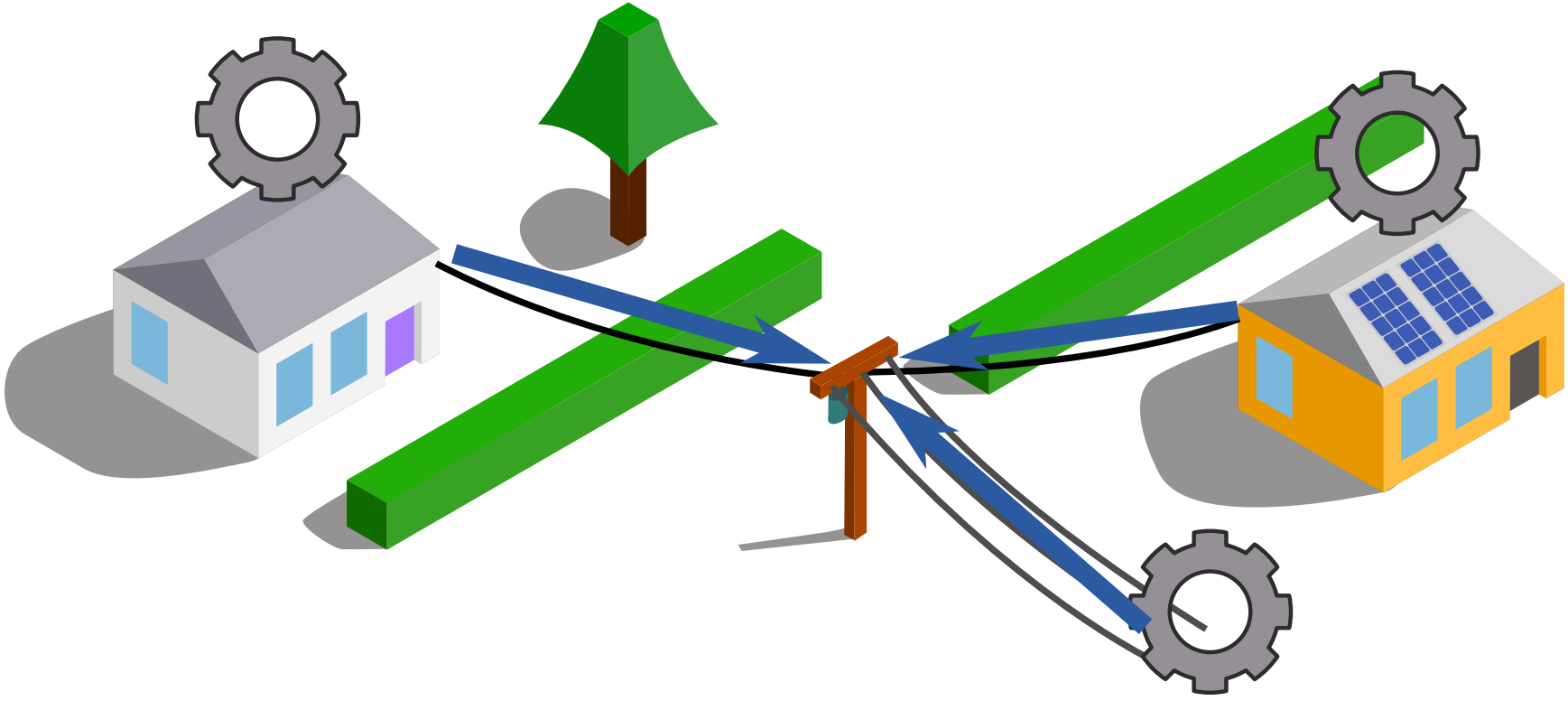
# VISUALISATION OF ALGORITHM



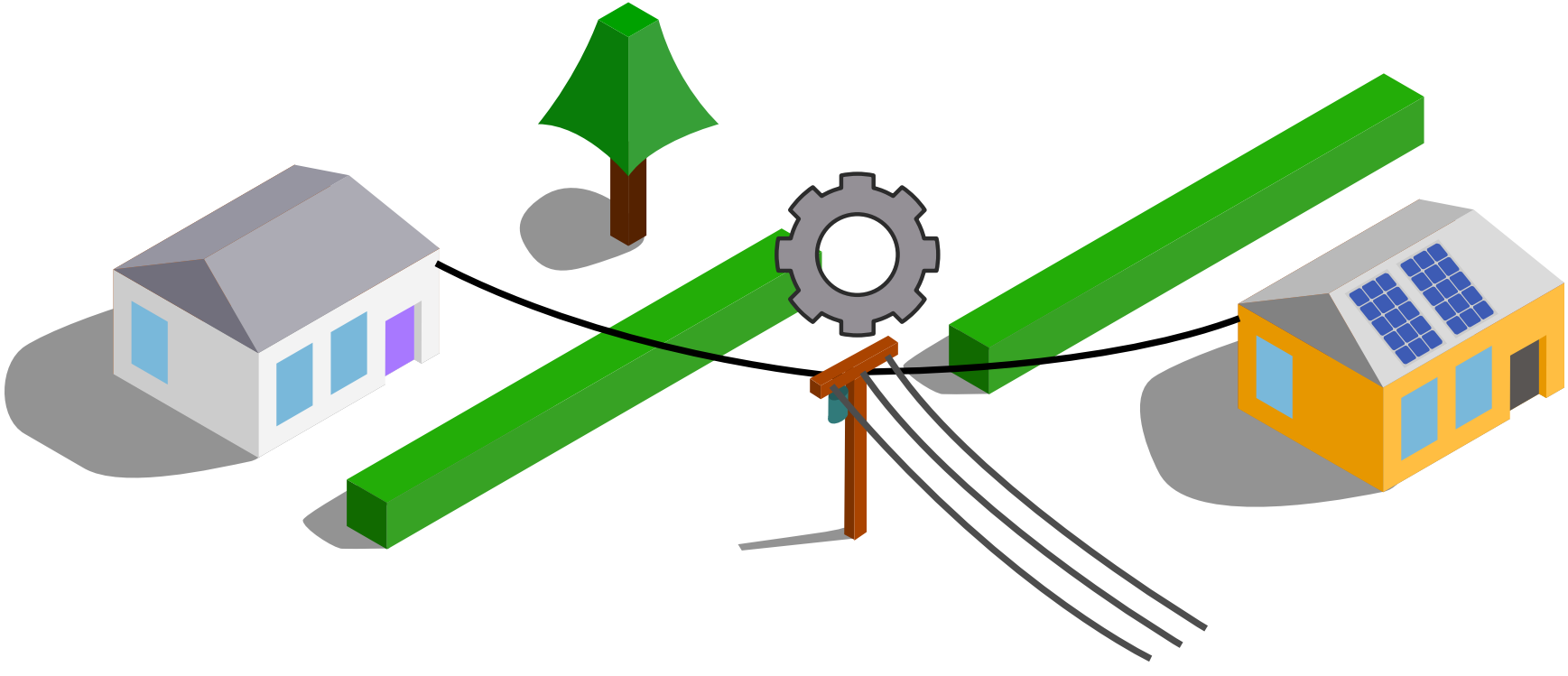
# VISUALISATION OF ALGORITHM



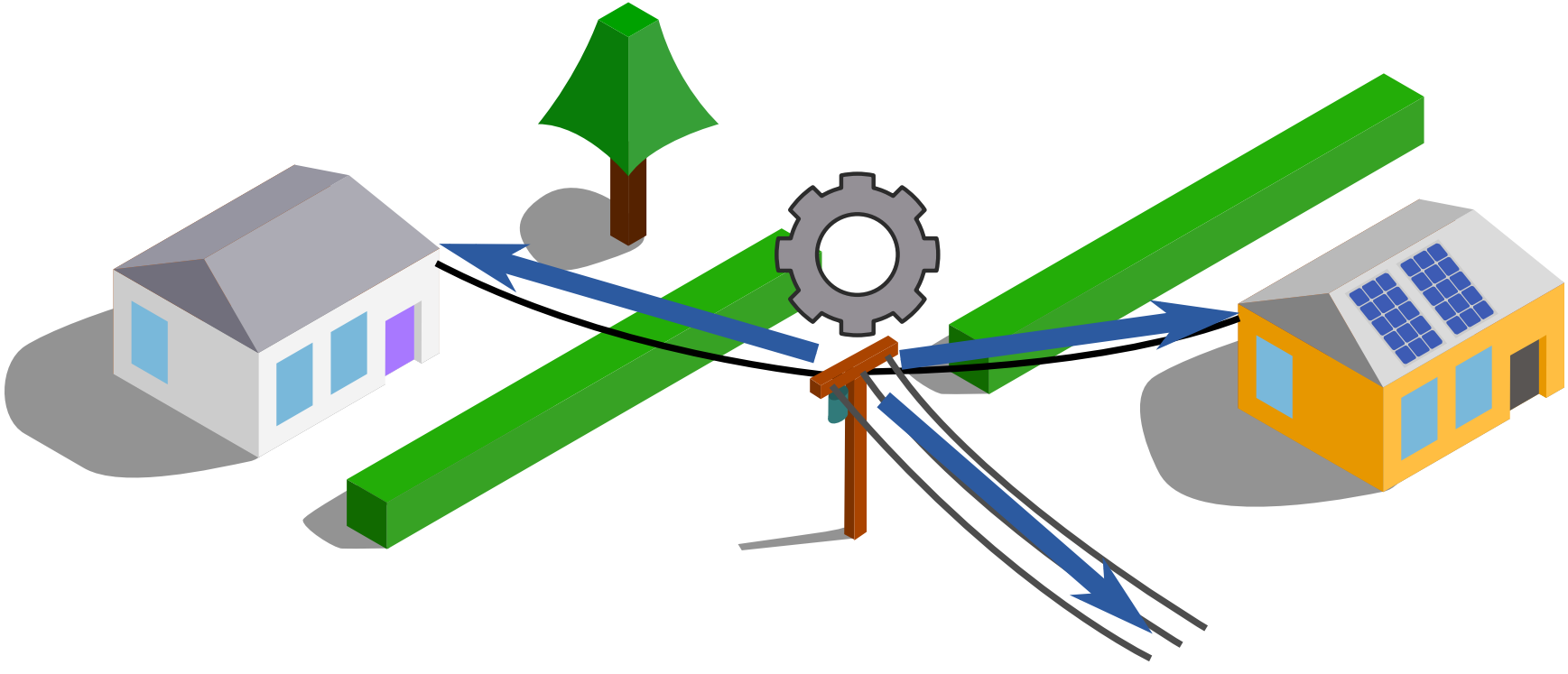
# VISUALISATION OF ALGORITHM



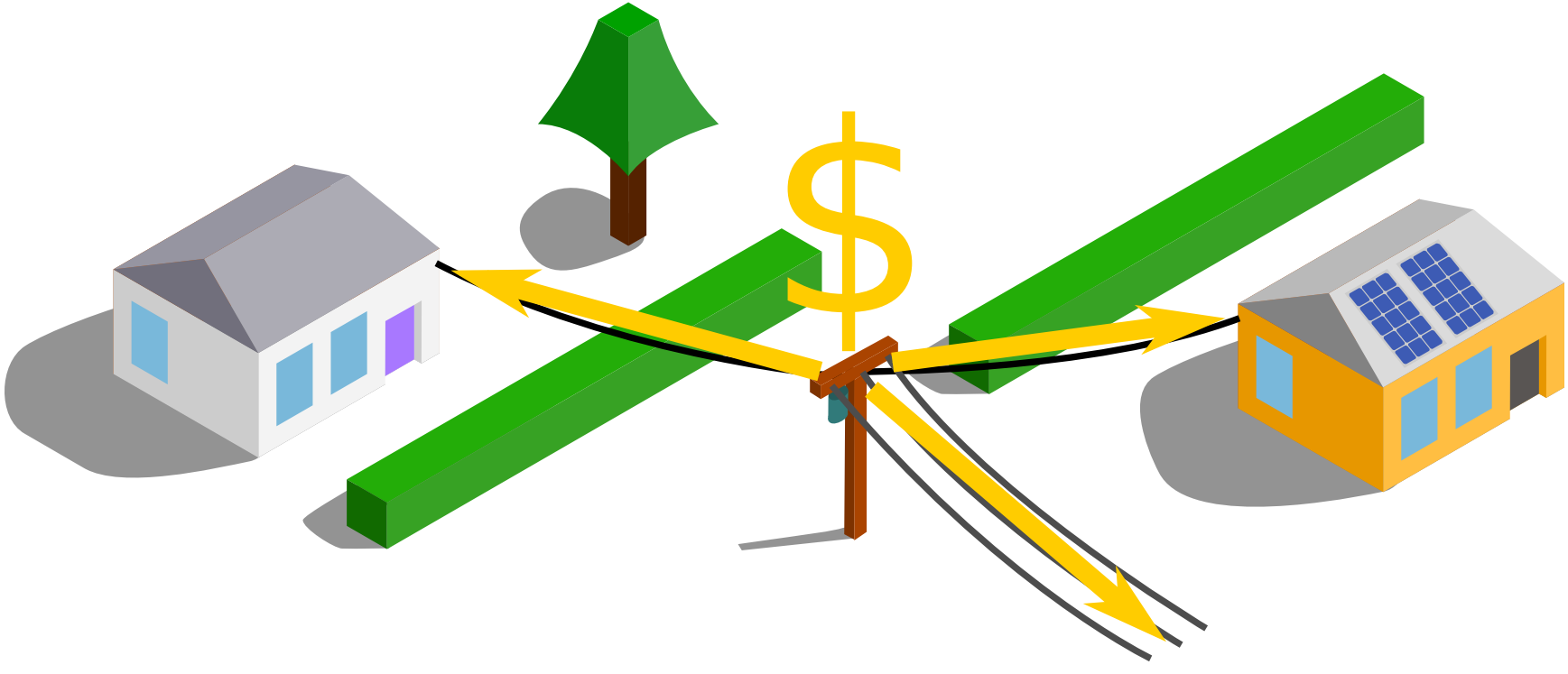
# VISUALISATION OF ALGORITHM

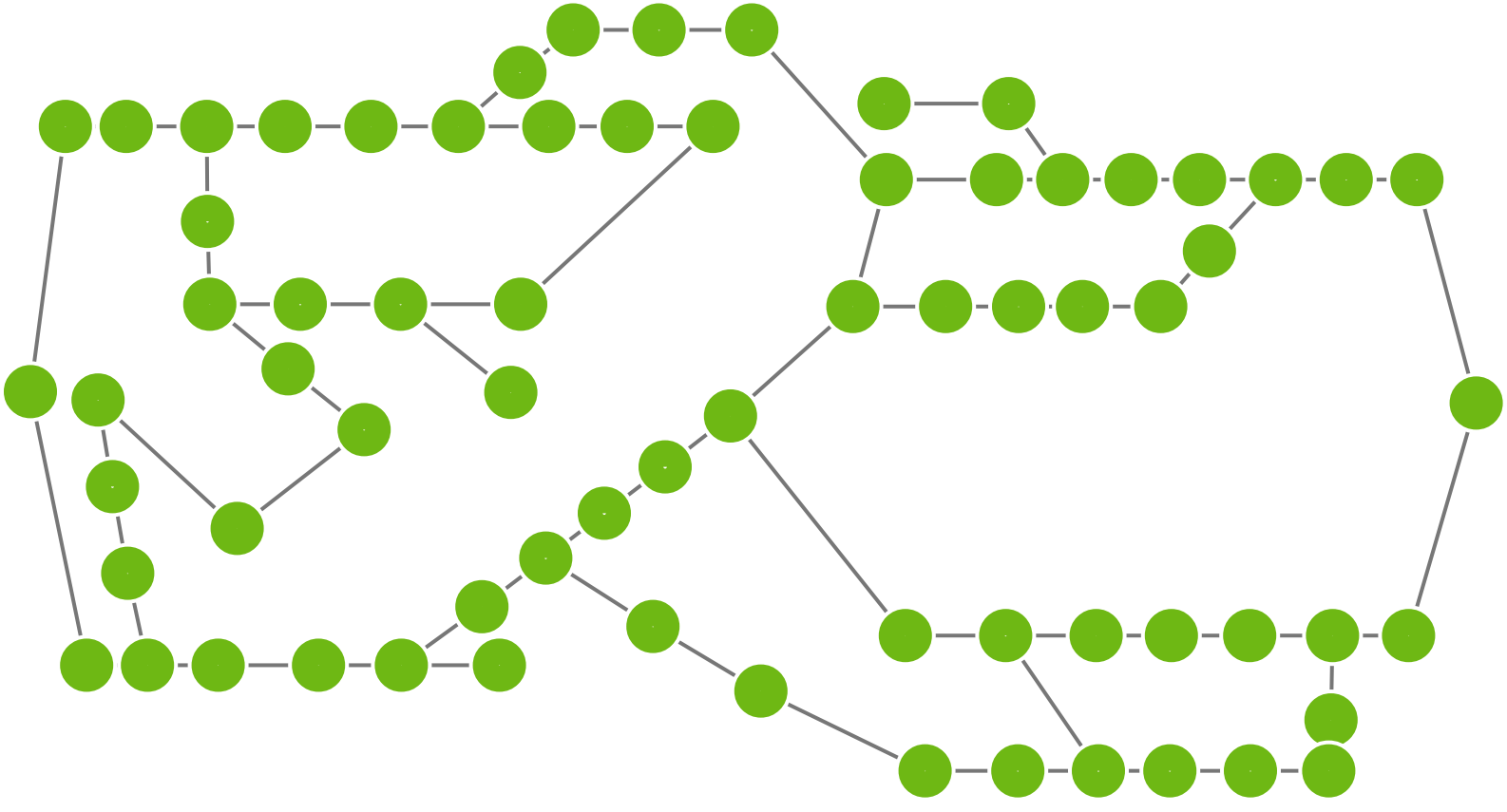


# VISUALISATION OF ALGORITHM

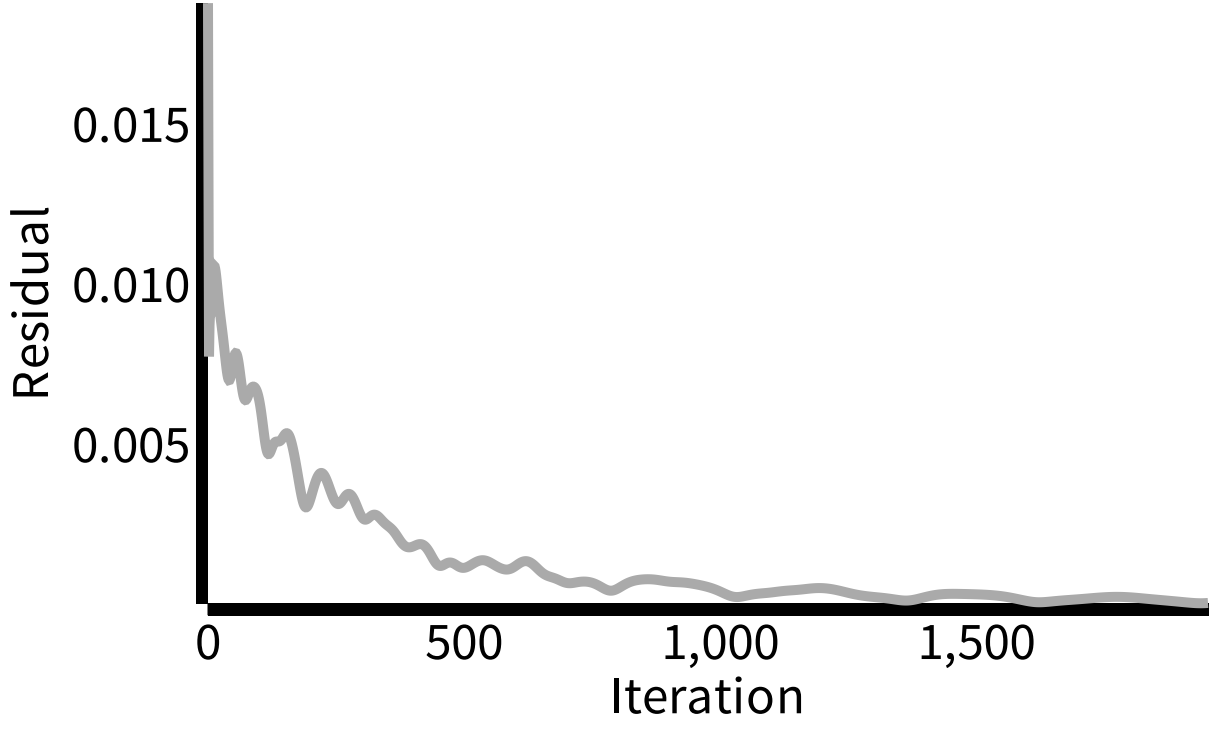


# VISUALISATION OF ALGORITHM





# CONVERGENCE



# RESULTS

Get within 1% of the global optimal. Works with AC power flows. Works with household discrete loads. Only a couple of minutes to converge.