RESOURCES for the FUTURE

Residential Electricity Tariffs: Impacts on DER Adoption and Use

Beia Spiller
Fellow, Transportation Program Director

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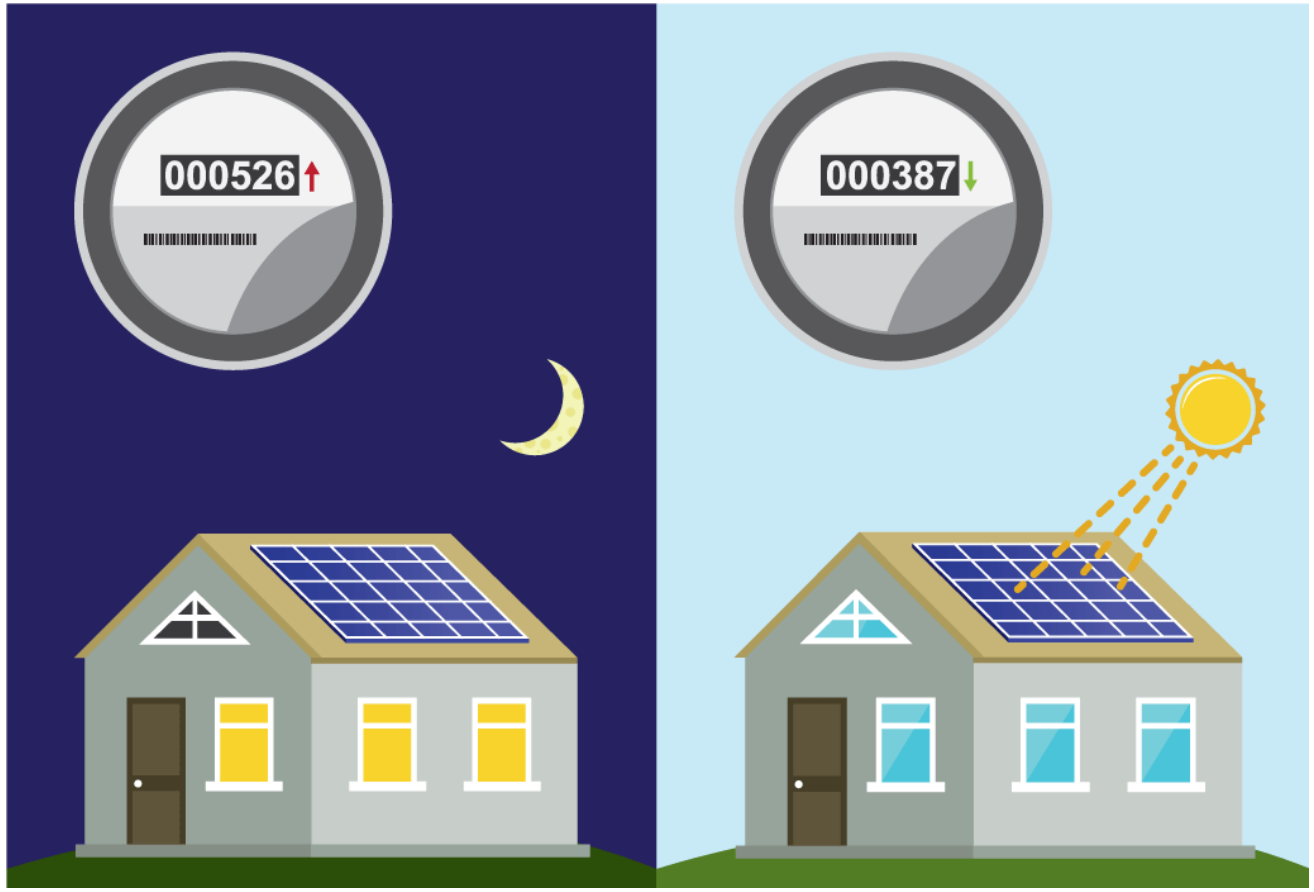
Residential Electricity Tariffs and DERs

- Compensation for DERs:

Net energy metering

(price export = price import)

- If prices are cost-reflective, aligns incentive to invest in DERs with minimizing underlying costs

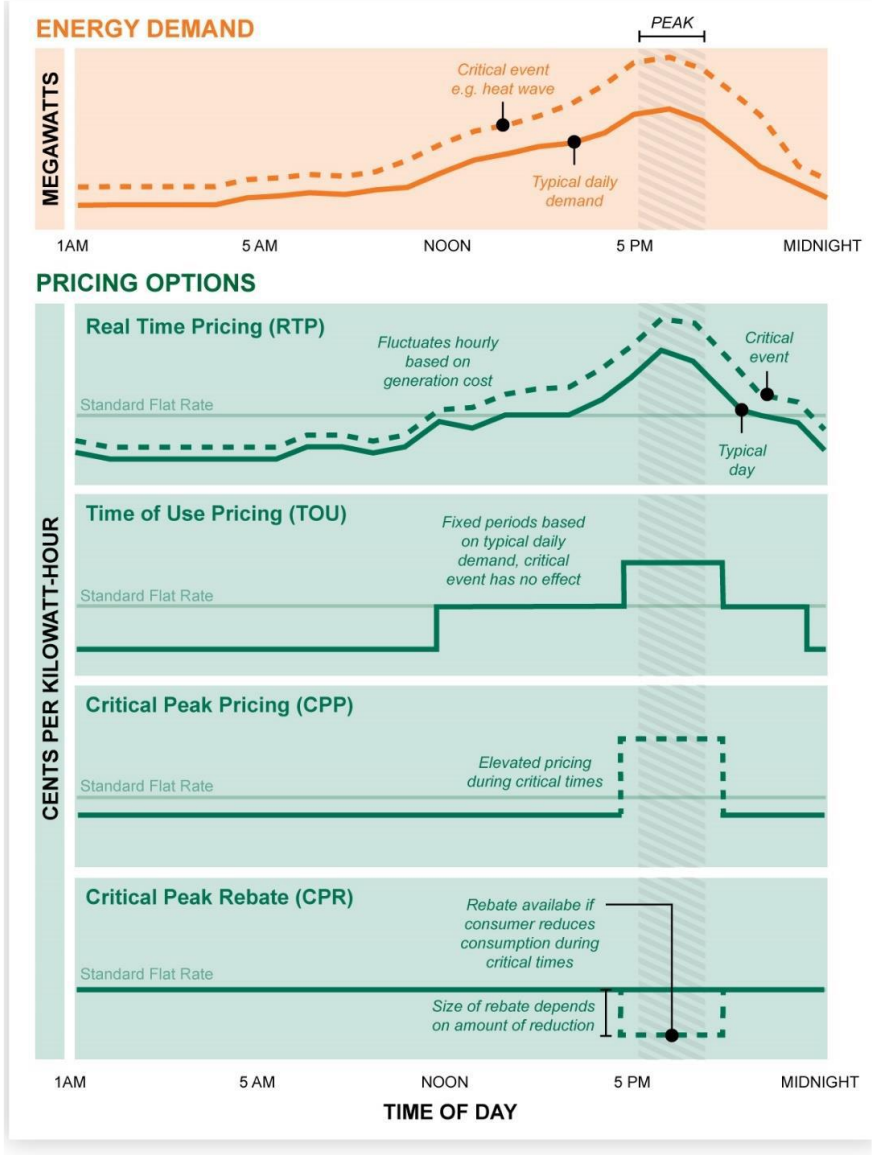


Underlying electricity tariff = compensation for DERs

- **Most residential tariffs are NOT cost-reflective**
  - Flat volumetric rates
  - No demand charges
  - Volumetric rates incorporate non-variable costs

Testable question:

- What happens when you change the underlying tariff?



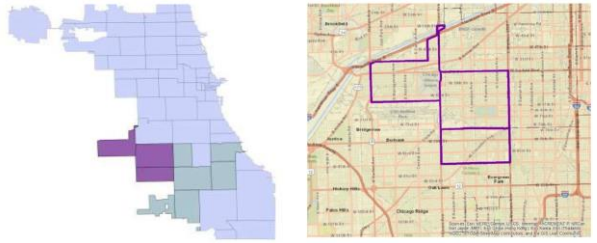
Simulation Project

- Multi-organization collaboration, funded by Sloan Foundation

Simulation based on real-world data

1. Residential data

44,185 Households



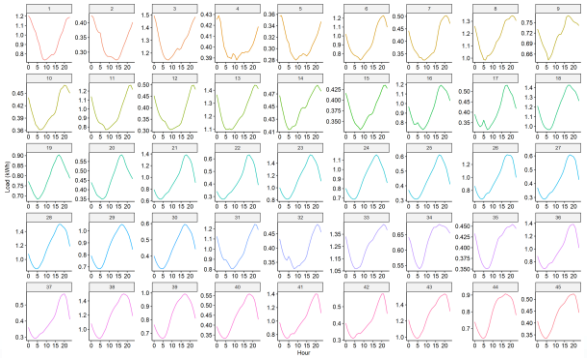
2. Estimate preferences

Calibration technique

- utility function
  - ➢ Thermal loads
  - ➢ Non-thermal loads

by hour of day

3. Create 45 clusters



4. Create electricity tariffs

Revenue neutral rates

Flat to most cost-reflective tariffs

5. Resulting Loads

Cost minimization:

- ➢ DER adoption
- ➢ Patterns of consumption

6. Final results

DER Adoption:

% adopting, size, type

Electric Bills

Environmental Impact

Main Findings

1. Regardless of compensation, solar too expensive to see adoption (2016)

2. Once installation costs decline, then underlying compensation matters

At 50% installation cost:

Time-of-use and Real time pricing result in largest solar adoption and largest average panel size

3. Low volumetric rates in the most cost-reflective tariffs:

- Hinder adoption of PV, batteries
- Benefit adoption of heat pumps

4. Batteries rarely adopted, regardless of cost reductions/tariff

- Carbon price facilitates adoption under all tariffs *except* lowest volumetric tariff

Conclusion

- Residential electricity tariffs affect DER compensation, NPV of investment
  - Will affect decision to invest in DERs
- Moving away from volumetric-based tariffs will
  - Reduce incentive to invest in generation DERs
  - Increase incentive to invest in beneficial electrification
- Open questions:
  - Interaction between solar and EV use?
  - More traditional demand charges (max demand every month or day)

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Thank you.

Synthesis paper: Mohlin et al (2021), link.

Impacts of tariffs on DER adoption: Spiller et al (2020), link.

Impacts of tariffs on emissions: Unel et al (2021), link.

Webpage describing project: link.

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