No Off Switch: Energy Affordability in a System Without Consumer Agency

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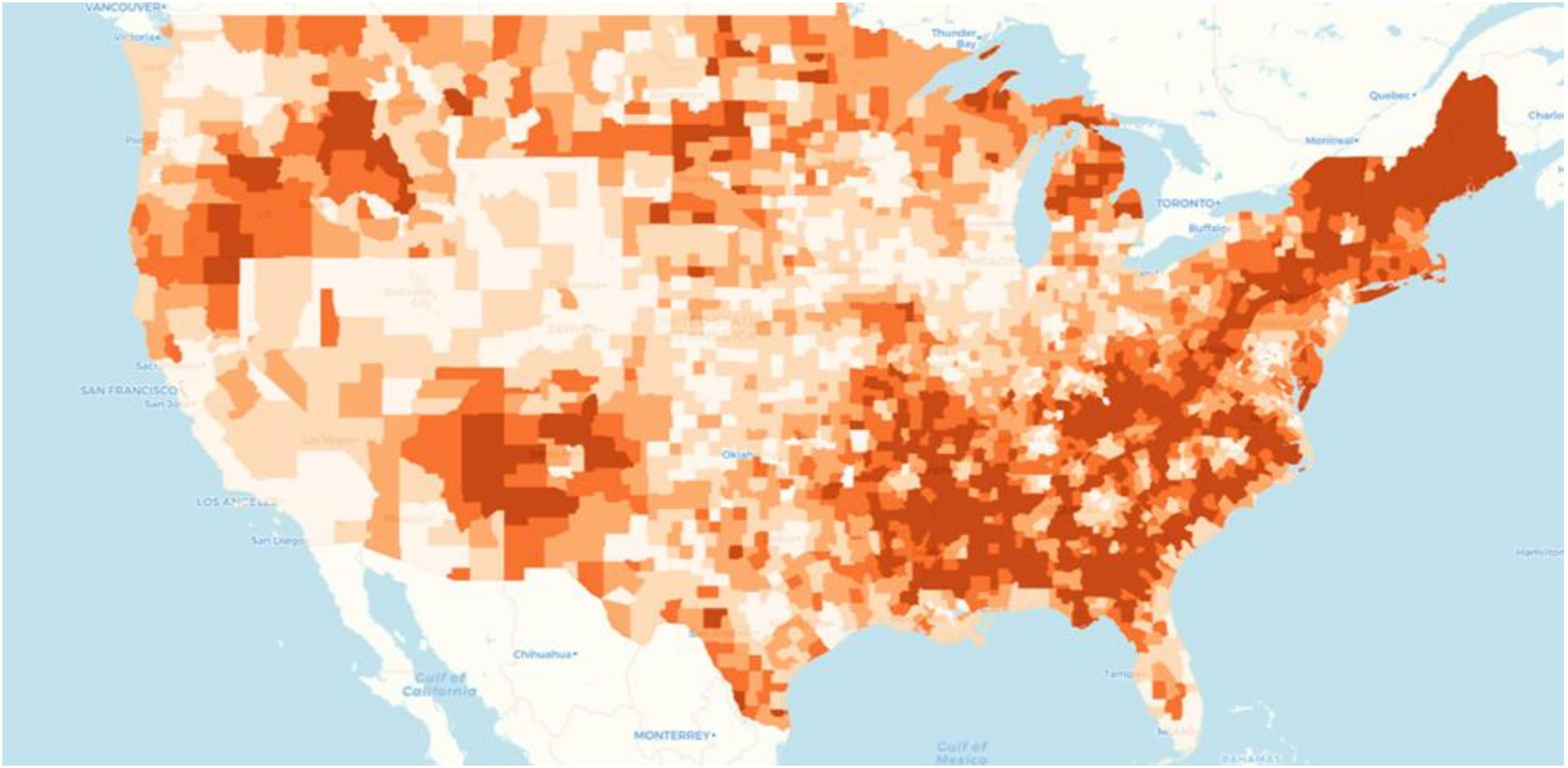
How Many People Have Experienced Pipes Freezing in your Home because you (or someone you know) was trying to save money on the heating bills?

2022 Christmas cold snap led to the entire duplex losing access to water

That's me ☹

(My tenant trying to save money on bills led to big consequences)

Energy poverty discussions dominated by Energy Burden



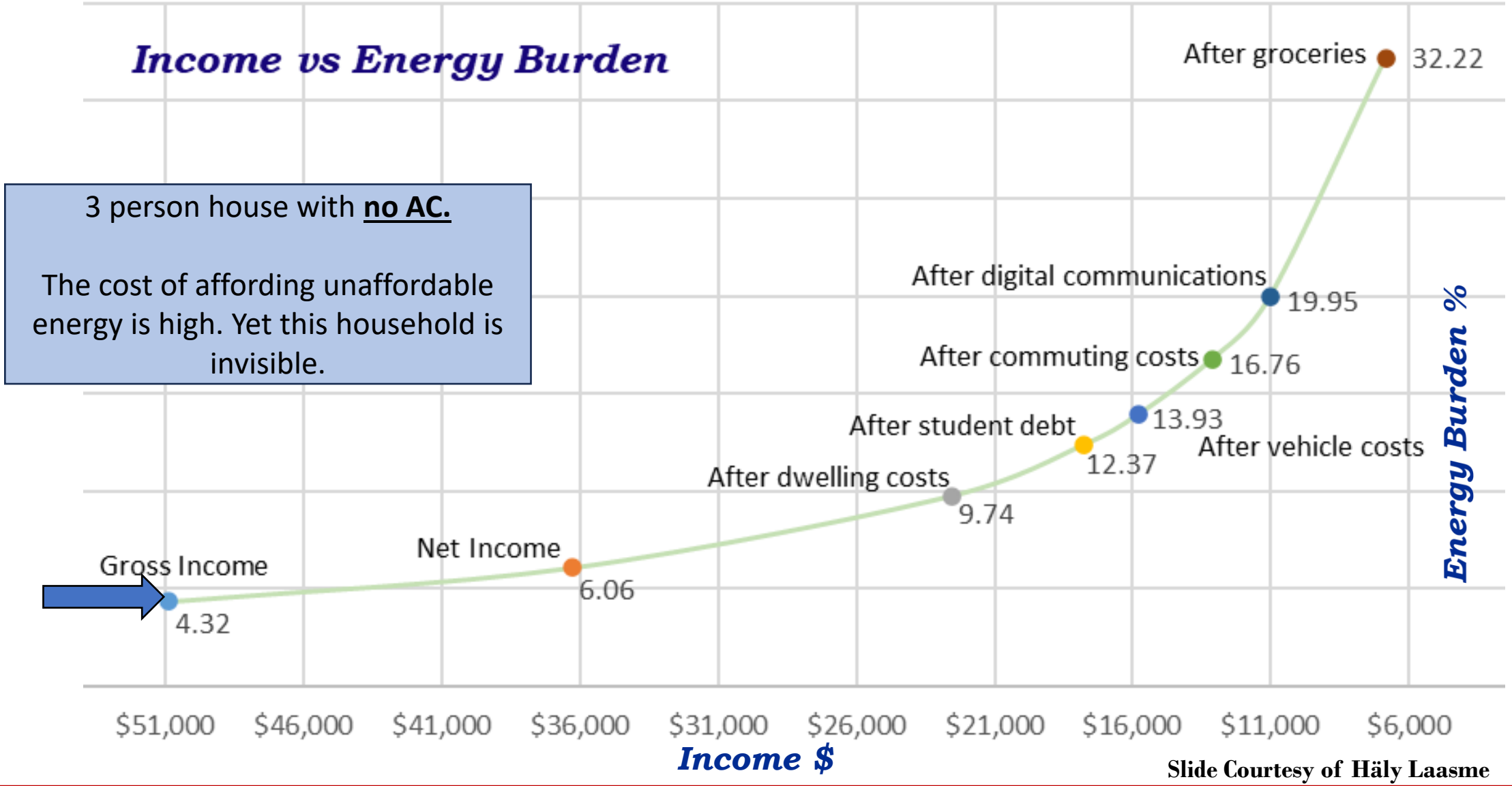
Energy burdens (at the county level) for LMI (low and moderate-income) households. The lightest color in the choropleth scale is <6% of annual income spent on housing energy bills, and the darkest is >19%.

https://blog.ucsusa.org/joseph-daniel/how-to-make-energy-burden-less-bad

Do you know the percent of income you spend on your energy bills?

- If most people don’t know their energy burden…why does that metric dominate research and analyses?
- It’s easy to calculate
- Many equate affordable with low bills, but this misses health and safety of indoor environments.

Energy Burden misses the big picture and true fraction



Slide Courtesy of Häly Laasme

Low Energy Bills ≠ Affordable

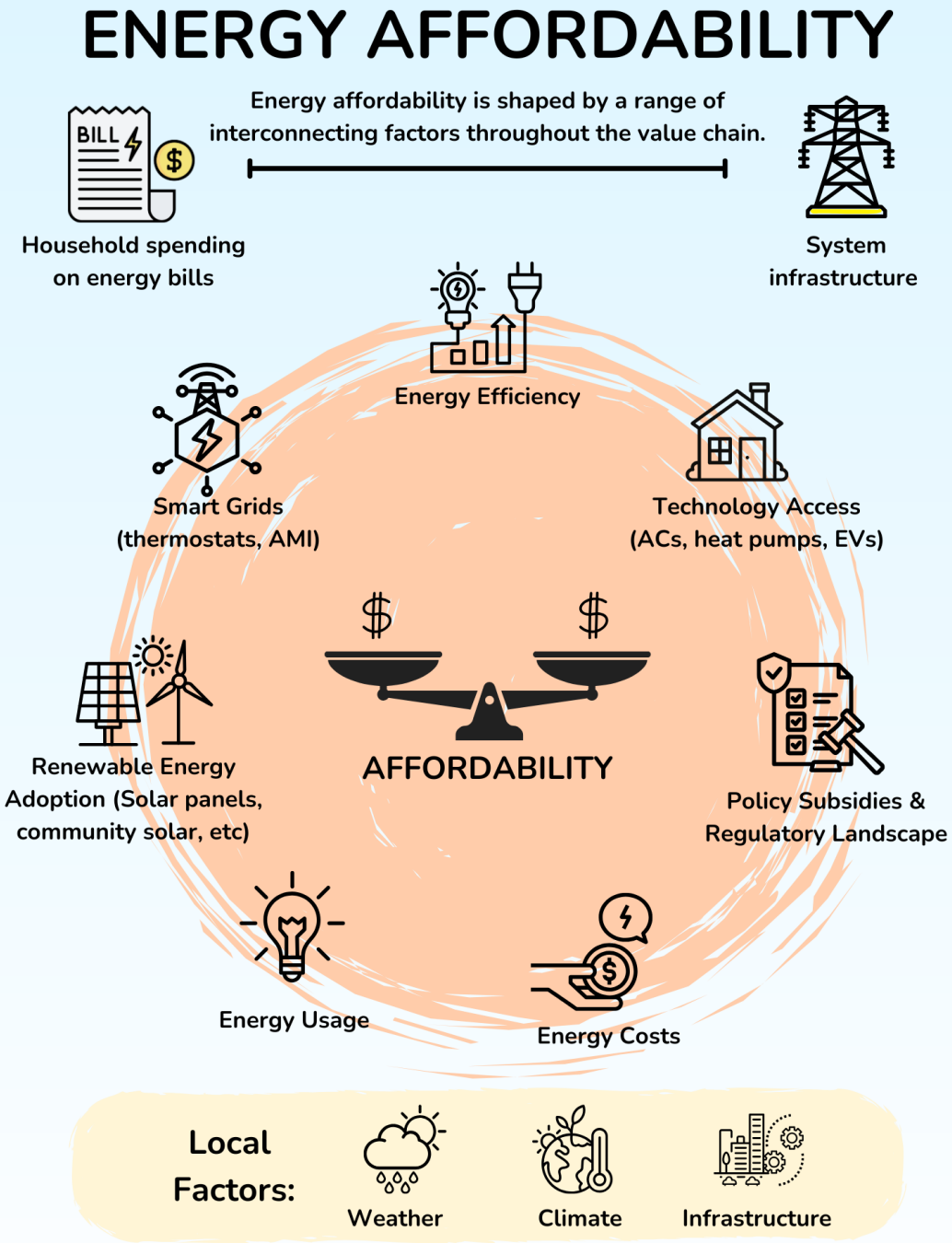
Energy Affordability Definition

Energy affordability is the ability of households to access reliable and sufficient energy services without compromising their financial well-being.

It encompasses energy costs, energy usage, efficiency, access to modern energy technologies, and the influence of policies and rate structures.

More comprehensive definition in the near-term recommendations (MA IRWG)

https://www.mass.gov/doc/defining-energy-affordability/download/



How Much Would You Be Willing To Pay for 345 kWh of electricity?

My husband said $5

Students said $2 - $30

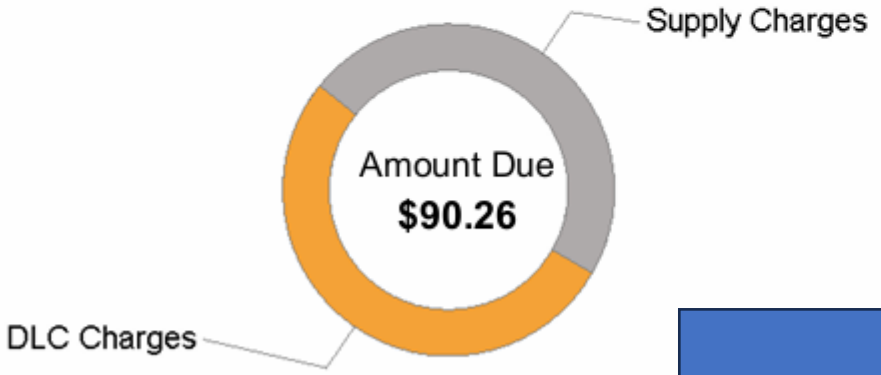
DUQUESNE LIGHT CO.

[redacted]@gmail.com

Account # [redacted]

Due Date	Amount Due
11/12/2025	$90.26

Bill Summary



Bill ID: [redacted] **Date Prepared: 10/22/2025**

Previous Account Balance	$127.37
Payment(s) Received as of 10/14/2025	-$127.37
Balance Forward	**$0.00**
DLC Charges	$47.39
Supply Charges	$42.87
AMOUNT DUE BY 11/12/2025	**$90.26**

But what did that $90 get me?

Message Center

Looking for ways to save on your bills? Visit our website or use the DLC Mobile app to review your home's energy usage and find tips to save. We also have easy to use tools, rebates, incentives and a store of energy-efficient products. Get started today by visiting **DuquesneLight.com/home-energy-center**.

Duquesne Light Company partners with Dollar Energy Fund to provide assistance to customers who struggle to pay their electric bill. If you would like to support the Dollar Energy Fund and your neighbors in need, make a tax deductible monthly pledge at **DuquesneLight.com/dollar**.

Usage Comparison Chart

Period	Total kWh Usage	Avg Daily kWh Usage	# of Days	Avg Daily Temp (F)
Current Month	345	12	29	61
Last Month	511	17	30	69
Same Month Last Year	329	11	29	62

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Since the summer and winter are not the same height I am probably not heating my entire home with electricity.

But since summer and spring not same height, you could guess I have AC.

Usage Comparison Chart

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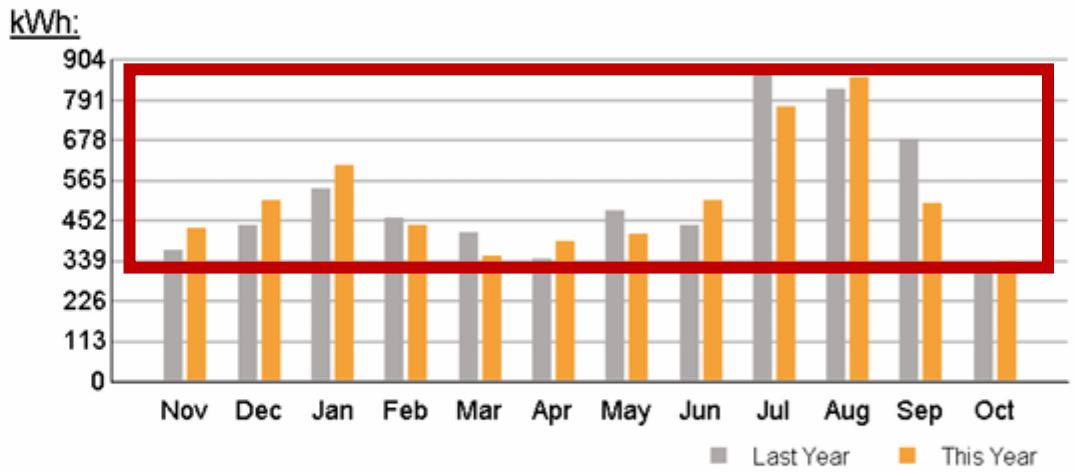


Average Monthly Usage for the last 12 months: 520 kWh
Total Annual Usage for the last 12 months: 6238 kWh

BI_EBILL_20251022PRD.xml

Online: www.DuquesneLight.com **Phone:** 888-393-7100 *Billing and meter reading details on page 3*

Please return this portion with your payment. Please enclose check facing forward.
Make payment payable to Duquesne Light Company in US Currency.

A late charge of 1.25% may be assessed after 2025-11-12

Due Date	Amount Due
11/12/2025	$90.26

General Information

Visit us online or call to learn about payment options, or for a copy of our rate schedules. For questions about your bill, please contact us before the bill due date.

Online: www.DuquesneLight.com

Phone: 888-393-7100 **TTY Users:** 711

Mail: Dept 6-1
411 7th Ave Ste 3
Pittsburgh, PA 15219-1942

Billing and Service Options

Sign up online for any of the following services:

- **Phone:** 888-393-7100 **TTY Users:** 711
- **Budget Billing** - Levels out payments across the year
- **Start/Stop Service** - If you're moving and need to have your service turned on or off, you must call Customer Service at 888-393-7100 or visit our website
- **Double Notice Protection** - Sends a payment reminder to you and a person you designate

Dollar Energy Fund

Give to Dollar Energy Fund to help people in our community without heat or light. There are several easy ways to donate and your gift is tax deductible.

Text: Make a one-time donation of $5 by texting POWER to 50000

Online: Visit www.DuquesneLight.com and select "Payment Options" from the Account & Billing menu

Phone: 888-393-7100

Understanding Your Bill

- **Customer Charge** – A monthly basic service charge that includes costs for meter reading, customer billing, service equipment, and other expenses. These expenses are incurred even in months when customers do not use electricity.
- **Distribution Charges** – Basic service charges for delivering electricity over a distribution system to the home or business from the transmission system.
- **Distribution System Improvement Charge (DSIC)** – A charge for company investment to improve service quality and increase safety by repairing, improving, or replacing eligible infrastructure used to deliver electricity.
- **DLC Charges** – Services necessary for the physical delivery of electricity service, such as supply, including default service, transmissions and distribution.
- **Kilowatt-Hour (kWh)** – The basic unit of electric energy for which most customers are charged. It equals the amount of electricity used by 10, 100-watt light bulbs left on for one hour.
- **Meter Reading** – An actual (Act) reading is a reading taken from the meter. An estimated (Est) reading is used when no actual reading is available and is based on past electric usage.
- **Non-Basic Service Charges** – Any category of service not related to basic service.
- **Smart Meter Charge** – Charges for advanced metering technology and related infrastructure that will provide the ability for features such as two-way communication and interval usage data.
- **Supply Charges** – Basic service charges for generation supply to retail customers.
- **Transmission Charges** – Basic service charges for the cost of transporting electricity over high voltage wires from the generator to the distribution system.

Account Detail

[redacted] Supplier Agreement ID: [redacted]

Meter Reading Usage Information

Meter Number		[redacted]
Present	10/22/2025 Act	42,945.6520
Prior		60
Difference		60
Your Mete		1
Total kWh		60

Current Bill Details

DLC Rate	RS-Residential Service	
Price to Compare	$0.1243 / kWh	
DLC Charges		**$47.39**
Customer Charge		$13.00
Distribution	344.8860 kWh@ $0.099869	$34.44
DSIC Surcharge	0.02%	$0.01
Pennsylvania Tax Adjustment		-$0.06
Supply Charges		**$42.87**
Supply	344.8860 kWh@ $0.097093	$33.49
Transmission	344.8860 kWh@ $0.027187	$9.38

Total kWh Used	**344.8860**
Service Charges	**$90.26**

Shopping and Supplier Information

When shopping for electricity with an Electric Generation Supplier, please provide the following information:

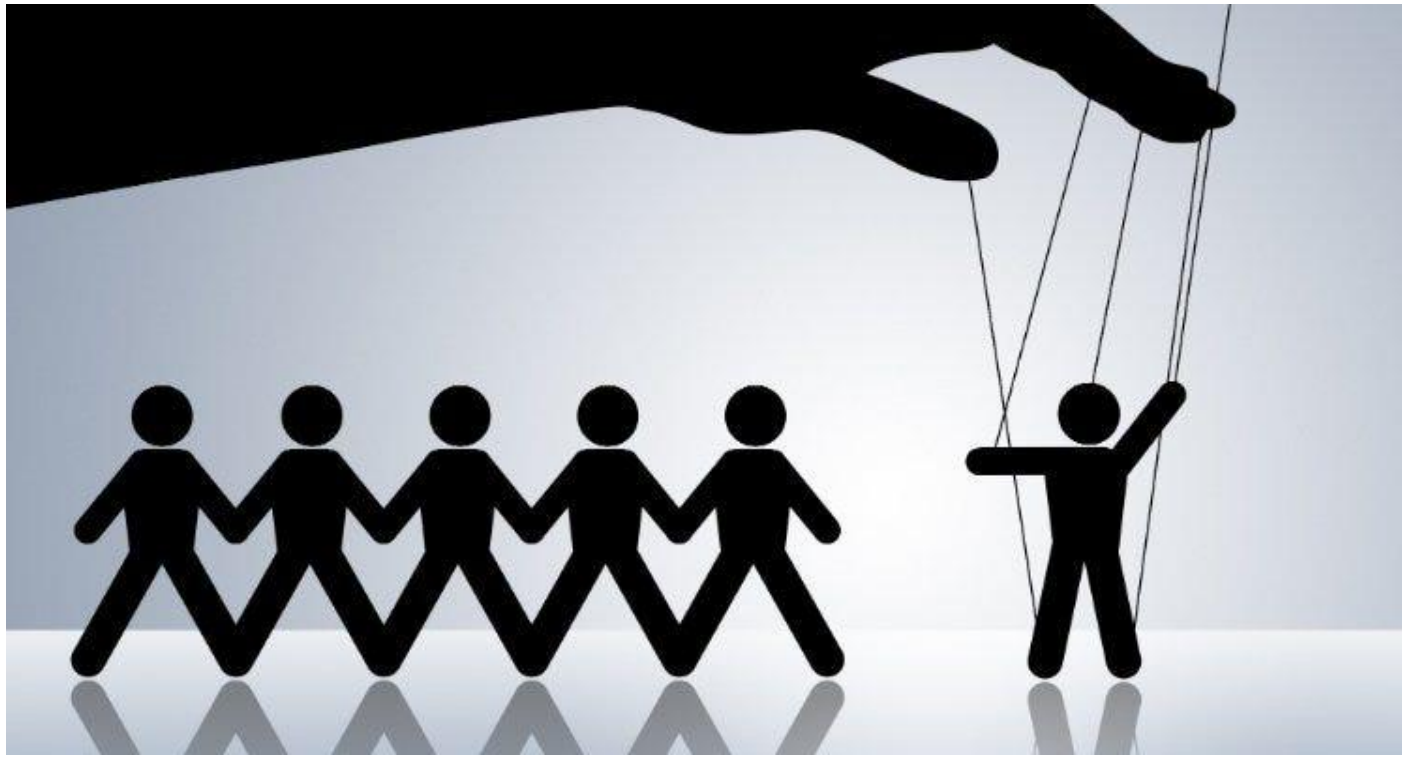
Supplier Agreement ID: 8628173655

Rate Schedule: RS-Residential Service

And All of That Was For Electricity….
in My Gas Heated Home…
Meaning I didn’t even Pay for Heat Yet.

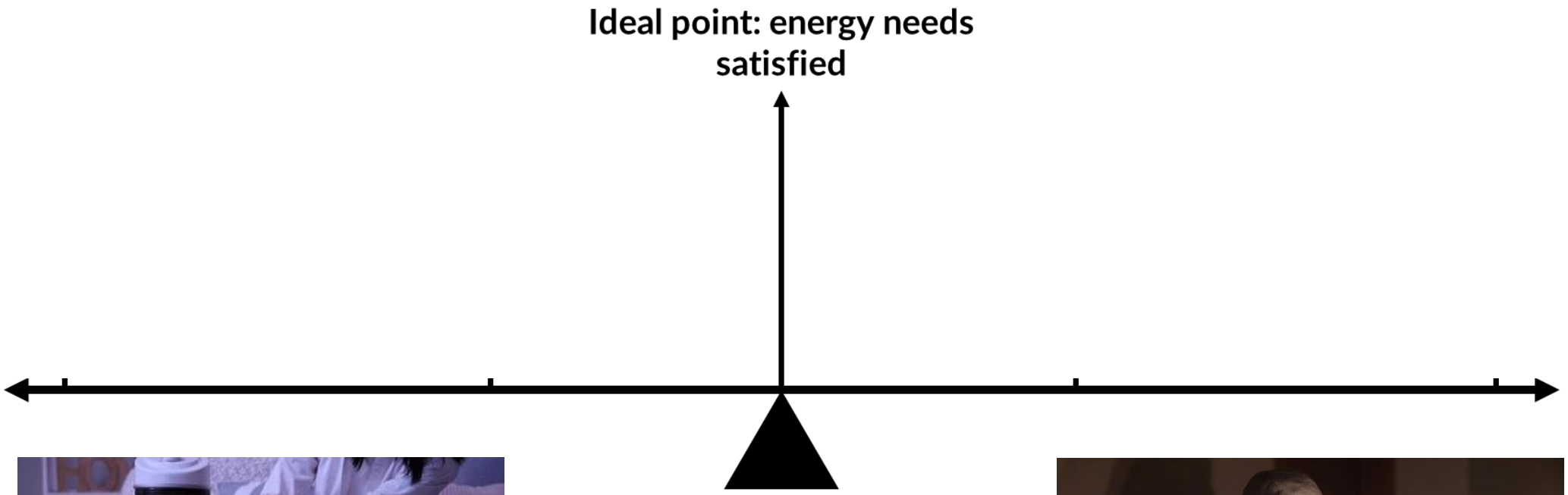
Affordability challenges are rooted in the lack of agency.

- With food and medicine people can choose different brands or quality levels, but with electricity and gas you need services to live in modern society.

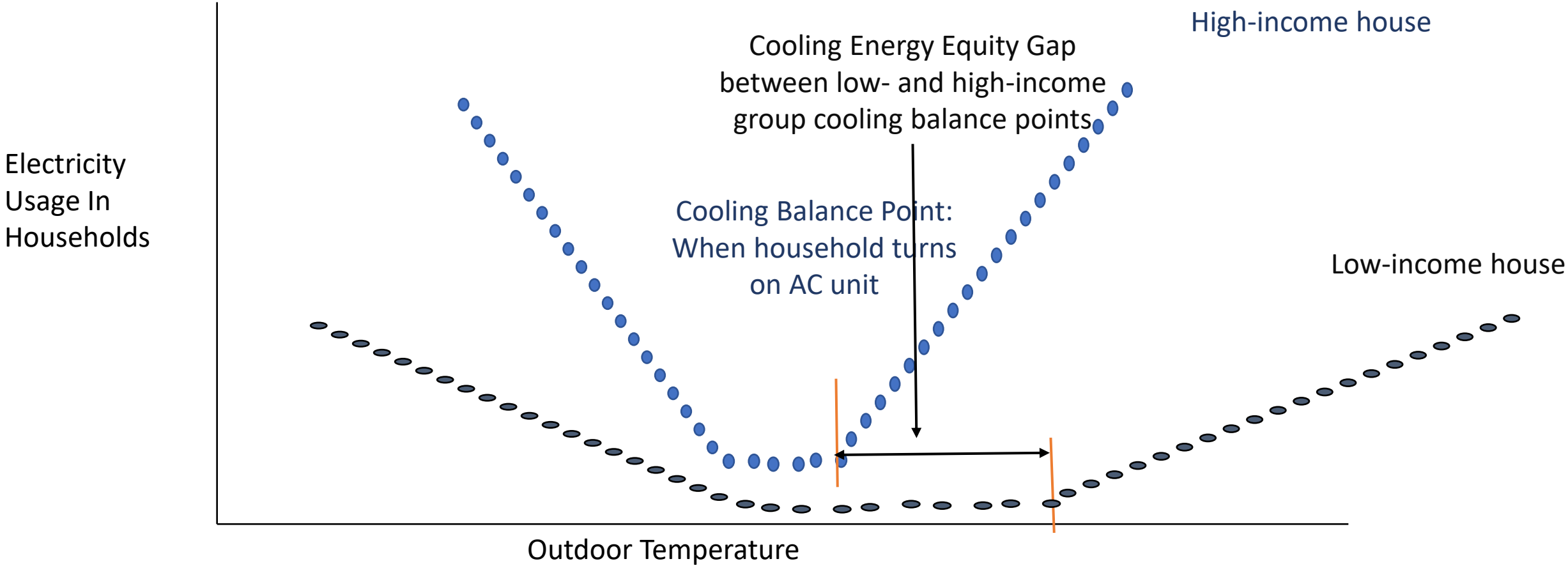



44% of Americans have found themselves in an argument over the thermostat
°F
°C
AROUND THE CLOCK SERVICE
MOONLIGHT MECHANICAL
THE LEGEND IN HEATING AND AIR
580-512-2014

Tradeoff between energy and other necessities

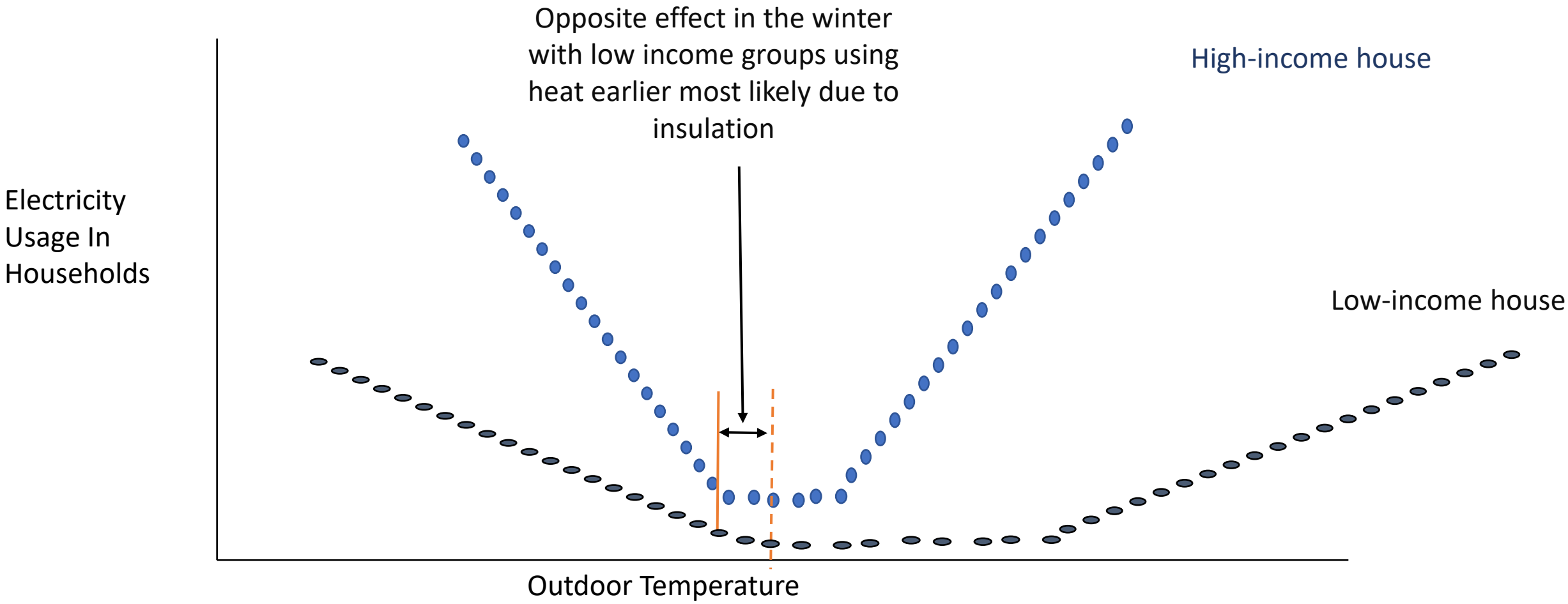


Identifying Energy Limiting Behavior



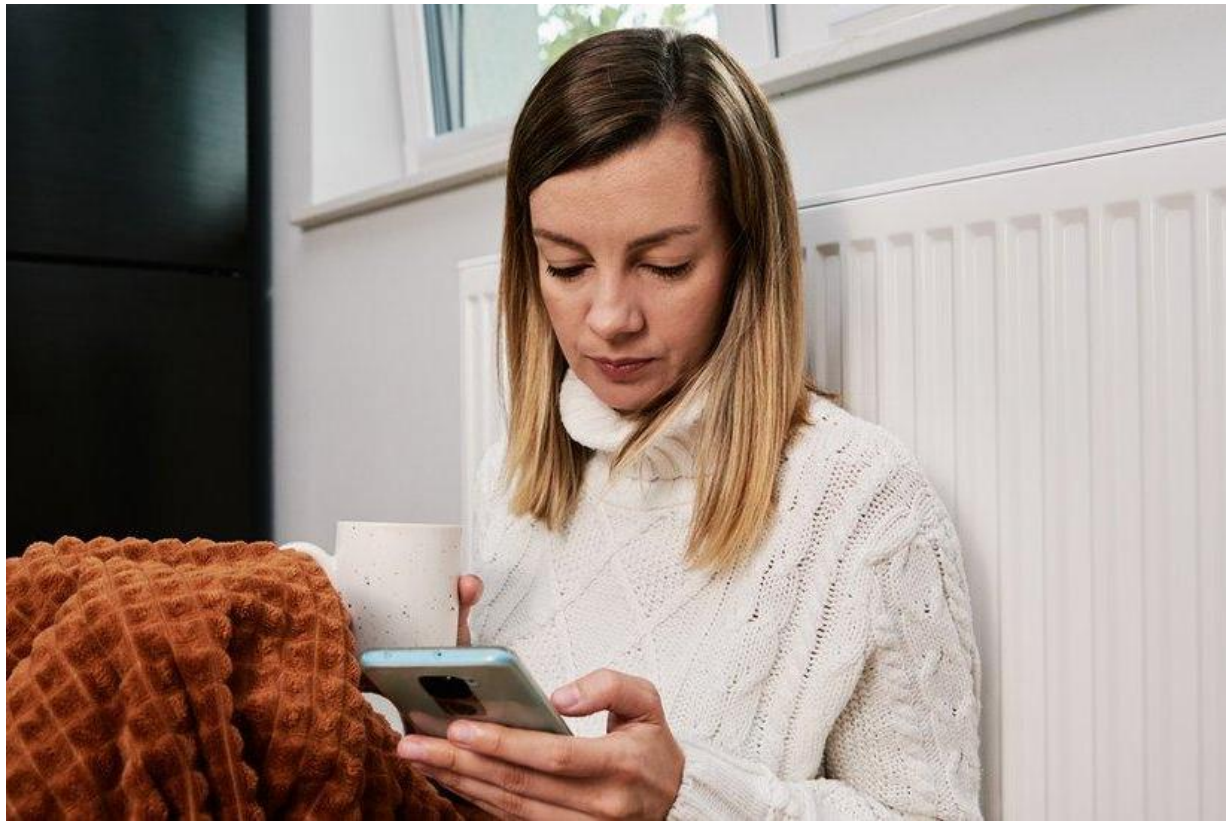
(Cong et al 2022 in Nature Communications and Huang et al (2023))

Identifying Energy Limiting Behavior



(Cong et al 2022 in Nature Communications and Huang et at (2023))

There needs to be a Holistic Approach and Better Insights into Individual Experiences

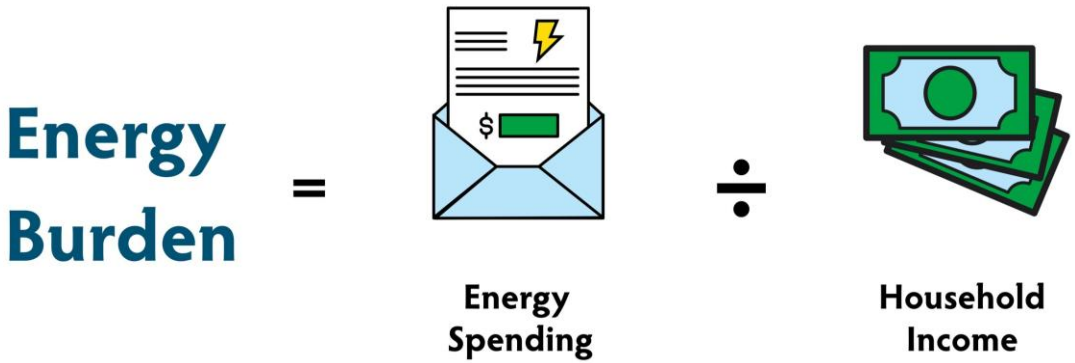


Redefine Acceptable Energy Burden Thresholds

The original 6% utility burden threshold was mean to be for all utilities (gas, water, electricity, etc.)

Recommendation:
Reduce acceptable thresholds to 2-3% as seen in the Massachusetts Docket 24-15

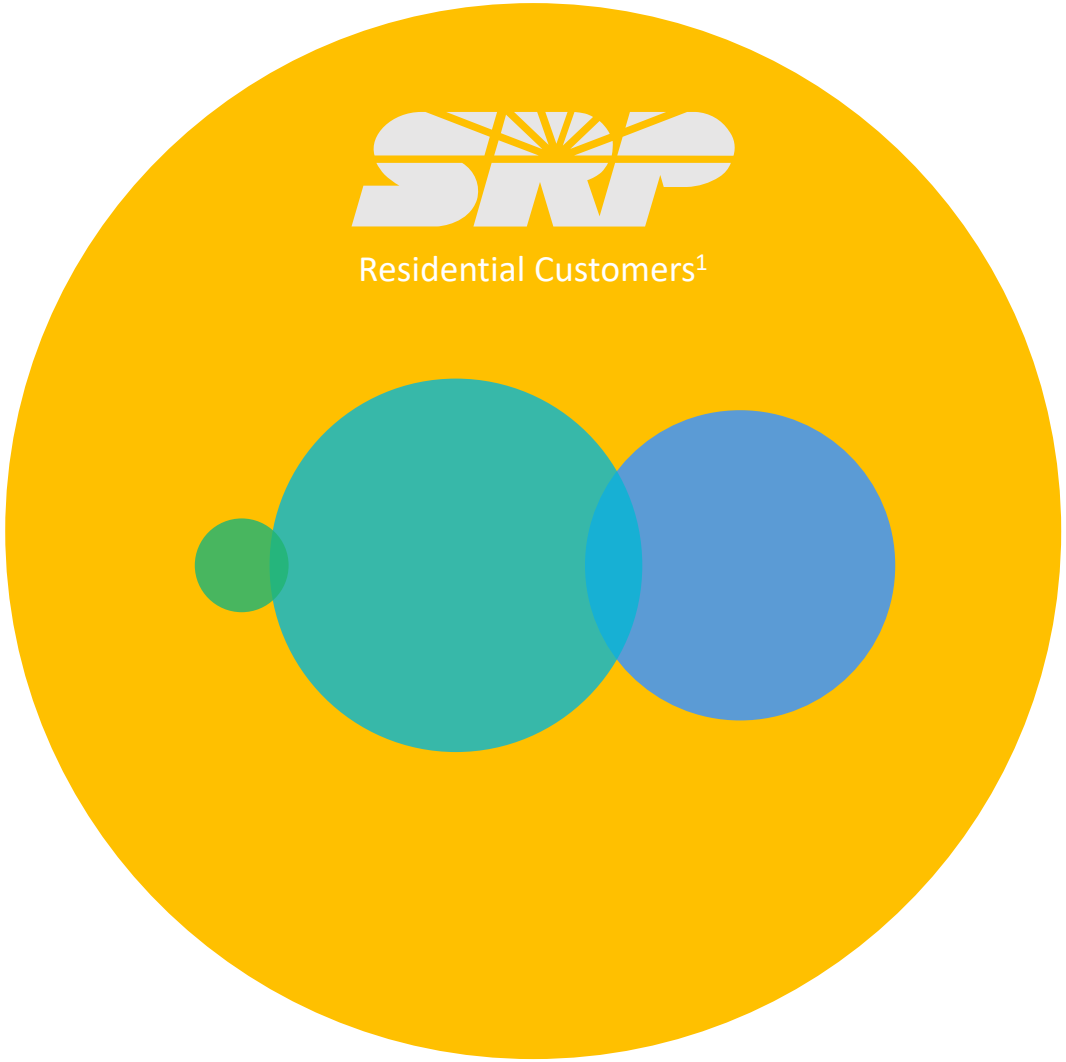
Solution:
This better reflects the original intent of the definition and household burdens.



But we still need to **expand** the current view of at-risk customers.

A traditional energy burden analysis only found the customers in the **orange** circle.

Our advanced metrics allowed us to identify additional at-risk households in the **blue** and **green** circles that were previously missed.



Total Households in Region

Energy Burden ≥ 6%

Cooling Balance Point > 78°F

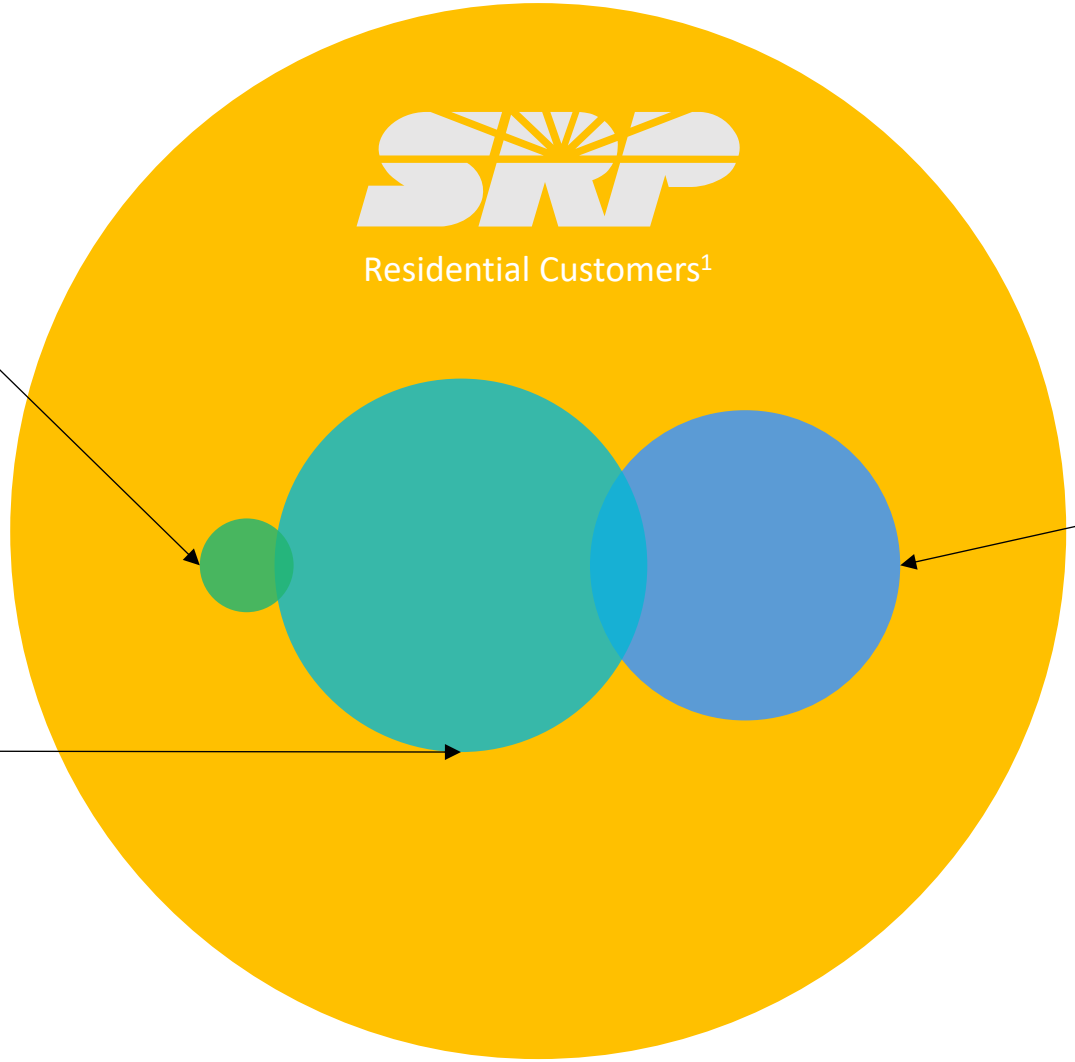
Cooling Slope < 0.1 kWh/F

1. Study conducted on a portion of Salt River Project (SRP) residential customer population. Circles are proportional to group size relative to the total.

We need to **expand** the current view of at-risk customers.

Extreme Temperature Energy-limiting behavior shown throughout the season, indicating a broken or a lack of an A/C unit.

Late- Season Energy-limiting behavior indicates a delay in turning on A/C until late summer.



High energy burden indicating functional energy infrastructure (or central A/C) but a potential lack of insulation.

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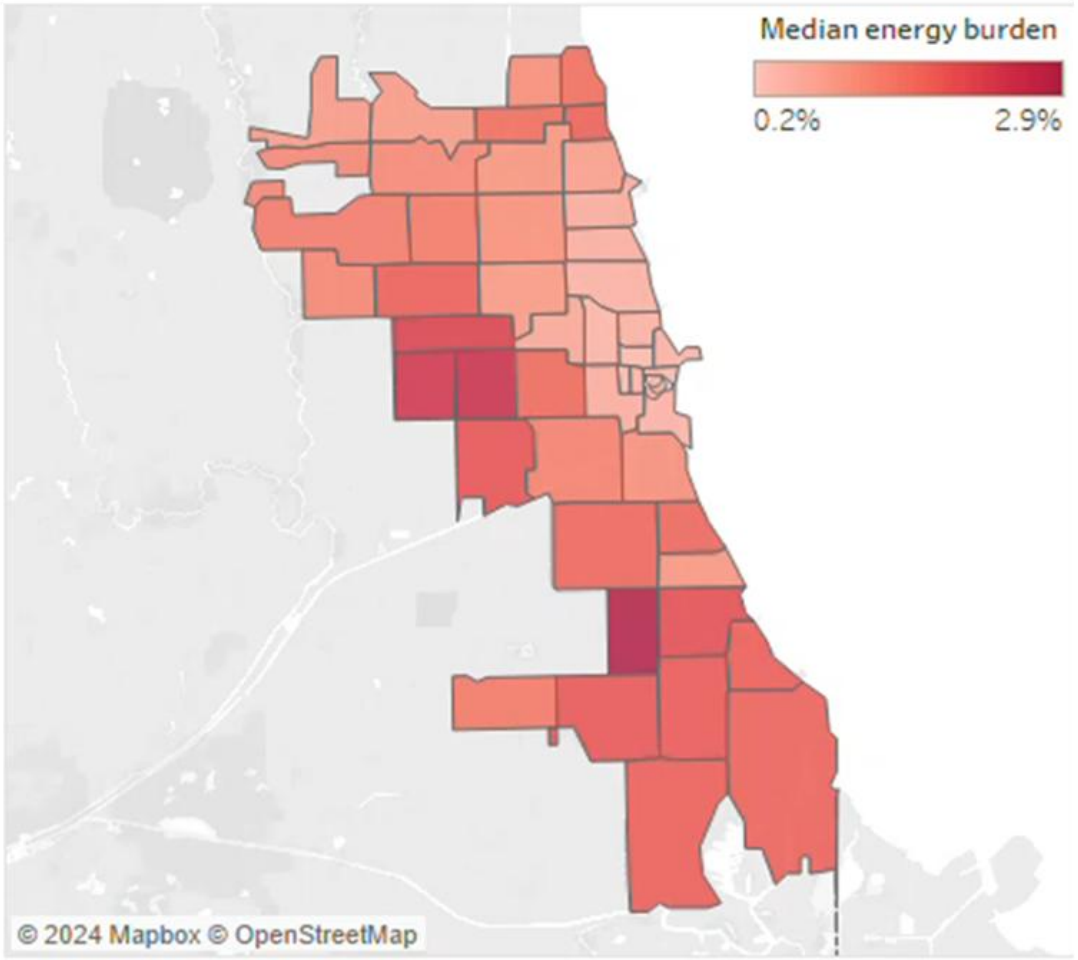
Customer classification dashboard

Zip Codes – High Financial Risk



Accounts – High Financial Risk

Accounts	
1001907	16.9%
1001859	16.5%
1001897	14.6%
1001853	14.2%
1001906	14.2%
1001842	14.0%
1001893	13.7%
1001836	13.7%
1001843	13.6%
1001822	13.4%
1001866	13.3%
1001838	12.9%
1001824	12.4%
1001889	12.4%
1001817	12.4%
1001905	12.2%
1001857	12.1%

Hidden for Privacy

Peoples Energy Analytics

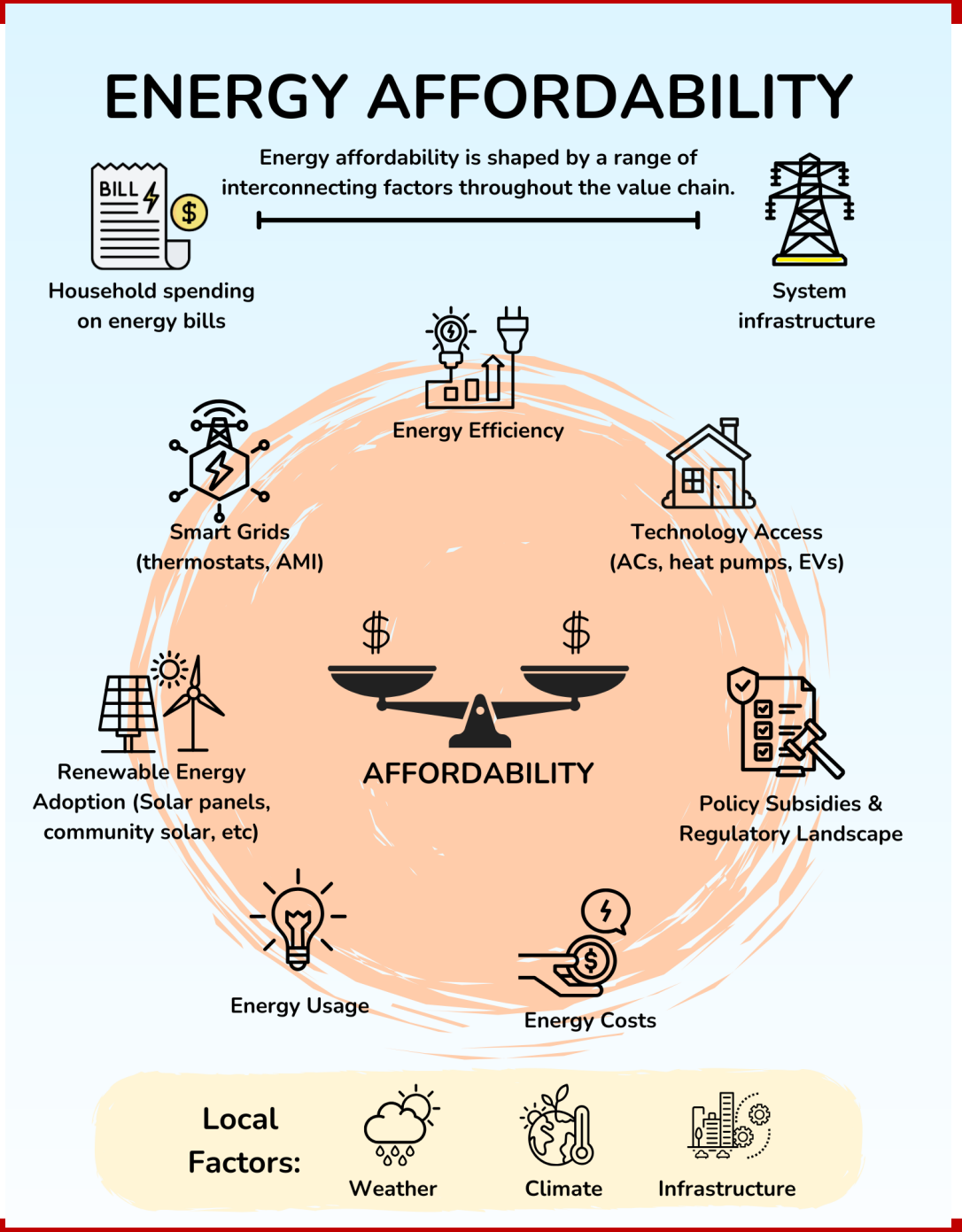
*Dashboards are created for six risk categories

Meter data analysis can benefit Low and Moderate Income customers through

- Identifying multiple at-risk households at the individual level
- Facilitating individual targeting of households for energy upgrades, bill assistance, and energy efficiency deployment
- Identifying households who are at risk of heat stroke (due to lack of AC use) or cold illness (due to lack of heating use)
- Finding households who need help early on
- Examples of Utilities doing this:
  - Peoples Gas – Pittsburgh, PA
  - Southern Company – AL, MS, GA

A big part of the solution

- Integrate energy justice as a measure of energy transition success
- We need to move beyond income-based measures to holistically understand the multiple facets of energy affordability
- States and energy advocates need to push for the adoption of comprehensive definitions of energy affordability



Contact and Acknowledgements

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  - BlueSky: @Destenie

Peoples Energy Analytics

- Huang, L., Nock, D., Cong, S., & Qiu, Y. L. (2023). Inequalities across cooling and heating in households: Energy equity gaps. Energy Policy, 182, 113748.
- Kwon, M., Cong, S., Nock, D., Huang, L., Qiu, Y. L., & Xing, B. (2023). Forgone summertime comfort as a function of avoided electricity use. Energy Policy, 183, 113813.
- Cong, S., Nock, D., Qiu, Y. L., & Xing, B. (2022). Unveiling hidden energy poverty using the energy equity gap. Nature communications, 13(1), 2456.
- Cong, S., Ku, A. L., Nock, D., Ng, C., & Qiu, Y. L. (2024). Comfort or cash? Lessons from the COVID-19 pandemic's impact on energy insecurity and energy limiting behavior in households. Energy Research & Social Science, 113, 103528.

Dr. Destenie Nock

Dr. Destenie Nock is an Associate Professor of Engineering and Public Policy and Civil and Environmental Engineering at Carnegie Mellon University. Dr. Nock is a leader in energy justice, environmental justice, sustainable energy transitions, and the energy-poverty-climate change nexus. She has pioneered new measures of energy poverty to help utility companies identify vulnerable populations and energy deficits (i.e., energy limiting behavior and forgone thermal comfort).

Dr. Nock is the Chief Executive Officer of Peoples Energy Analytics, a data driven company which uses energy analytics to identify energy poverty in vulnerable households. Dr. Nock received her PhD in Industrial Engineering and Operations Research from the University of Massachusetts Amherst, and two BS degrees in Electrical Engineering and Applied Mathematics from North Carolina A&T State University.