



Wendell Grinton, Ph.D. Student  
[wgrinton@vt.edu](mailto:wgrinton@vt.edu)  
[www.STILEResearch.com](http://www.STILEResearch.com)  
Wednesday, April 21, 2021  
Virginia Tech  
BEHAVE 2020-2021

---

# OPTIMIZING ENERGY FEEDBACK MESSAGES USING FNIRS

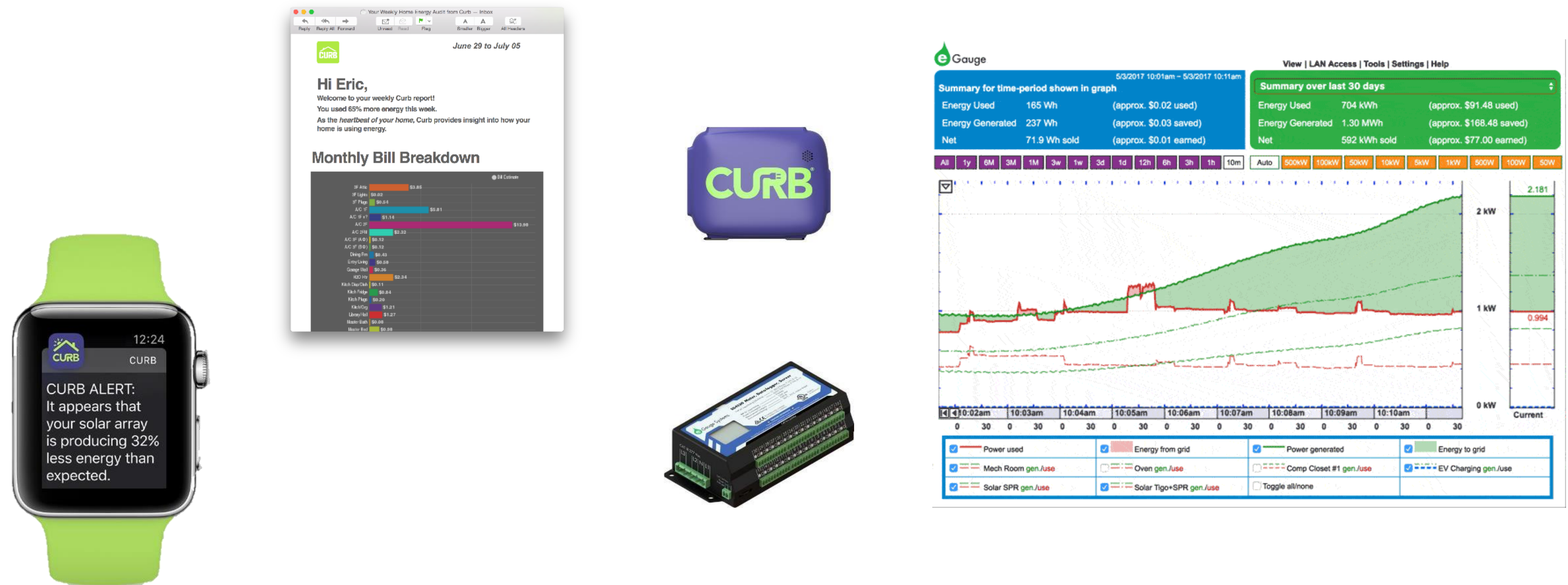


Beyond the cost, consumers have a limited understanding of what their energy bill is communicating ([EIA 2019](#); [Tweed 2016](#)).

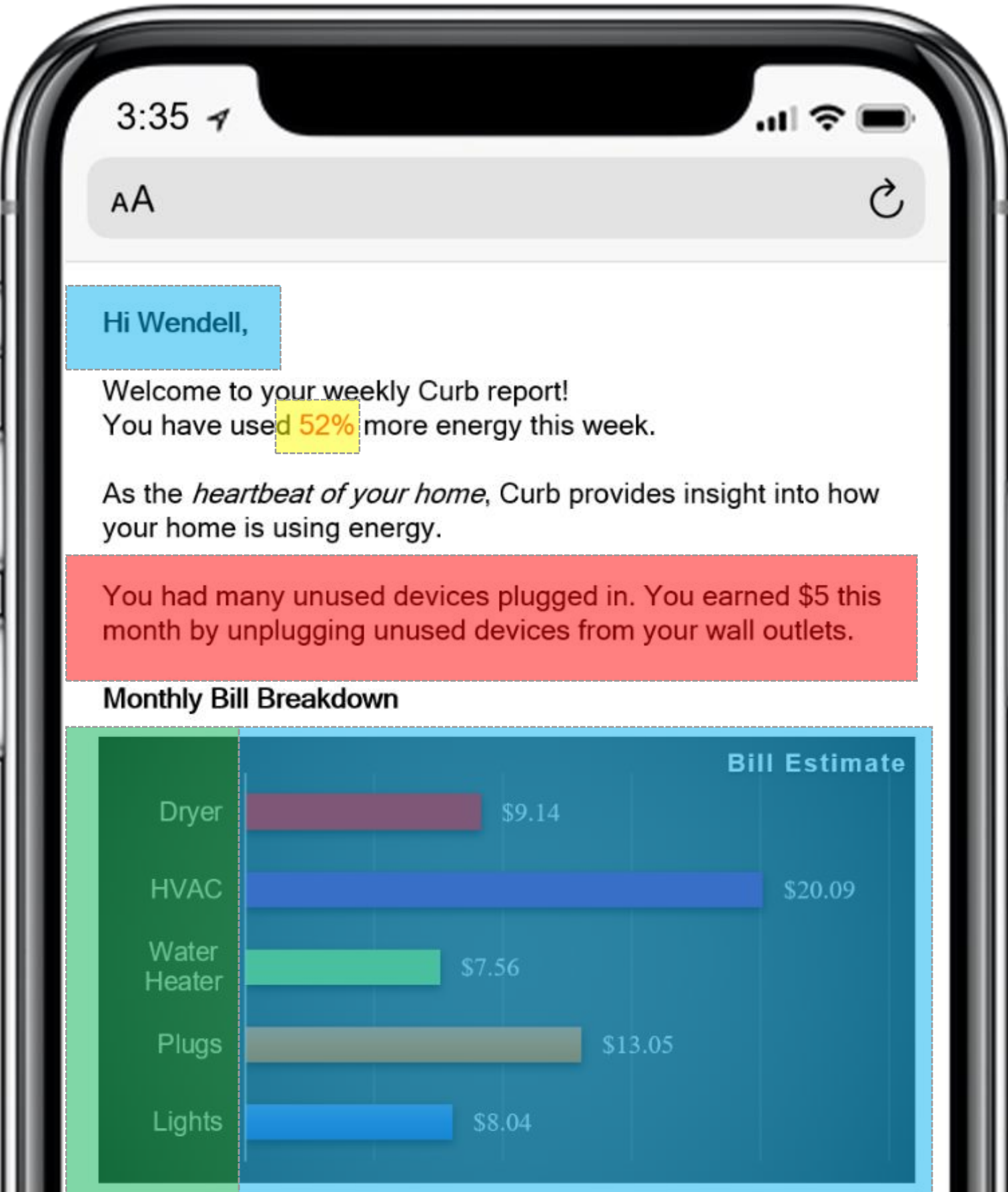




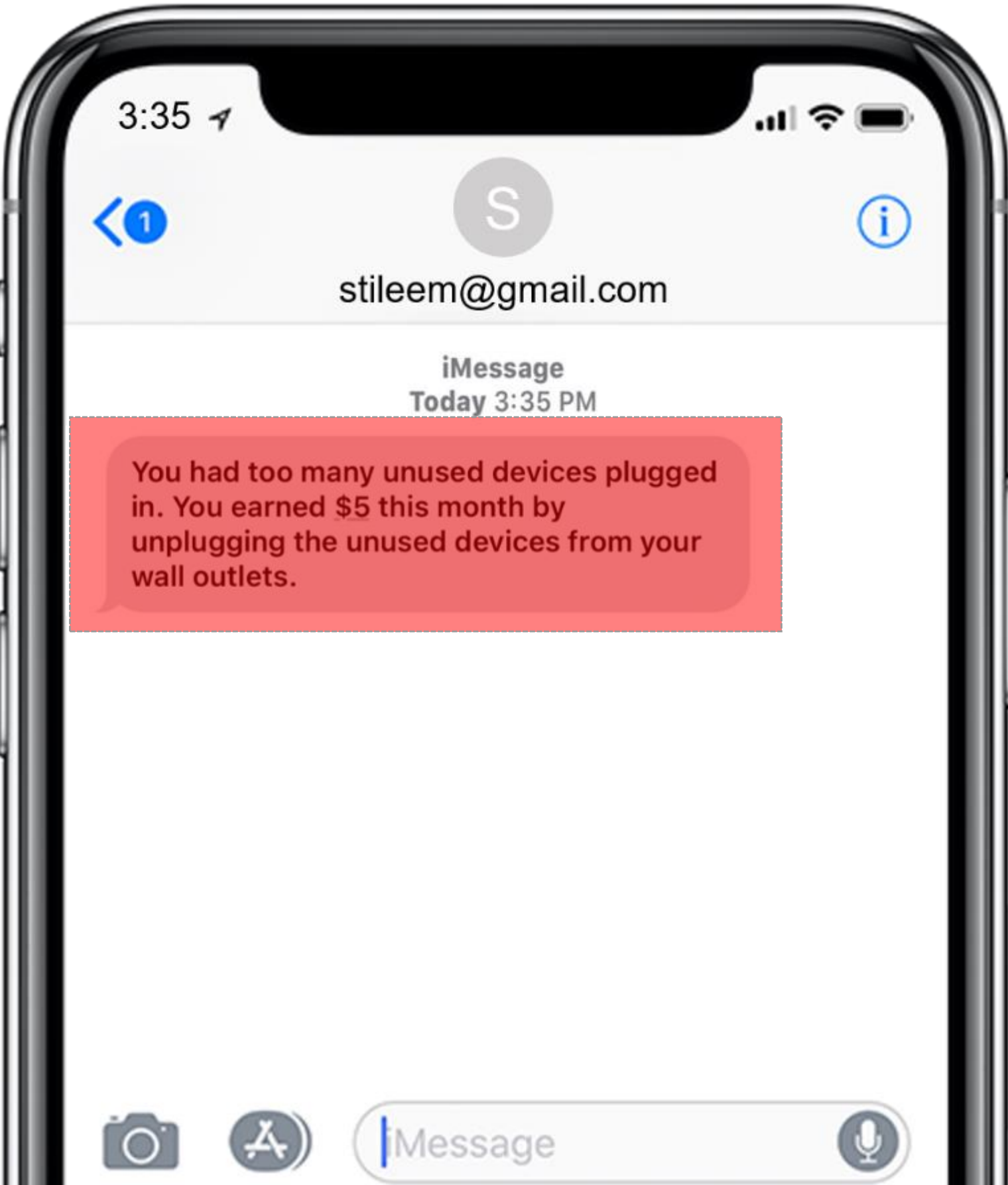
# Energy feedback messages are socio-technical innovations that can help consumers further engage with their energy bills.



# Existing message design theories can improve the personalization and aesthetic of energy feedback messages.



Curb Weekly Energy Audit Message Mockup



eGauge Energy Monitor Text Alert

KEY

Choice Architecture

Color

Text Size

Action Items



# fNIRS can show which types of messages participants think about the most.

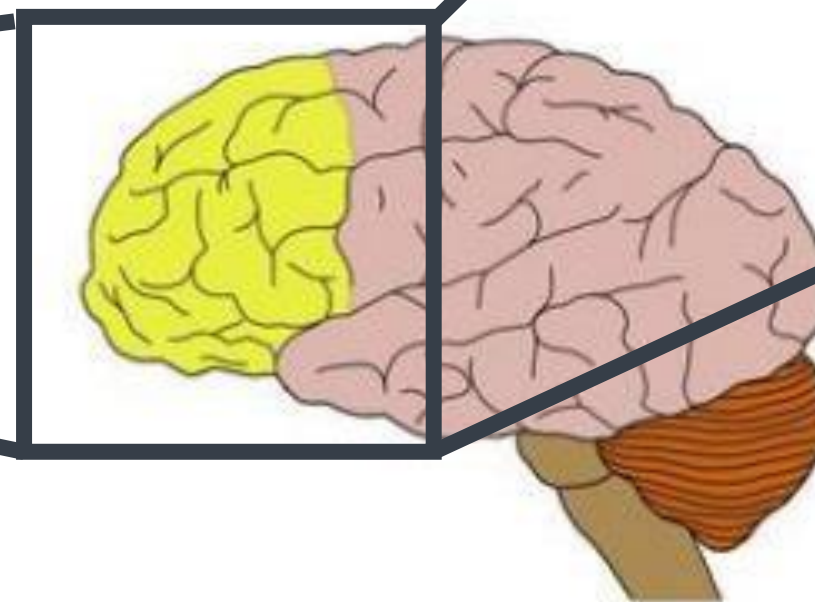
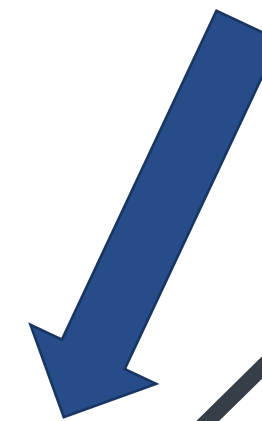


*fNIRS device*



*fNIRS cap with sensors*

Prefrontal  
Cortex  
(PFC)



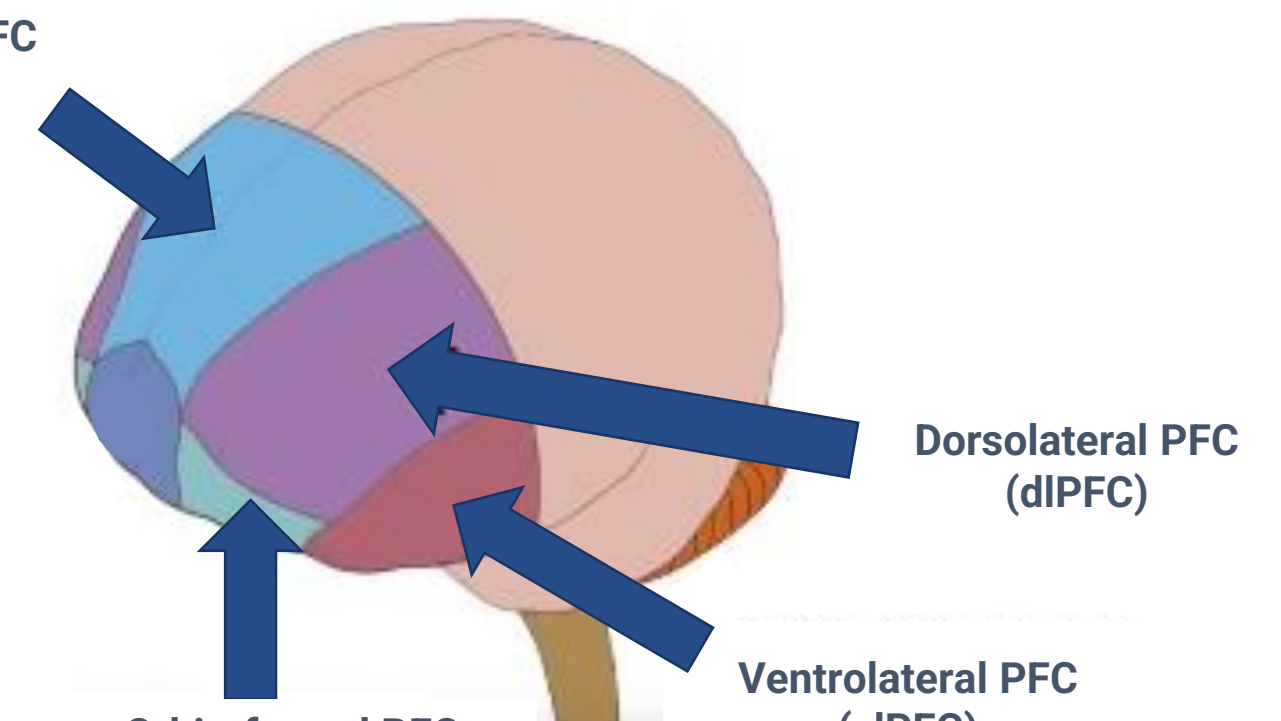
Medial PFC  
(mPFC)



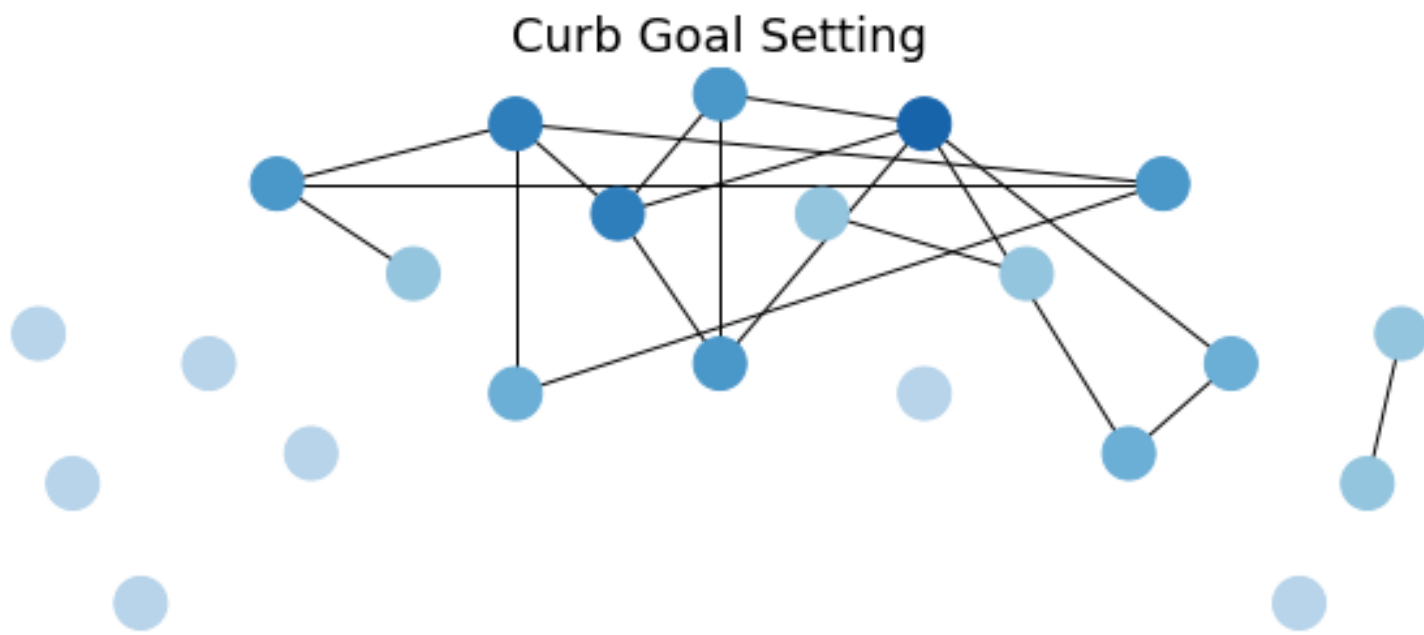
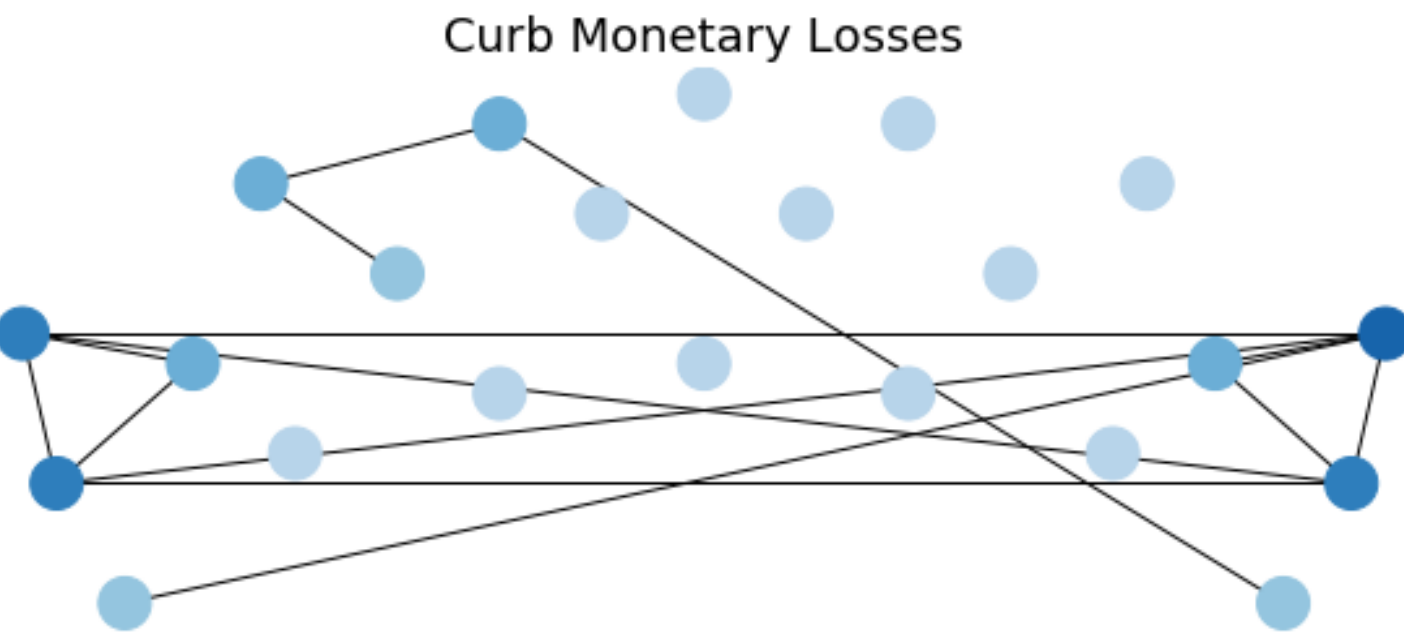
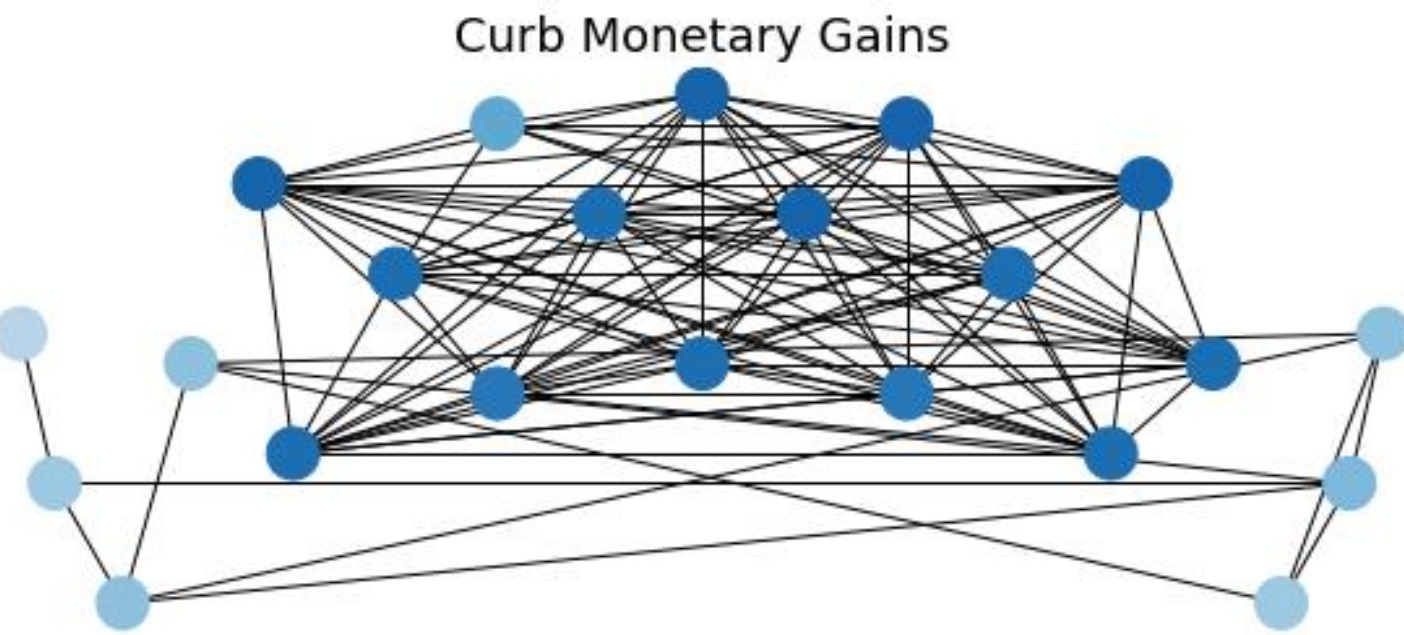
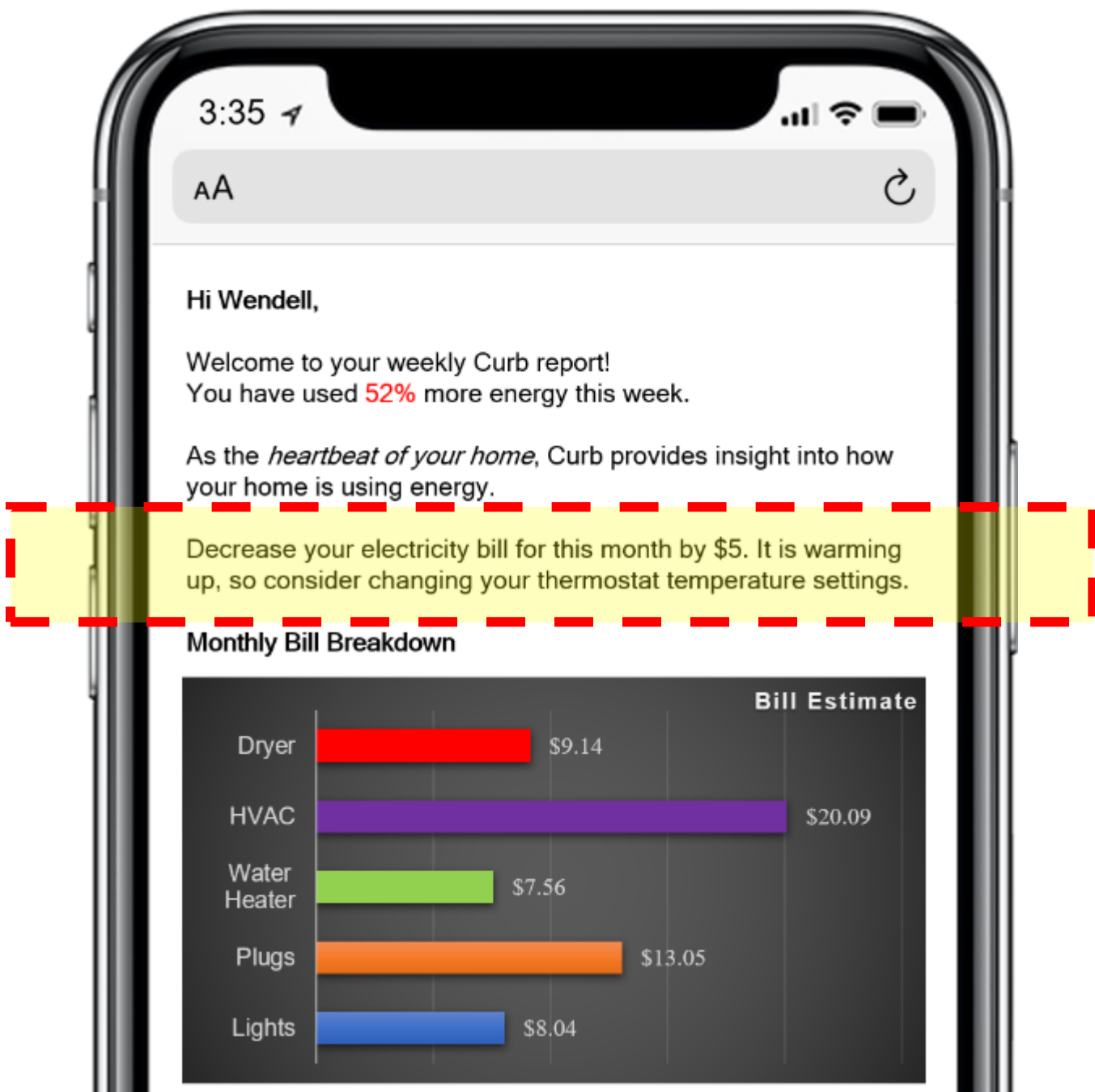
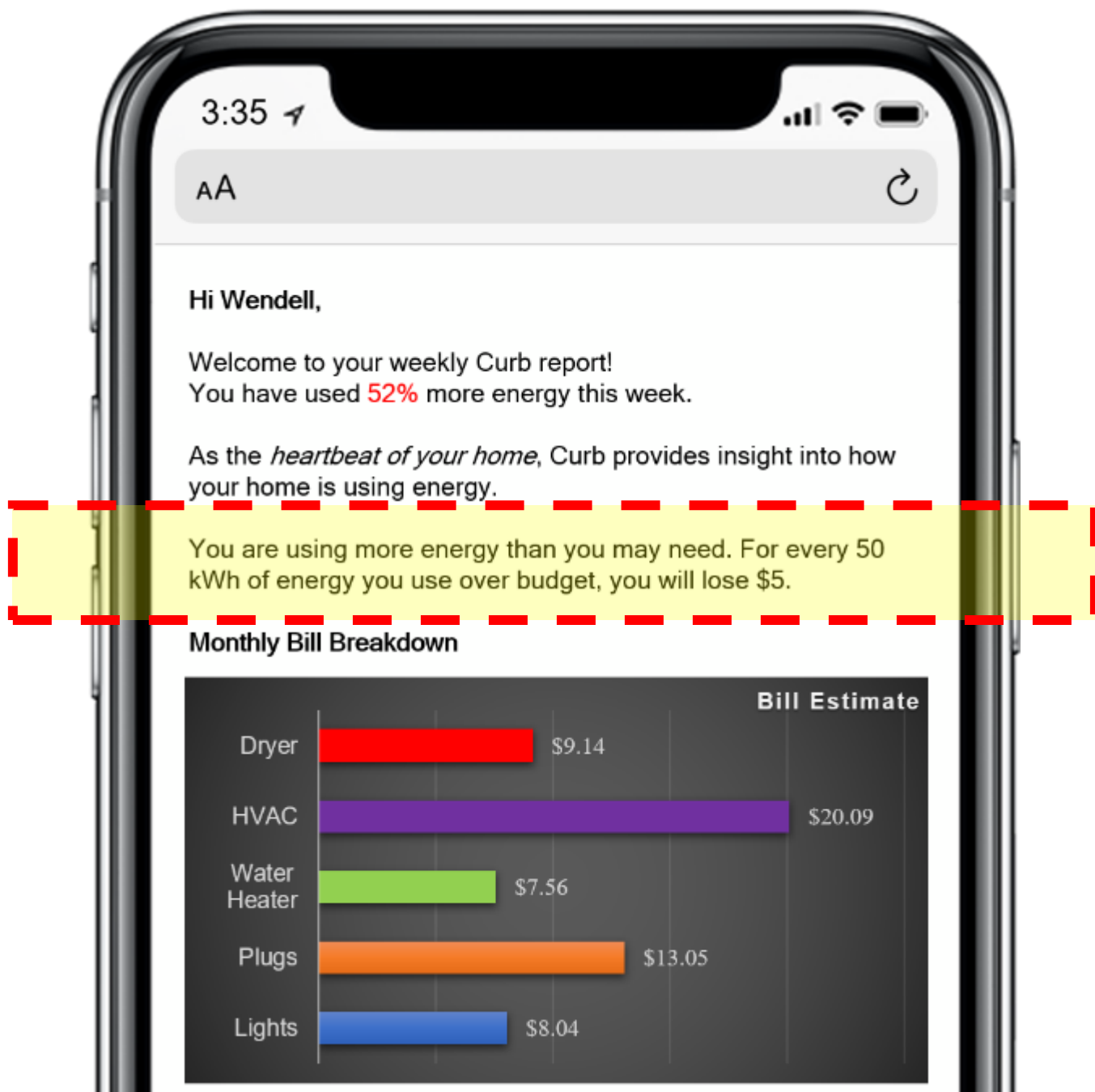
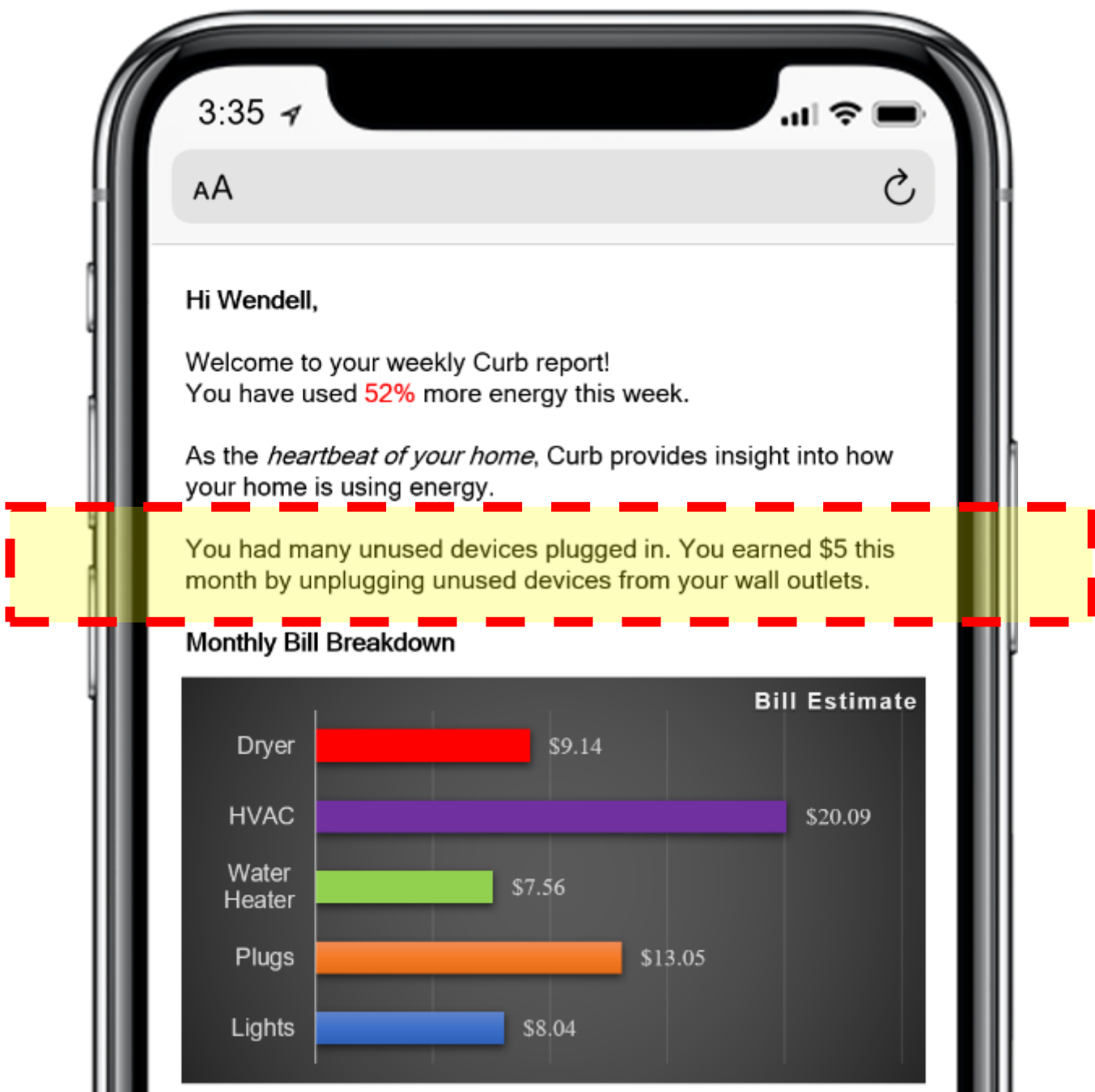
Dorsolateral PFC  
(dlPFC)

Ventrolateral PFC  
(vlPFC)

Orbitofrontal PFC  
(OFC)



# Preliminary findings show messages about monetary gains produced the most cognitive response in participants.





# Preliminary findings show messages about monetary losses produced the most cognitive response in participants.



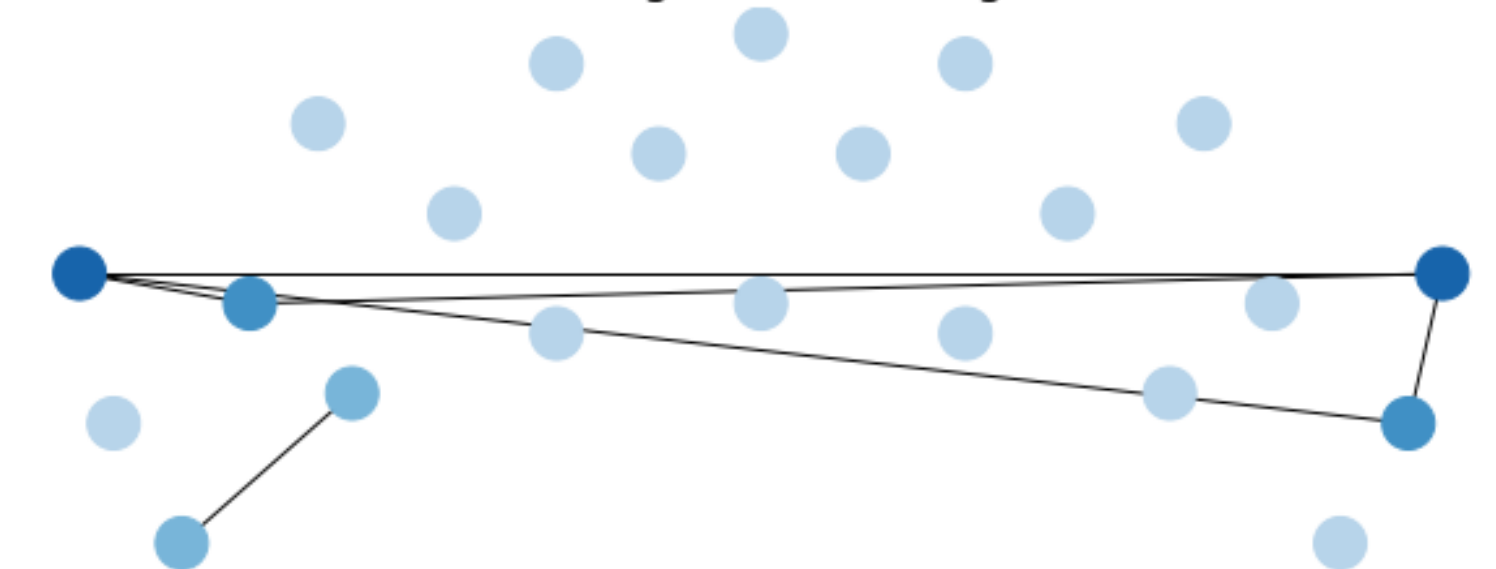
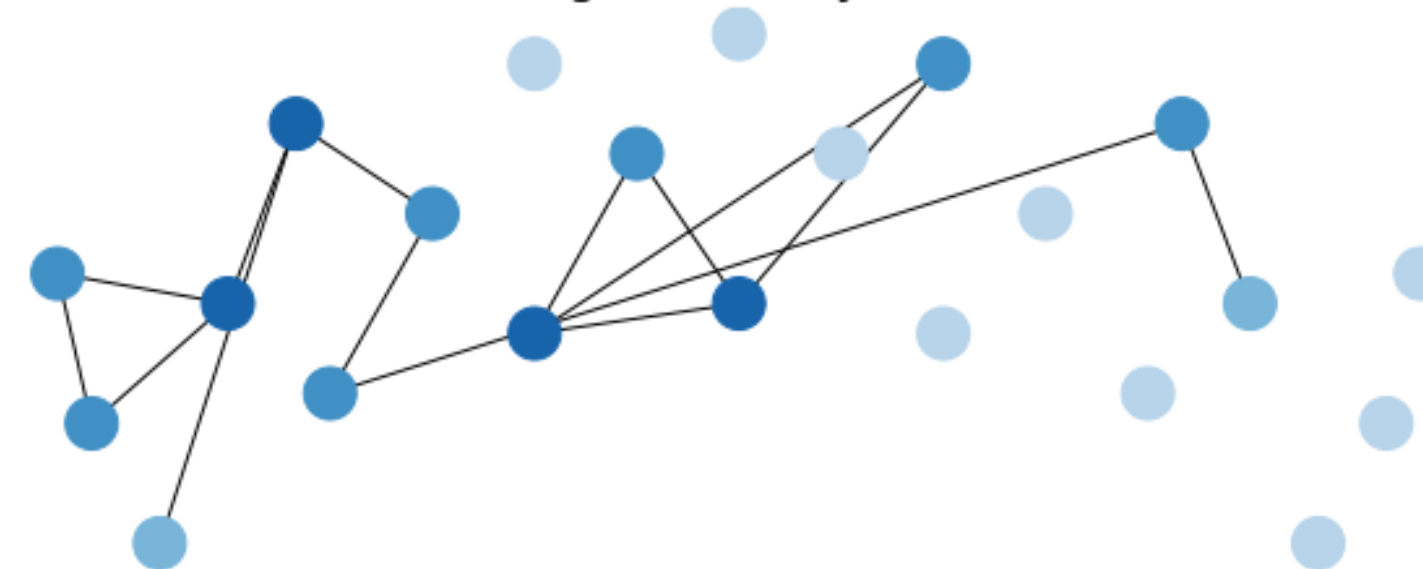
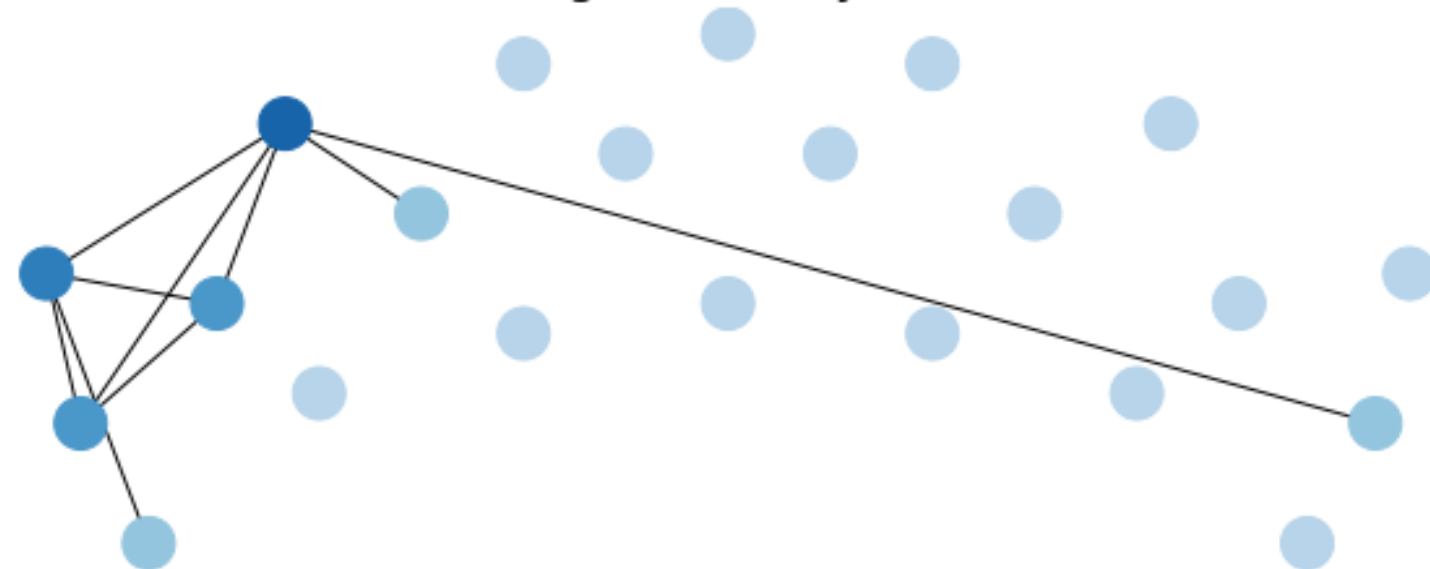
eGauge Monetary Gains



eGauge Monetary Losses



eGauge Goal Setting



# Further, the post-task survey showed that participants...

## The most memorable messages were...

“the ones that gave actionable suggestions about how to decrease your utility bill.”

“the messages that told me exactly what to do...like unplug 5 items that are not in use...”

“messages that told me I earned money for saving a certain amount of energy...”

## The hardest messages to understand were...

“the ones that states you will lose money.”

“the messages that referenced kilowatt-hours...I could not conceptualize how I could change it or how much that was relative to my bill”

## The easiest messages to understand were...

“the ones that stated you can decrease your bill by doing this action.”

“the messages that told me how much I lost and then gave me a tangible task to address it.”

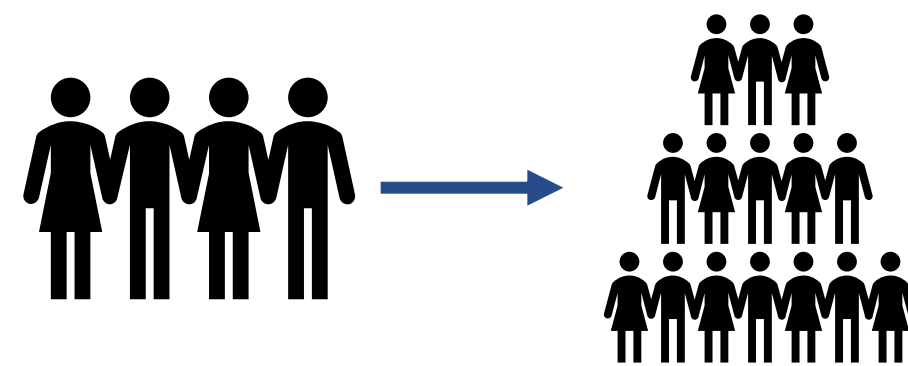
“the ones that gave actionable suggestions about how to decrease your utility bill.”

## Participants interacted with their energy bills for...

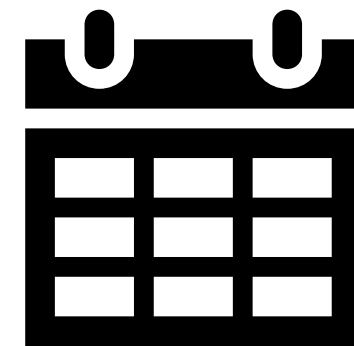
**5 MINUTES OR LESS**



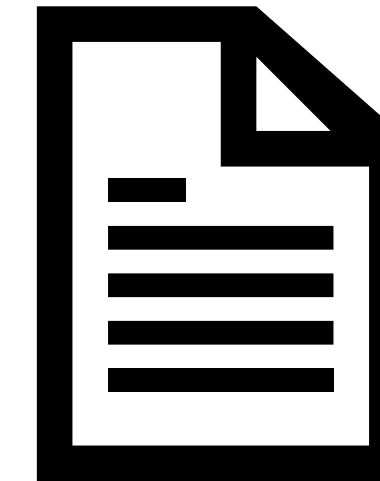
# Future work can explore...



Testing larger sample populations



Testing participants periodically (every 3 months) to determine if there is a response relapse/fallback effect



Integration into future policy



Collaborating with Curb and eGauge to implement these devices into communities to test effectiveness

# Acknowledgements



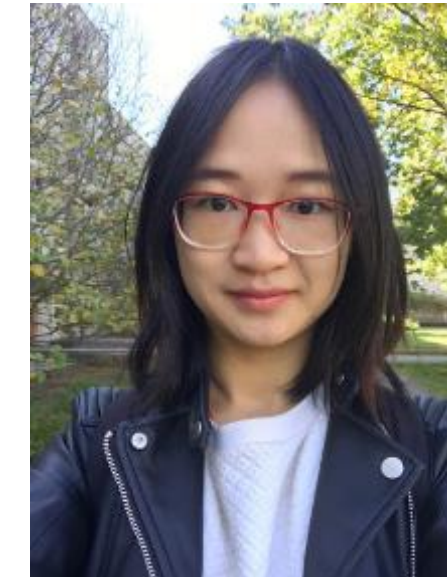
**Dr. Freddy Paige**



**Dr. Tripp Shealy**



**Dr. Josh Iorio**



**Mo Hu, M.S.**



**New Horizon's  
Graduate  
Scholars (NHGS)**



# Please remember, universally designed energy feedback messages can be achieved by personalizing messages to target what consumers care the most about!



Wendell Grinton, Ph.D. Student

Contact Me: [wgrinton@vt.edu](mailto:wgrinton@vt.edu)



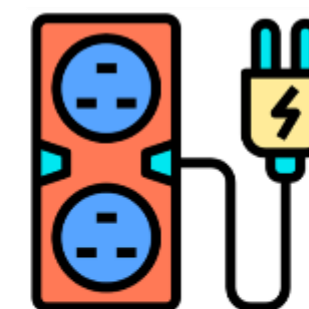
Saves  
5-20%

**Choice Architecture**  
(Sanguinetti et al. 2018; Wilhite et al. 1995)



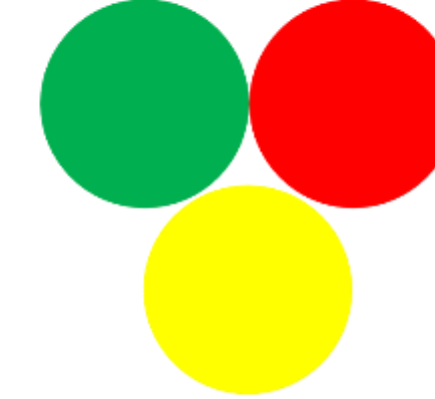
*Curb Example*

**Action Items**  
(Laskey 2011)



**Color**

(Buchanan et al. 2014;  
Alahmad et al. 2012)

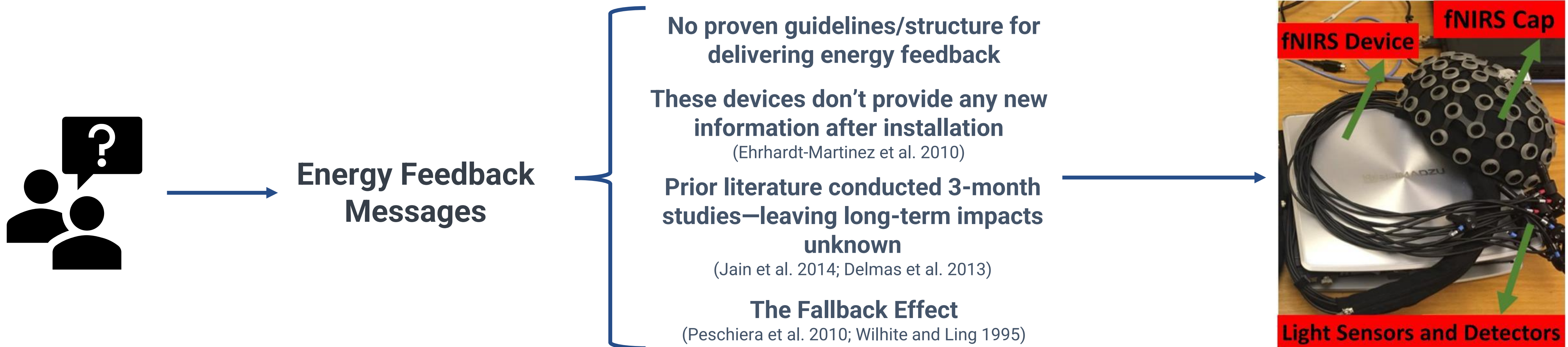


**Font, Text Size**  
(Darroch et al. 2005)

Microsoft  
Sans Serif,  
Size 16

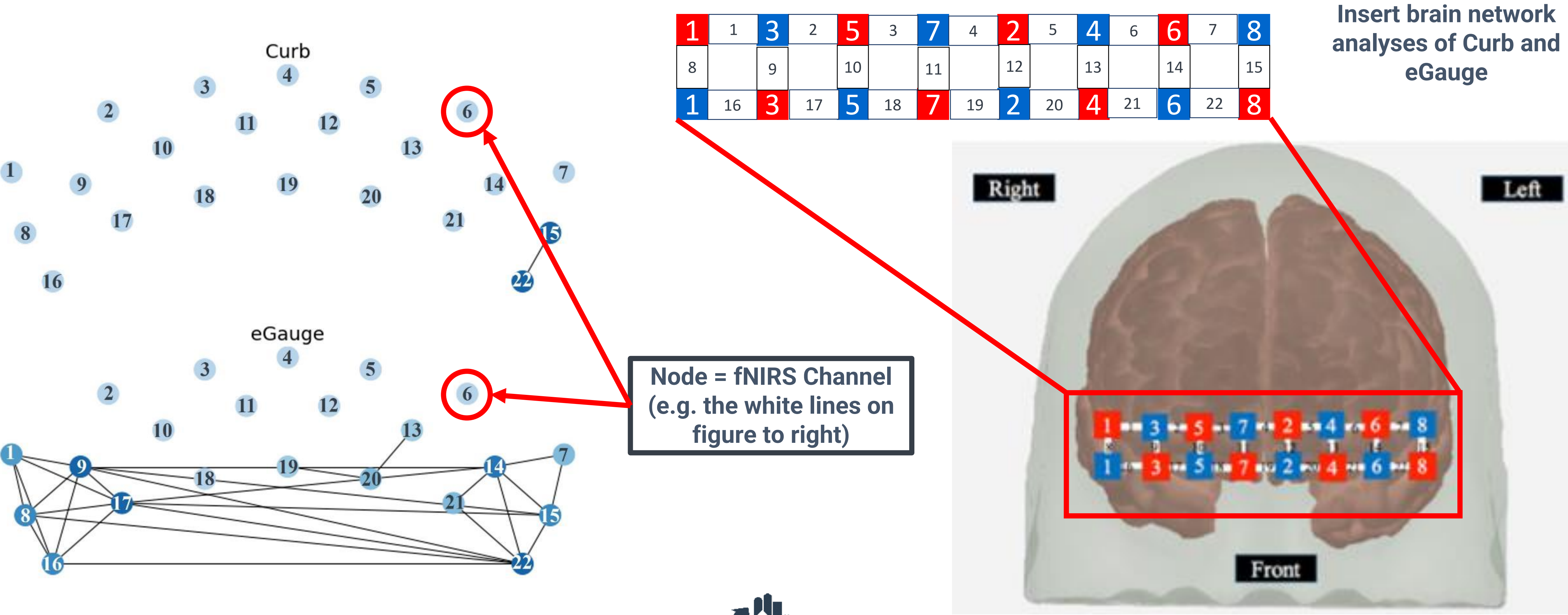


# Why Energy Feedback Messages?

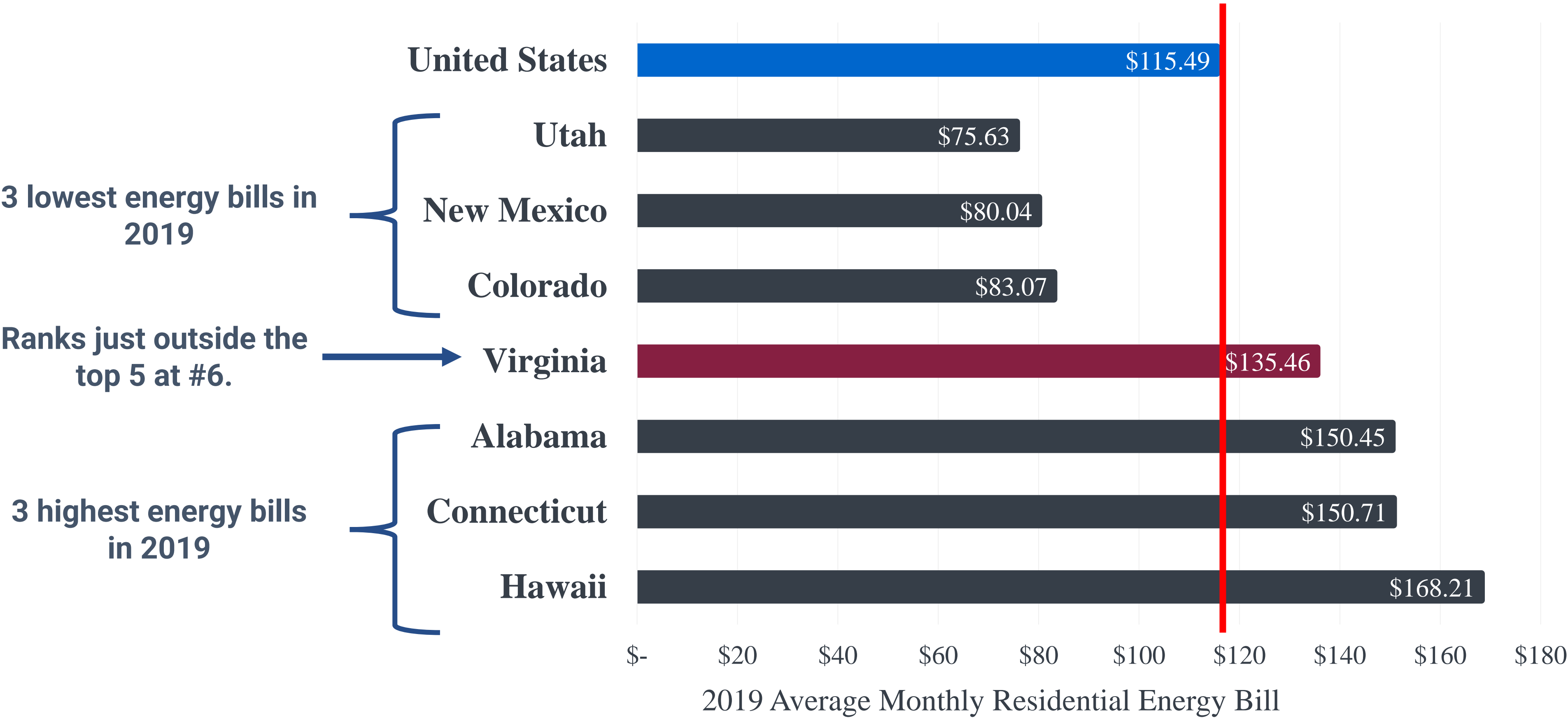




# eGauge messages and messages about monetary gains and losses produced the most cognitive response.

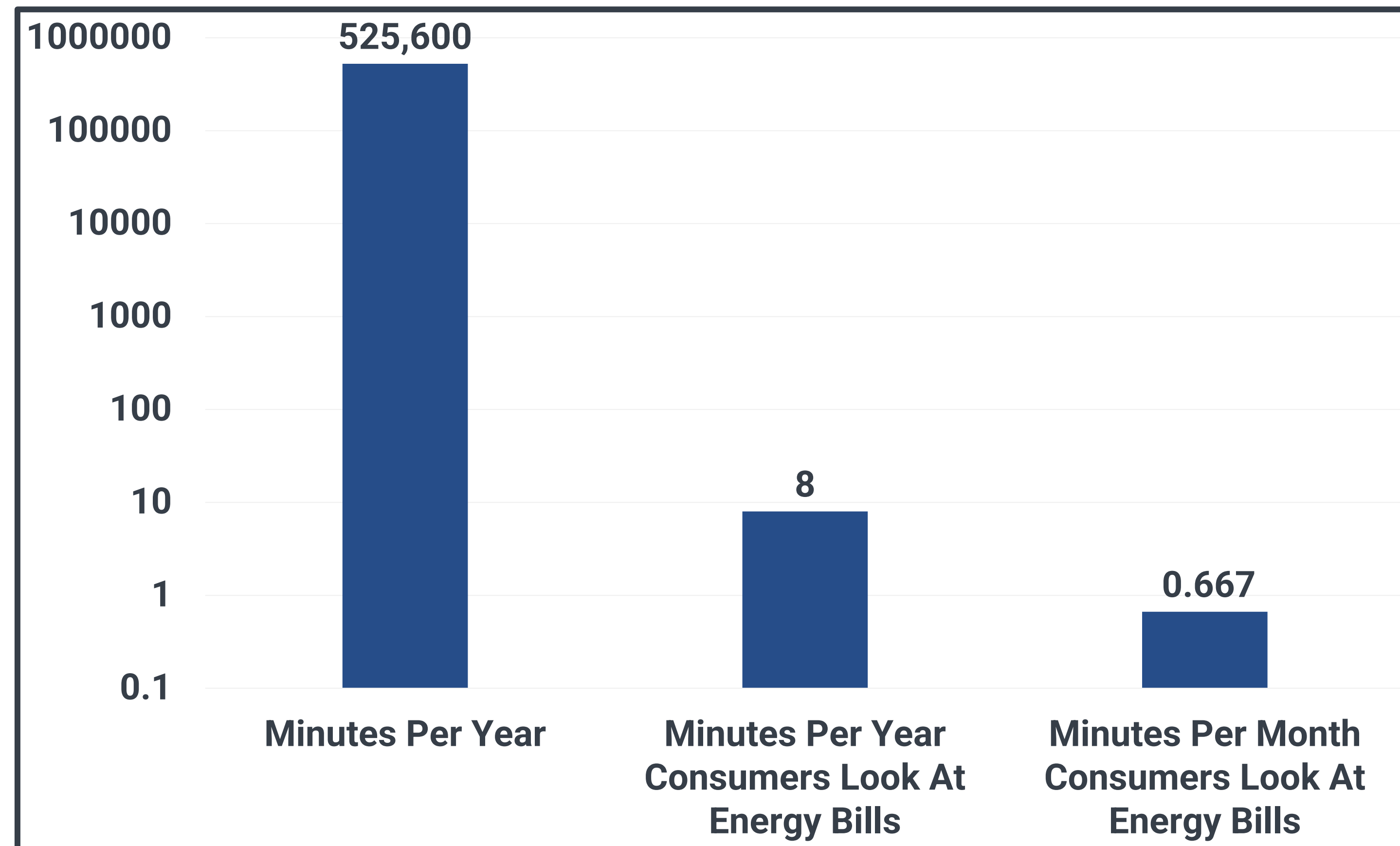


# Beyond the cost, consumers have a limited understanding of what their energy bill is communicating ([EIA 2019](#); [Tweed 2016](#)).

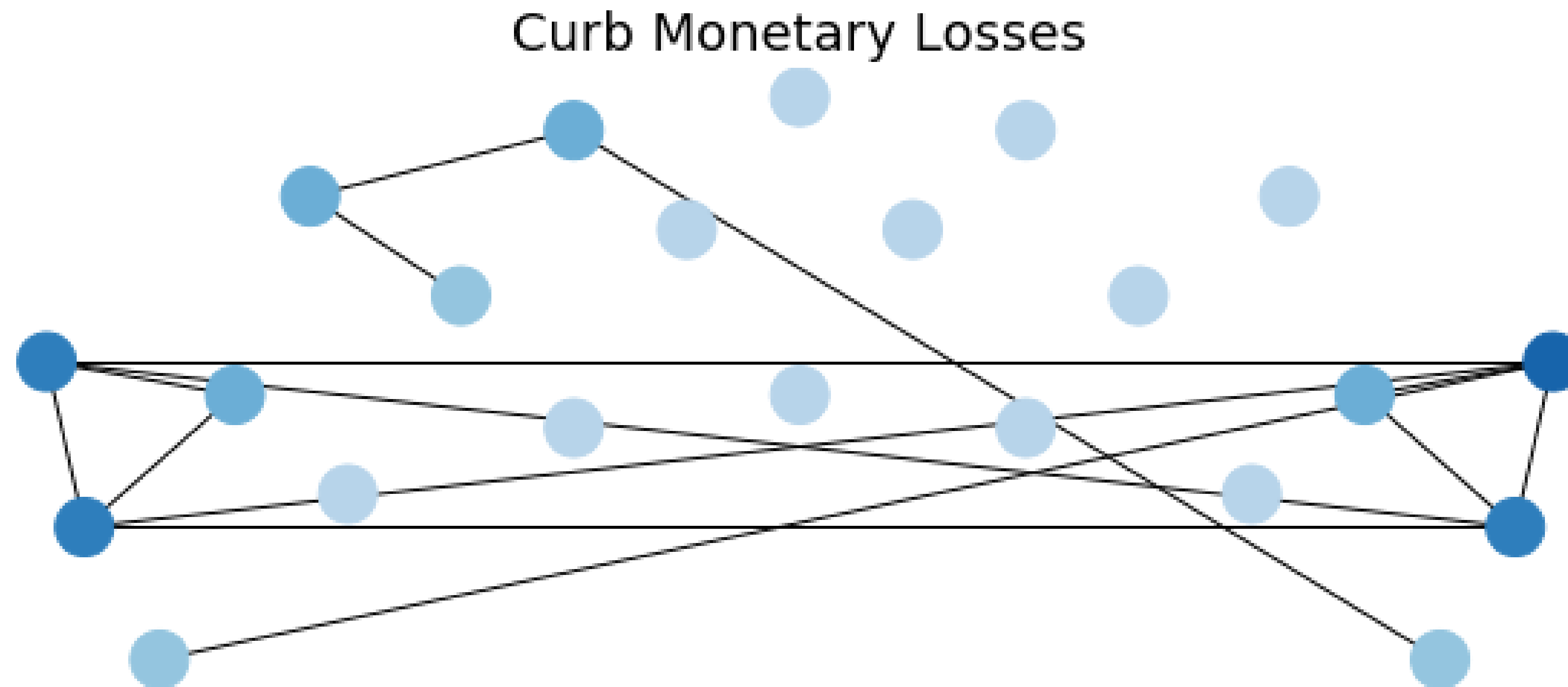




Energy consumers look at their energy bills for 8 minutes a year, which is 40 seconds per month ([Tweed 2016](#)).

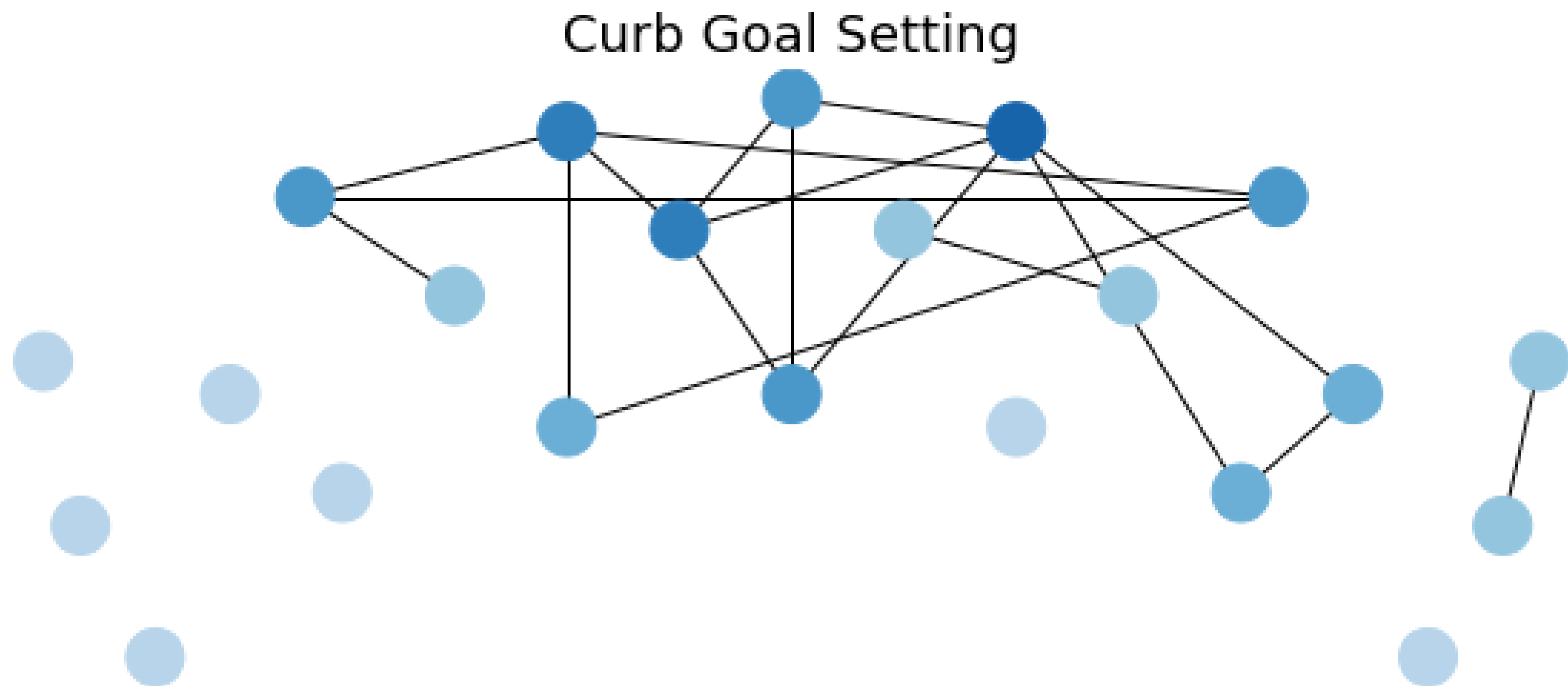


# Messages about monetary losses in the Curb Energy Monitor format.

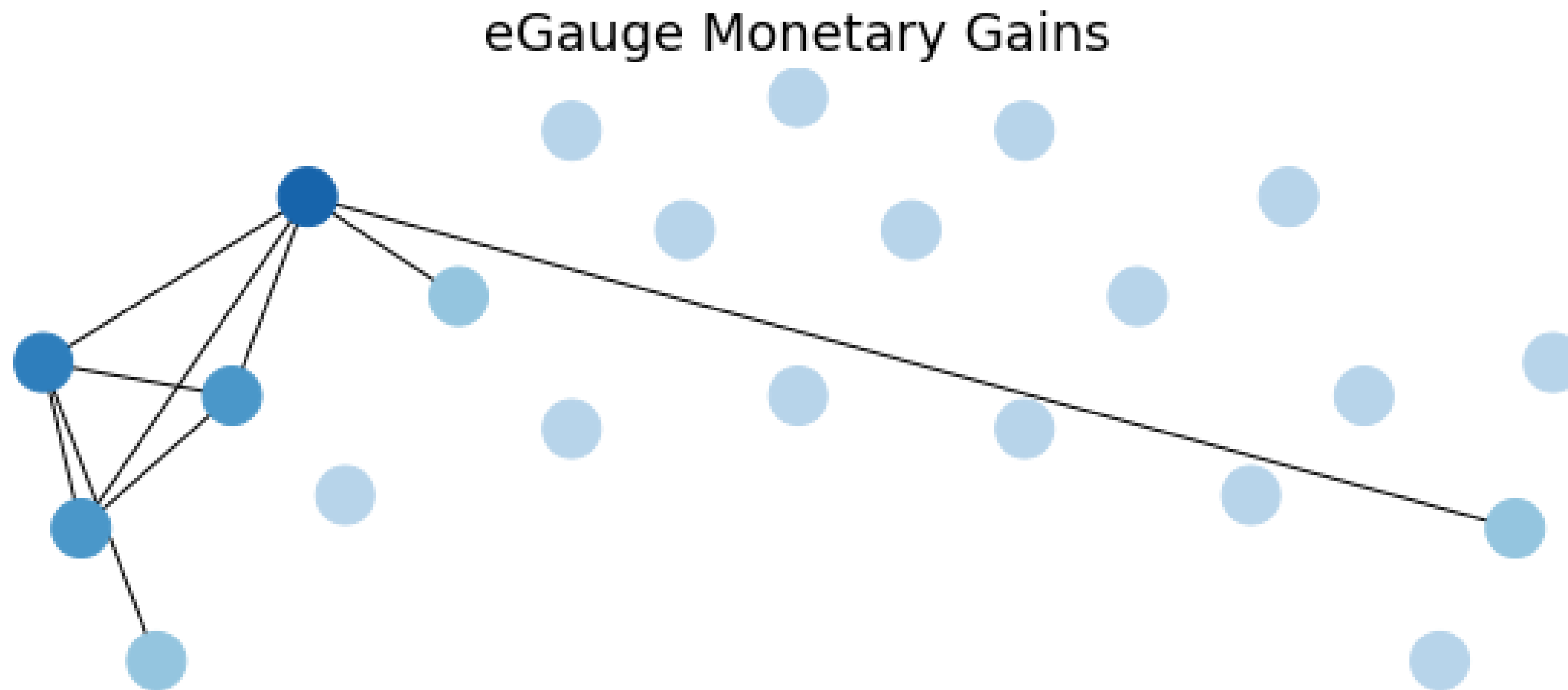




# Messages about goal setting in the Curb Energy Monitor format.

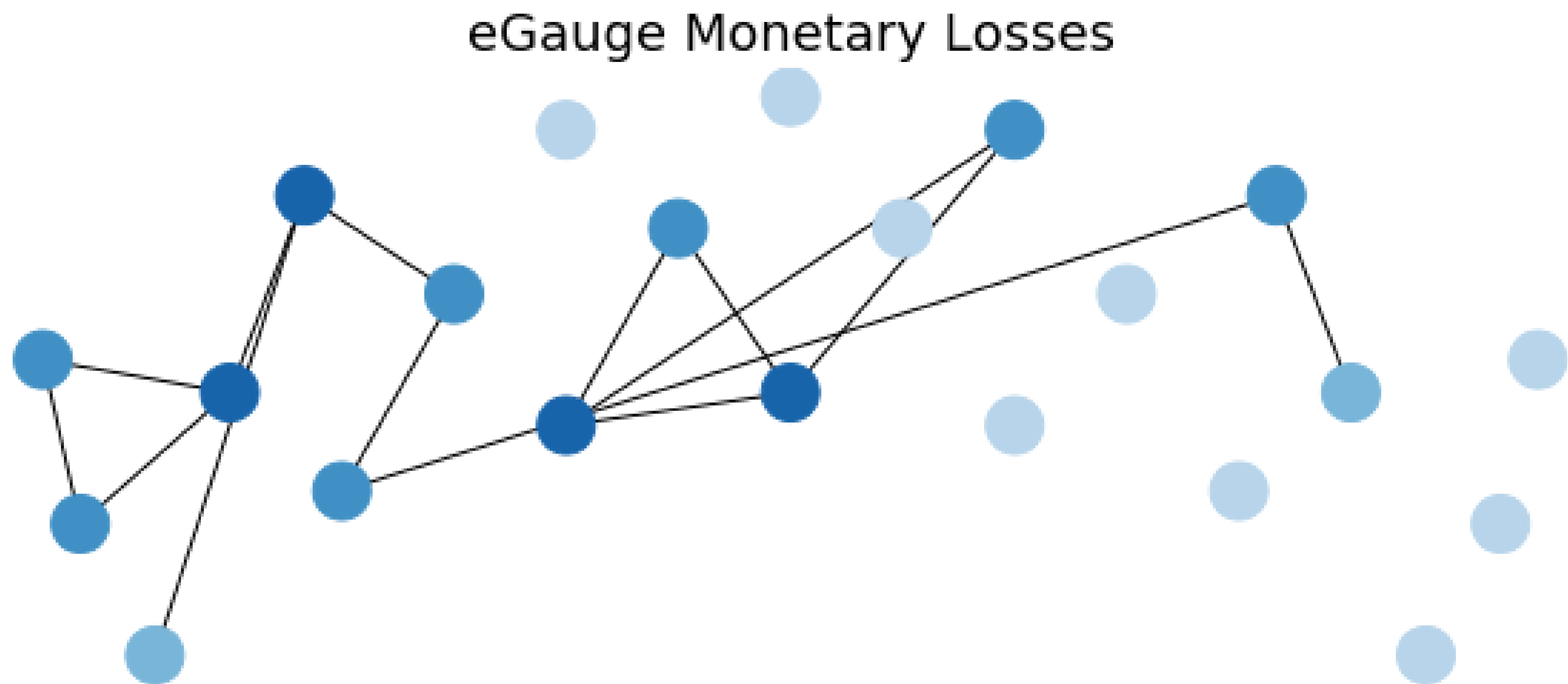


# Messages about monetary gains in the eGauge energy monitor format.





# Messages about monetary losses in the eGauge energy monitor format.



# Messages about goal setting in the eGauge energy monitor format.

