

Smart Energy and What Lies Ahead

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NYU and
GroundedPower, Inc.

Rob Faludi

- Wireless Networks
- Cognitive Psychology
- Physical Computing
- Instructor at NYU's ITP

GroundedPower, Inc.

- **GroundedPower** provides wireless, real-time energy monitoring coupled with secure web applications that empower consumers to cut their electricity bills, help improve the environment and improve energy security. The technology also gives utilities more accurate, verifiable, real-time data about customer usage and demand.
- one of a number of companies thinking about energy
- collaborative effort between interesting people

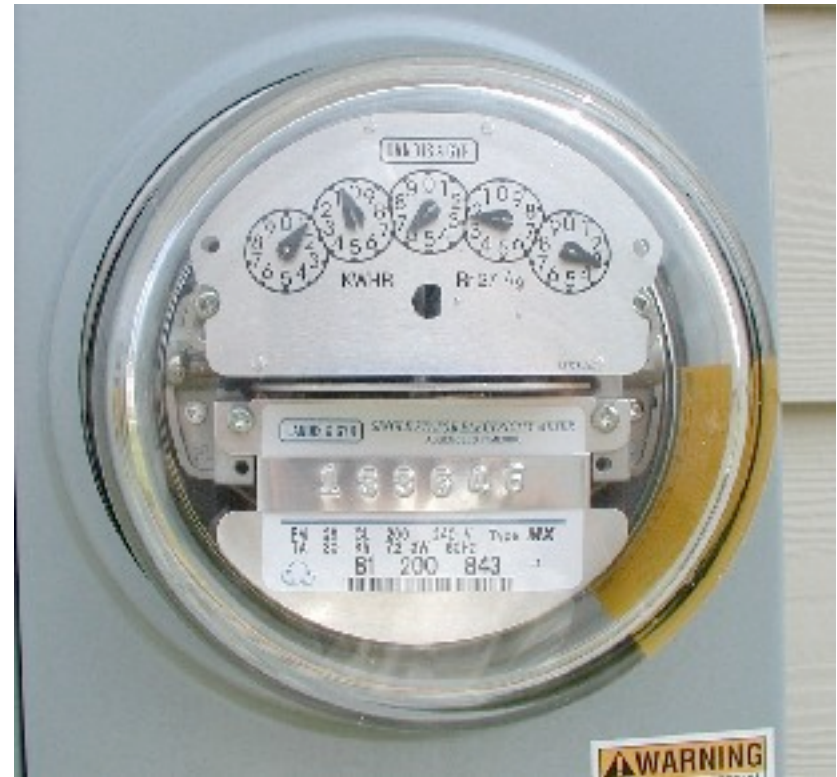
People

- Paul: Lotus workgroups, psychologist
- Mike: web applications to help smokers quit
- Me: device networks and cognition
- Demetrie: interface and user interaction
- Terence: interaction and industrial design
- Yin: systems engineering and scientific data manipulation
- Carl: we call him the utility guy

Energy Monitoring Things



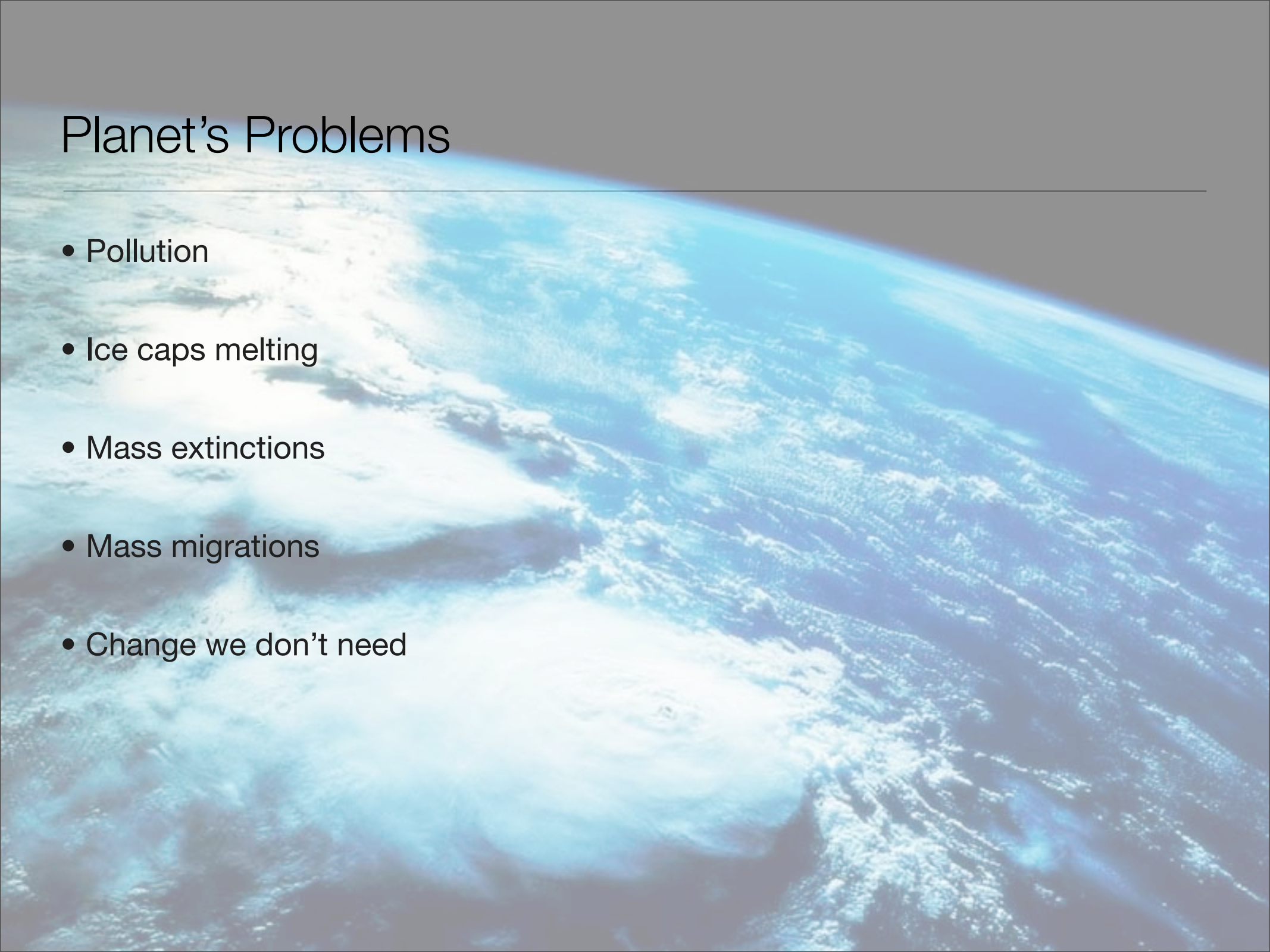
Energy Issues



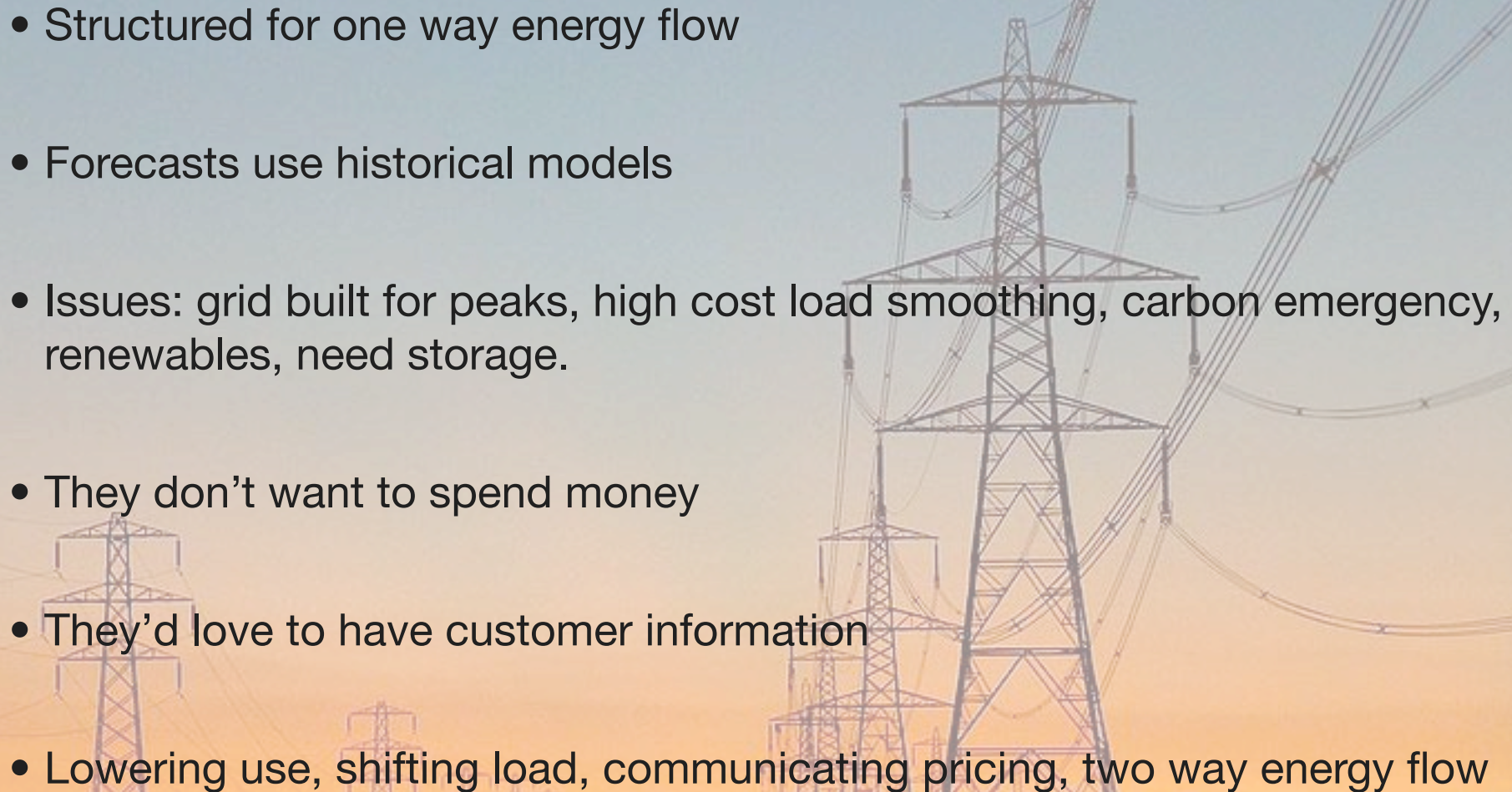
Whose Problems?

Planet's Problems

- Pollution
- Ice caps melting
- Mass extinctions
- Mass migrations
- Change we don't need

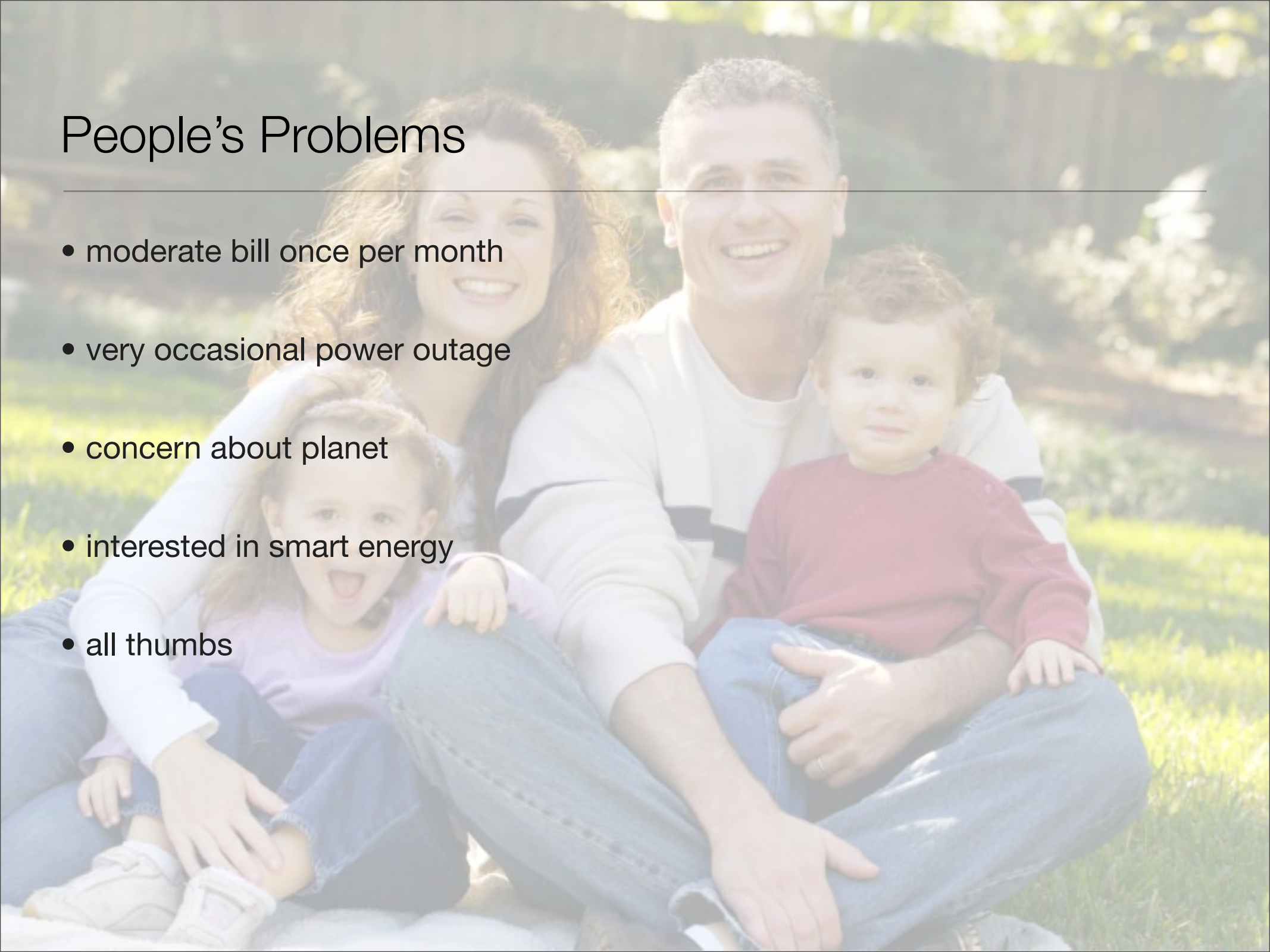


Utilities' Problems

- Structured for one way energy flow
 - Forecasts use historical models
 - Issues: grid built for peaks, high cost load smoothing, carbon emergency, renewables, need storage.
 - They don't want to spend money
 - They'd love to have customer information
 - Lowering use, shifting load, communicating pricing, two way energy flow
- 
- The background of the slide features a series of high-voltage power line towers and their associated transmission lines. The scene is set against a sky transitioning from a pale blue at the top to a warm orange and yellow at the bottom, suggesting a sunset or sunrise. The towers are silhouetted against the sky, and the lines curve across the frame, creating a sense of depth and perspective.

People's Problems

- moderate bill once per month
- very occasional power outage
- concern about planet
- interested in smart energy
- all thumbs

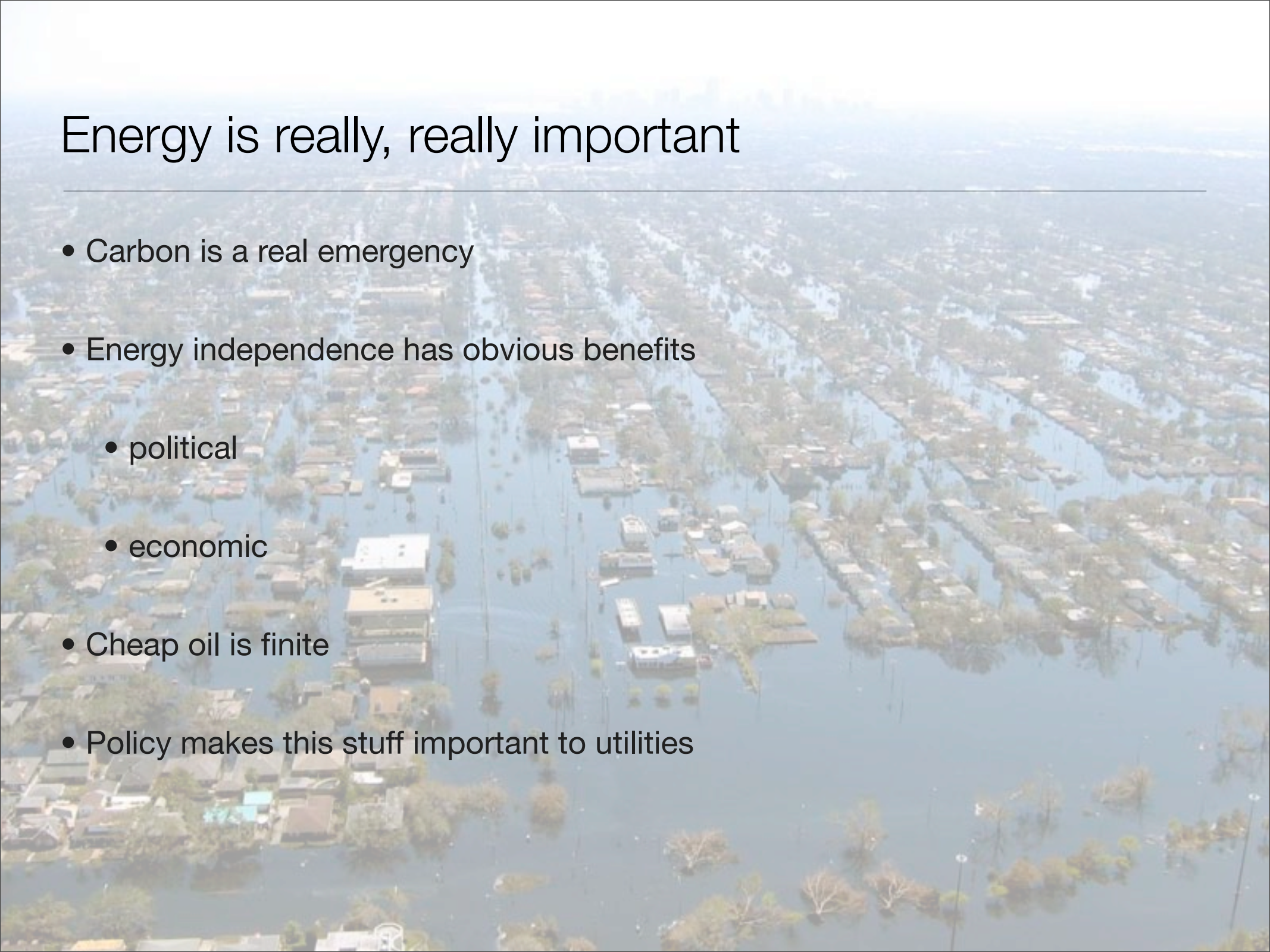


What's really going on here?

- A lot of things don't use much power
- Cost of energy is very low
- 5% - 20% savings. \$15 per month? 50 cents a day?
- We treat power like air
 - available everywhere
 - no social prohibition against taking power (vs. an apple)
 - We only notice it when it's gone

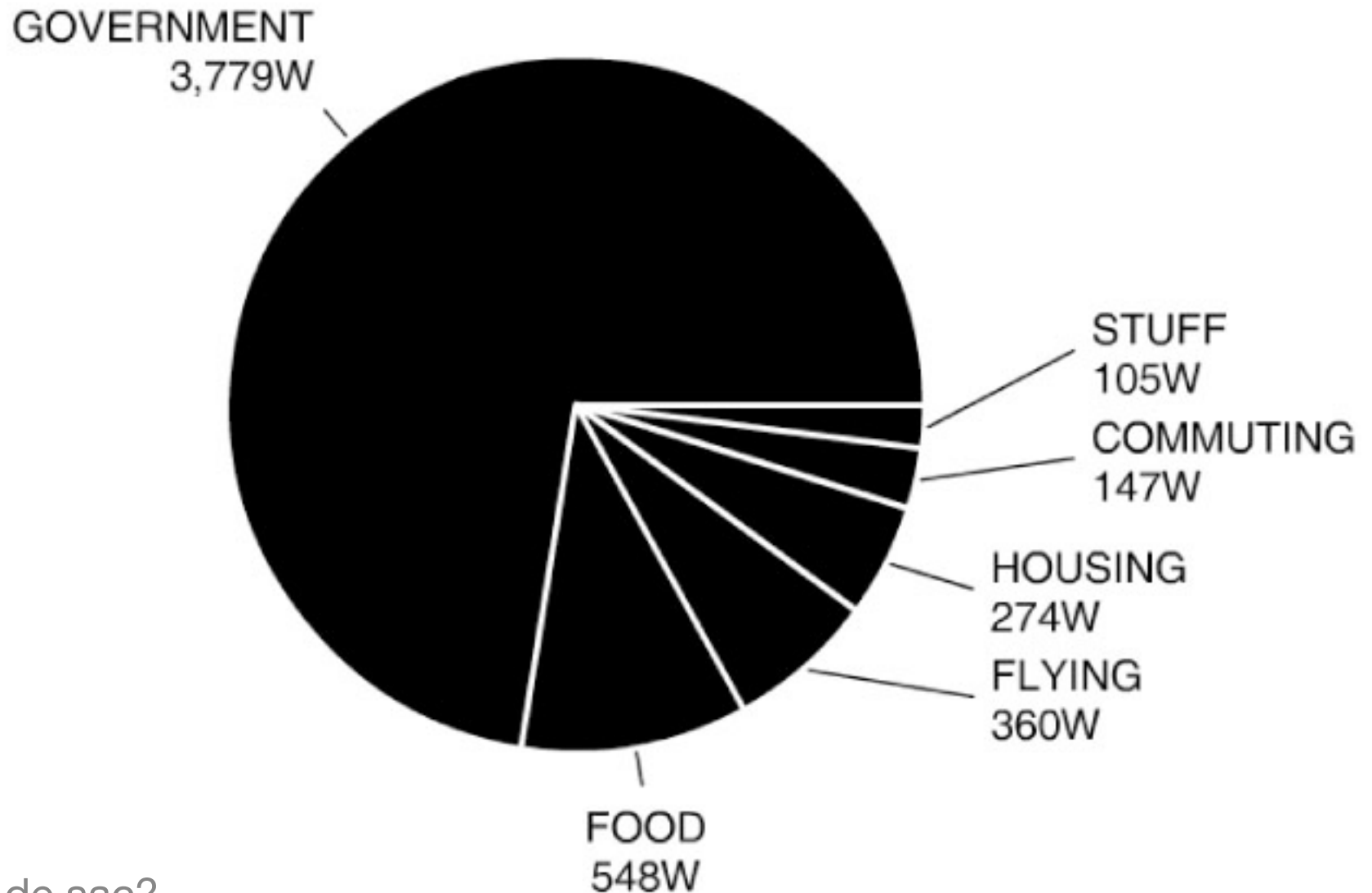
Energy is really, really important

- Carbon is a real emergency
- Energy independence has obvious benefits
 - political
 - economic
- Cheap oil is finite
- Policy makes this stuff important to utilities



Influencing Customers

Awareness & Comprehension



- cul de sac?

Awareness & Calculation

Electrical Energy Use Calculator

Select an appliance

* Enter time used per day

Enter the days used per week

Select Electric Rate \$/kwh

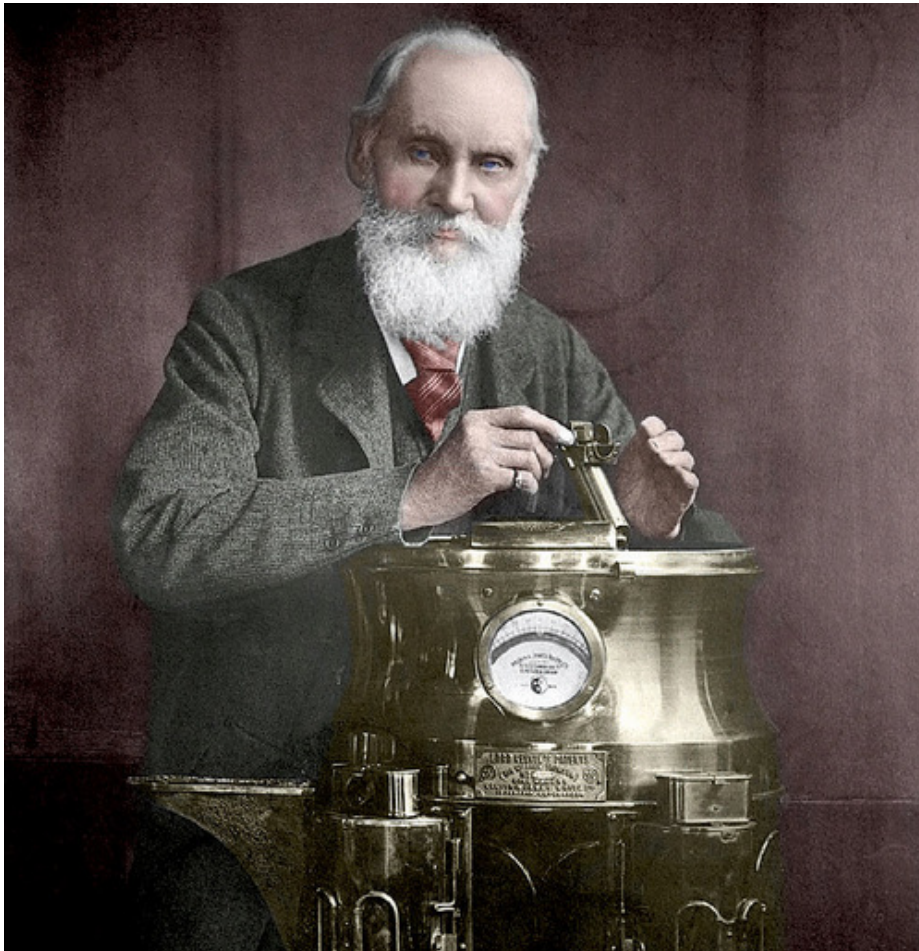
Monthly Consumption (kwh)

Cost Per Month (\$)

* Suggested Input for Daily Usage
Refrigerator 14 hr/day
Water heater 3 hr/day

Measuring

- "If you can not measure it, you can not improve it."
- Sir William Thompson, Lord Kelvin (1824-1907)



- more data points, current data points

Visibility



C Smith Statistics as of: 9/17/2008 8:30 AM

Select Appliance: **Smith**

You have 0 current alerts
[View all my alerts](#)

Did You Know?

Energy Saving Tips

- > Take control of your energy consumption! The Customer Portal makes it easy for you to see what your energy consumption is throughout the home, where you can cut back, and what your environmental impact it. Becoming more energy efficient is just a few clicks away.
- > A compact fluorescent light bulb uses 75% less energy than a regular bulb and last sometimes 4x as long.

My Weather

Right now in
Chantilly, VA (20152)

63°
Partly Cloudy
Feels like: 63°F



UV Index: 2 (Low)
Wind: 4 mph N
Barometer: 30.20" / Steady
Visibility: 10.0 mi.

[Show 4-Day Forecast](#)

Monitoring

Energy Settings

Product Profile

[Overview](#) [Storage](#) [Consumption & Production](#) [Device Load Profile](#) [Savings](#) [Environment](#)

Welcome!

My Most Recent Data:

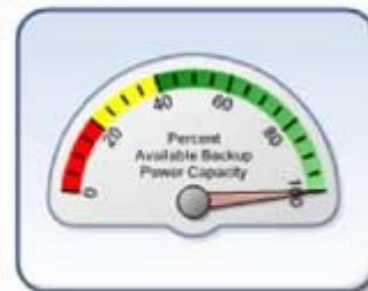
Statistics as of: 9/17/2008 12:30pm
Updated at least every 15 minutes.
(Requires broadband)

Live Household Consumption: 5.7 kW

Live Renewable Production: 2.4 kW

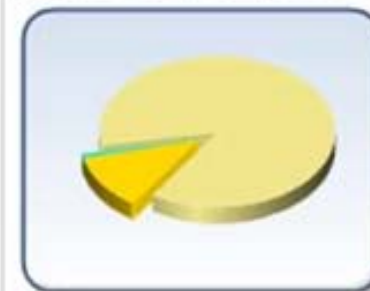
View By:

Backup Power



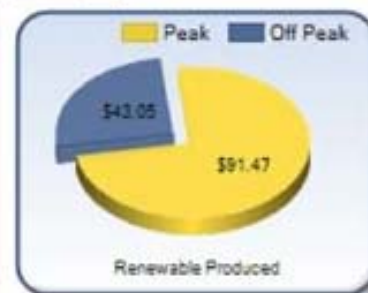
Backup Power Available:
32.1 Hrs.
Secure Load Usage:
0.5 kW

Device Consumption Breakdown



HVAC
479.4 kWh
Refrigerator
65.3 kWh
PHEV
6.0 kWh

Savings



Renewable Produced:
\$134.52
Peak: **\$91.47**
Off-Peak: **\$43.05**

Environment

This is equivalent to:

- The CO2 processed by 0.14 acres of trees per year. **CO2 Emissions Avoided 97.6 lbs.**
- Conserving 5 gallons of gasoline.
- Removing 3 cars off the road for a day.

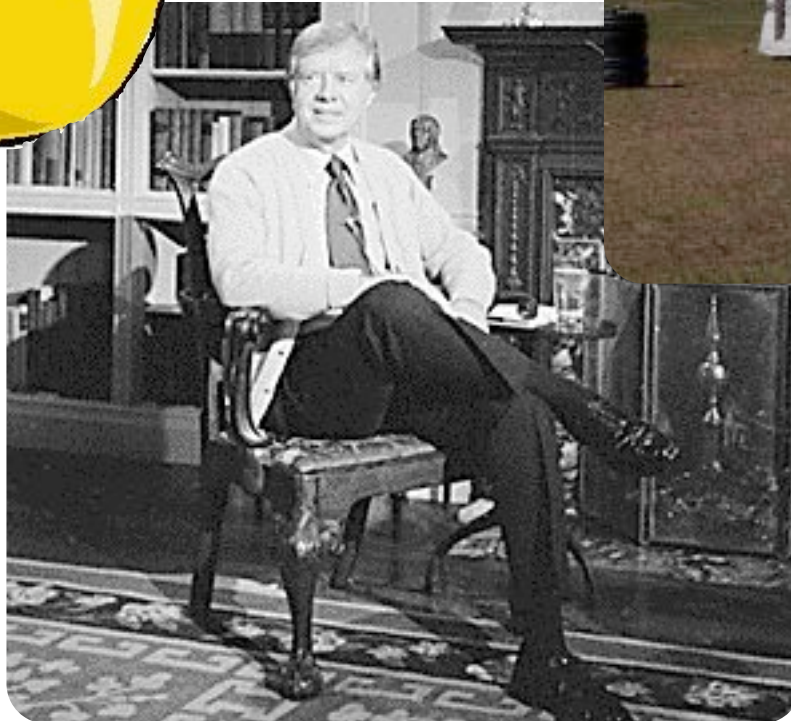
The Grandma Test



Capital Expenses



Lifestyle Change



Dynamic Pricing

Monitors - Energy Consumption in KW over the last 24 Hours

Mon Mar 9 6:34pm - Tue Mar 10 7:41pm

View Last: 1hr 3hr 6hr 12hr 24hr



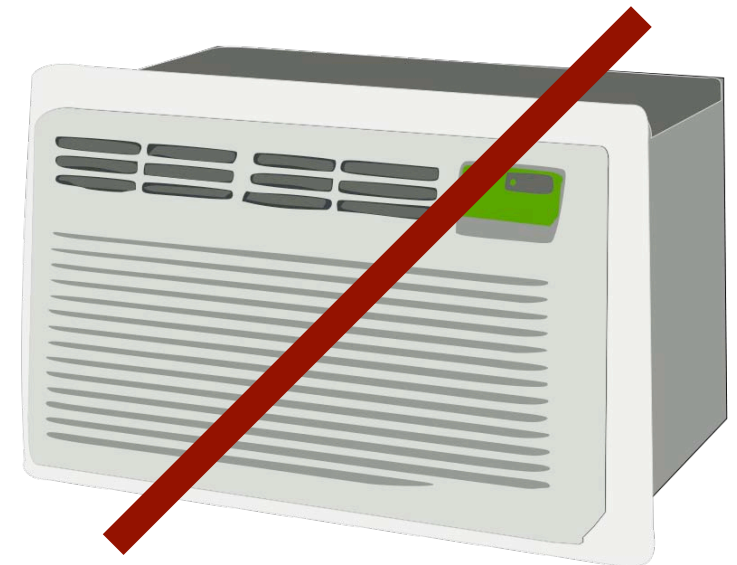
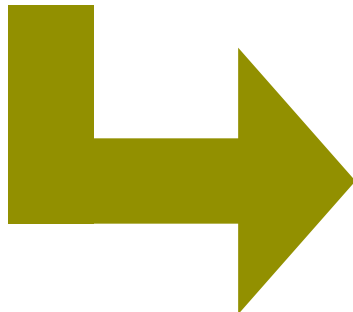
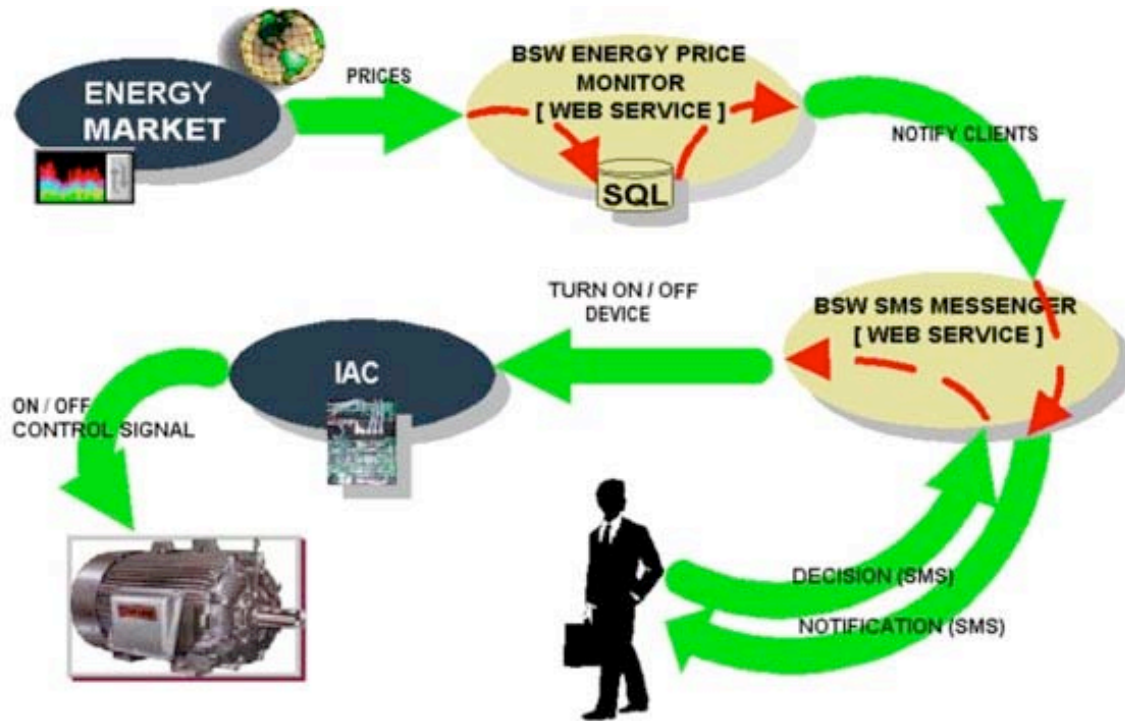
Monitors - Energy Consumption in KW over the last 24 Hours

Mon Mar 9 7:28pm - Tue Mar 10 7:39pm

View Last: 1hr 3hr 6hr 12hr 24hr



“Demand Response”



Have I missed anything so far?

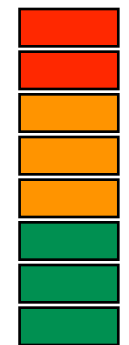
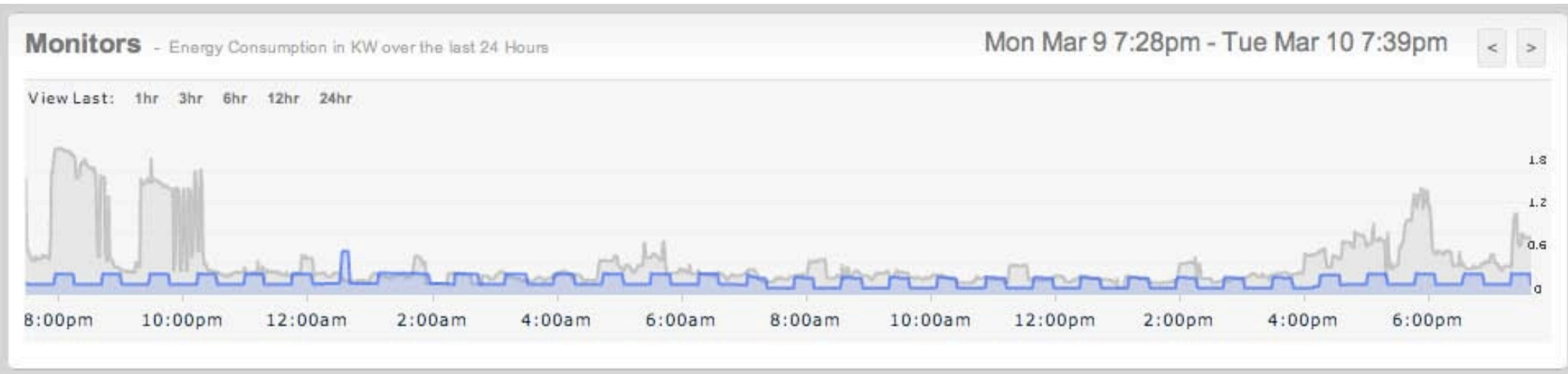
Behavior

Energy Therapy

- How about some help?
 - perception-action loop
 - social cognition



Self-monitoring



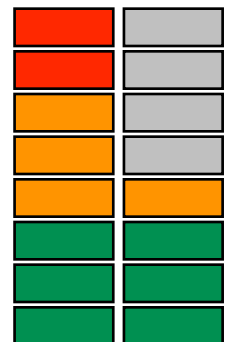
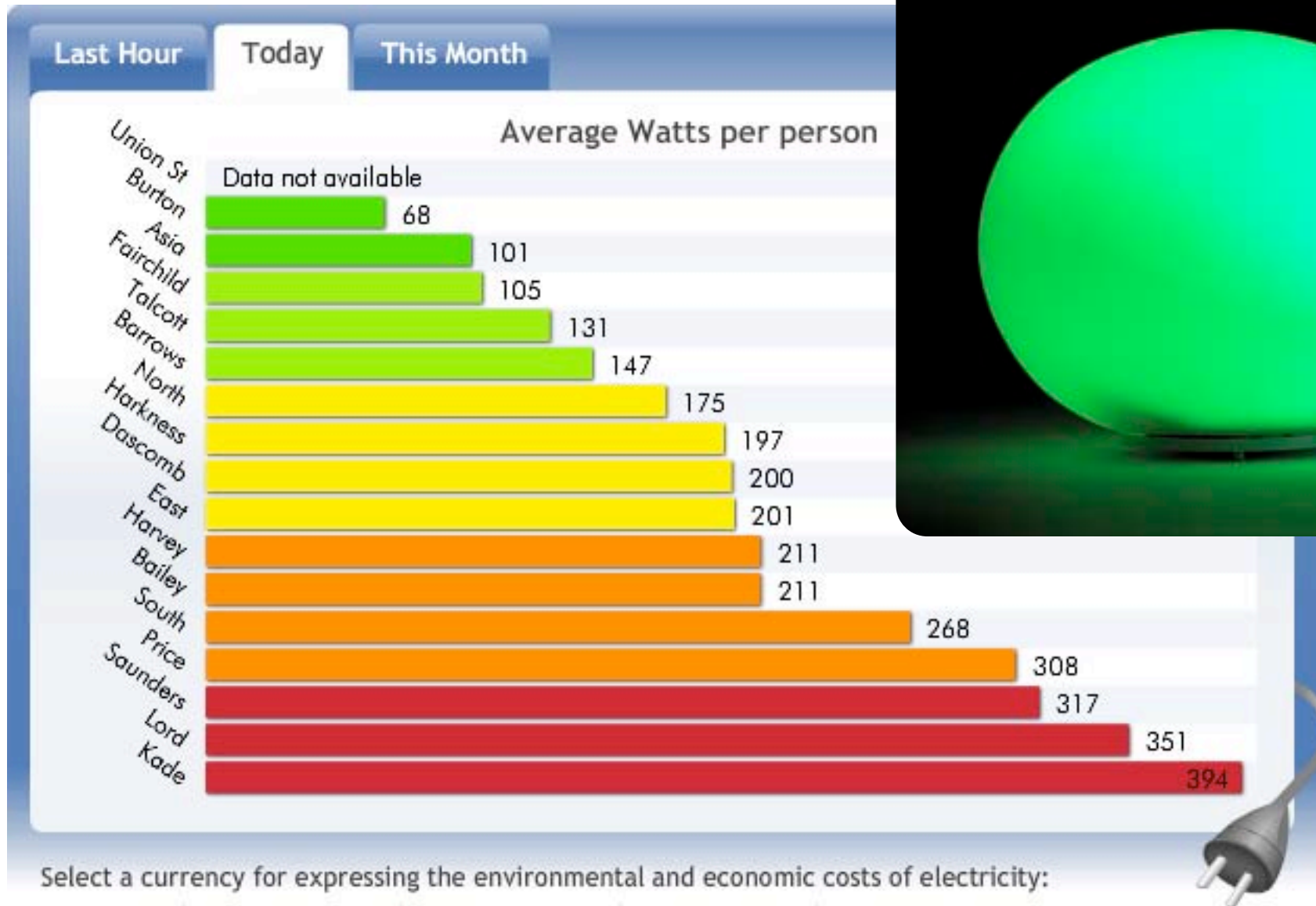
Comparing Yourself



To Your Neighbors



Community



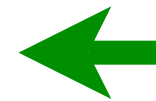
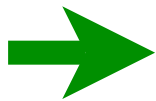
First-order Tasks



Getting (Energy) Things Done



Forming Good Habits

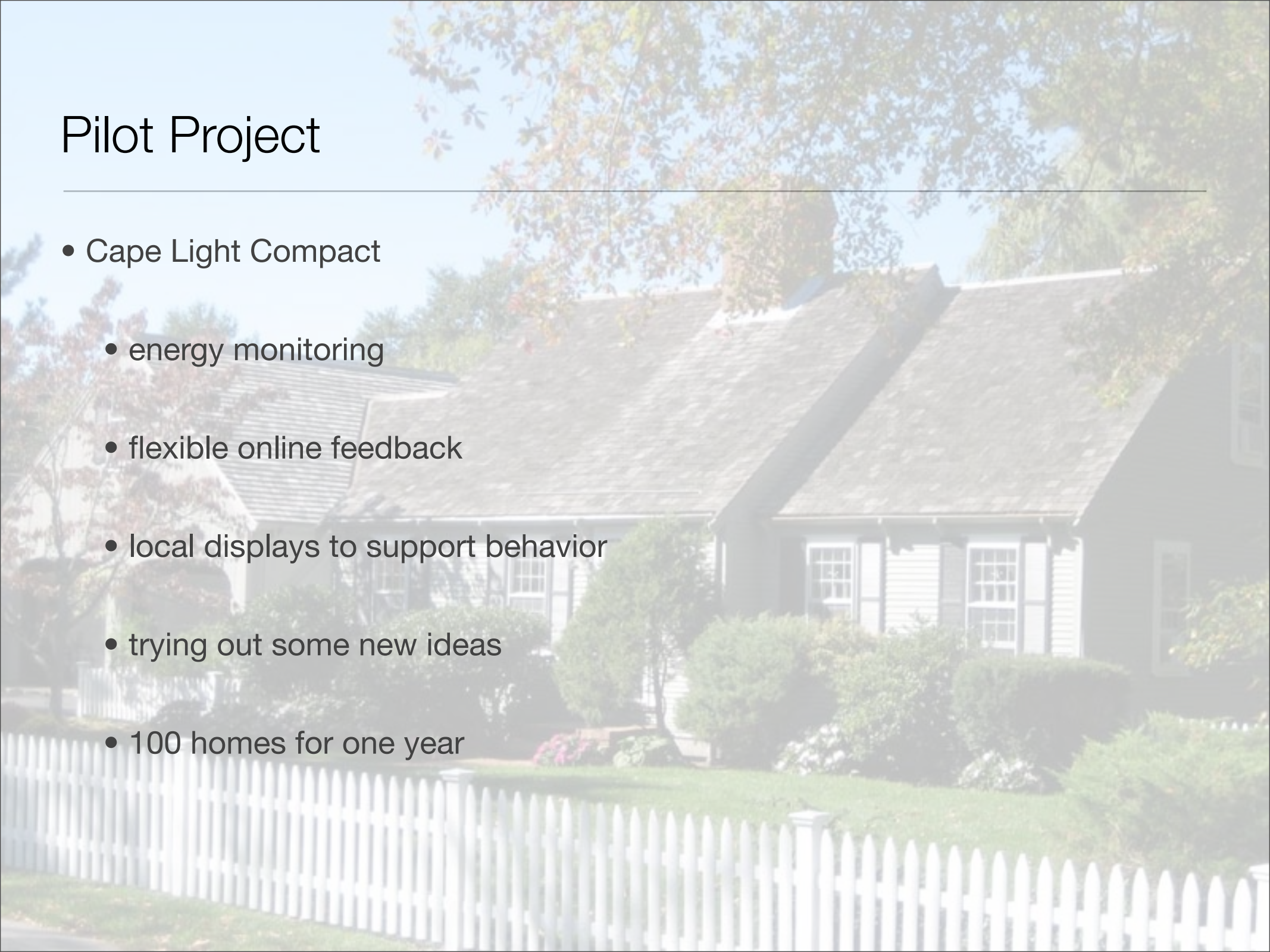


Beware Behavioral Fantasies

- We're all guilty of creating technology without knowing impacts
- ECD: engineer centered design
- What we can do with tech vs. what we ought to do which may be no tech at all
- gadget-driven tasks
Keeping track of electricity pricing on your phone
- interfaces that can't pass the grandma test
- The fantasy of a fixation on energy to the exclusion of your actual life.
"I'm using too much power!"

Pilot Project

- Cape Light Compact
 - energy monitoring
 - flexible online feedback
 - local displays to support behavior
 - trying out some new ideas
 - 100 homes for one year



Thank you!

