

# Lab Equipment Energy Consumption & Conservation Opportunities

Rashmi Sahai

Assessments Program Manager

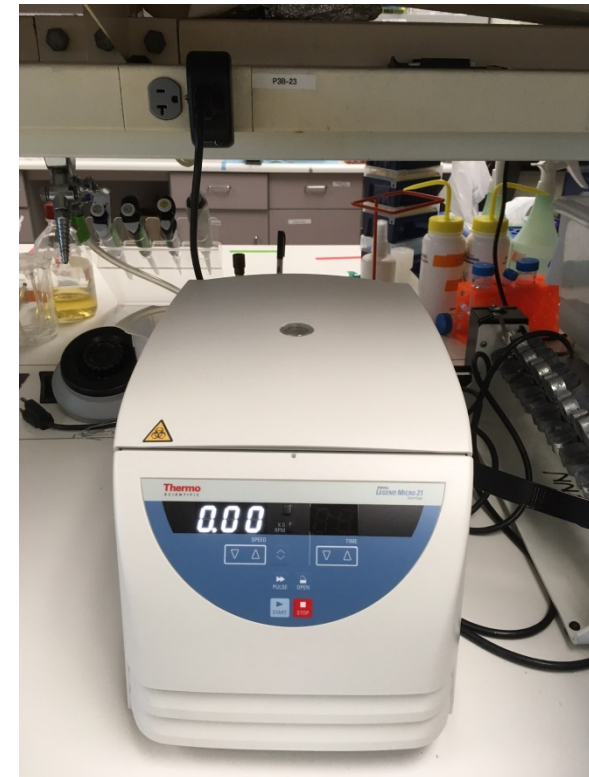
Sustainability and Energy Management

Stanford University

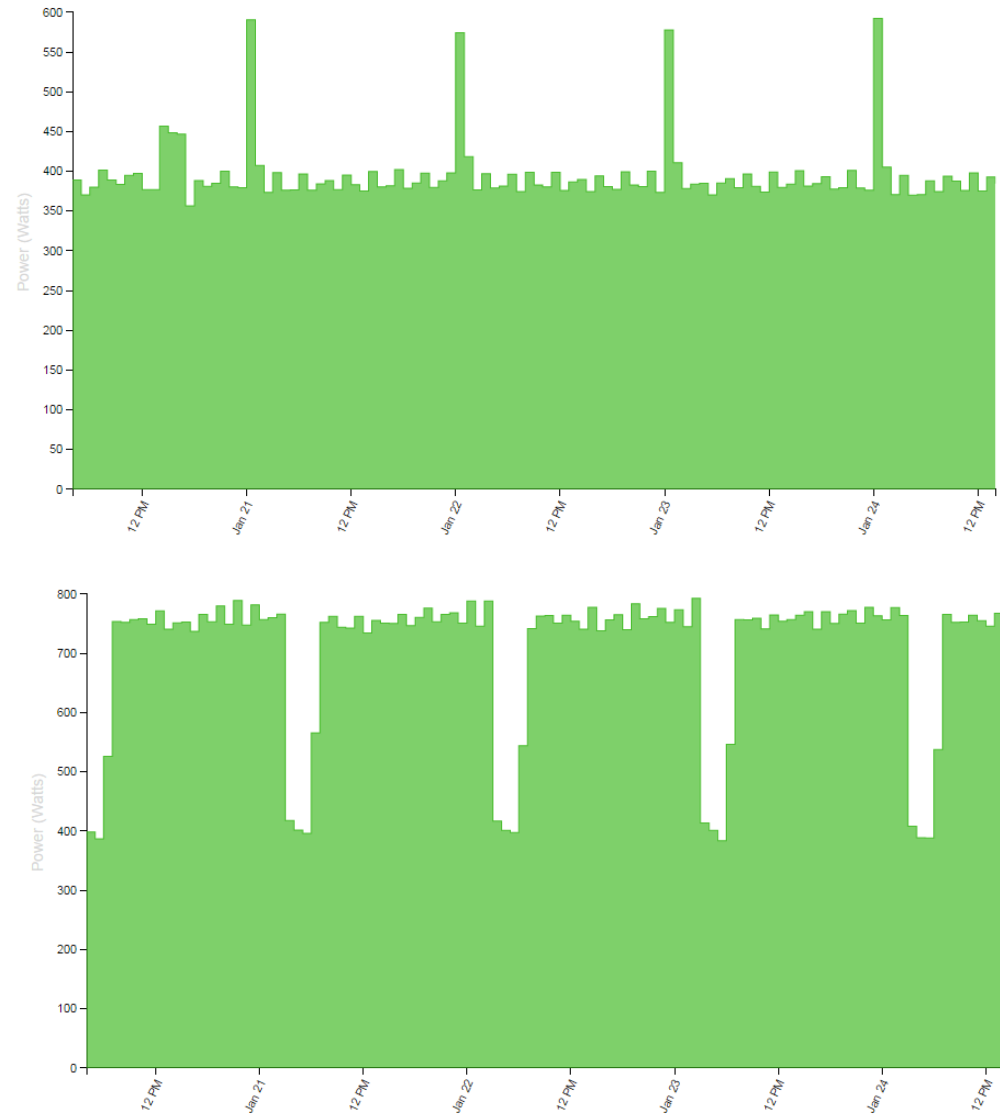


# Study Overview

- **Purpose:** understand energy consumption and usage patterns, and test out energy conservation opportunities
- **Partners:** Electric Power Research Institute (EPRI), My Green Lab, Ibis Networks
- **Funding:** CEC grant
- **1** School of Medicine Building (focusing on stem cell research)
- **114** pieces of equipment metered, representing 7 labs and 6 shared equipment hallways
- **23** pieces of equipment put on schedules

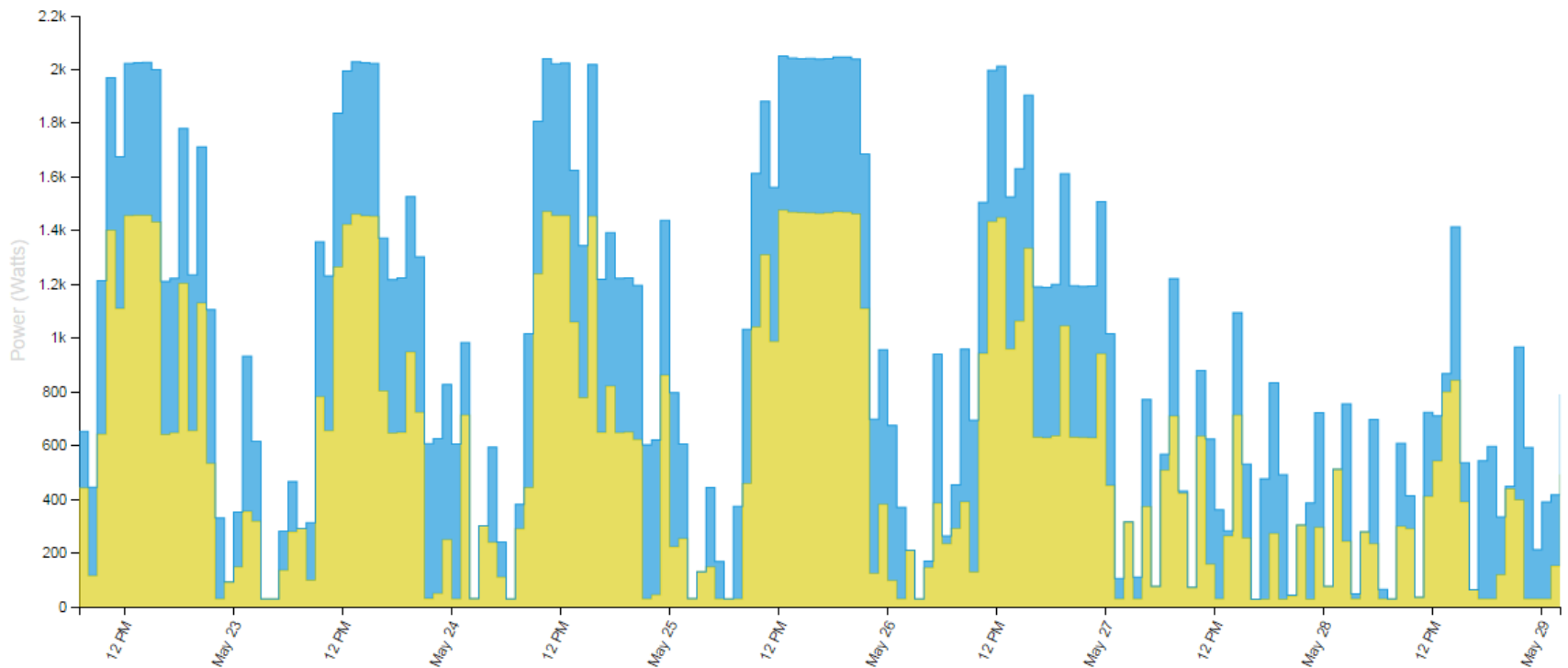


- 2 metered
- Used for cutting cell tissue, which need to be cold when cut
- Draws 400-700 W continuously → 10-16 kWh/day
- Possibly good candidate for timer
- Be aware of defrost at night



# Ice Machines

- 4 metered
- Consume  $\sim 4\text{-}6$  kWh/day  $\rightarrow$  good candidates for incentivizing energy efficient options



# Bio-safety cabinets (Class II)

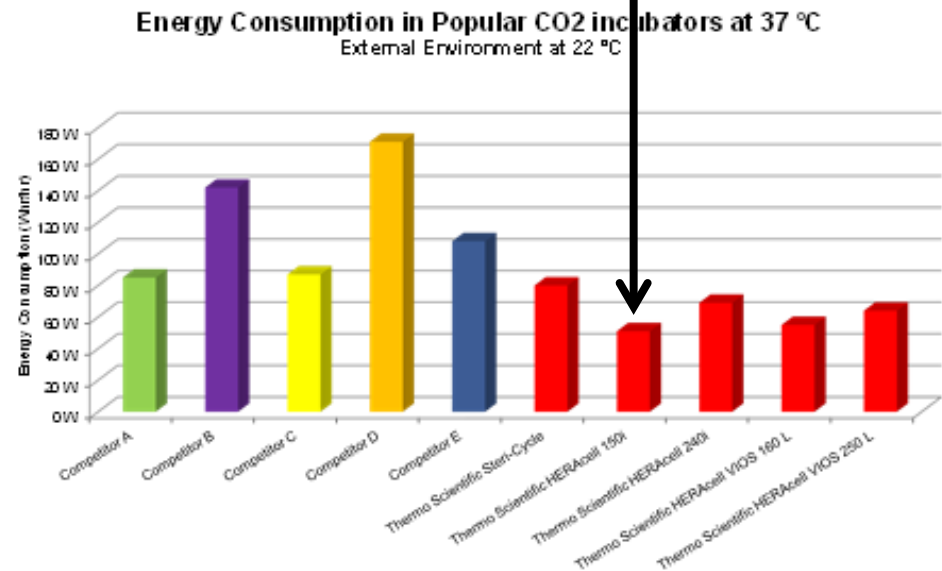
Brand	Liner Feet	Standby-mode Power Draw
SterilGARD	6 ft.	50 W
SterilGARD	4 ft.	50 W
Baker SterilGARD (supposed to be energy-efficient)	6 ft.	140 W
Baker SterilGARD (supposed to be energy-efficient)	4 ft.	110 W
Thermo Scientific 1300 Series A2 Bio-safety Cabinet	4 ft.	25 W

Some labs are ok with completely turning off bio-safety cabinets and others are not.

Power draw highly variable: 10-300 W, depends on size, temp., and function

- CO<sub>2</sub> incubators almost always on (1 metered)
- Non-CO<sub>2</sub> incubators act more like ovens → can be turned off depending on use (1 metered)
- Incubator shakers – can be turned off depending on use, but timers could interrupt long shaking periods (2 metered)

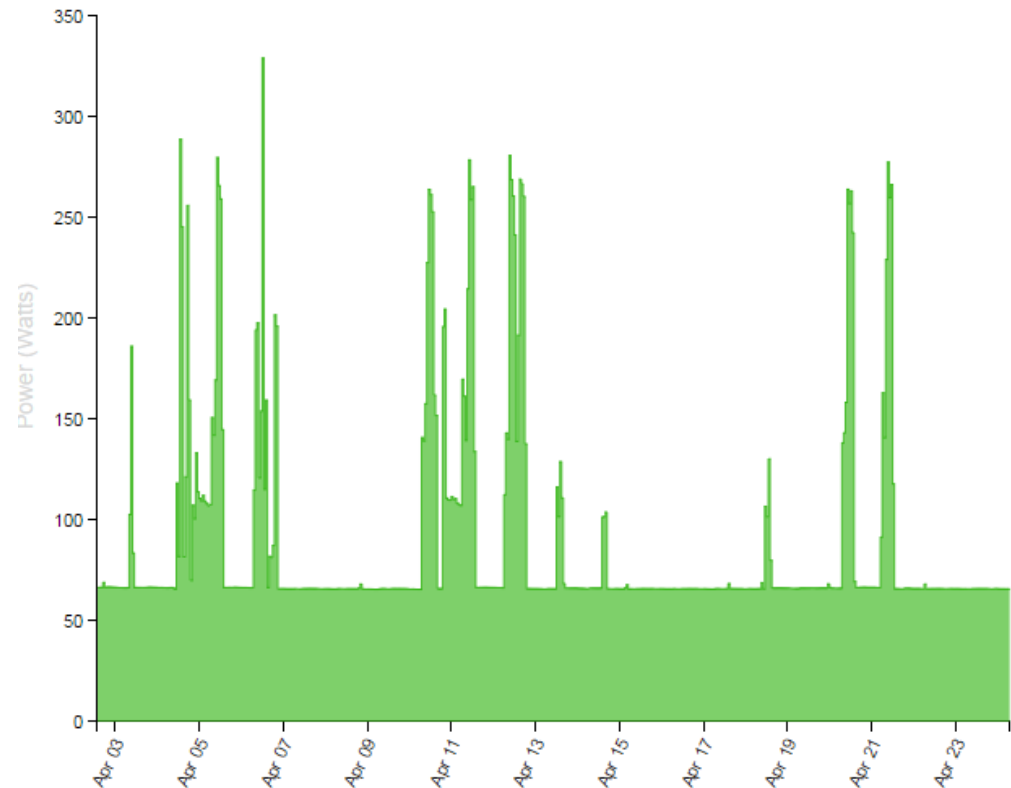
We found the Thermo Scientific HERAcCell 150i Incubator to consume 75 W at 37 deg. C



# Thermal Cyclers (type of PCR machine)

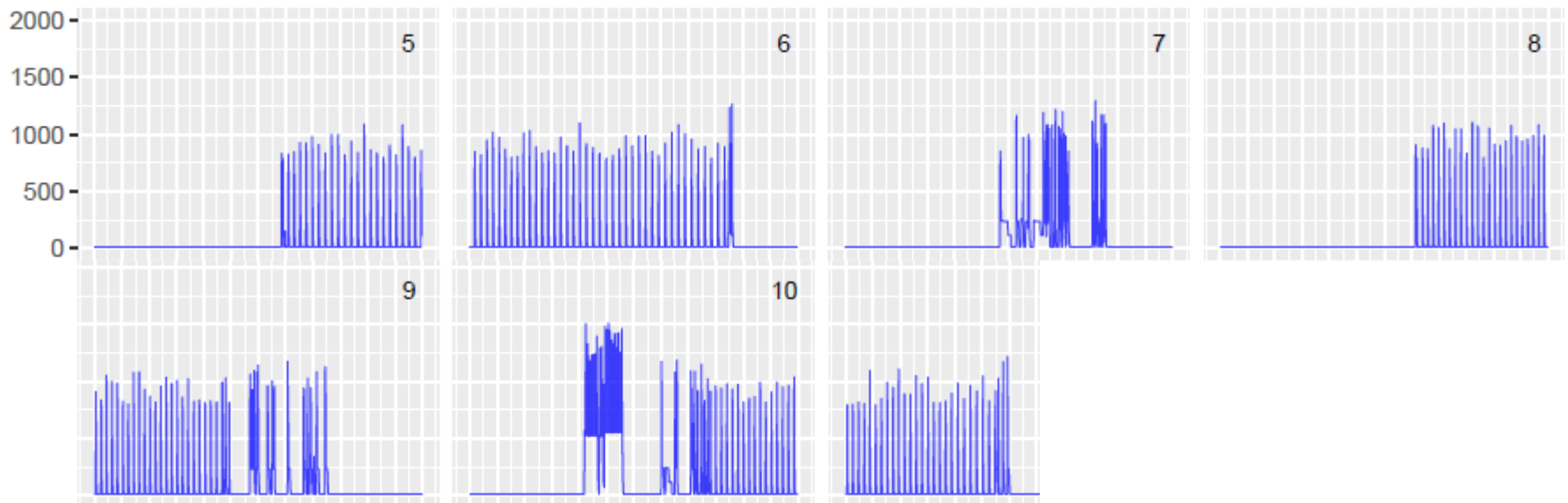
- 9 metered
- 30 – 70 W when not cycling, depends on temp. setpoint
- Set to run for a certain time (often overnight) → therefore not good candidate for timer

One energy conservation option is to have default temp. setpoint be room temp., but some like to keep samples in overnight.



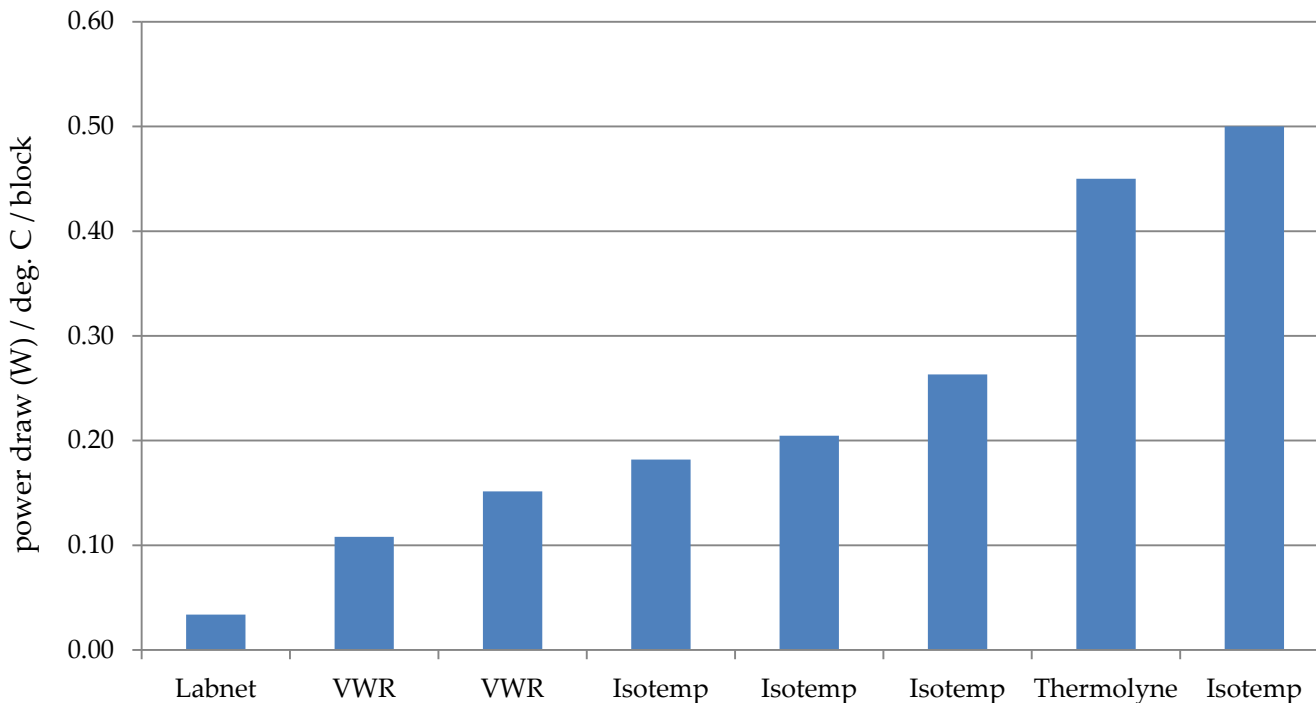
# Thermally-controlled Centrifuges

- 34 metered
  - 10 Floor
  - 13 Benchttop
  - 11 Micro
- Power draw varies considerably when not in use, varies by size, brand, and setpoint temp.: 6-50 W
- Some lab occupants leave -4 deg. C temp. setpoint when not in use → leads to high energy consumption / savings potential
- 11 set on timed schedule, avg. energy savings of 90 kwh/centrifuge/yr

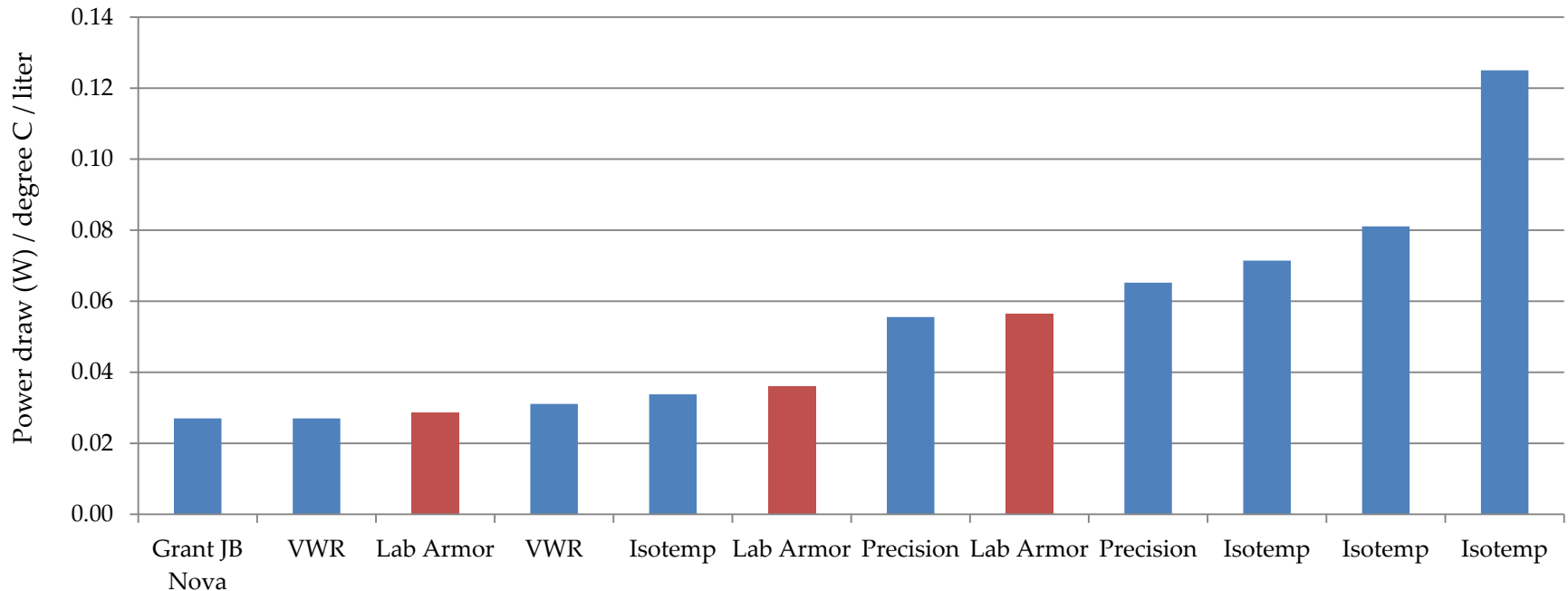




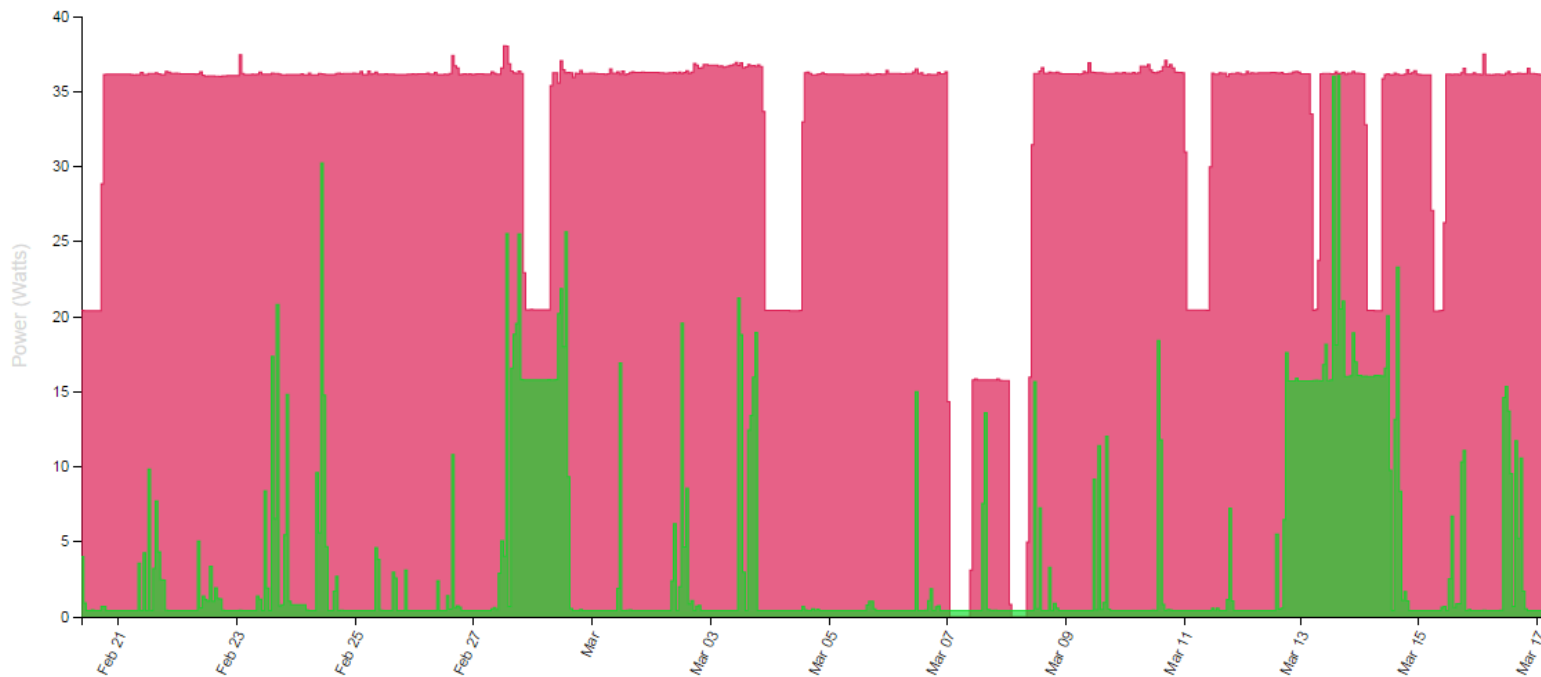
- 15 metered, comparable data for 8
- Power draw: 2-50 W, main driver is temp.
- 6 put on timed schedule—avg. energy savings of 80 kWh/heating block/yr.
- Did see pattern by brand. Worth investigating further.



- 21 metered, comparable data for 12
- Power draw: 2-50 W, main driver is temp.
- 4 put on timed schedule—avg. energy savings of 70 kWh/water bath/yr
- Did not see pattern by brand—Lab Armor water baths not significantly more efficient than normal water baths



- 8 metered
- LED technology - consume up to 20 W when on
- Some labs leave microscopes on at all times → good candidate for timer
- Often accompanied by cell counters (3 included in our study)—consume 8-30 W when on



# Other Equipment

Name	Power draw when in use (W)	Power draw when not in use (W)	Good candidate for timer?
Imager	100	100	Yes
Photo Developer	200	0	No
Plate Washer	45	20	Yes
Plate Reader	75	75	Yes

- Do your own metering when evaluating energy consumption across models
- Be careful to compare across brands—often labs have preferred brand and energy consumption is more a result of lab culture than brand
- Specialized equipment is worth investigating
- Shutting equipment off at night is a key conservation measure
- When talking to labs about shutting equipment off at night, its better to ask to the individual researcher directly than the lab manager

Rashmi Sahai  
Assessments Program Manager  
Sustainability and Energy Management  
Stanford University  
[rsahai@stanford.edu](mailto:rsahai@stanford.edu)  
650-736-7636