Studying a Vacant Building: Heitman at UC Davis

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How do we reduce energy while vacant?

Issues

- ✗ Wasted energy use
  - ✗ Weekends, holidays
- ✗ Especially widespread during pandemic

Goals

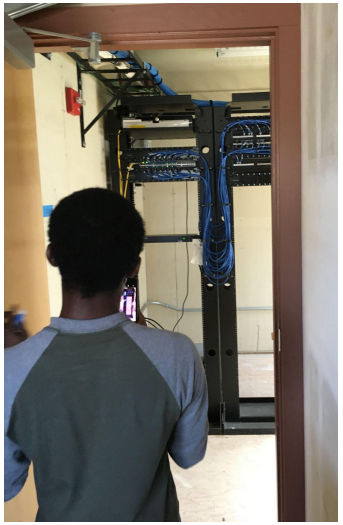
- Find out causes and link them
- Develop energy conservation strategies
- Possible application to other campus buildings

Heitman Staff Learning Center

Client: Dr. Alan Meier
Energy and Efficiency Institute

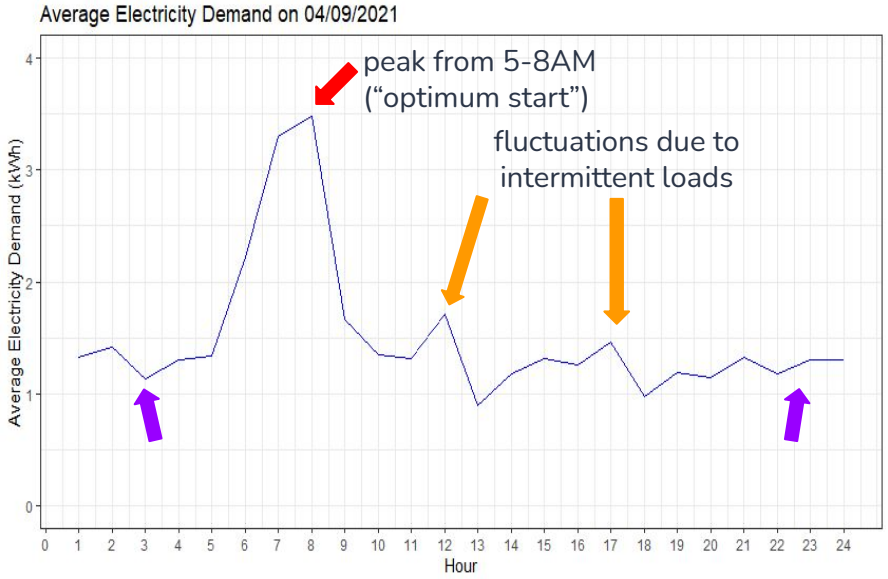
Methodology

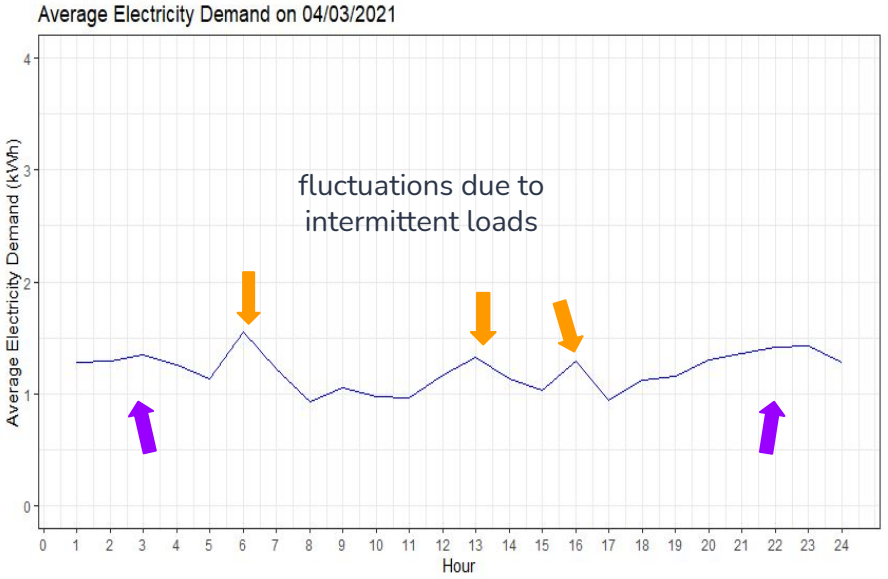
- Energy Audits
  - Major and minor appliances
  - Plugged and unplugged loads
  - Sensors, lights, thermostat
  - HVAC and water heater
- Quantified MELs
  - Vampire loads - computer chargers, portable heaters, printers, etc.
  - Link usage data to specific appliances/MELs
- Sources of data
  - Plug load monitors
  - Equipment nameplates
  - Pelican SWARM Thermostat Data
  - HVAC Data
    - Schedule



Results and Findings: **Single-day** vacant data

- ✗ Friday, April 9th, 2021
- ✗ Saturday, April 3rd, 2021

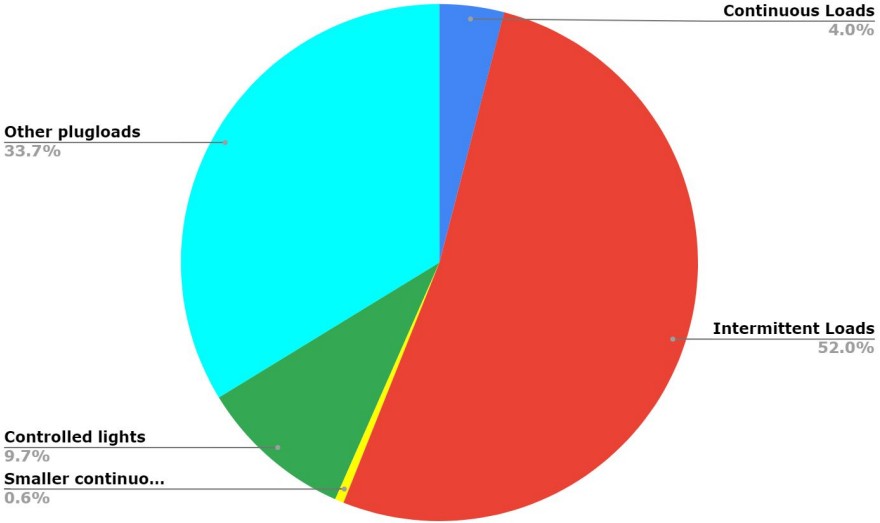




constant nighttime lighting
(approx 1.3-1.4kWh)

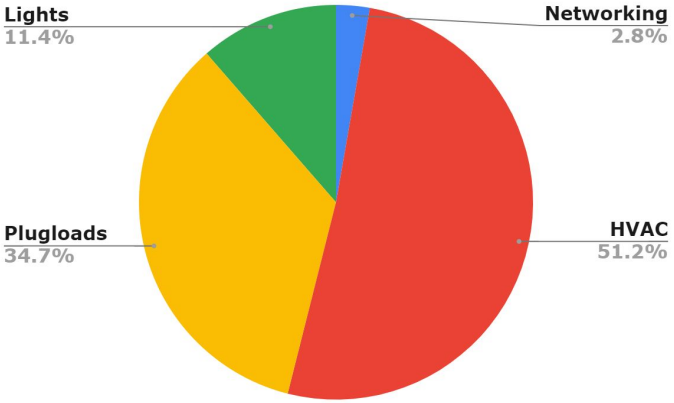
Results and Findings: **Week-Long** vacant data

Results and Findings



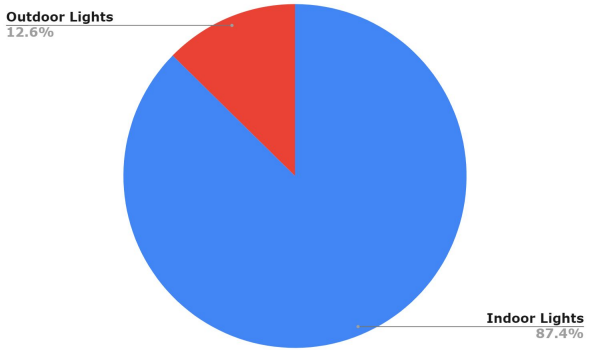
Energy Usage by Usage Time

✗ Intermittent Loads >50%



Energy Usage by Devices

✗ HVAC is >50%



Indoor vs. Outdoor Lights

✗ Majority indoor

Results and Findings

6 were found in the office space

Networking equipment. Always on!

1 out of 3 HVAC systems on the 2nd floor

Uncertainties and Additional Follow-Up

- ✗ Uncertainties
  - ✗ Unmeasurable Loads
    - Server rack energy use scheduling
  - ✗ HVAC Scheduling
    - Intermittency throughout the day
- ✗ Follow-Up
  - ✗ Observe when building is in use
  - ✗ Occupancy levels
  - ✗ Ambient temperature comfort levels
    - Foot heaters
  - ✗ Water fountain compressor data

Recommendations

- **HVAC System**
  - Keep heating and cooling schedule OFF
- **Water Heating and Pumping System**
  - Non-residential building
  - Keep system OFF
  - Applicable to other buildings
- **Server Rack Temperature Regulation**
  - Analyze server rack cooling requirement; adjust on A/C unit
- **Outdoor Lighting**
  - Depending on safety - put OFF lights during the night
  - Change light to more efficient bulbs

Water heater pump

Heitman night lighting

Conclusion

- ✗ Heitman is generally energy **efficient**
  - ✗ Still has room for improvement for **conservation**
- ✗ Save 3282 kWh energy per year
- ✗ Opportunities to apply savings strategies in other buildings

Bibliography

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[3] Rauch, E. M. (2011). Assessing and Reducing Miscellaneous Electric Loads (MELs) in Lodging (PNNL-21055, 1034592; p. PNNL-21055, 1034592). https://doi.org/10.2172/1034592

Thanks!

We are open to any questions or comments!