

Energy & Store Development Conference

E+Scd 2014

September 7-10, 2014
St. Louis Union Station Hotel
St. Louis, MO



THE VOICE OF FOOD RETAIL 

Net Zero Store Update

**Jamie J. Meyers, LEED AP, Manager of
Sustainability, Walgreens**

**Rob Olden, CEM, Director of
Engineering, North America, GE Energy**

20% IRR over 5 years

120,000 kWh in refrigeration

14,820 SF of roof space

15/7/365

Technology

Footprint

Precedence

Brand Reputation

Technology



Technology





Technology

First Solar Project in
2008

Now have 150, with
200 more on the
books

First LEED Project in
2009

Now in LEED Volume
Program

First all LED store in
2010

All new stores receive
an LED lighting
package

Footprint

8,215

120,000,000

28W to 25W

\$765/year/store

$$\$765 \times 8,215 = \$6,284,475$$

Precedence

7,665 kwh

41,000,000 kWh

46,300 kwh

138,000,000 kWh

37,000 kwh

148,000,000 kWh

Brand Reputation

Walgreens
AT THE CORNER OF **HAPPY** & **HEALTHY**®

“Everyday I help people get, stay, and live well.”

1. Energy Produced – Energy Consumed > 0

2. Operate like a normal Walgreens

3. Share our learnings

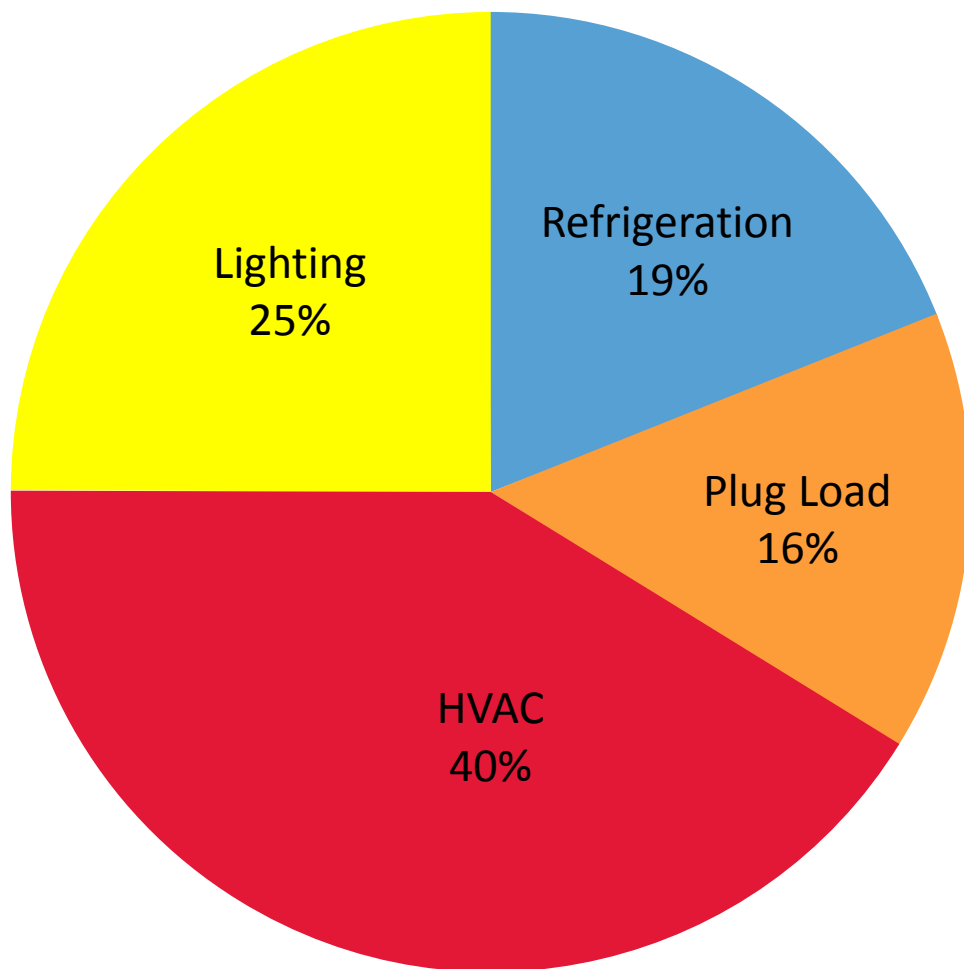
Close proximity to corporate office

A cooperative developer

A supportive community

Correct timeframe





100%

90%

80%

70%

60%

50%

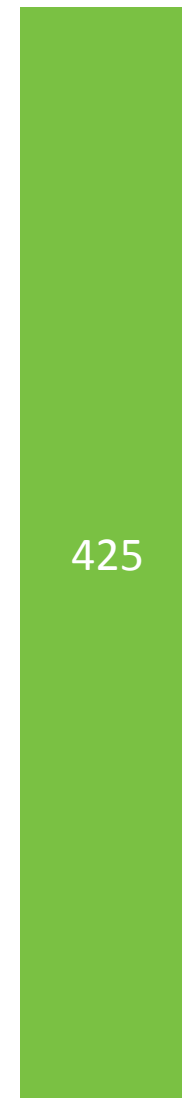
40%

30%

20%

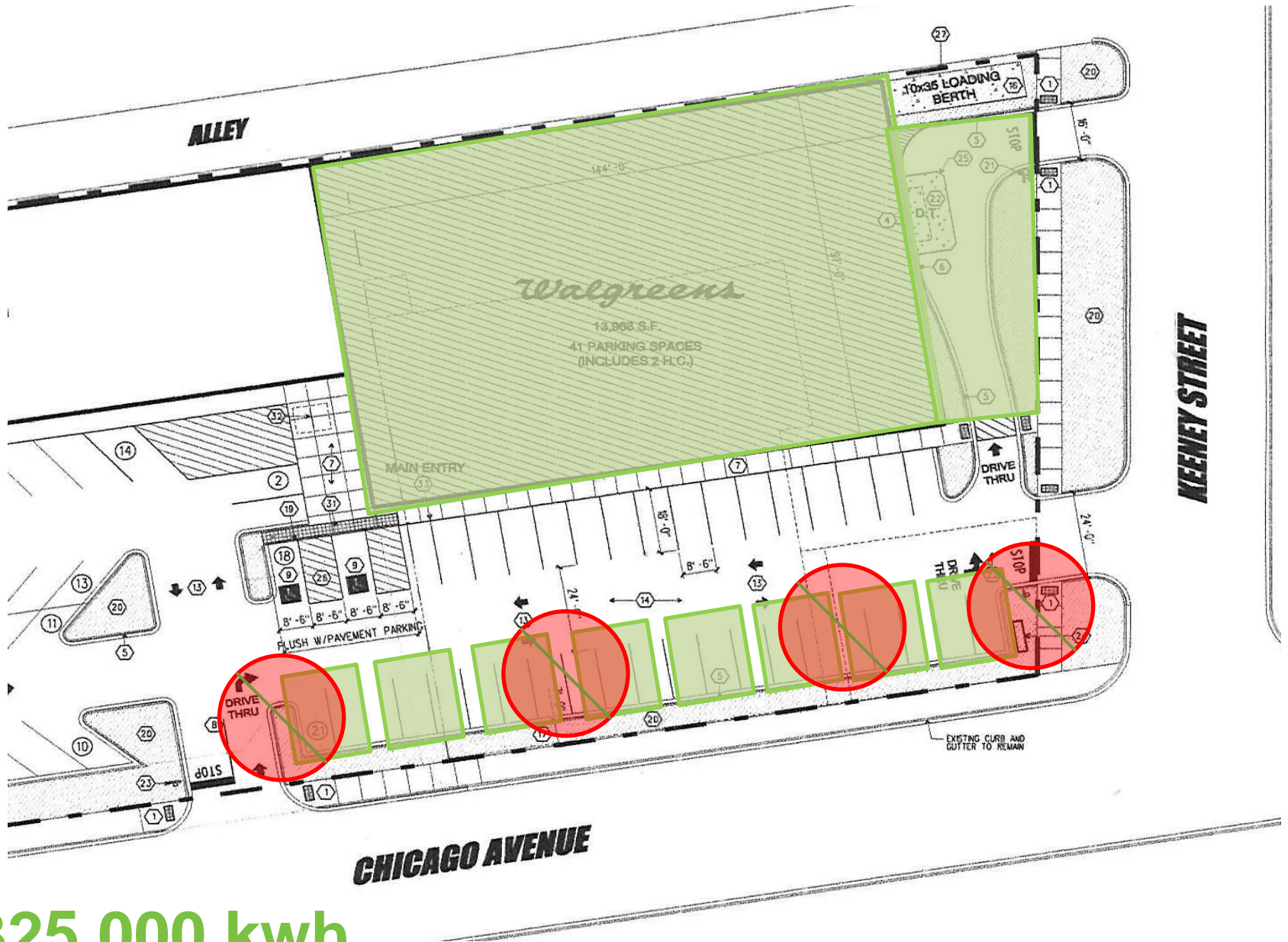
10%

0%

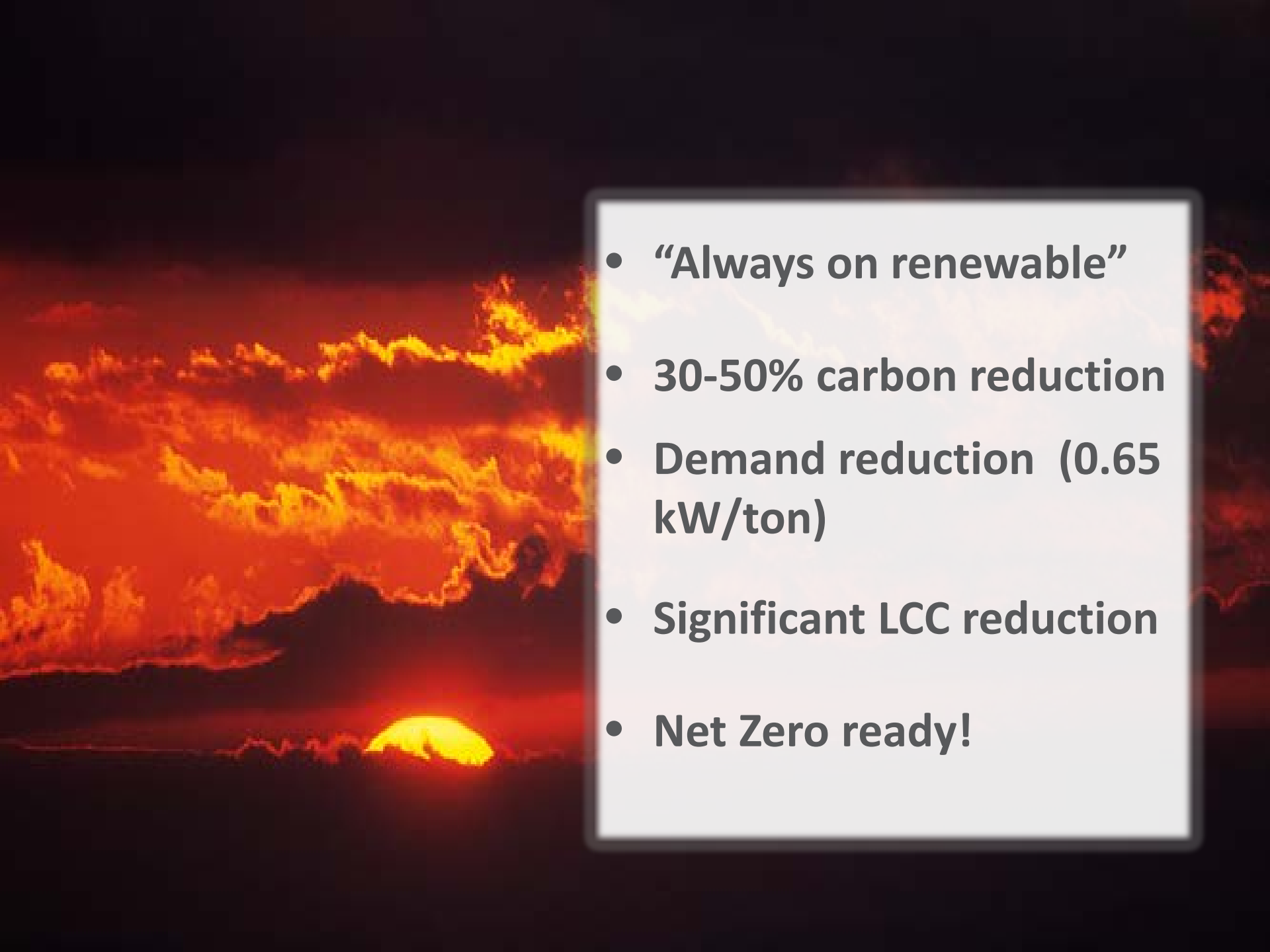


Total Energy
Use (Mwh)

$$0 - 425,000 \text{ kwh} > 0 \quad \times$$



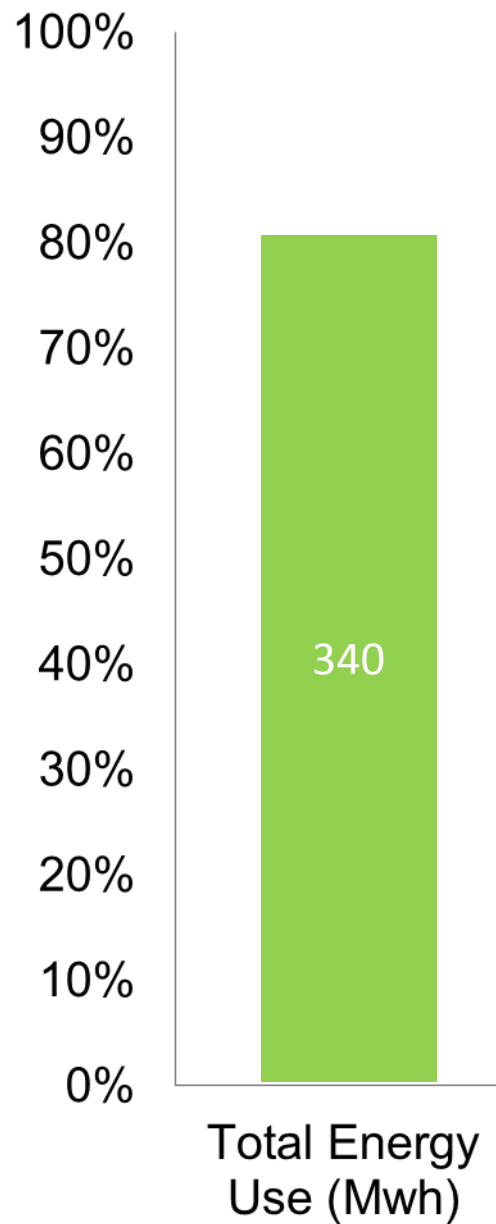
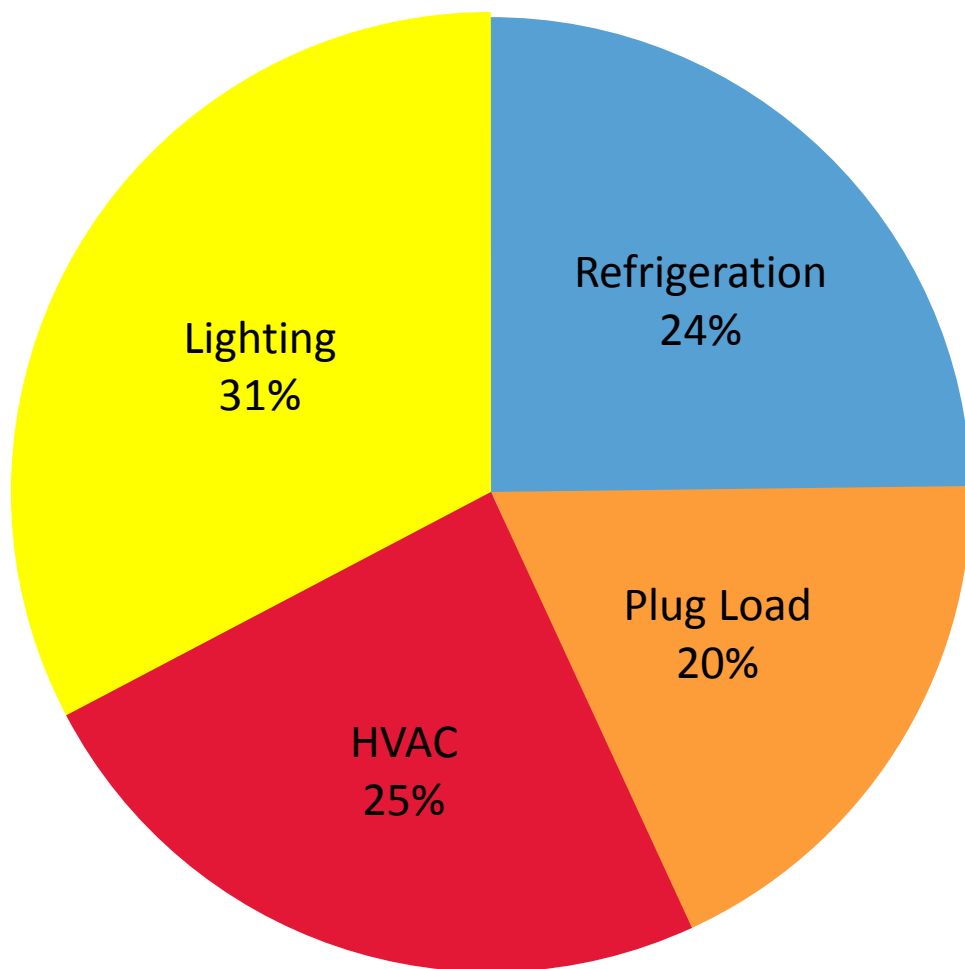
325,000 kwh

- 
- **“Always on renewable”**
 - **30-50% carbon reduction**
 - **Demand reduction (0.65 kW/ton)**
 - **Significant LCC reduction**
 - **Net Zero ready!**



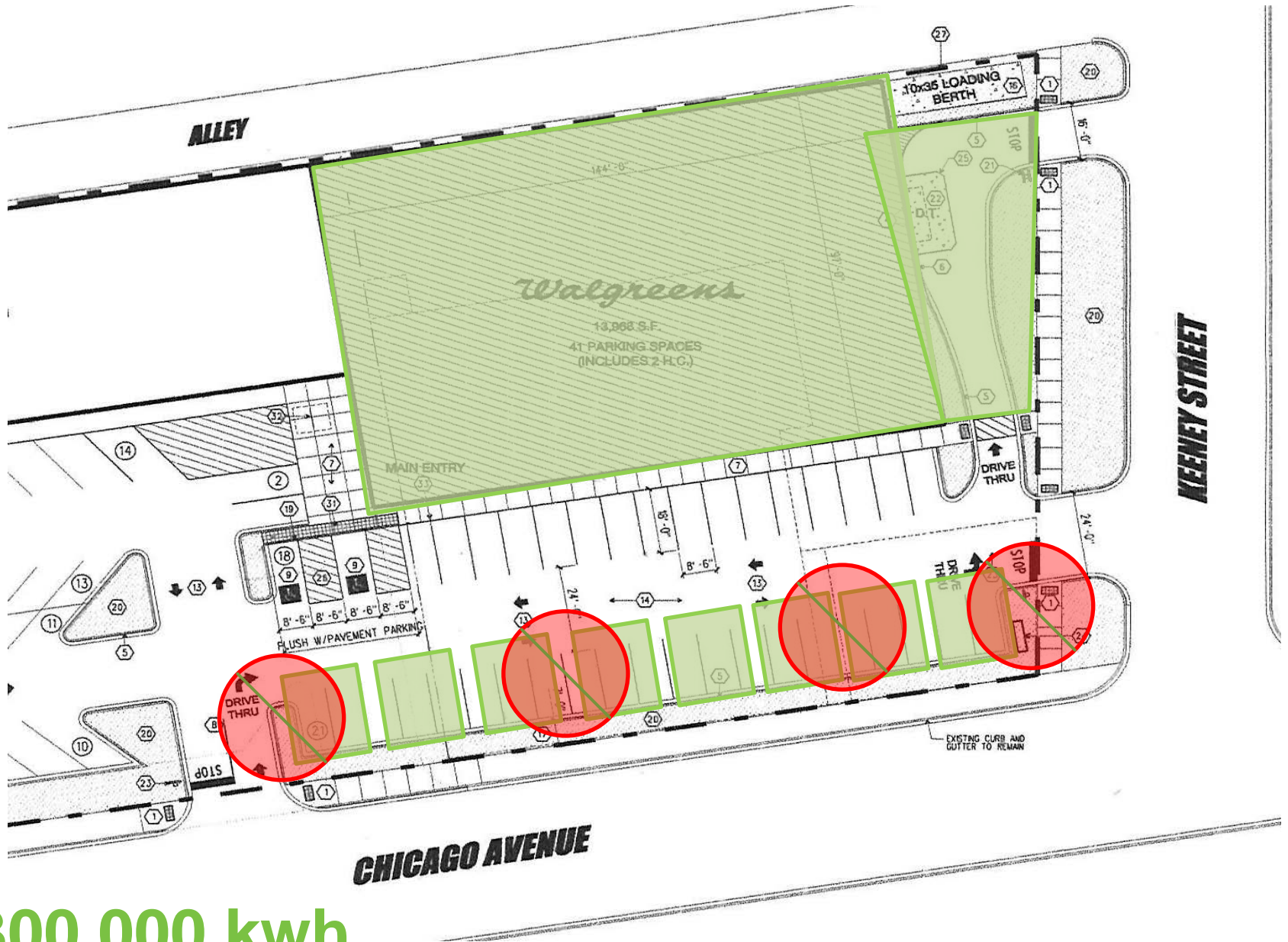






$$0 - 425,000 \text{ kwh} > 0 \quad \times$$

$$325,000 \text{ kwh} - 340,000 \text{ kwh} > 0 \quad \times$$



300,000 kwh



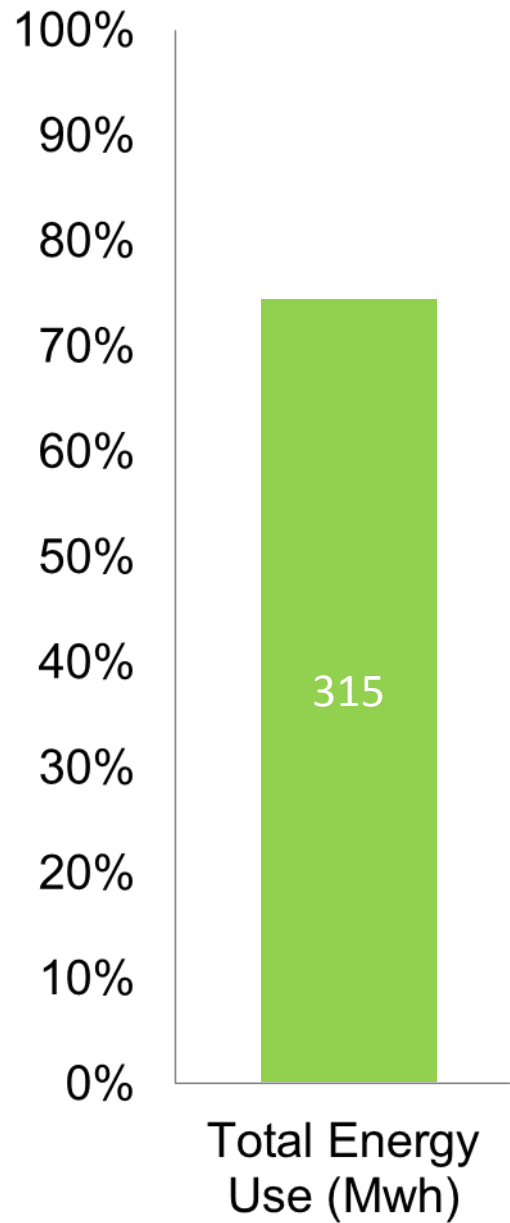
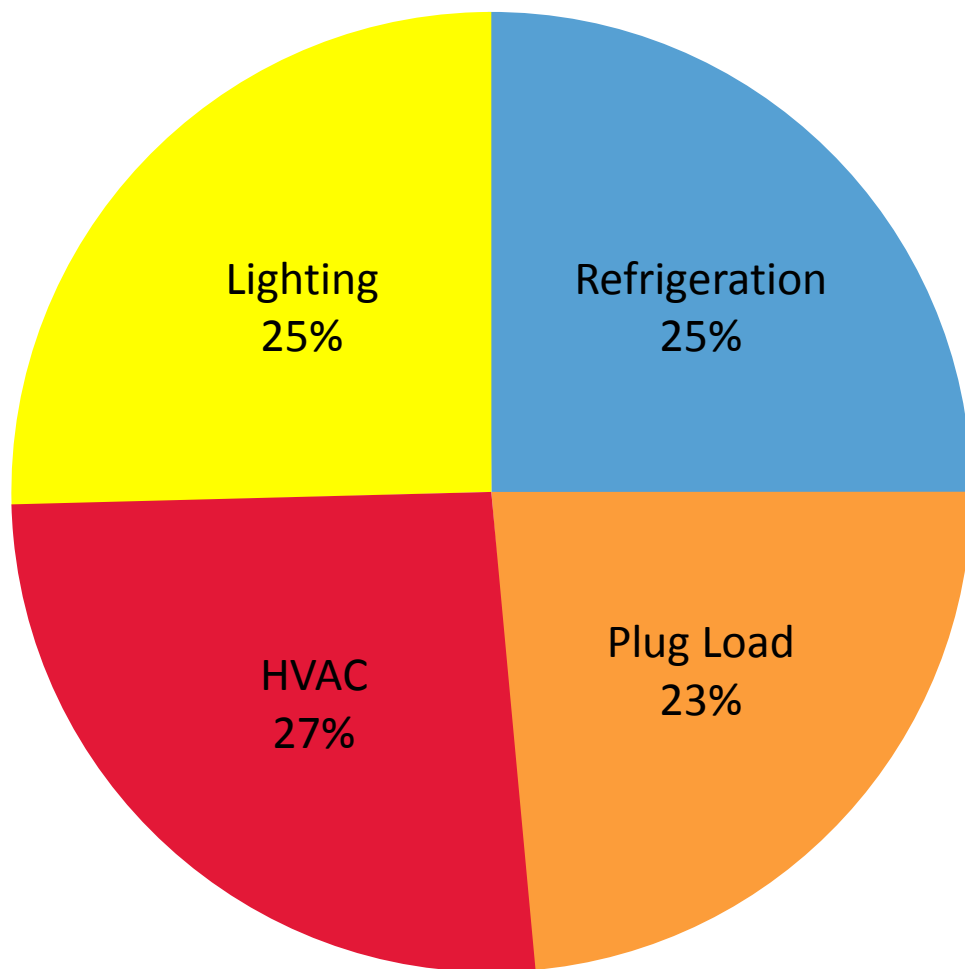
pharmacy

EXIT

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at the clinic

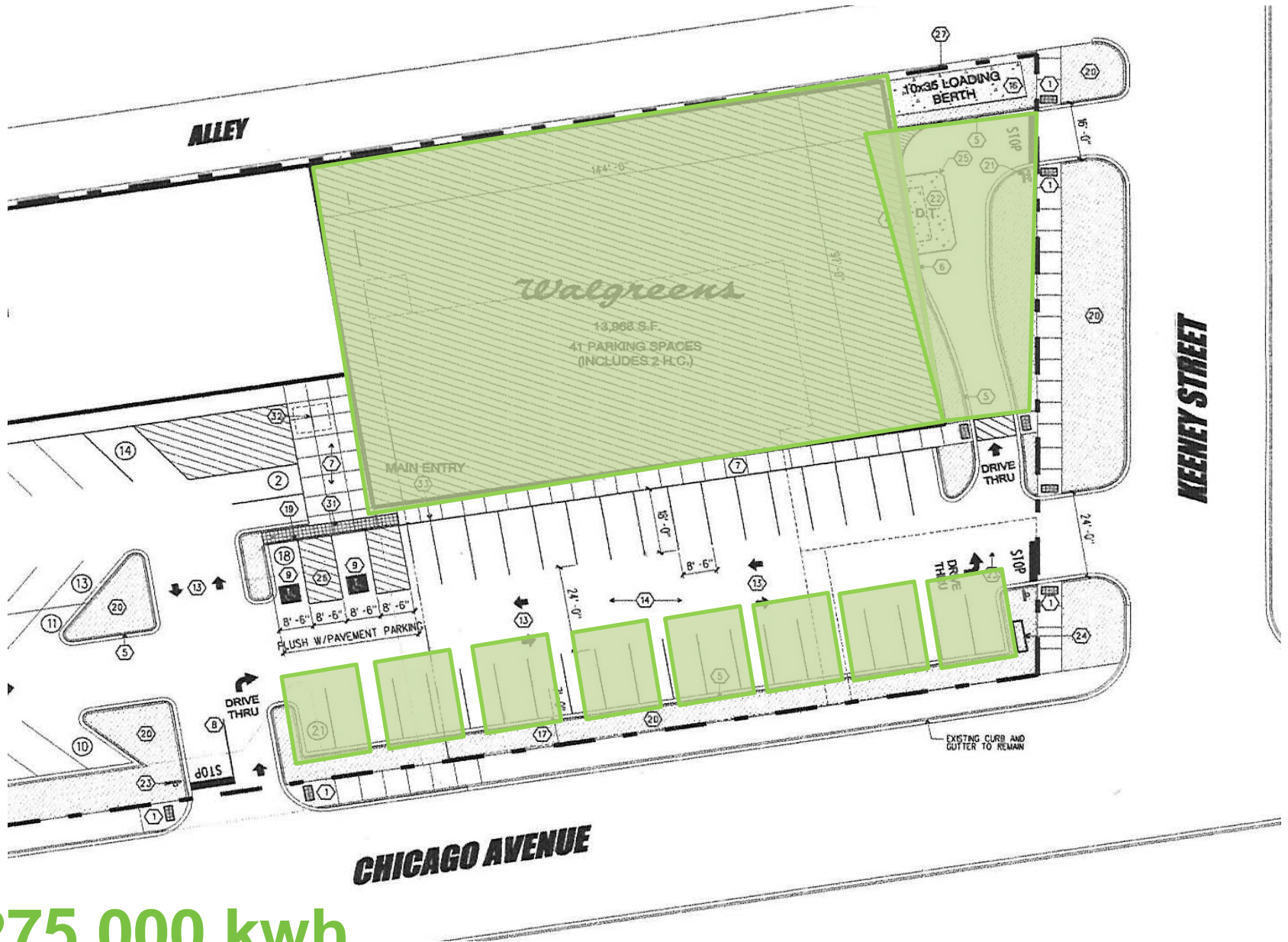




$$0 - 425,000 \text{ kwh} > 0 \quad \times$$

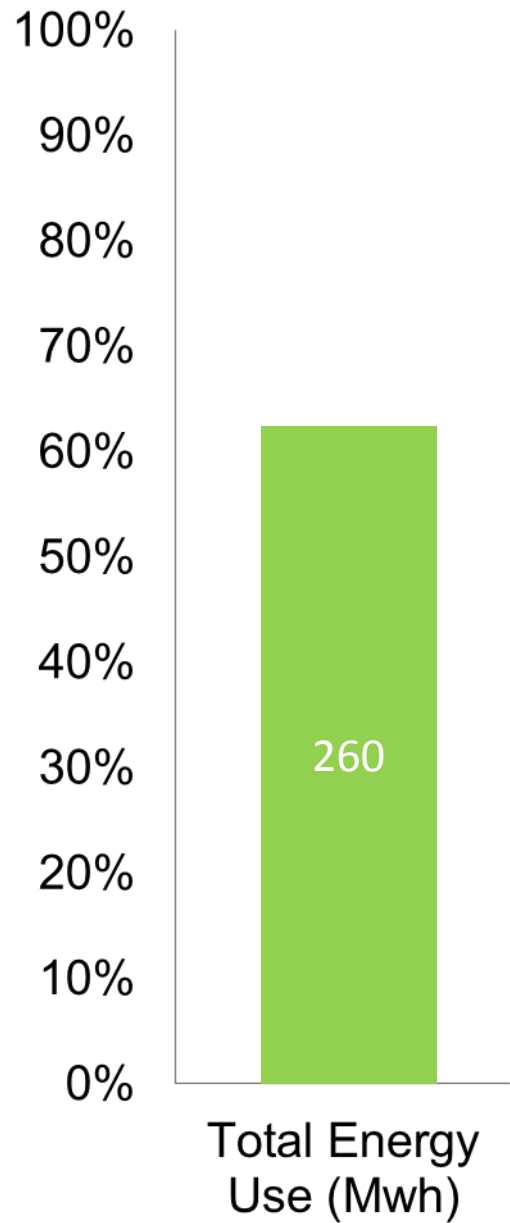
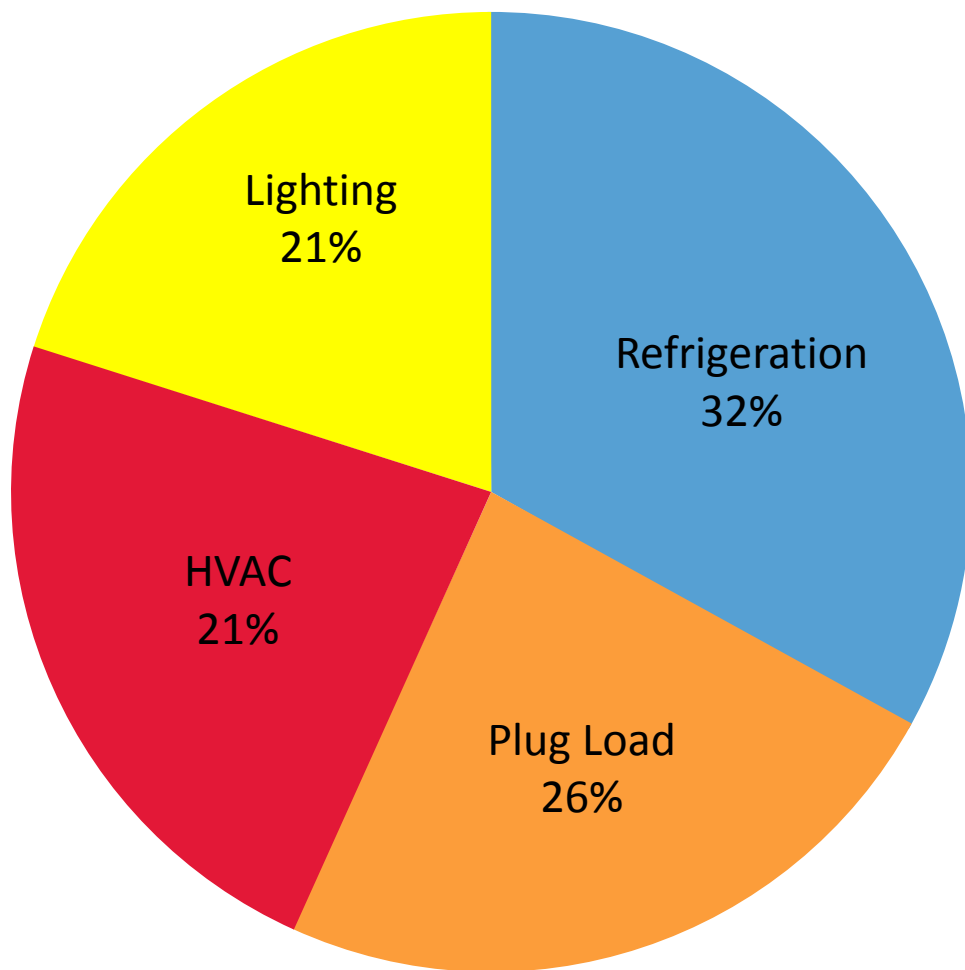
$$325,000 \text{ kwh} - 340,000 \text{ kwh} > 0 \quad \times$$

$$300,000 \text{ kwh} - 315,000 \text{ kwh} > 0 \quad \times$$



275,000 kwh



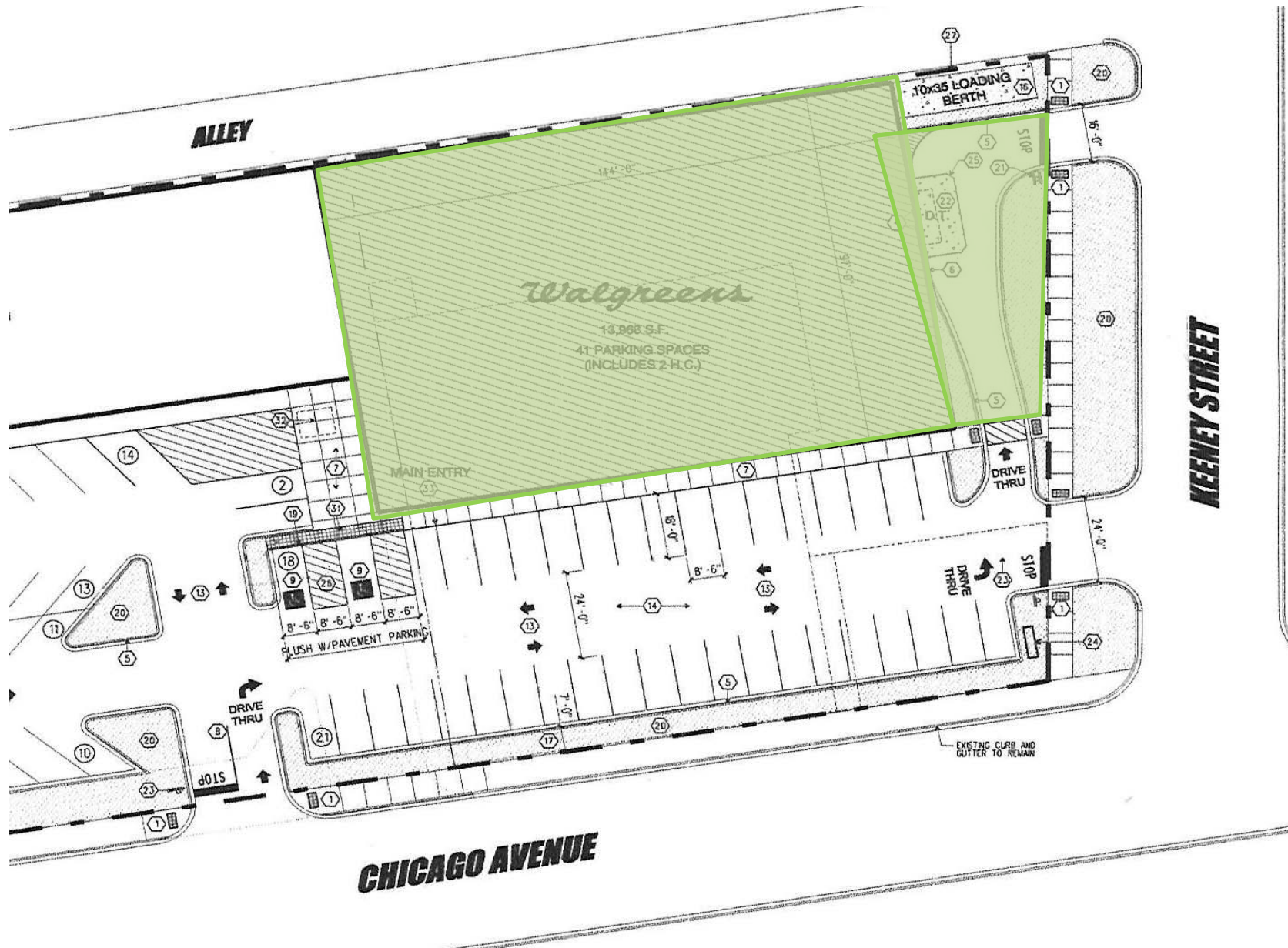


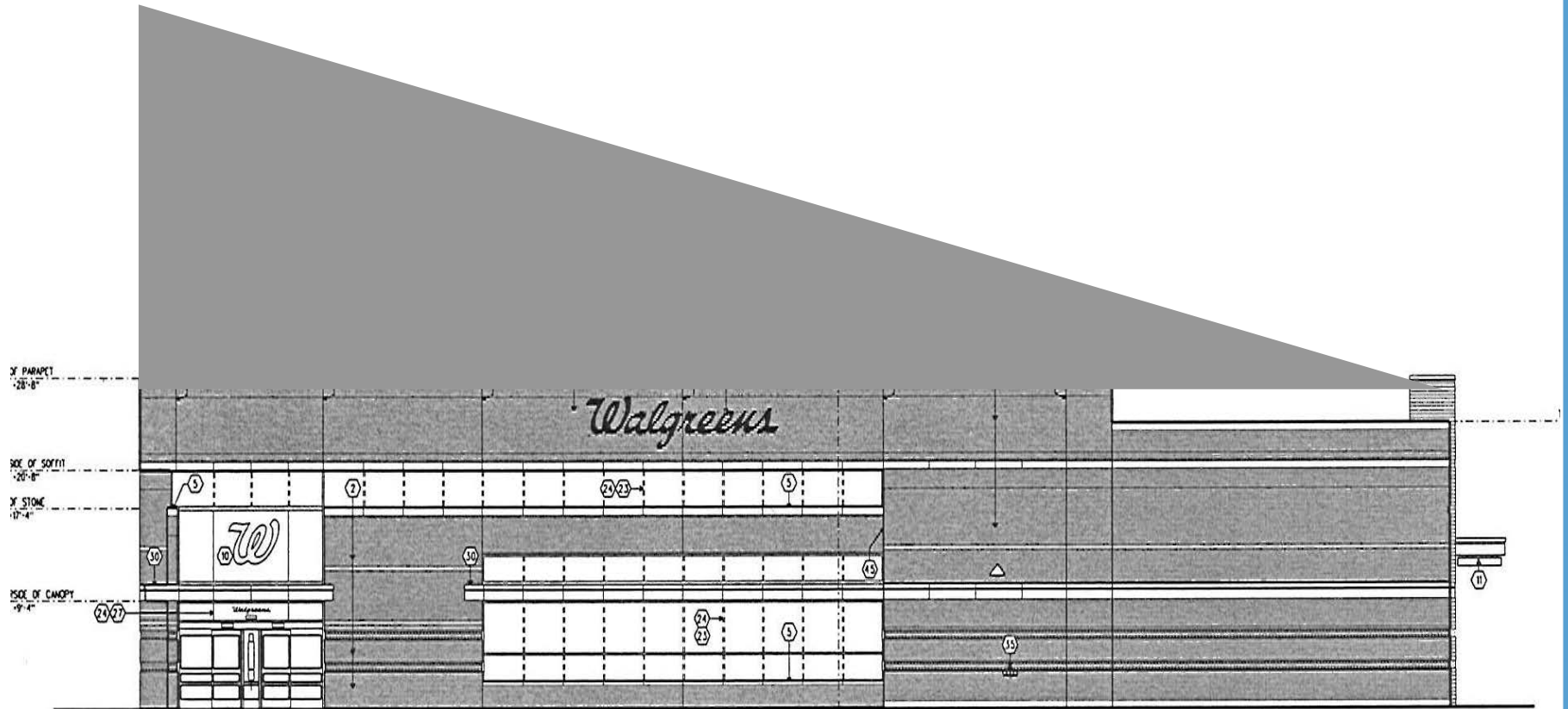
$$0 - 425,000 \text{ kwh} > 0$$

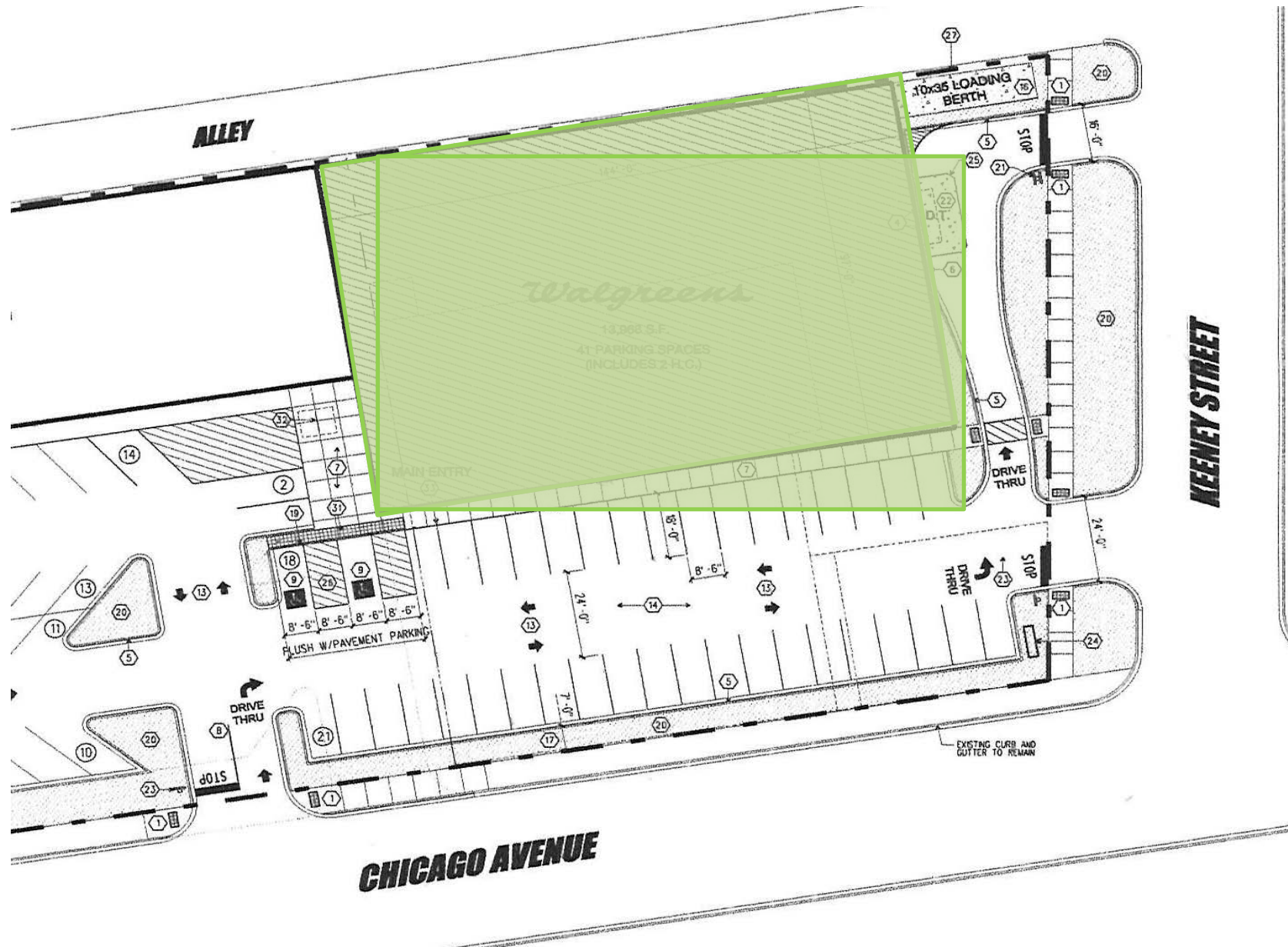

$$325,000 \text{ kwh} - 340,000 \text{ kwh} > 0$$

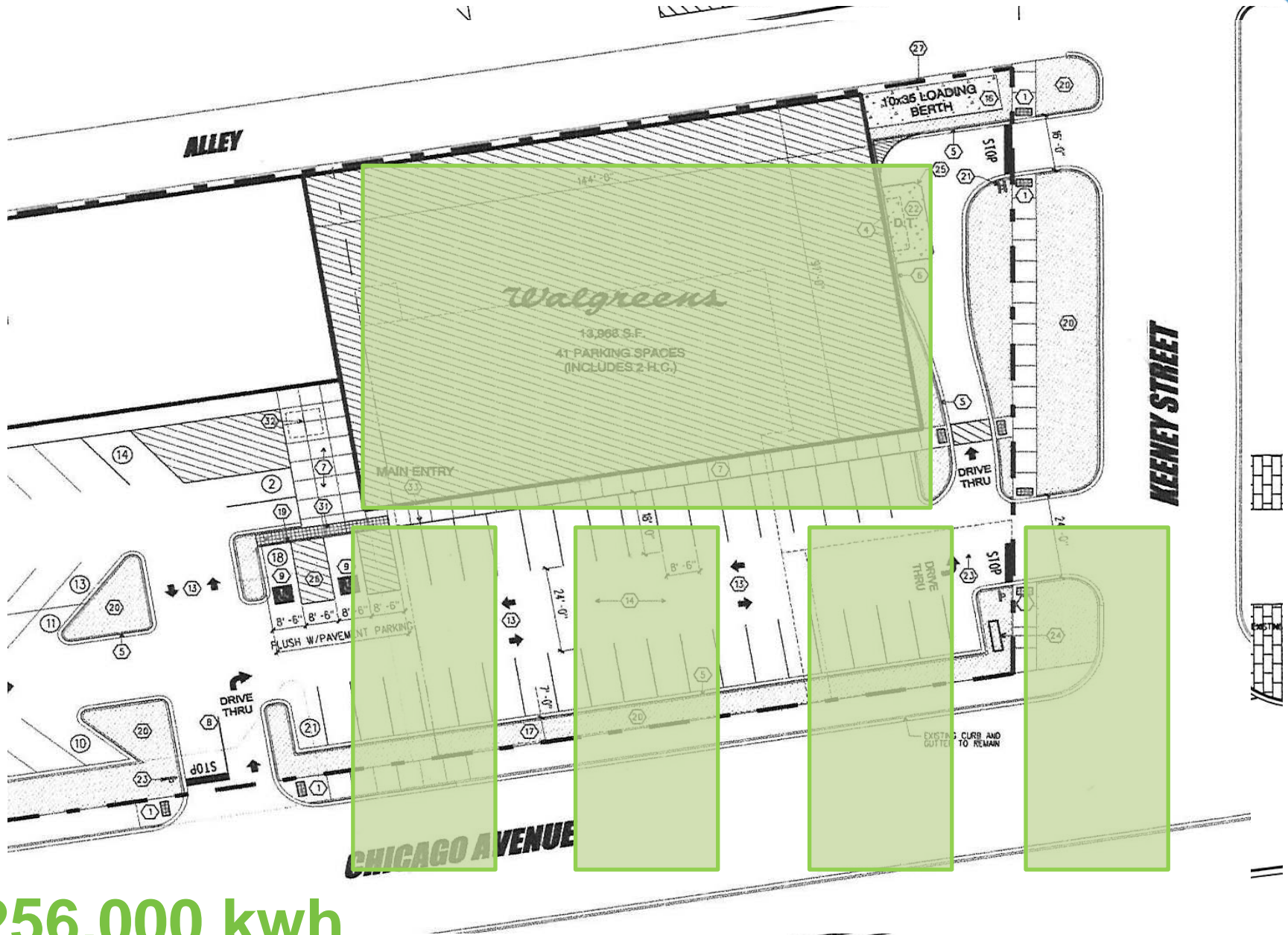

$$300,000 \text{ kwh} - 315,000 \text{ kwh} > 0$$


$$275,000 \text{ kwh} - 260,000 \text{ kwh} > 0$$







256,000 kwh

ed since 1901.



HOLIDAY VALUES

sale this week

WALG COUGH DROP MENTHOL 30S

Buy 1 at \$1.29 get 1

50% off*

Unit price 3.26 each on 2

Reg price \$1.29

*Select Walgreens

Cough, Cold or

Allergy products

Offer ends 11/27

©2019 Walgreens

NOV 27

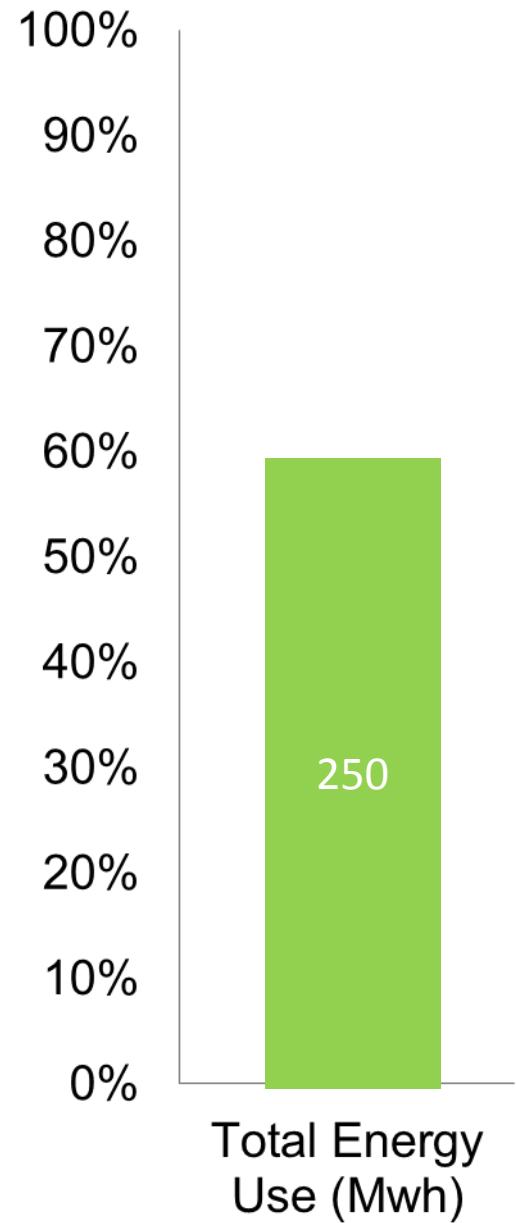
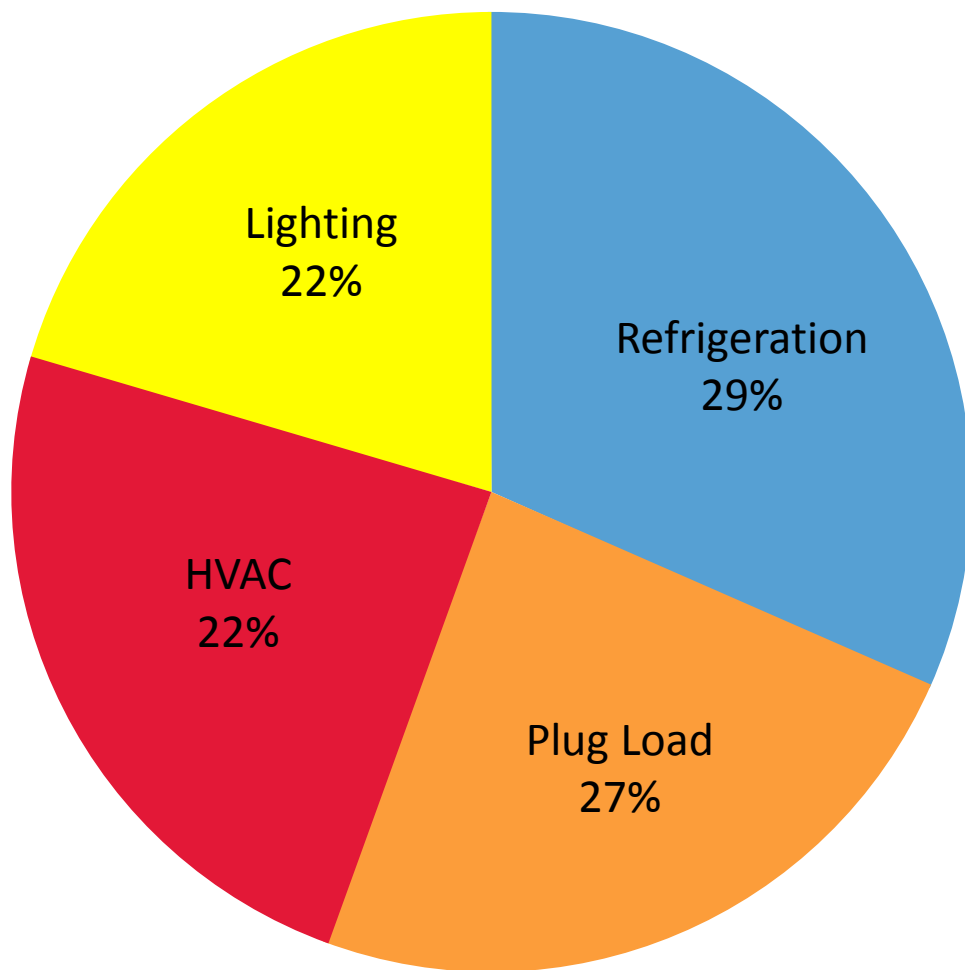
essentials

electronics

Walgreens



y



$$0 - 425,000 \text{ kwh} > 0$$

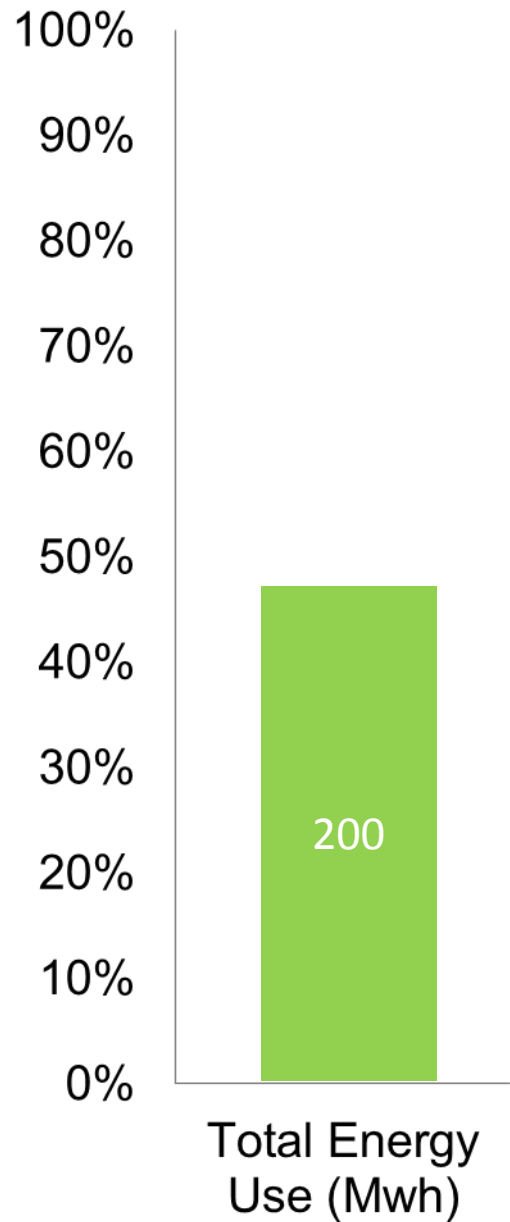
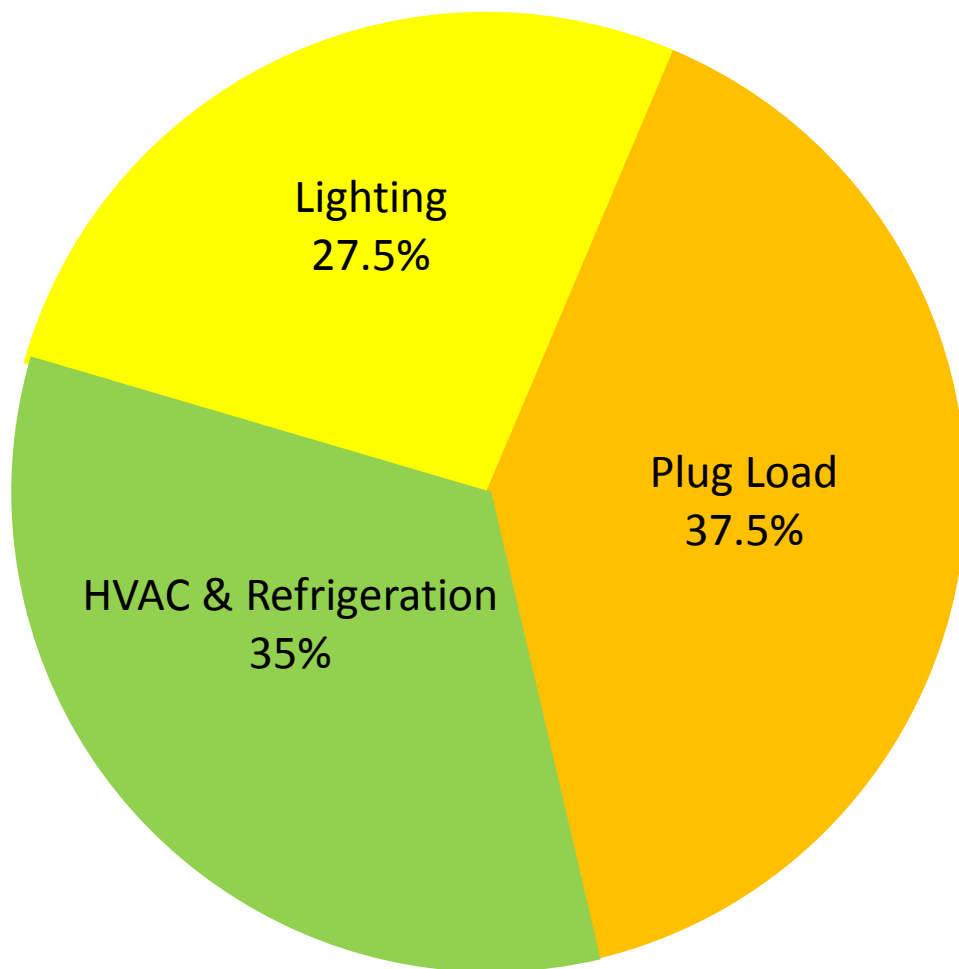

$$325,000 \text{ kwh} - 340,000 \text{ kwh} > 0$$


$$300,000 \text{ kwh} - 315,000 \text{ kwh} > 0$$


$$275,000 \text{ kwh} - 260,000 \text{ kwh} > 0$$


$$256,000 \text{ kwh} - 250,000 \text{ kwh} > 0$$



$$0 - 425,000 \text{ kwh} > 0$$


$$325,000 \text{ kwh} - 340,000 \text{ kwh} > 0$$


$$300,000 \text{ kwh} - 315,000 \text{ kwh} > 0$$


$$275,000 \text{ kwh} - 260,000 \text{ kwh} > 0$$


$$256,000 \text{ kwh} - 250,000 \text{ kwh} > 0$$


$$220,000 \text{ kwh} - 200,000 \text{ kwh} > 0$$




eat well



Every day we help people get, stay and live

pharmacy

Well at Walgreens

BURT'S BEES

beautiful

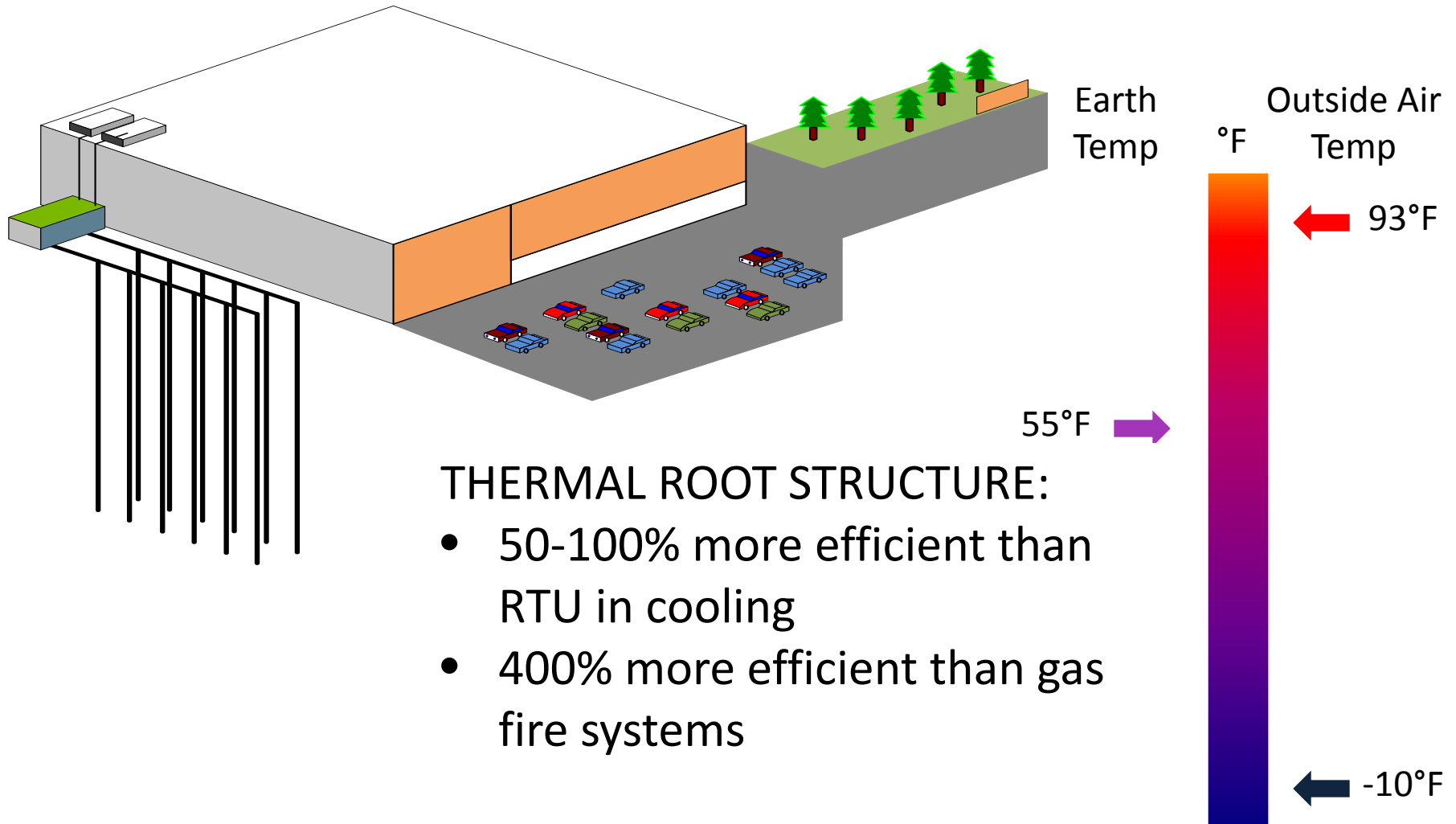






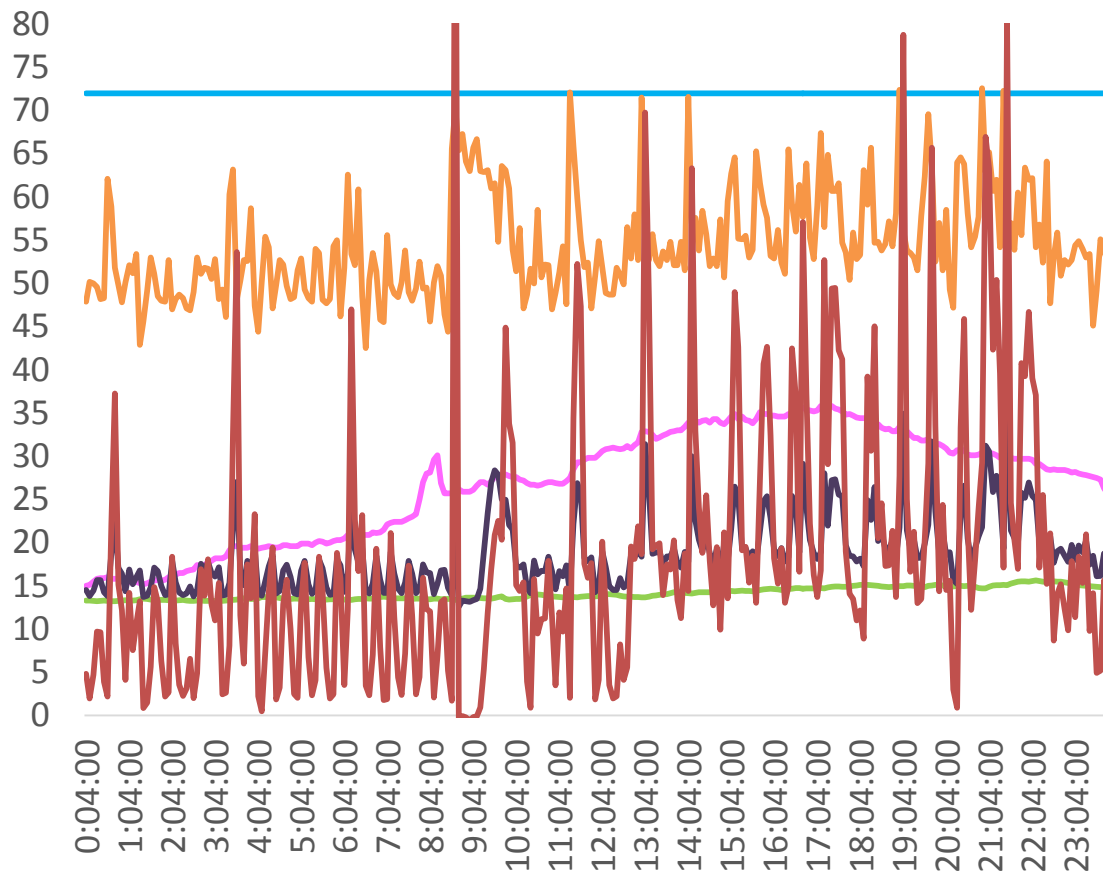
CO₂ REFRIGERATION: LESSONS LEARNED

Benefits of Geothermal



May 8: Case in Point

Geothermal loop provides steady condensing temperatures < 15C (60F)



Blue= Transcritical Op.
(72 BAR)

Orange= PT1

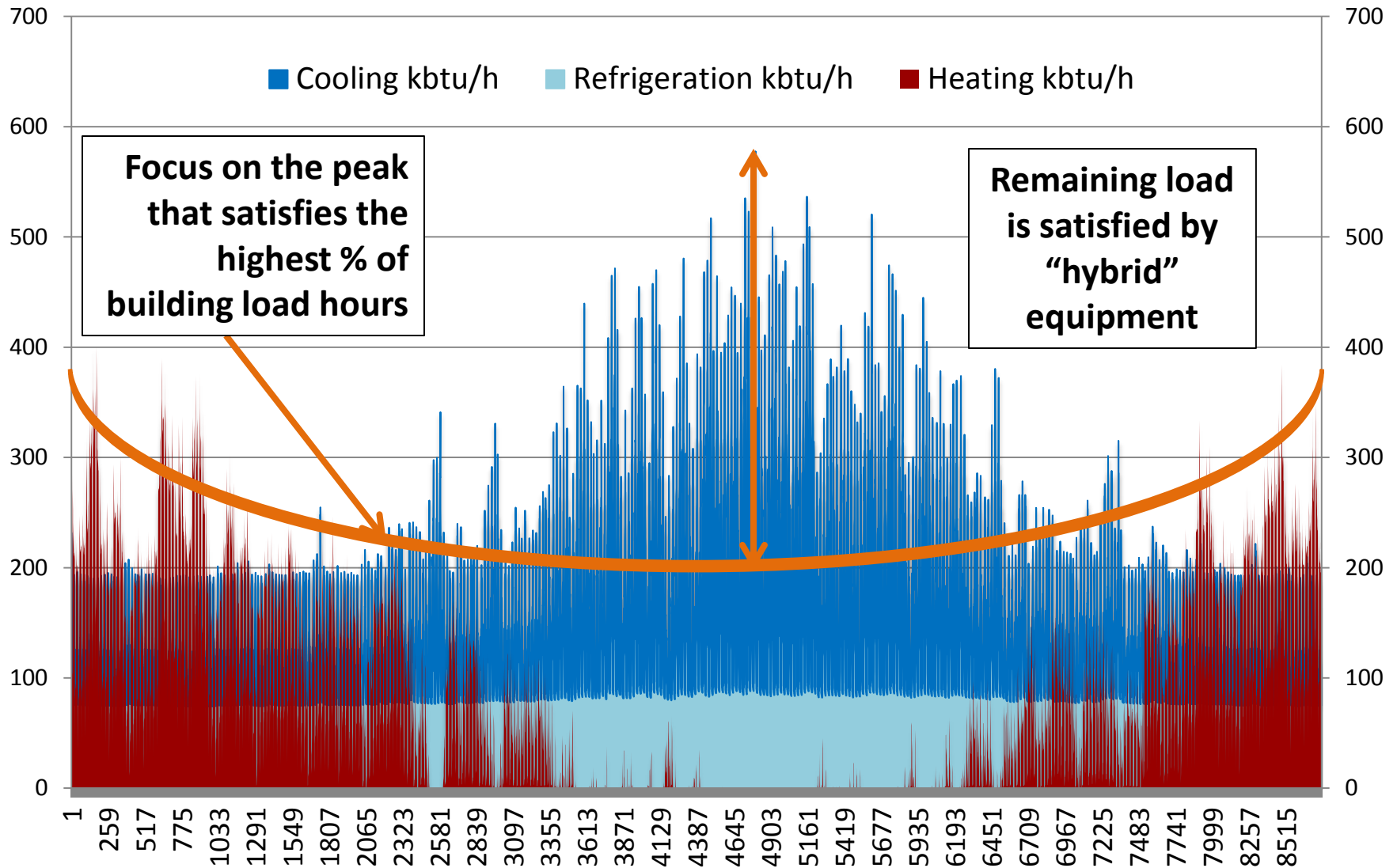
Pink= OA Temp

Navy= GEO Temp_{out}

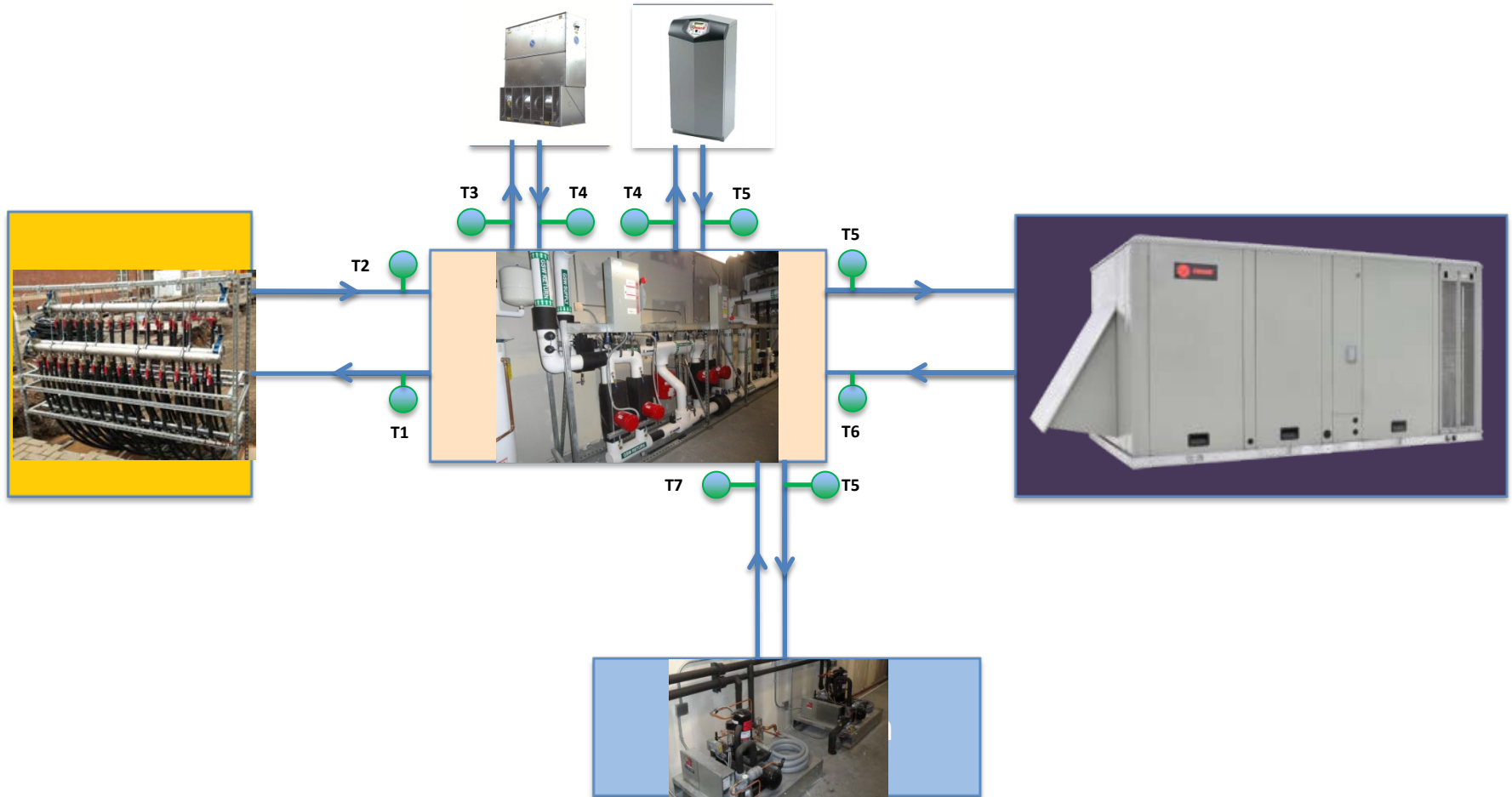
Green= GEO Temp_{in}

Red= GEO power

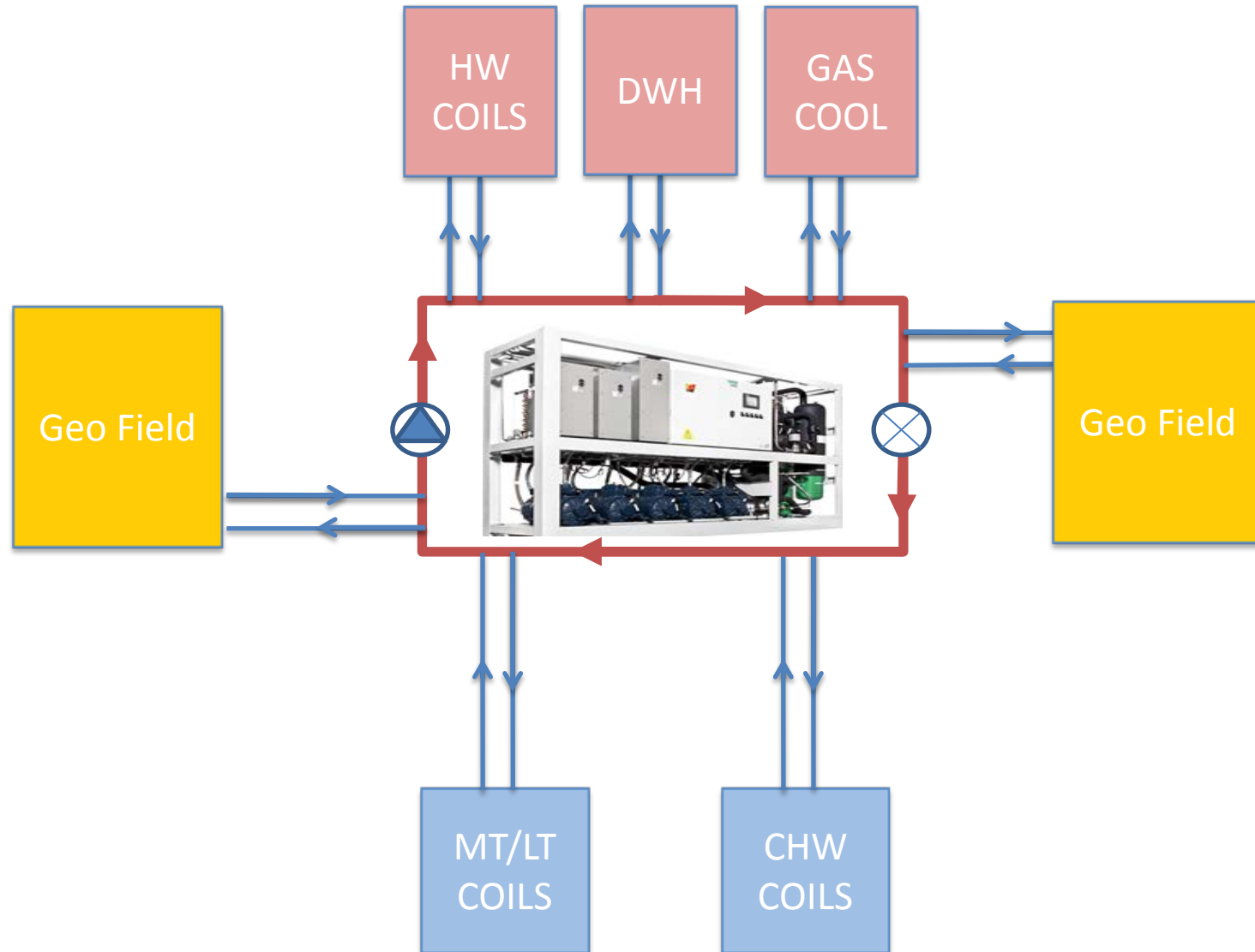
Hybrid Geothermal Concept



“Typical” Hybrid Geothermal Design

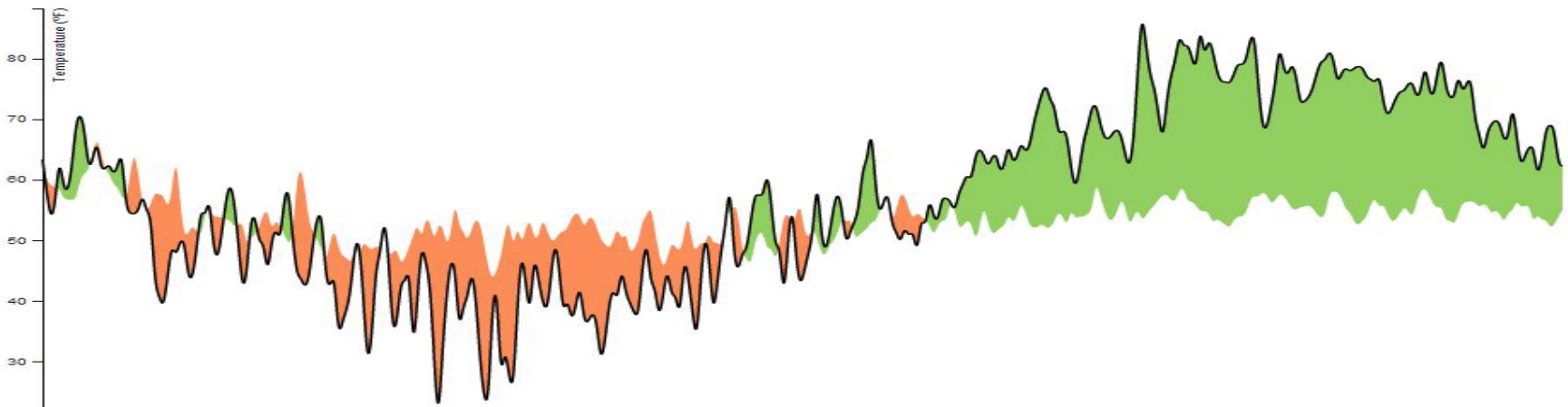


CO2 Central Plant Design

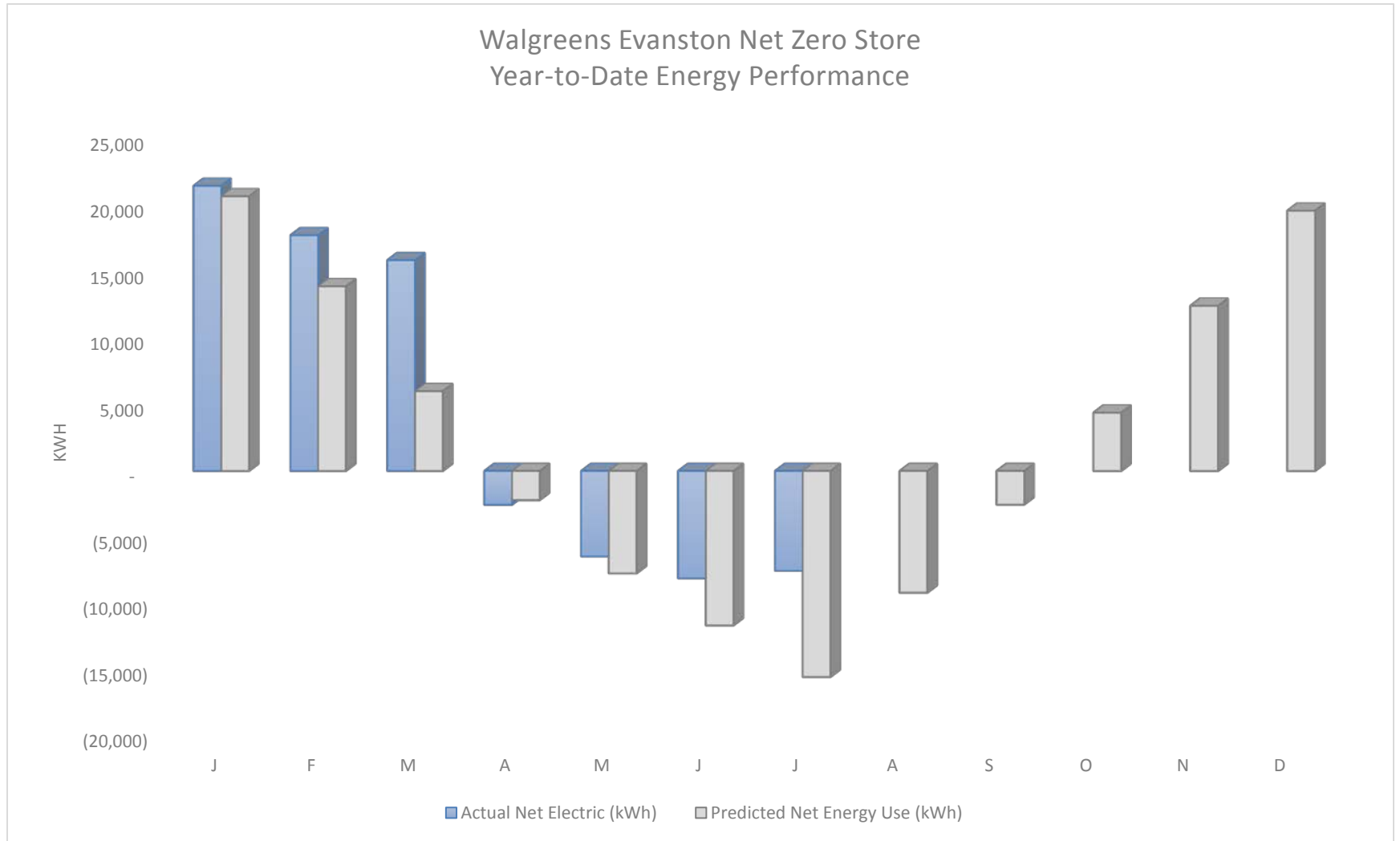


Net Zero , explained

- T – 1 year... and counting
- It's actually a continual process
 - Collect data
 - Diagnose
 - Corrective actions

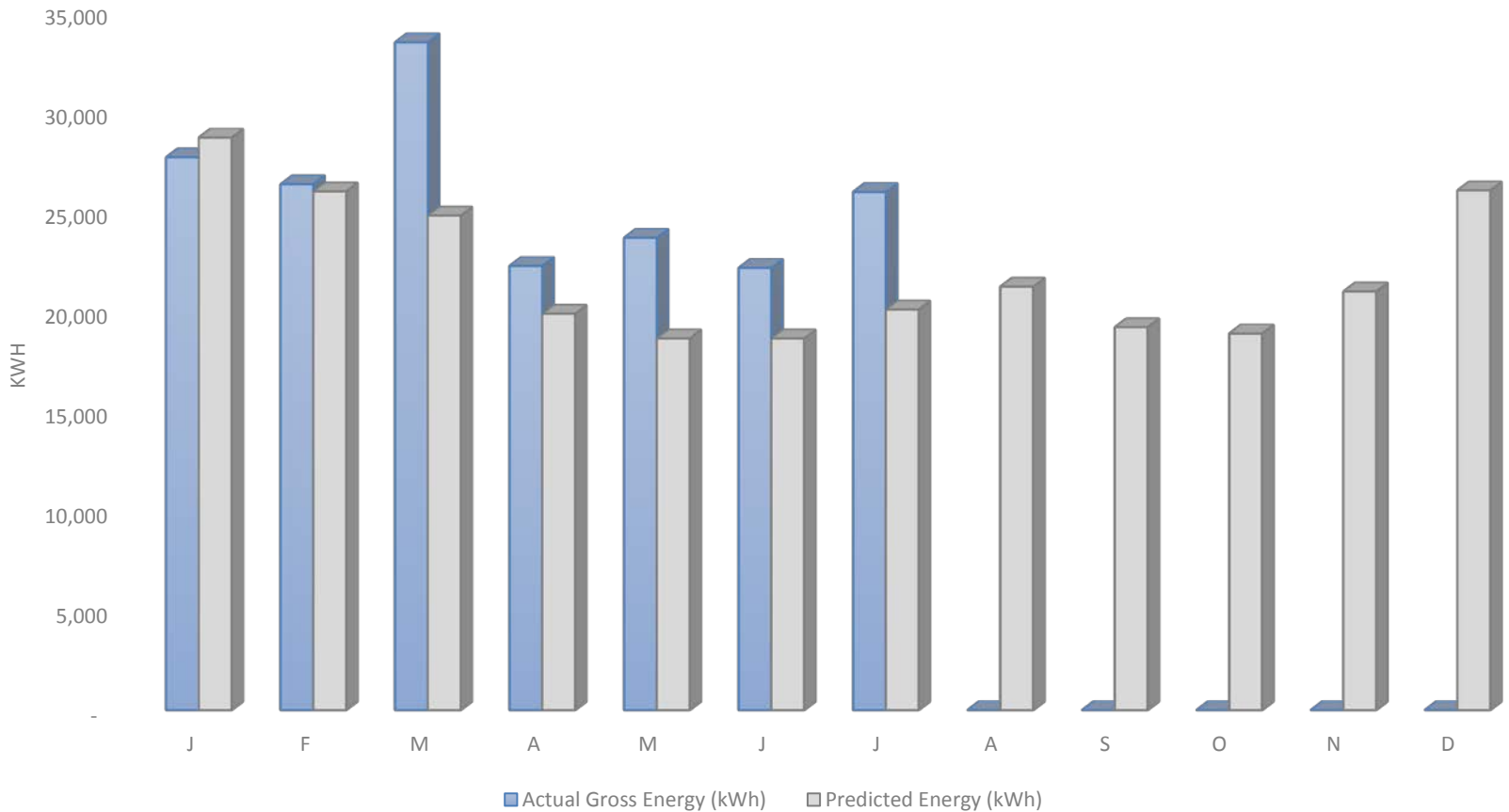


Total Net Meter Data



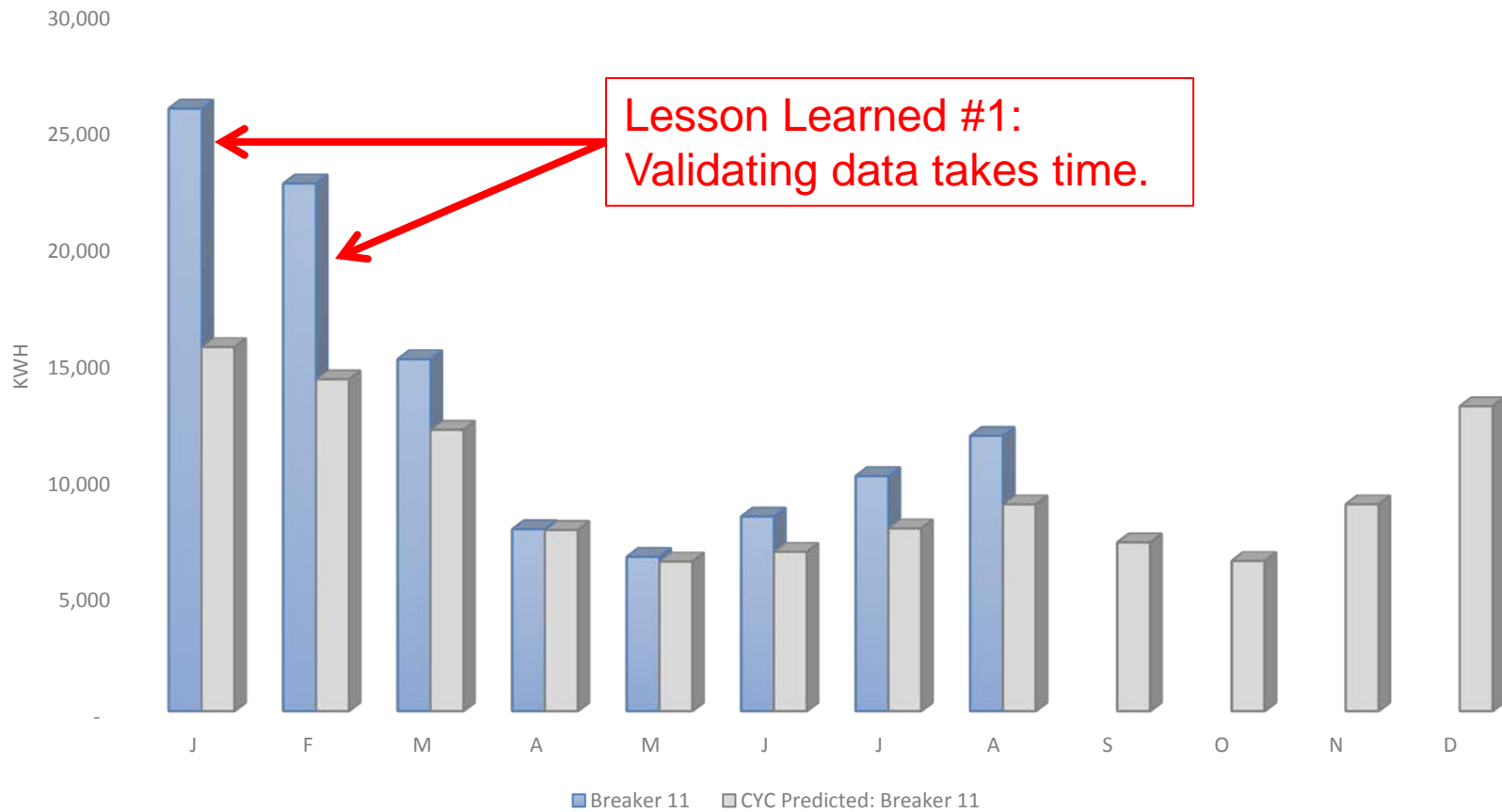
Gross Energy Consumption

Walgreens Evanston Net Zero Store
Year-to-Date Gross Energy Performance

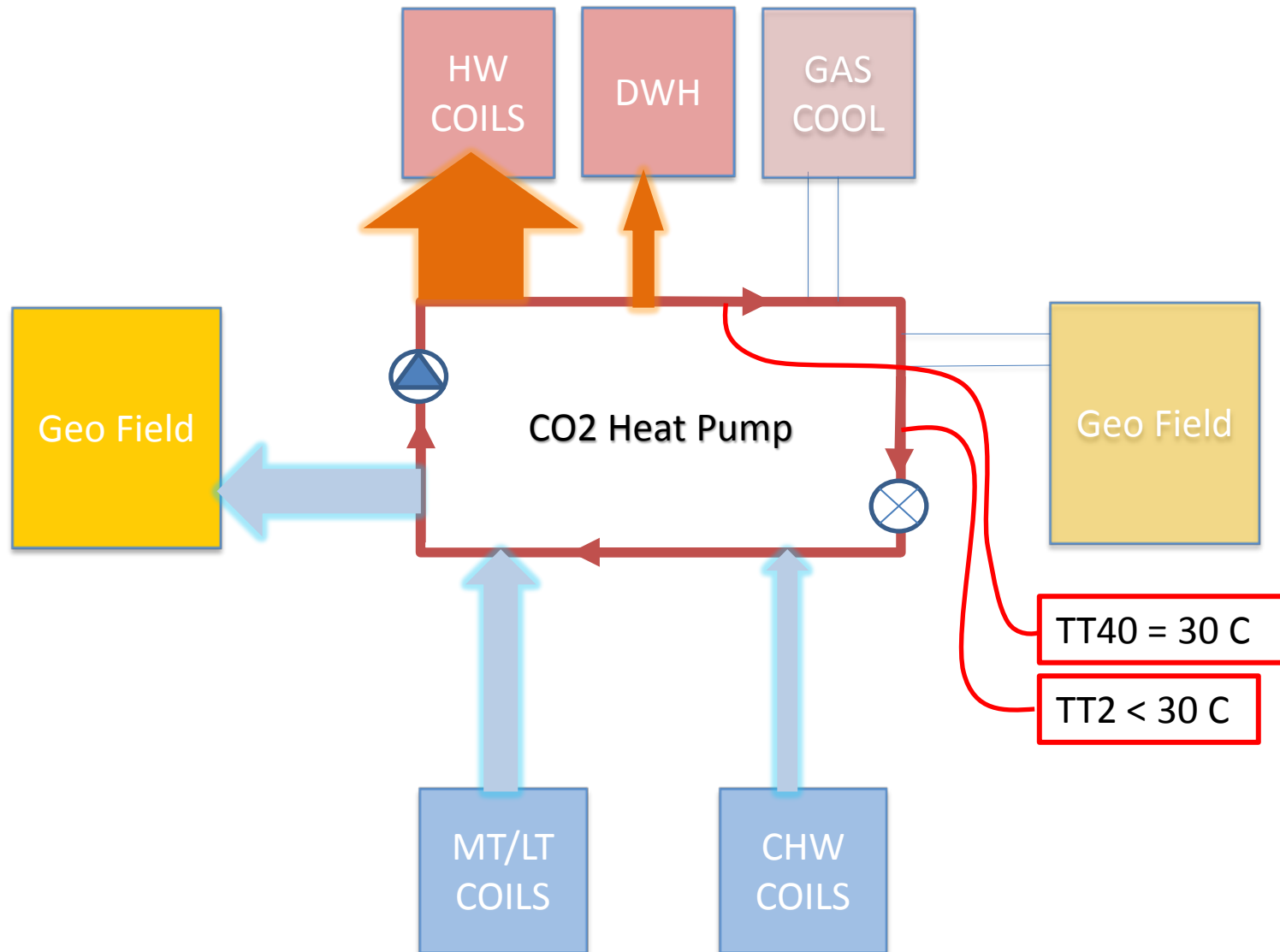


CO2 Heat Pump Data

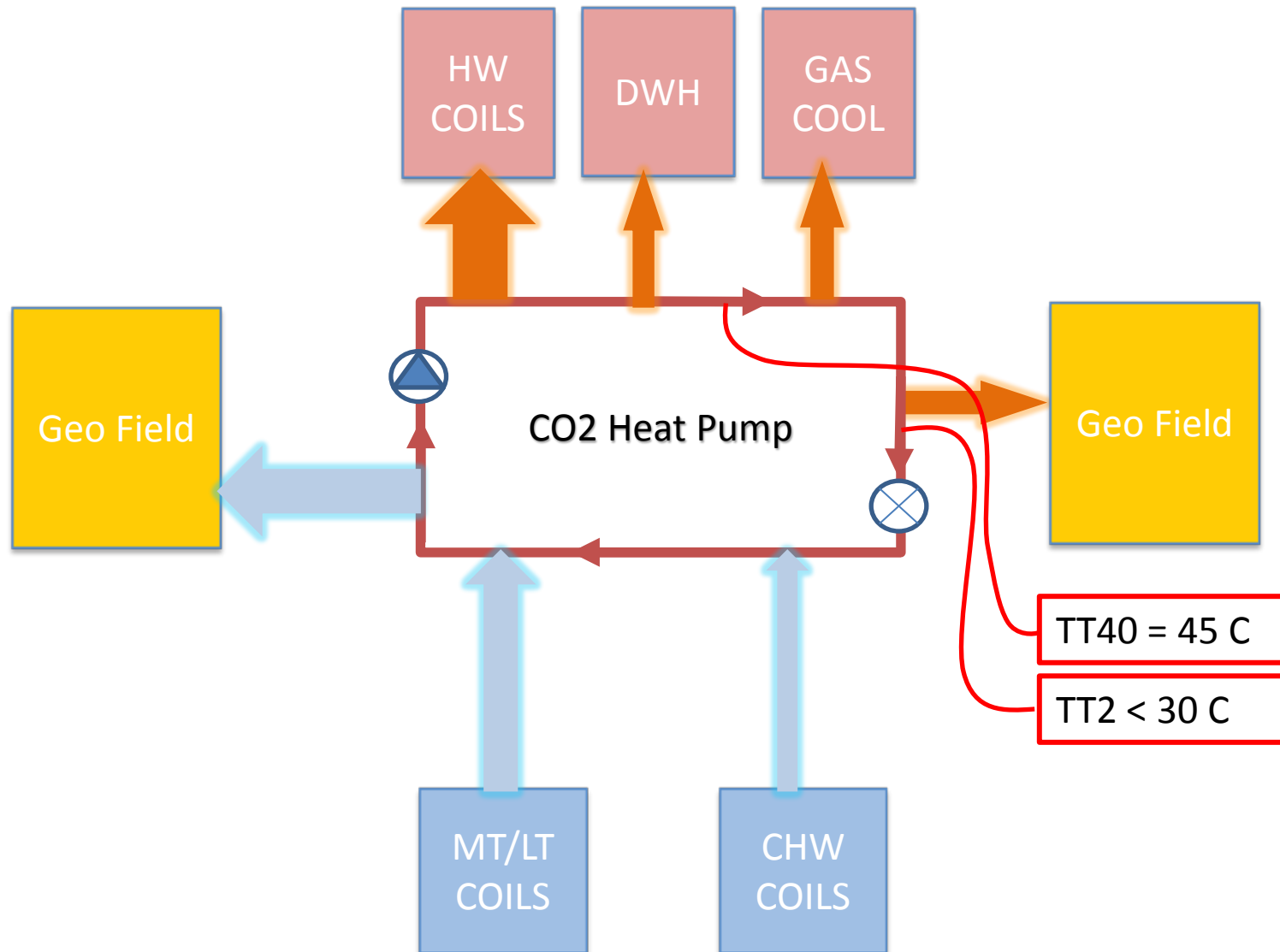
Walgreens Evanston Net Zero Store
Year-to-Date CO2 Heat Pump



Heating Operation: Expected

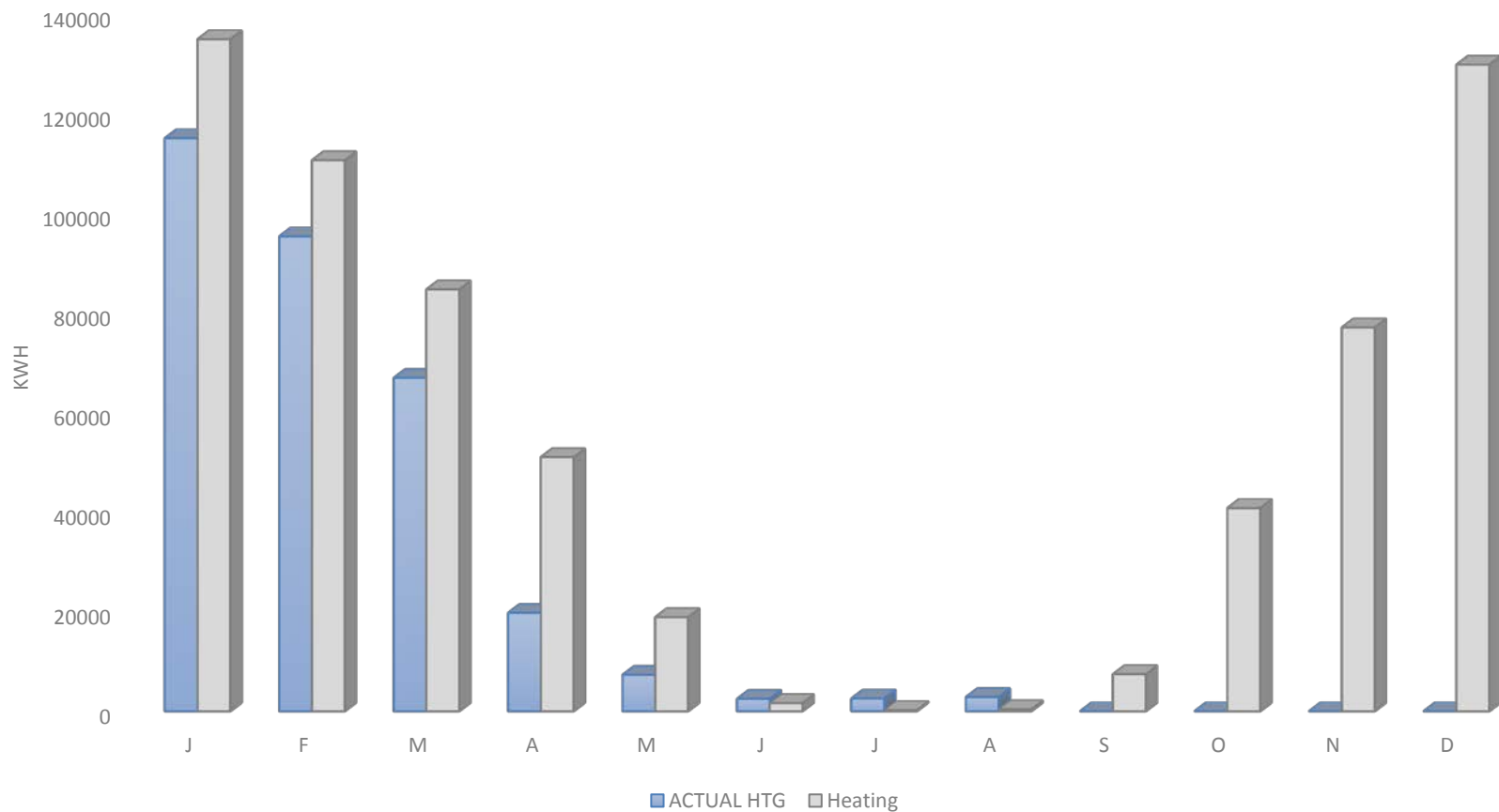


Heating Operation: Actual



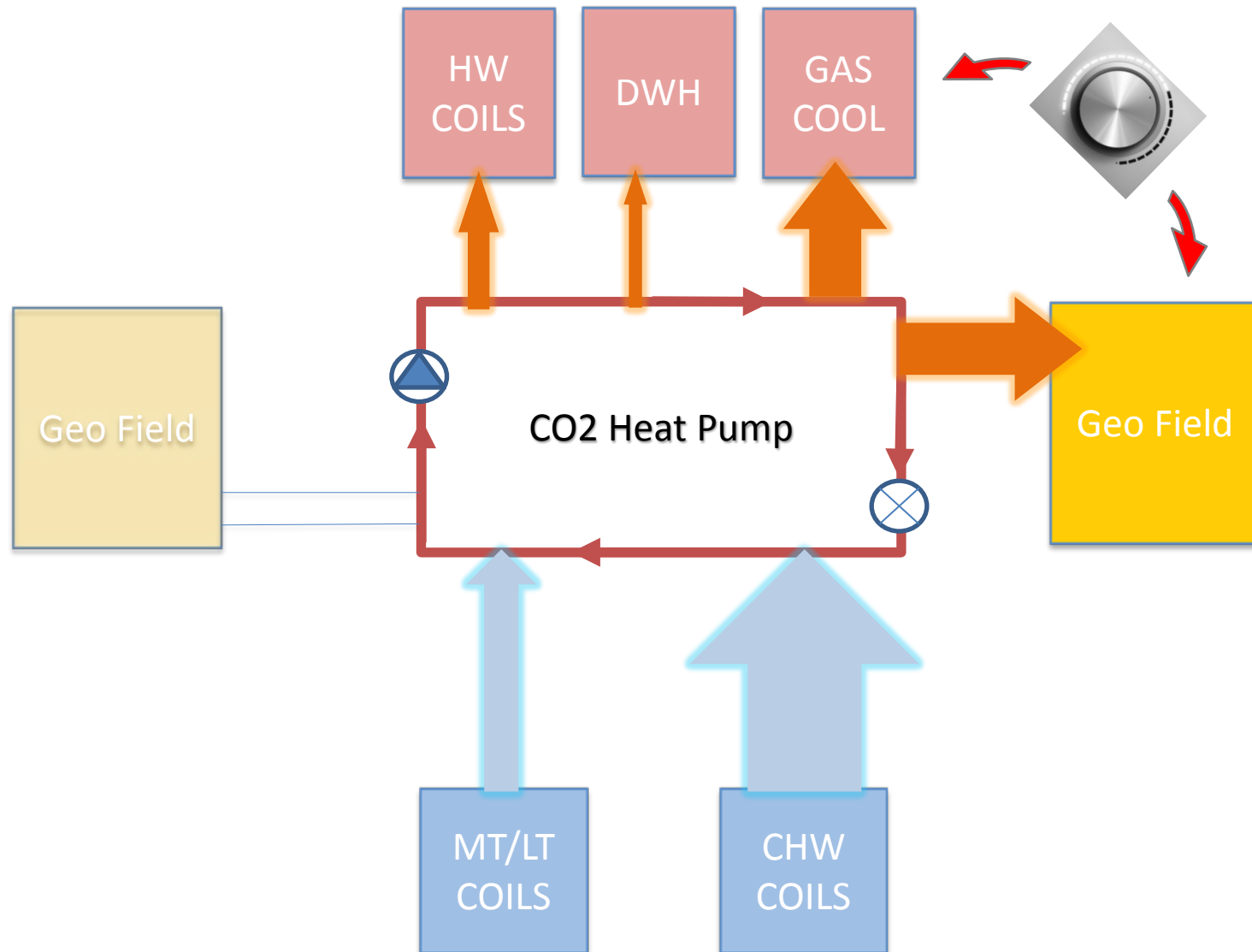
Heating Loads

Walgreens Evanston Net Zero Store
Year-to-Date HTG Load

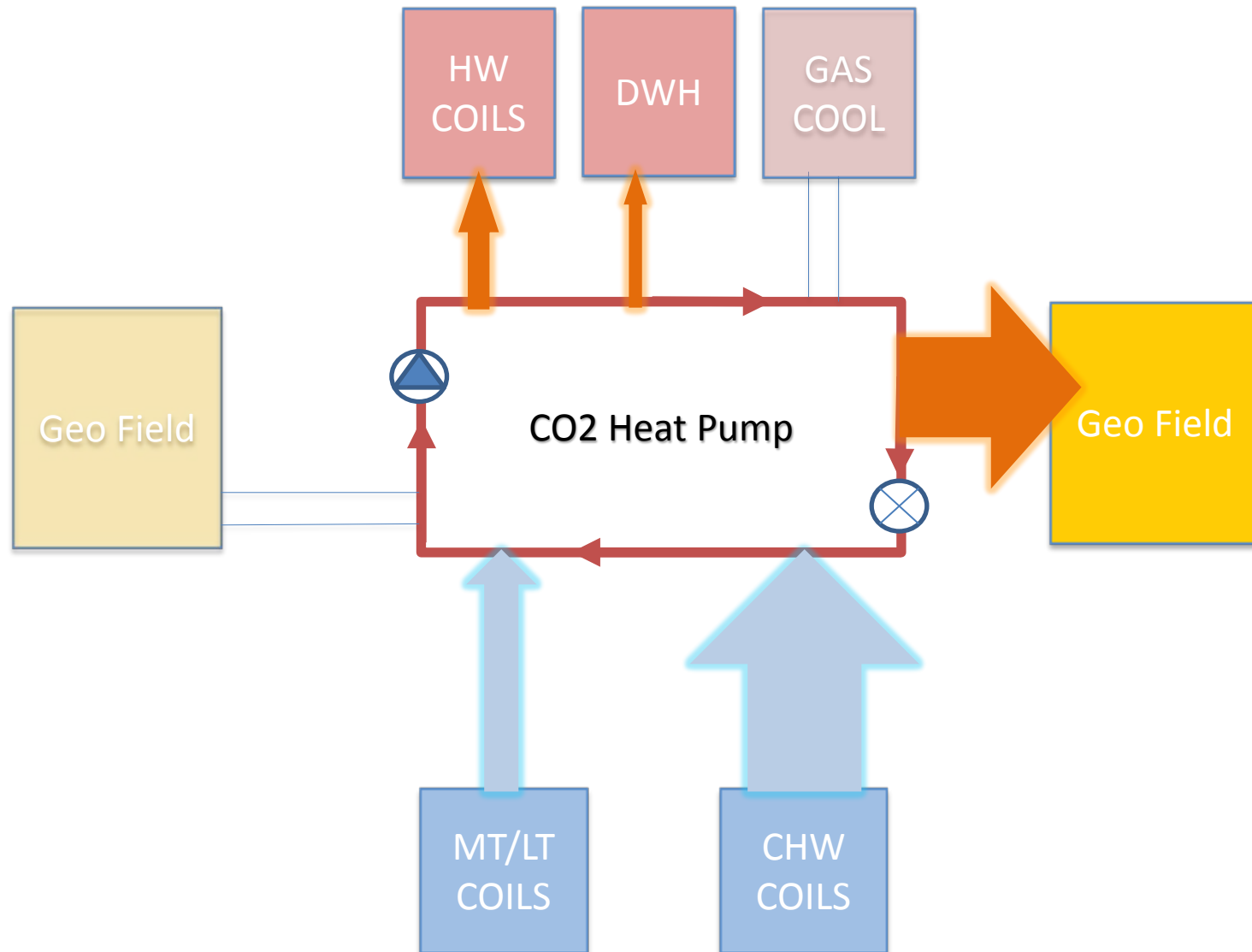




Cooling Operation: Expected

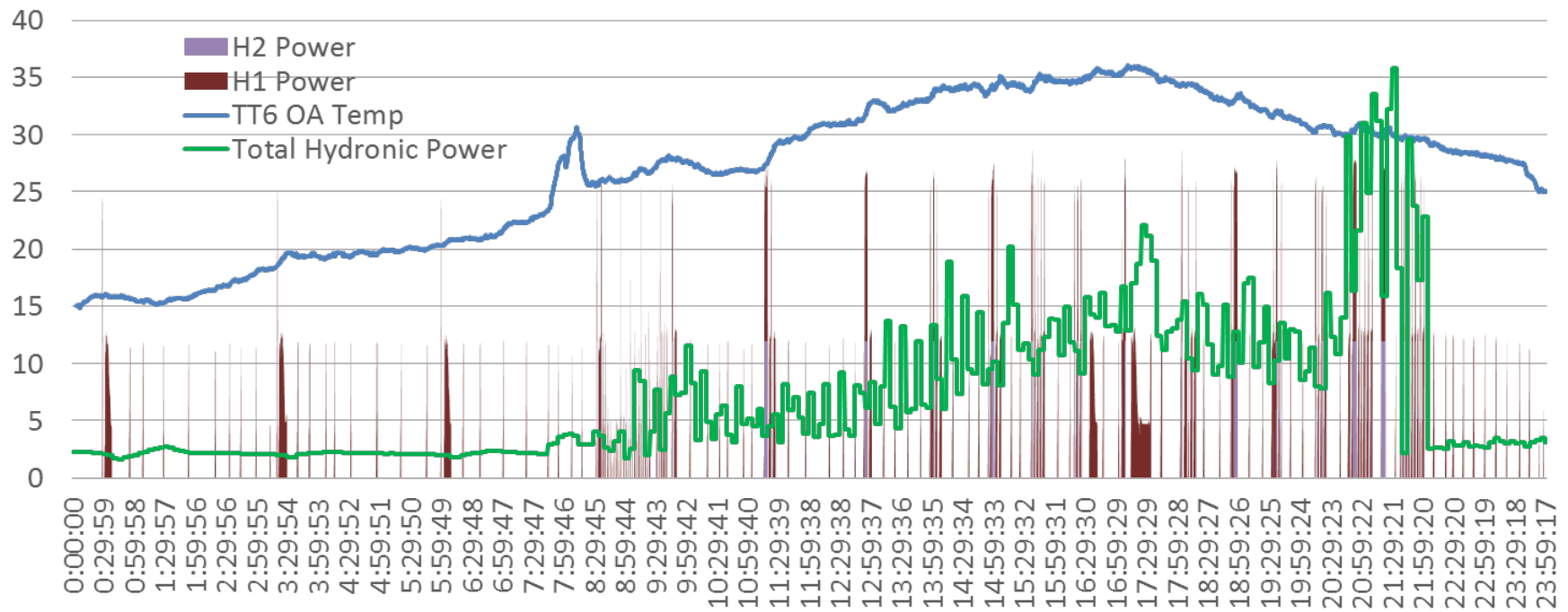


Cooling Operation: Actual



HT (Heat Pump Compressor)

Instantaneous HT COPs up to 10, range:4-6
Aggregate hydronic COP = 3.4



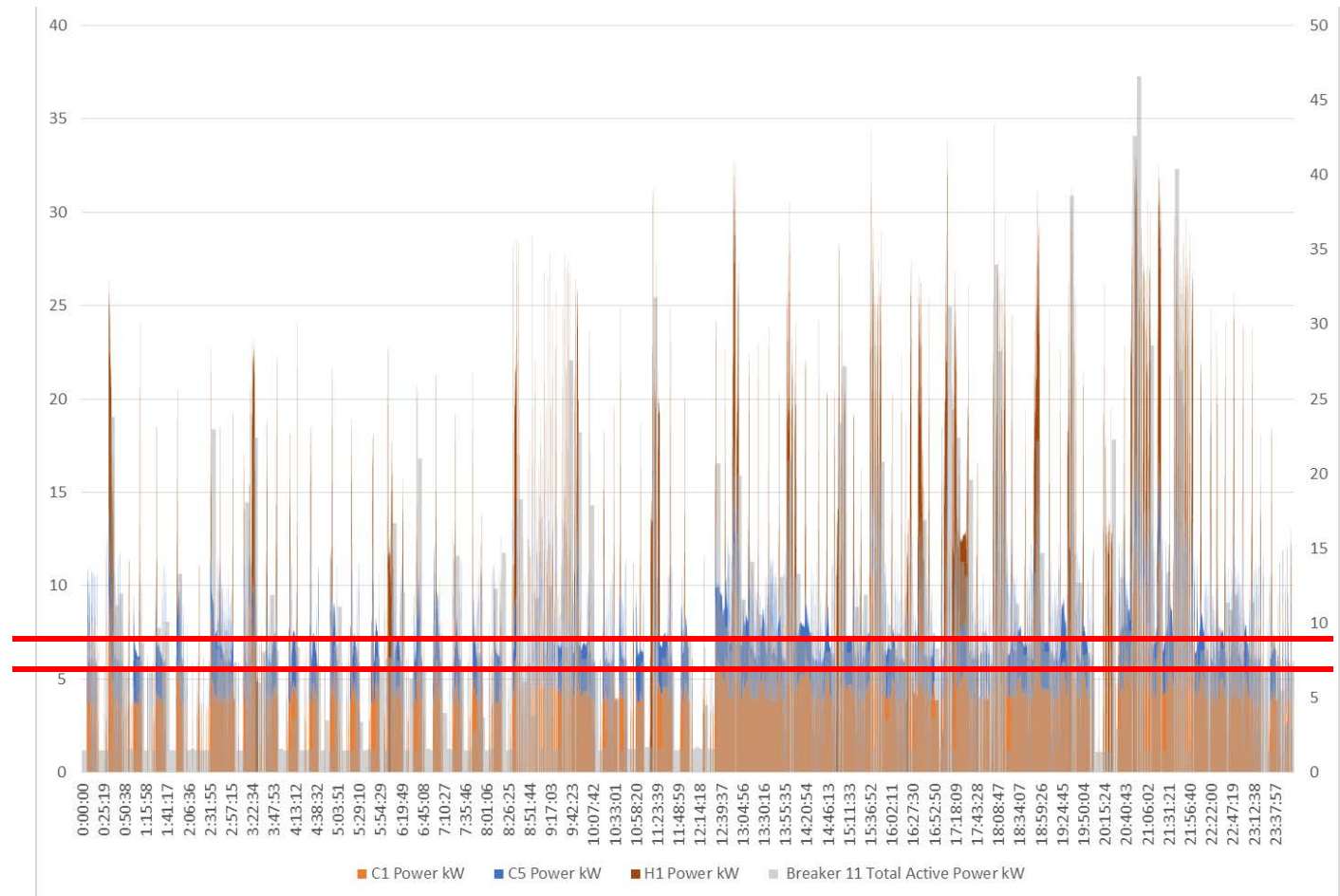
MT/LT Compressor Power

8% energy penalty

Solution: right-size the compressors

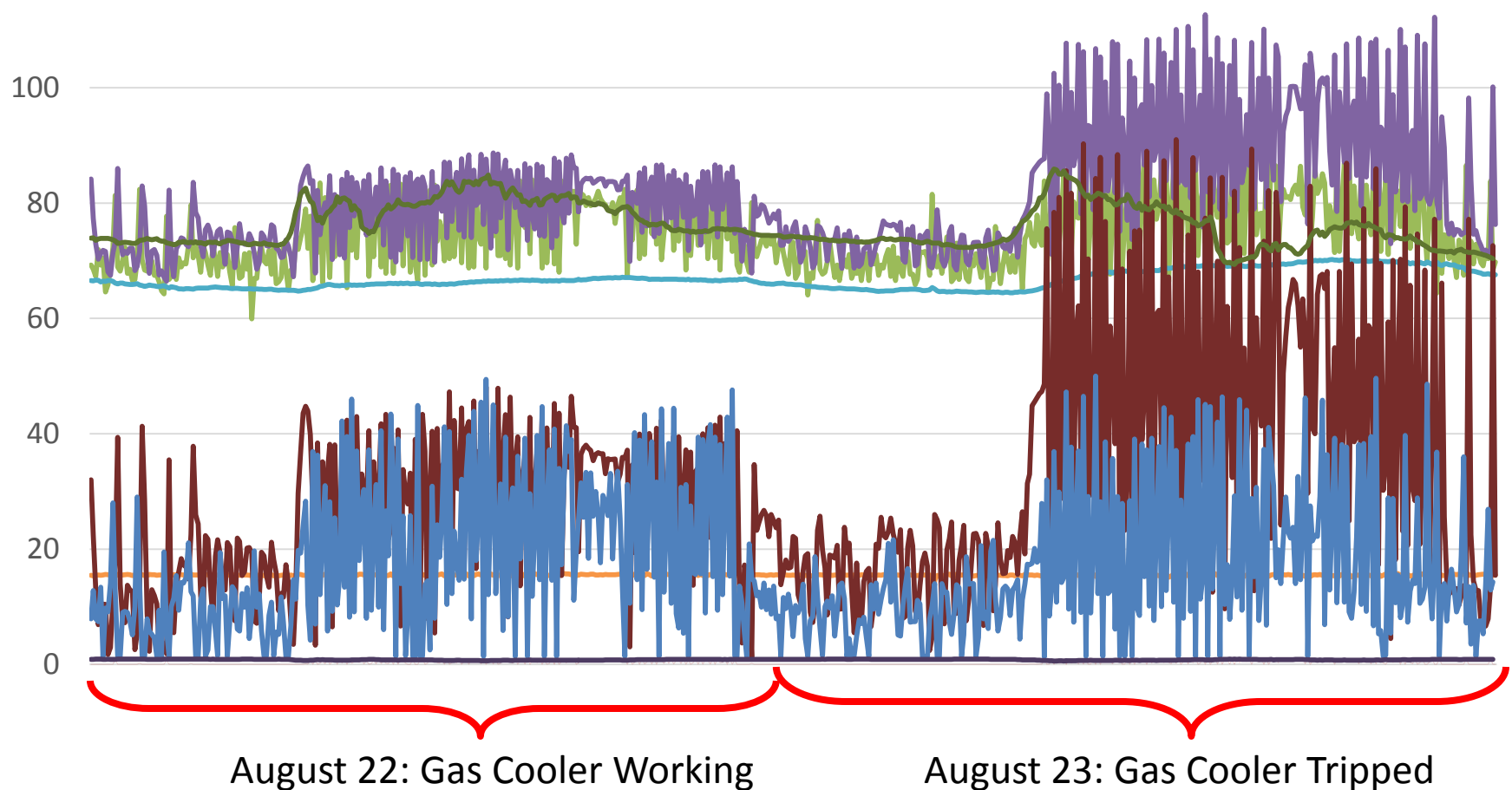
AVG = 5.4kW

EXP = 5.0 kW

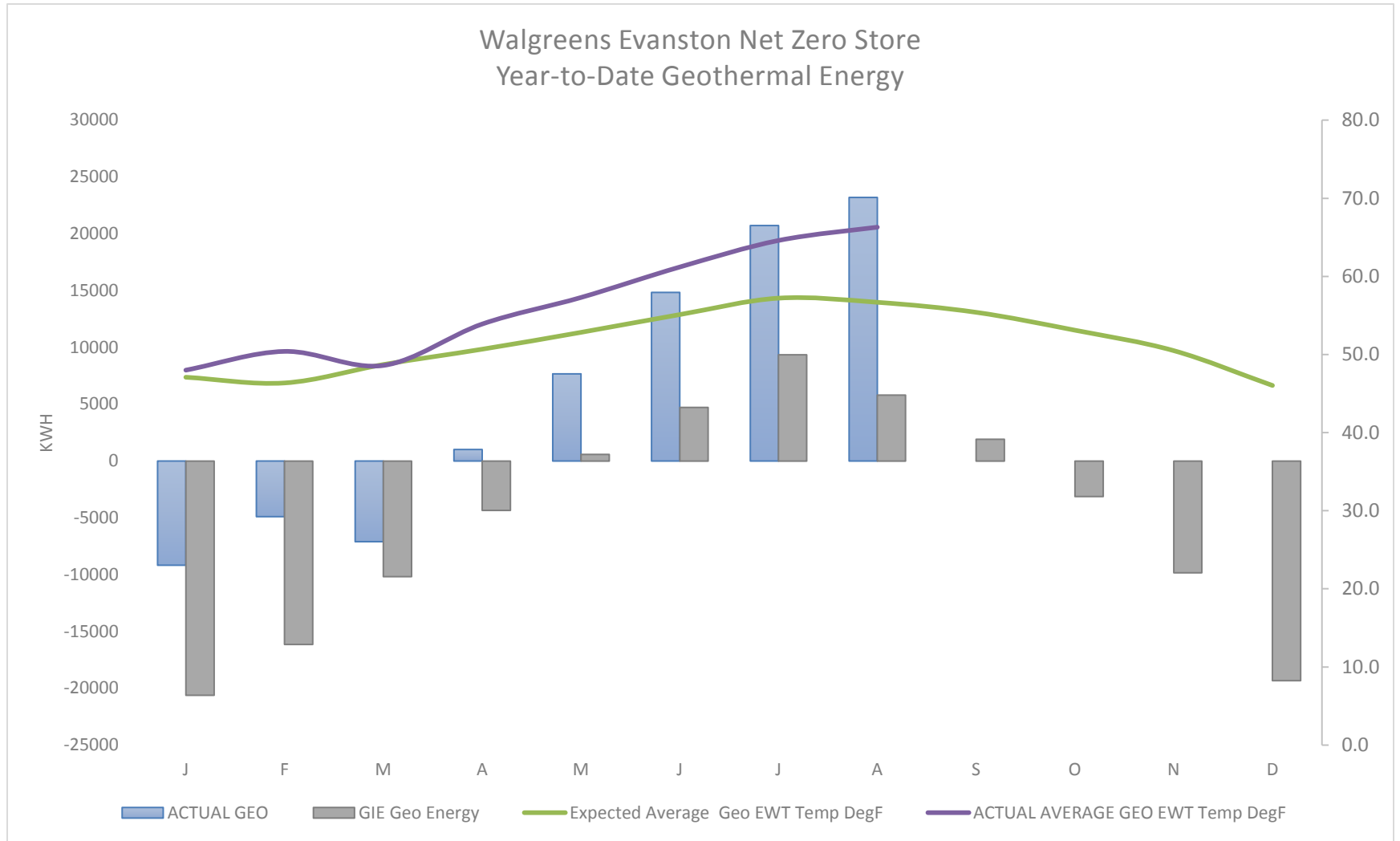


System Impact of the Gas Cooler

- GC Machine TT2 - Gas Cooler Out Temperature °F
- Geo Loop Well Field Entering Temperature (BTU-01) °F
- BTU Meter 01, Energy Rate kW
- Outdoor Air Temperature °F
- Geo Loop Well Field Leaving Temperature (BTU-01) °F
- Geo Loop Flow (BTU-01) GPM
- Micrologic Branch Breaker 11 Total Active Power kW
- GC Machine S1 - Gas Cooler Output Signal %



Geothermal Energy Data



Coarse Tuning = Course Corrections

- Oversizing of MT/LT Compressor is having a significant impact
- The gas cooler is offline and has been all summer
- More heat rejection into the store is required during the winter
- Acoustic design must be addressed to enable full airflow and maximum DT

Service Issues

- CO2 is less expensive than synthetic refrigerants!
- 2-3 leaks that were caught and addressed without loss of stock.
 - Gas Cooler Braze failed
 - Service caps have failed
 - Ball valve on carbon steel line
- Manual resets are completely unnecessary when the system is fully remote controlled
 - Gas cooler
 - Compressor lock out
- Triple temp racks are sensitive to % charge.

Overall Lessons Learned

- UL Certification hurdles. 5x pressure rating is challenging at 90 Bar
- Incorporating HVAC into refrigeration rack breaks down historic barrier to innovation
- Geothermal loop adds redundancy and increases operational flexibility
- Aluminum piping is a no-brainer
- US suppliers lack sufficient stock of 80 Bar rated components.
- Real time monitoring and transparency are vital

Overall Lessons Learned

- Don't Rush!
- Commissioning before opening
- Engage all contractors early
- Punchlist
- Don't do this project before historically cold winters