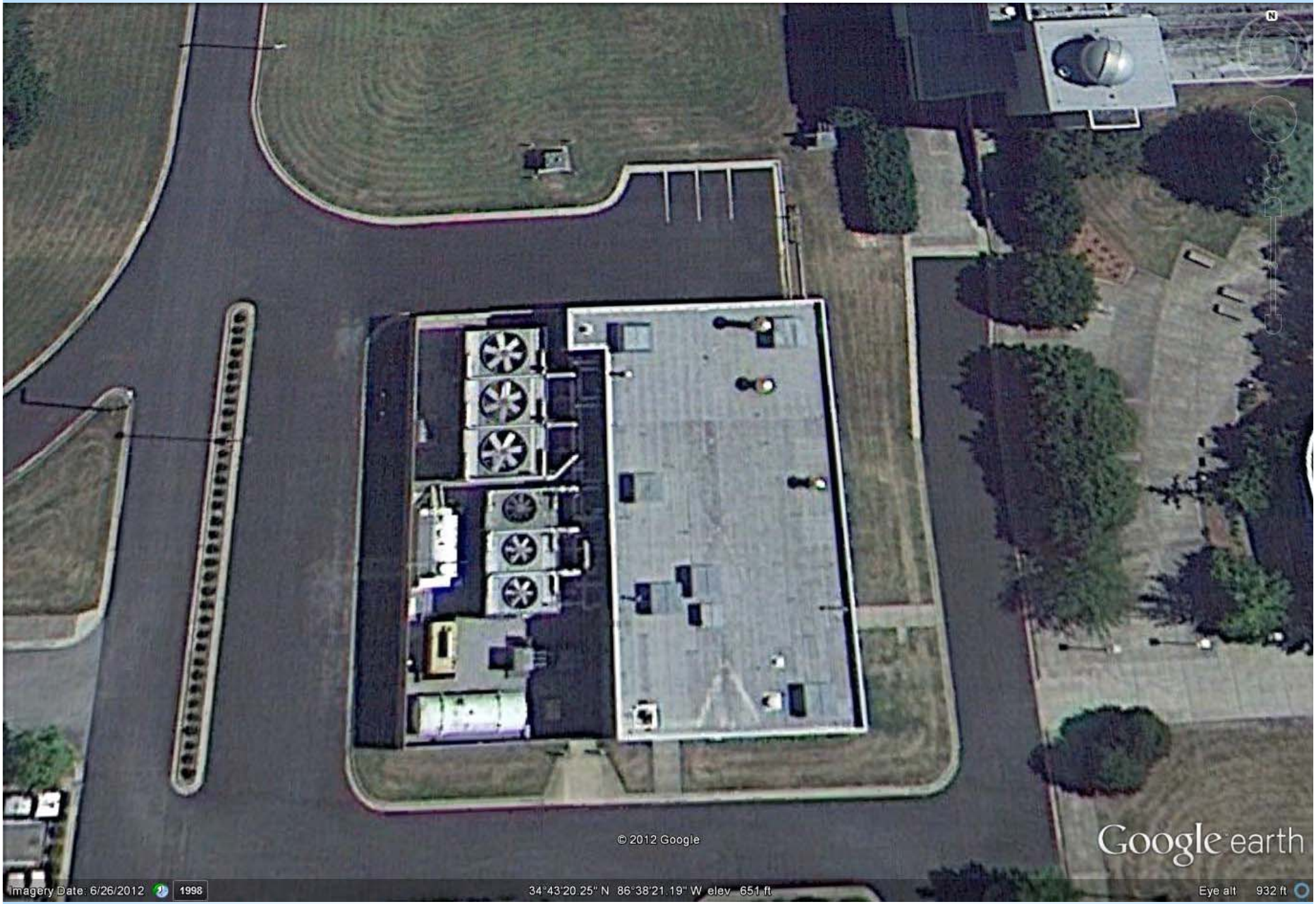
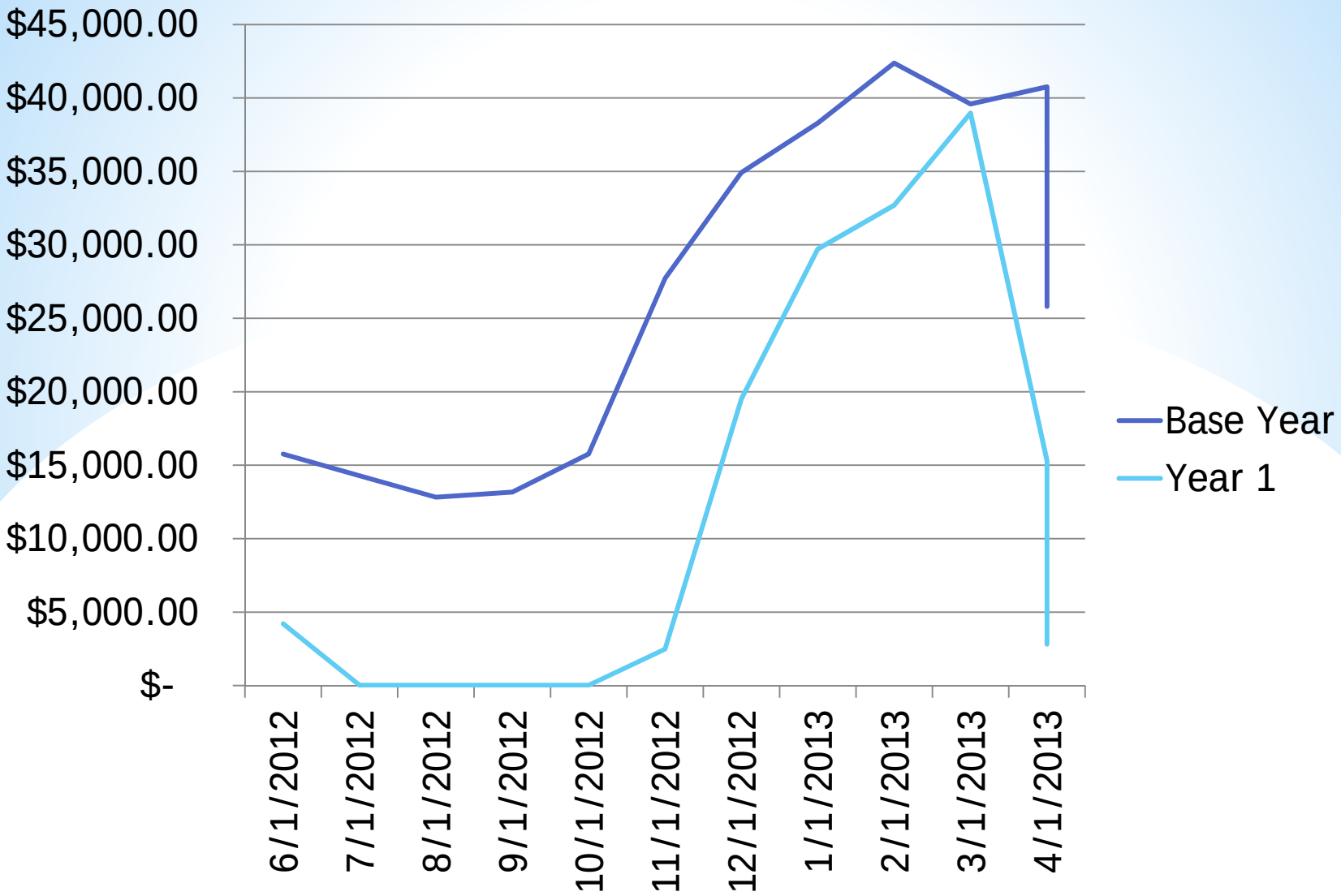
Real World Application of the Heat Machine

UAH Central Plant

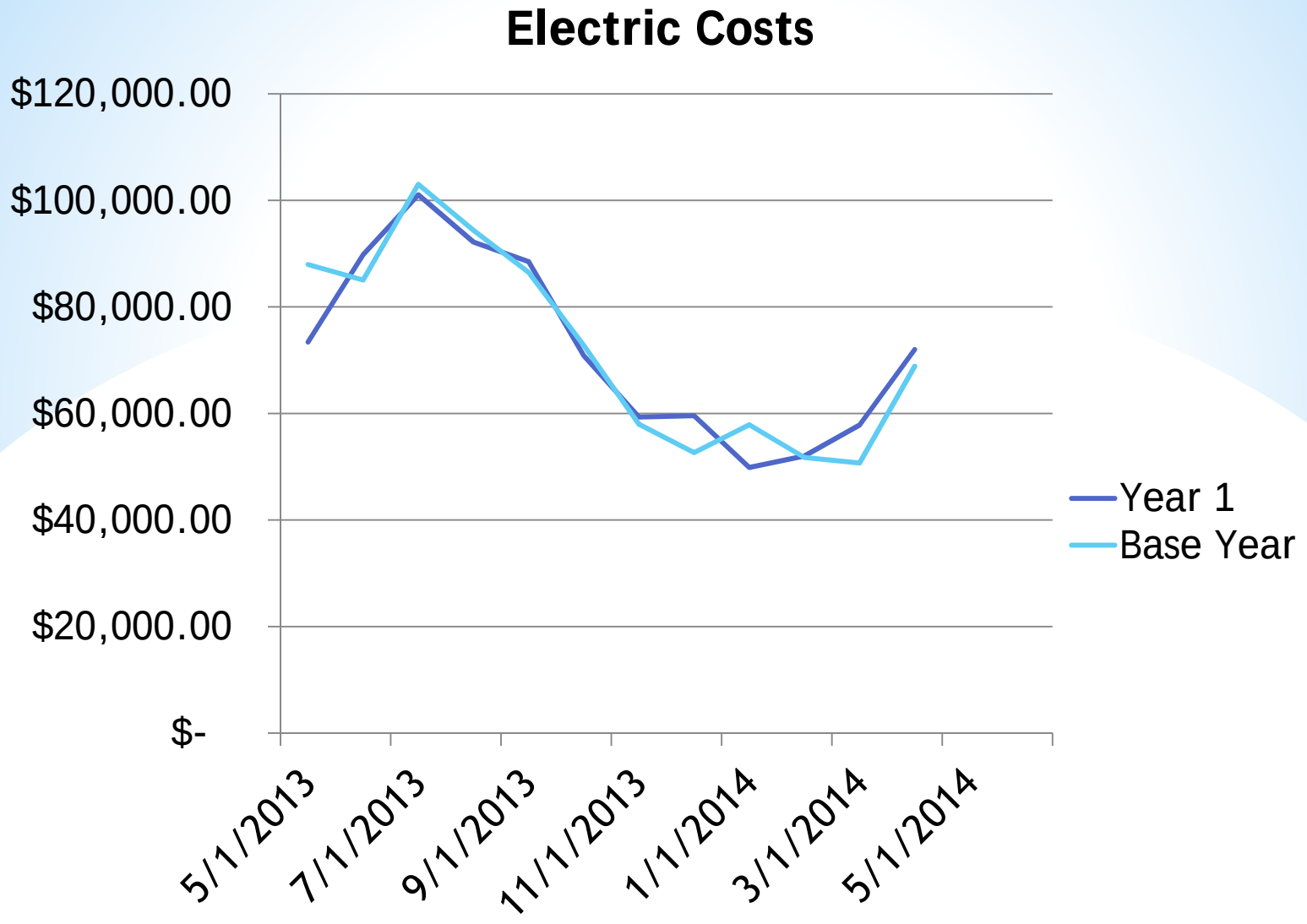
- Serves app. 1 million square feet
- Dorms, classrooms and research labs
- Half a million square feet in research labs
- Once through air has to be de-humidified
- Accomplished by chilling air to 55 and reheating to maintain comfort conditions
- Year round heating demand
- 3600 tons of conventional chillers
- 1300 Boiler horsepower


© 2012 Google
Google earth
Imagery Date: 6/26/2012
1998
34°43'20.25" N 86°38'21.19" W elev 651 ft
Eye alt 932 ft


AQUAFORCE
CAUTION - NOTICE TO RIGGERS
Carrier


$45,000.00
$40,000.00
$35,000.00
$30,000.00
$25,000.00
$20,000.00
$15,000.00
$10,000.00
$5,000.00
$-
6/1/2012
7/1/2012
8/1/2012
9/1/2012
10/1/2012
11/1/2012
12/1/2012
1/1/2013
2/1/2013
3/1/2013
4/1/2013
Base Year
Year 1

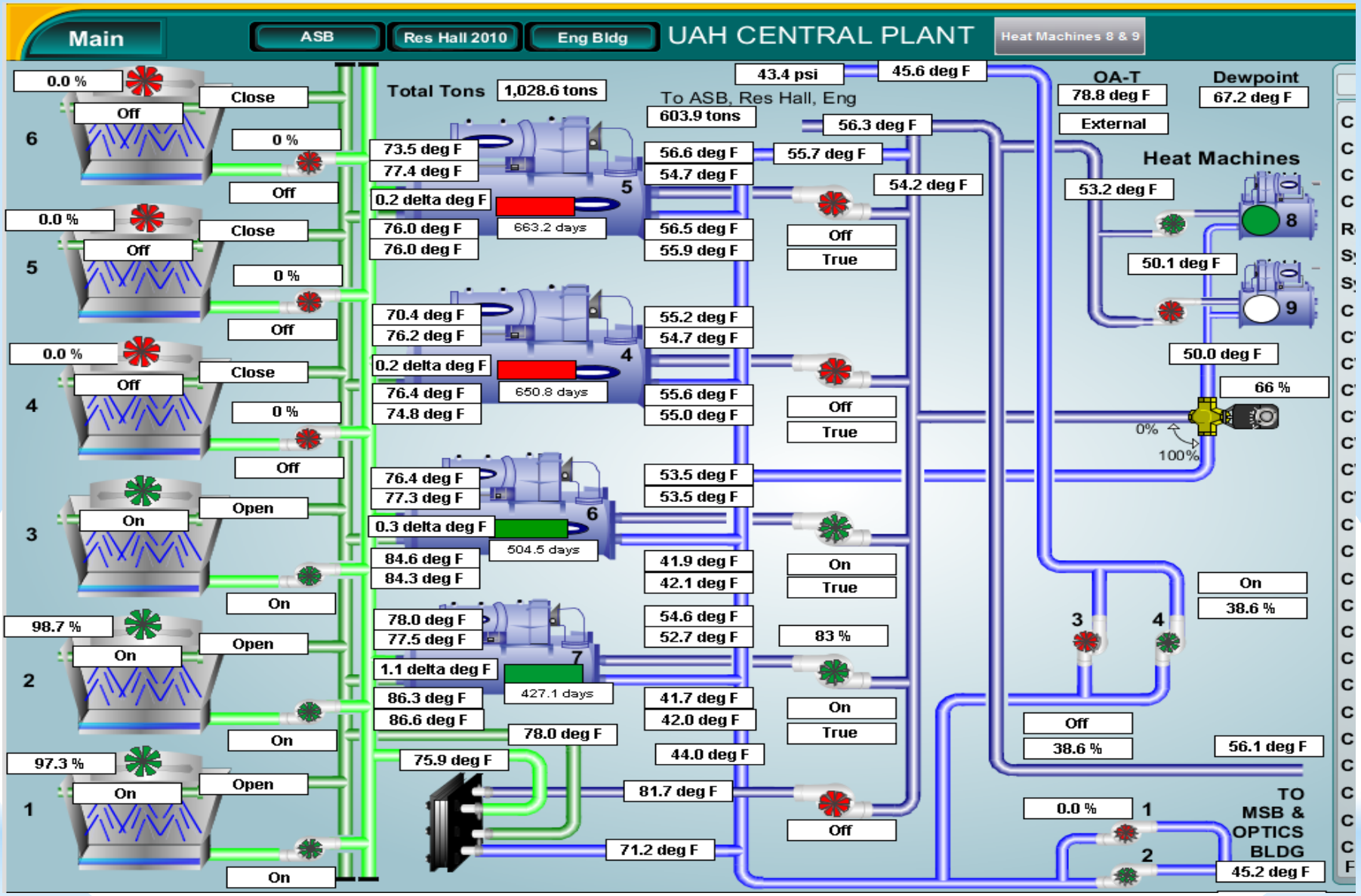
*Gas Costs



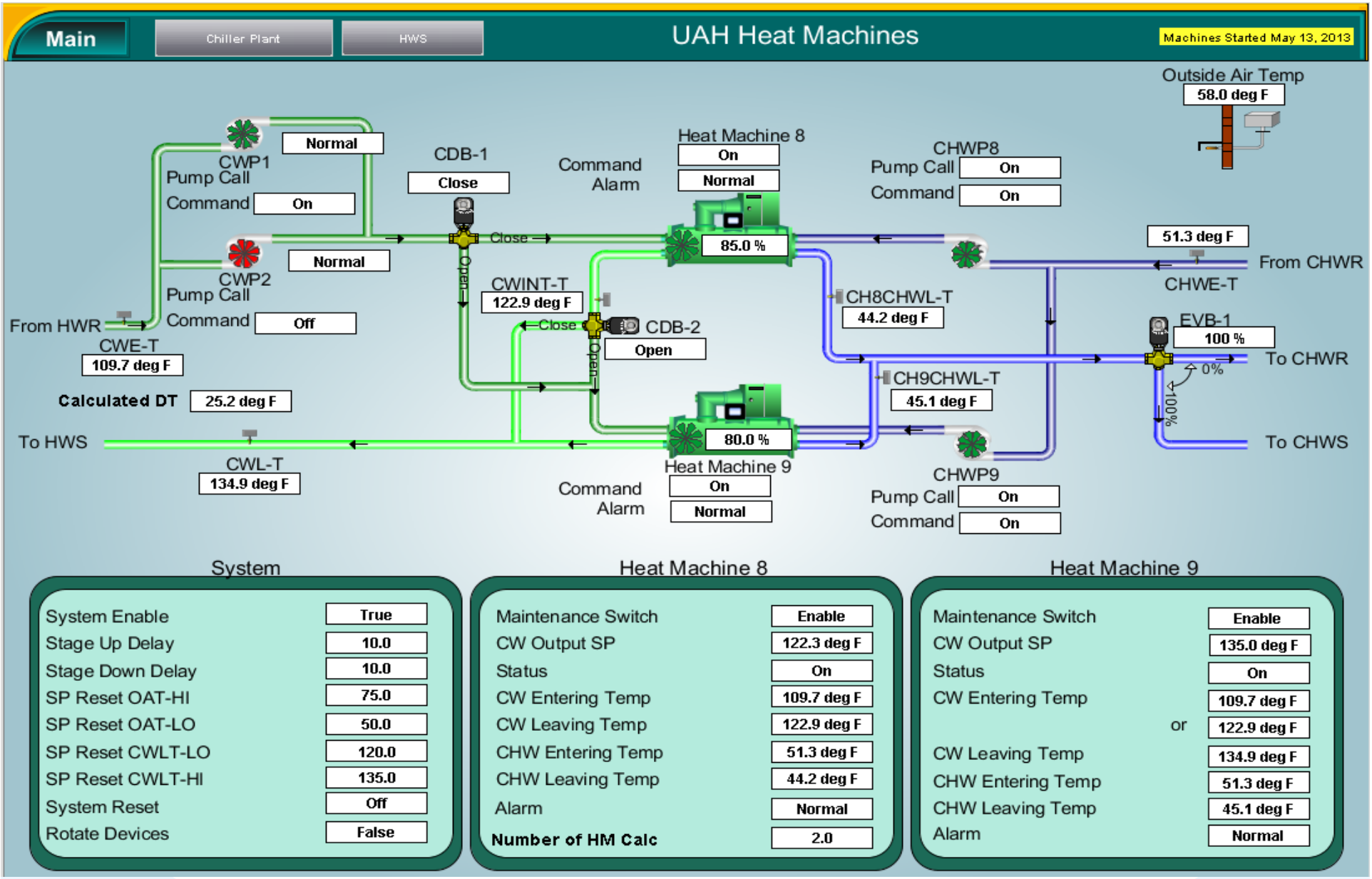
*Raw Electric Costs

Primary/Secondary Pumping

- Low Delta T syndrome
  - Characterized by:
    - Over pumping primary system
    - Higher chilled water supply temperatures
    - Forcing additional chillers on before chillers are fully loaded.



UAH Chilled Water Plant



UAH Heat Machines

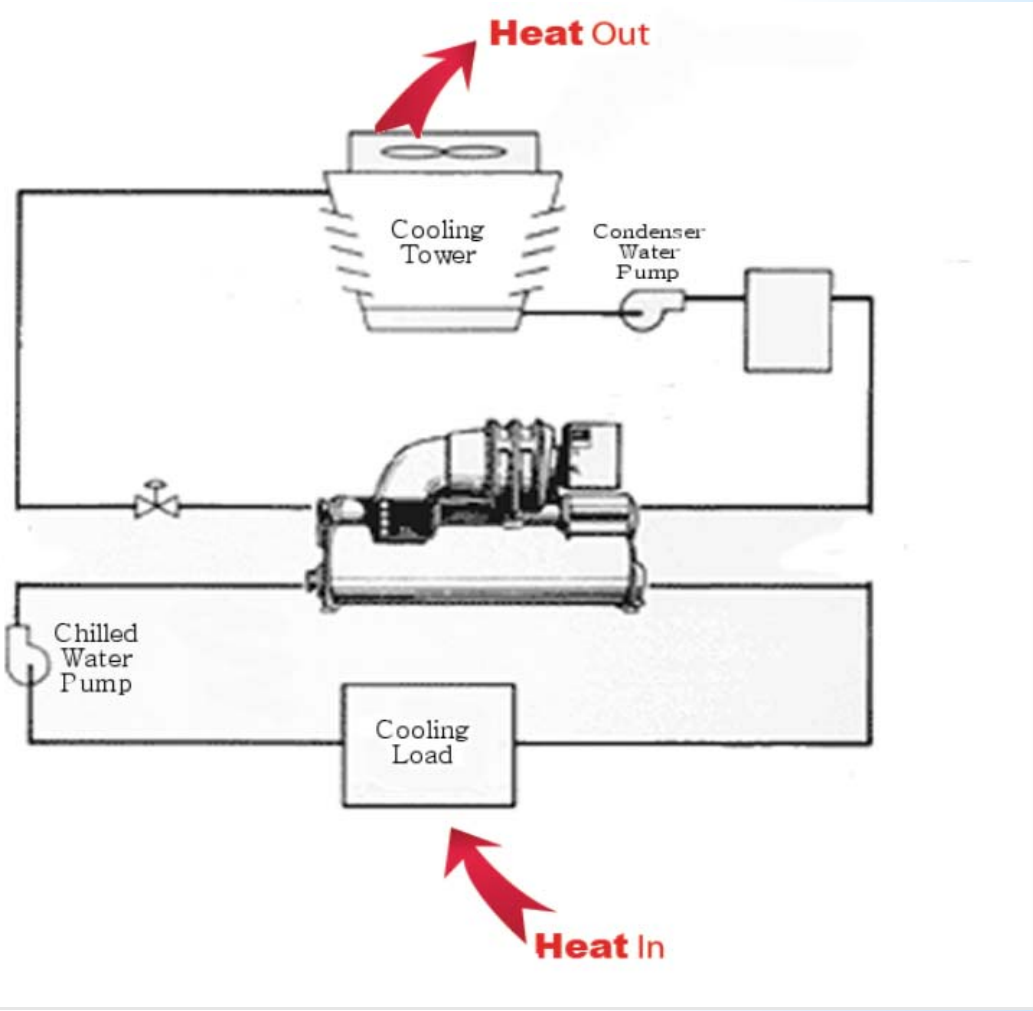
Reasons for Heat Machine

- Lowest first cost option
  - Reduced run time on boiler by 3
  - Reduced maintenance on boiler
- Essentially solved low Delta T syndrome

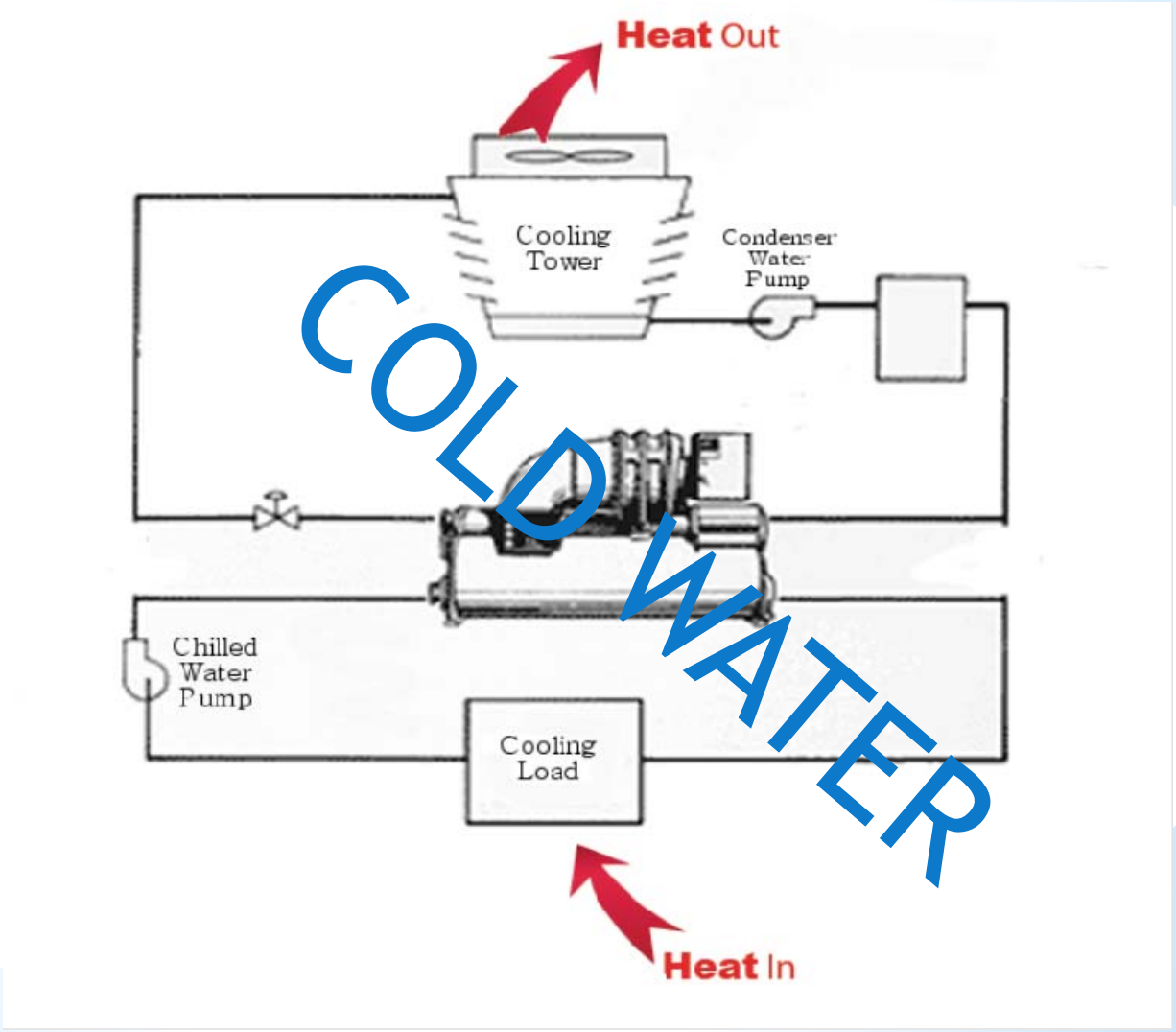
Why We Decided To Install Heat-Machines

- Allowed Us To Condition Our New Student Center From Our Existing Central Plant
  - No Square Footage Needed for Boiler in New Building
  - No Air-Cooled Chiller Near Building (Noise)
- Lowest Design/Construction Option
  - Total Project Cost ~ $550,000
- Added Cooling and Heating Redundancy
  - ~ 400 Tons of Cooling (4,800,000 BTUH)
  - ~ 180 Boiler Horsepower (6,000,000 BTUH)
- Most Economical Way For Us to Make Hot Water

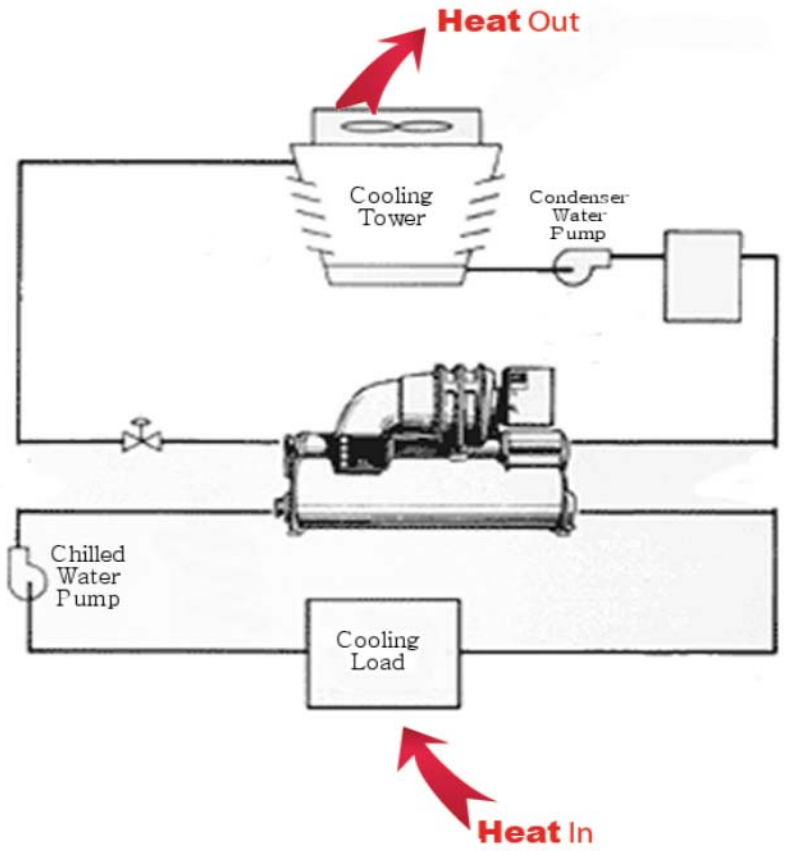
What Is The Product Of A Water To Water Chiller?



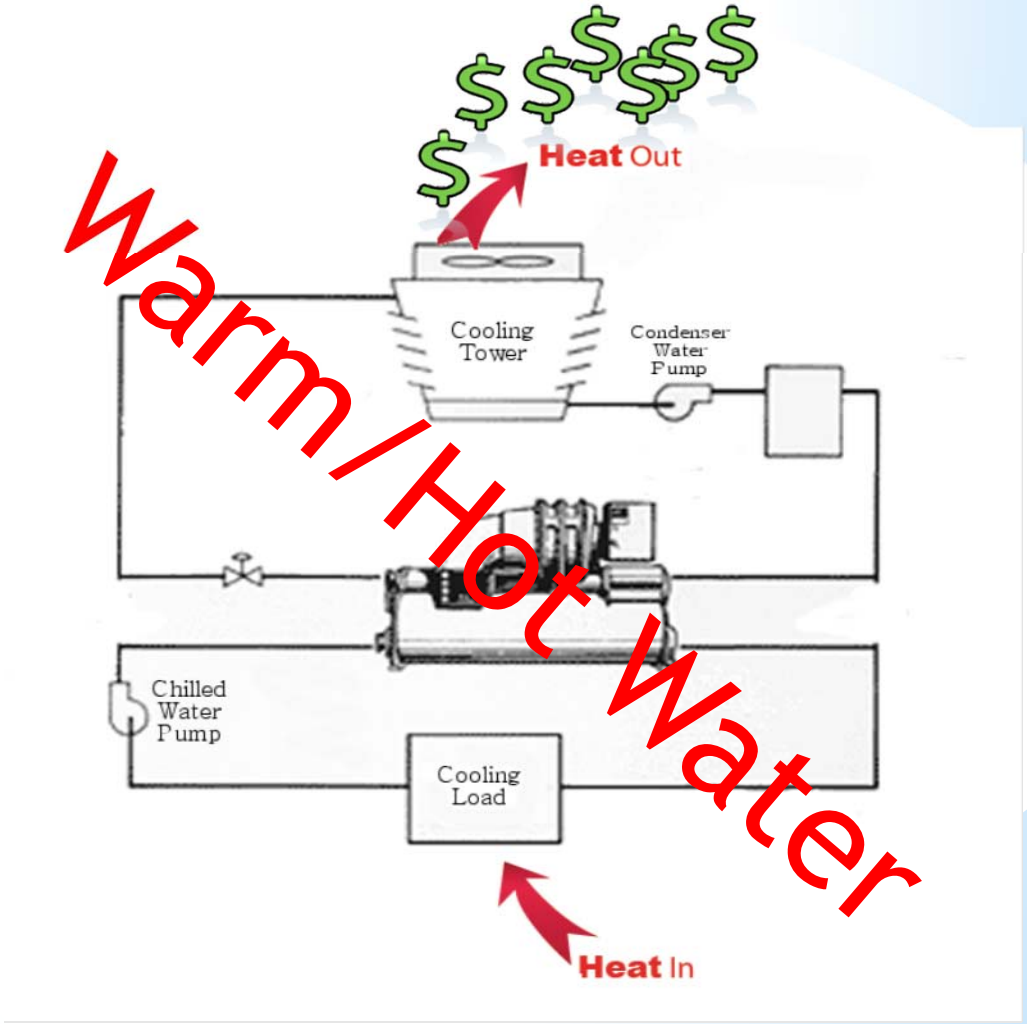
What Is The Product Of A Water To Water Chiller?



What Is The BY-Product Of A Water To Water Chiller?

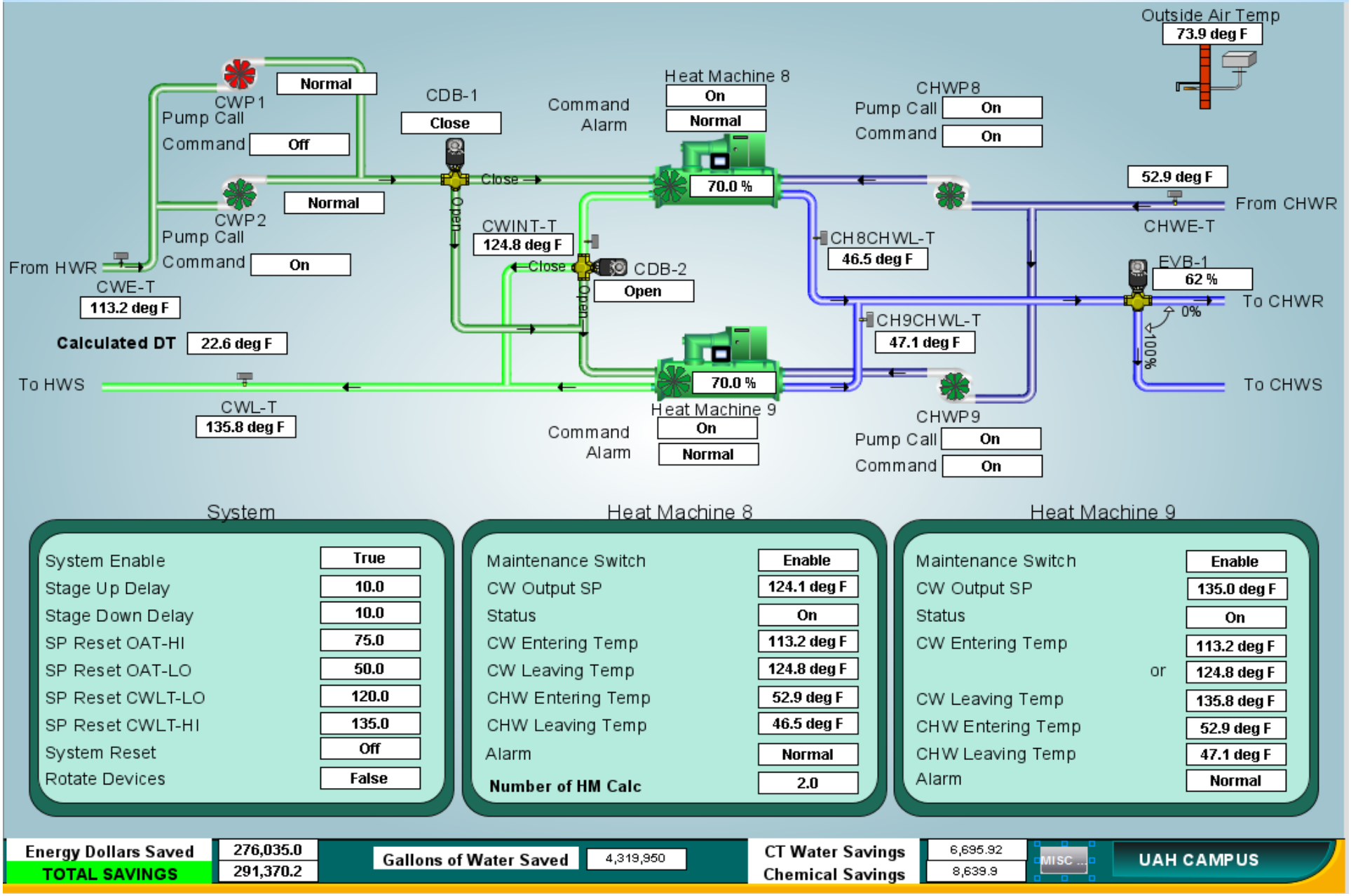


What Is The BY-Product Of A Water To Water Chiller?



September 21, 2014 Heat-Machine Snapshot

What Is The Product – What Is The By-Product?



System

System Enable	True
Stage Up Delay	10.0
Stage Down Delay	10.0
SP Reset OAT-HI	75.0
SP Reset OAT-LO	50.0
SP Reset CWLT-LO	120.0
SP Reset CWLT-HI	135.0
System Reset	Off
Rotate Devices	False

Heat Machine 8

Maintenance Switch	Enable
CW Output SP	124.1 deg F
Status	On
CW Entering Temp	113.2 deg F
CW Leaving Temp	124.8 deg F
CHW Entering Temp	52.9 deg F
CHW Leaving Temp	46.5 deg F
Alarm	Normal
Number of HM Calc	2.0

Heat Machine 9

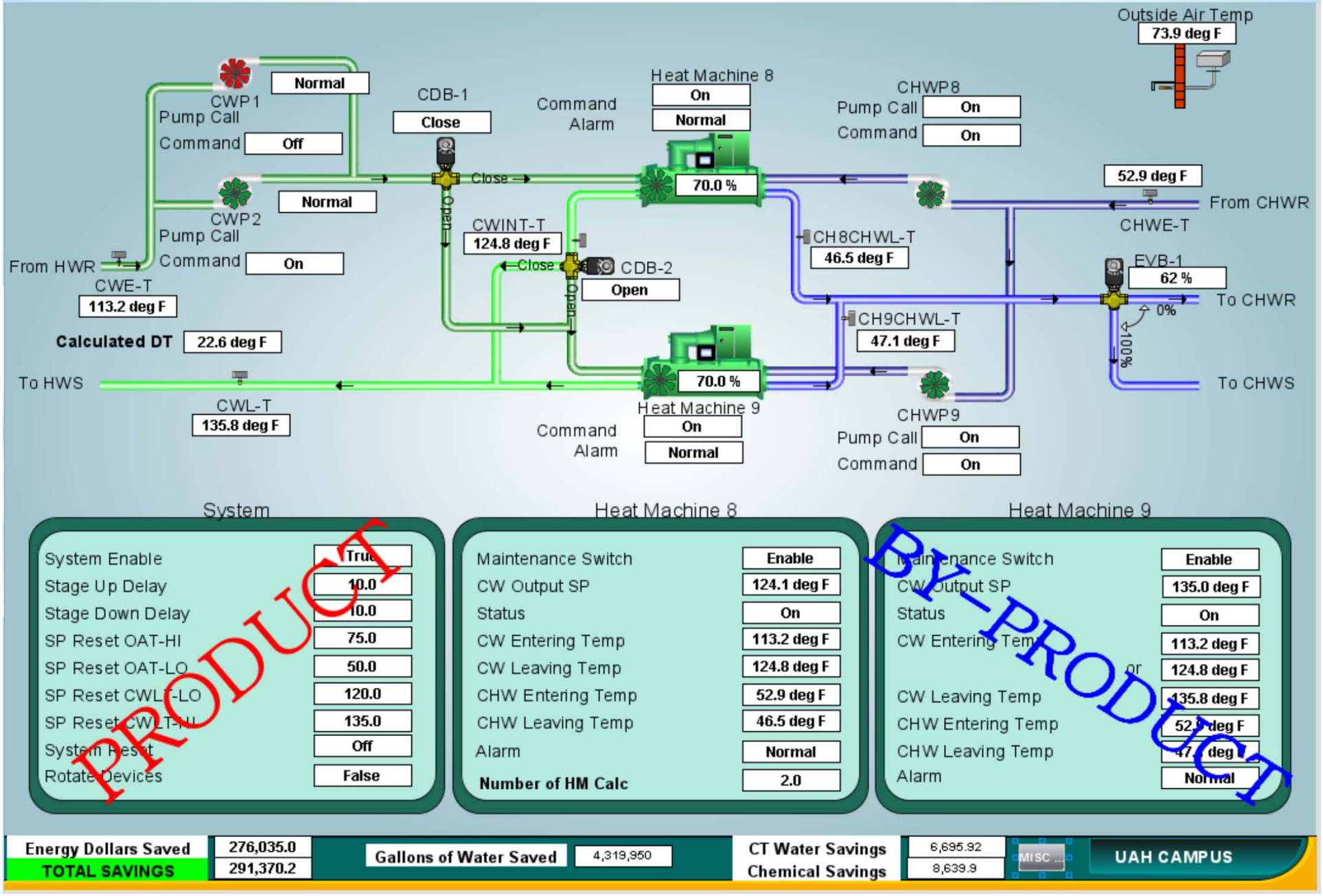
Maintenance Switch	Enable
CW Output SP	135.0 deg F
Status	On
CW Entering Temp	113.2 deg F
or	124.8 deg F
CW Leaving Temp	135.8 deg F
CHW Entering Temp	52.9 deg F
CHW Leaving Temp	47.1 deg F
Alarm	Normal

Energy Dollars Saved	276,035.0	Gallons of Water Saved	4,319,950	CT Water Savings	6,695.92
TOTAL SAVINGS	291,370.2			Chemical Savings	8,639.9

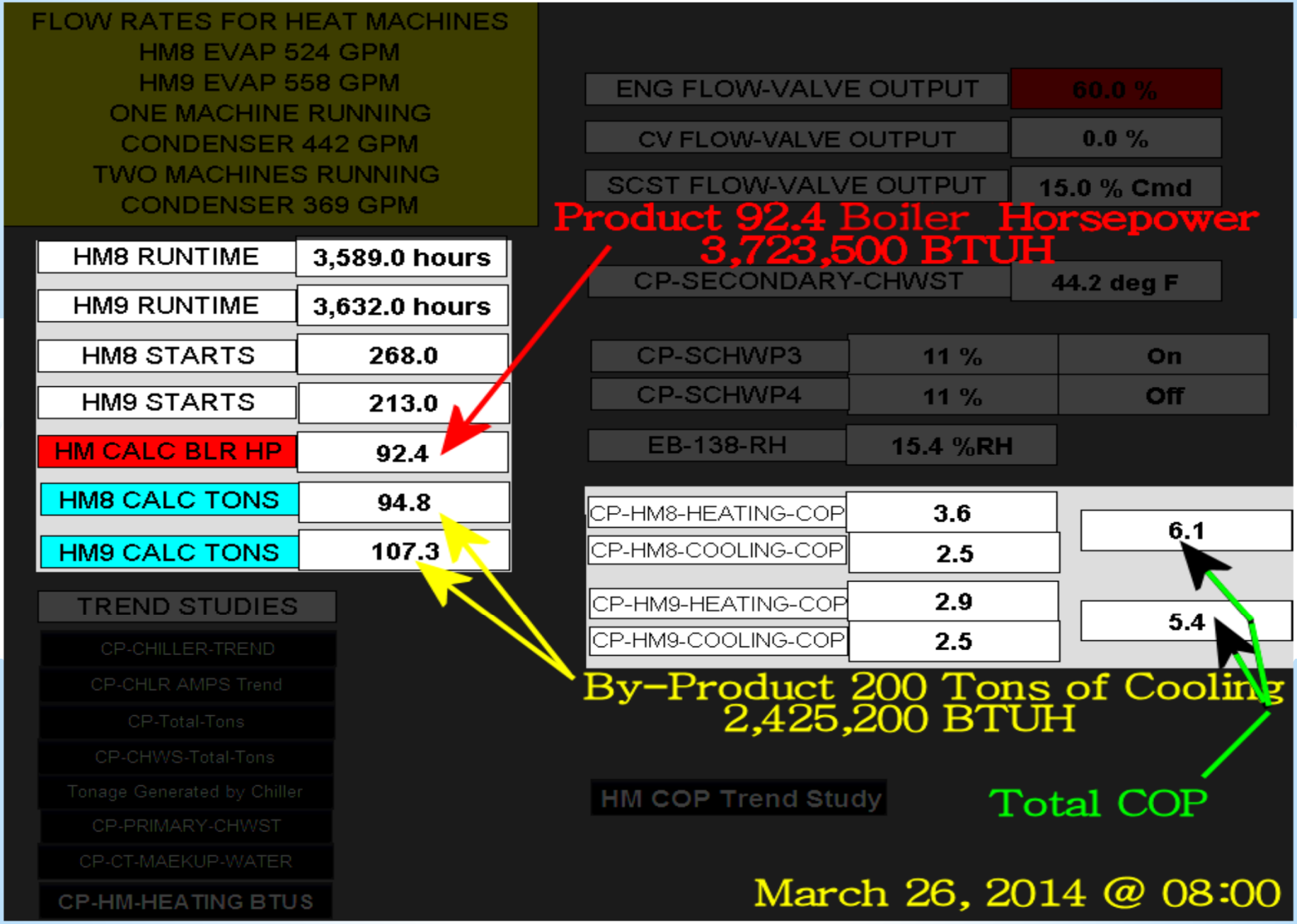
MISC ...

UAH CAMPUS

September 21, 2014 Heat-Machine Snapshot



March 26, 2014 Snapshot



Current Fuel Cost

For 1,000,000 BTUs

Electricity $25.25

Nat. Gas $8.02

#2 Fuel Oil $24.51

Current Fuel Cost

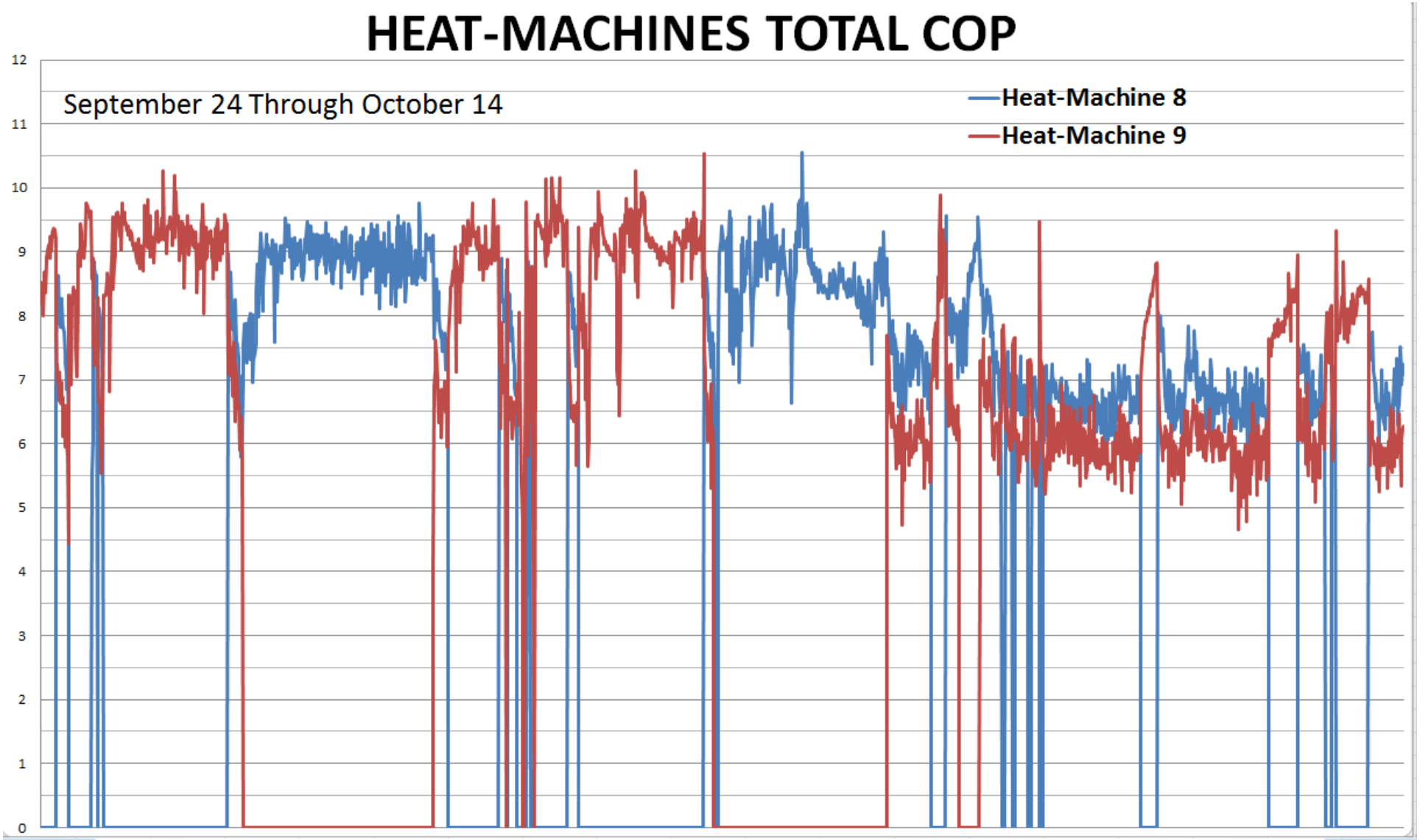
For 1,000,000 BTUs

Electricity	$25.25	_____ with COP of 7.09
Nat. Gas Boiler	$8.02	$9.22 if used in 85% eff. COP 0.85
#2 Fuel Oil boiler	$24.51	$28.84 if used in 85% eff. COP 0.85

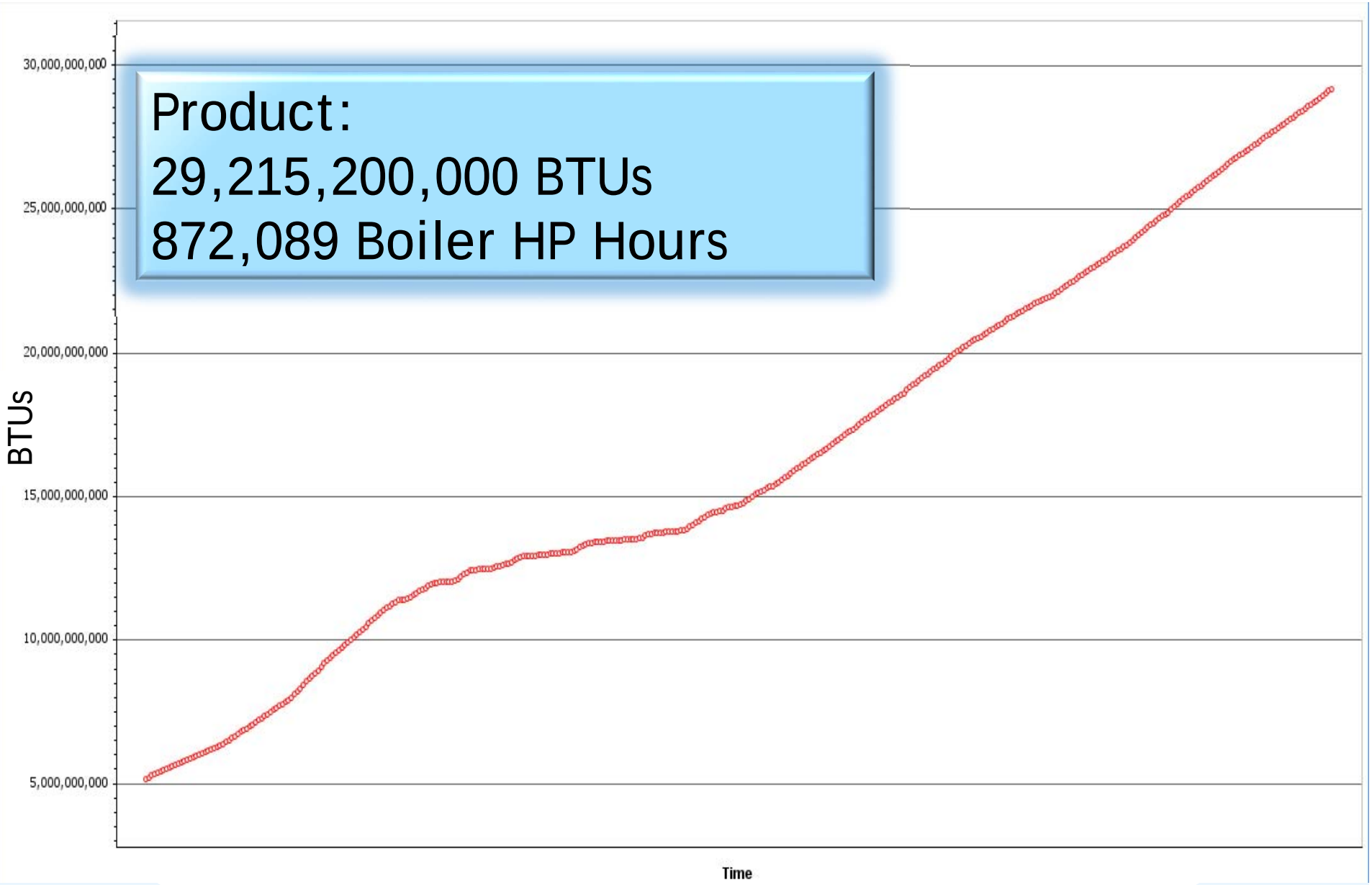
Current Fuel Cost

For 1,000,000 BTUs

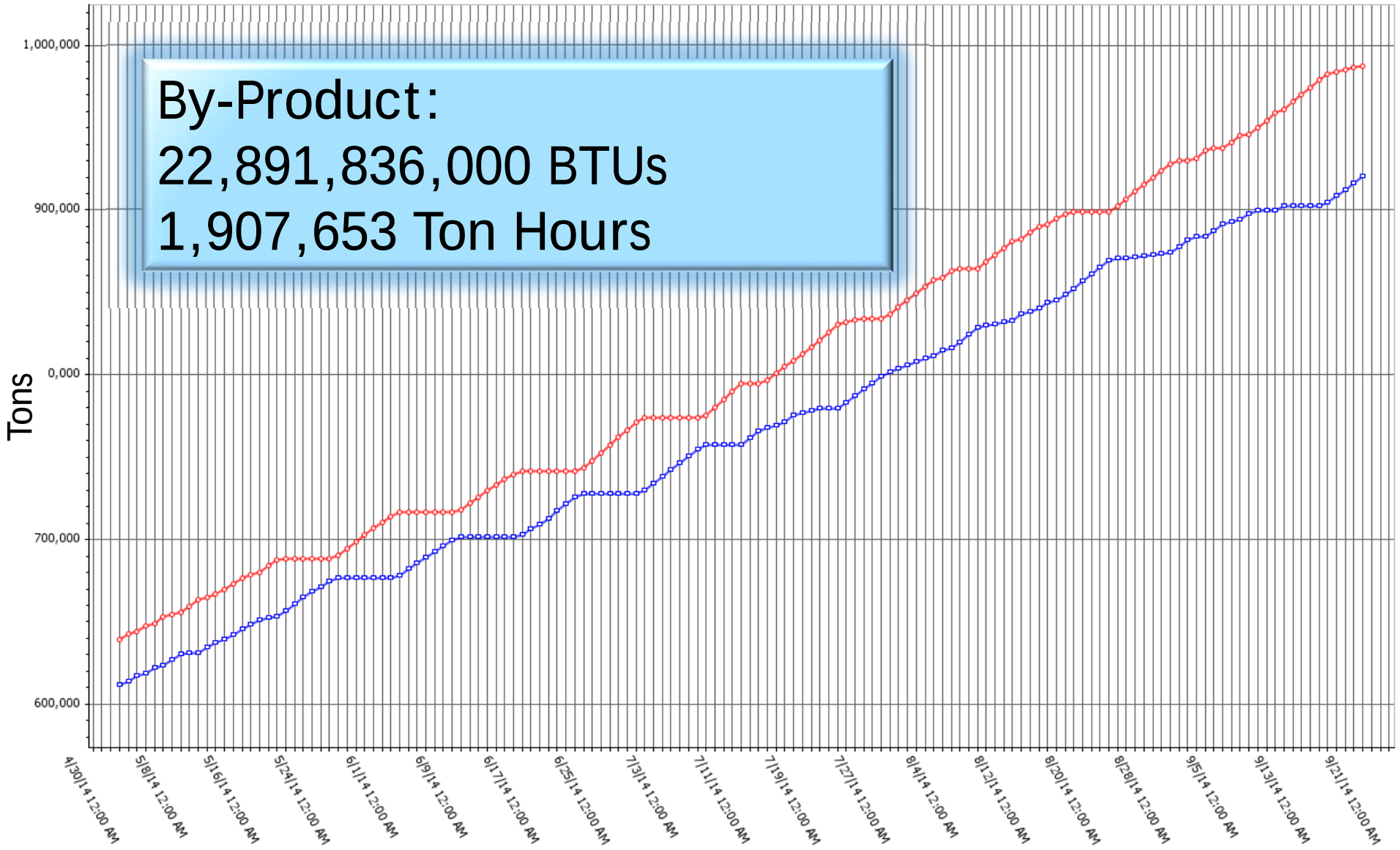
Electricity	$25.25	**$3.56** with COP of 7.09
Nat. Gas Boiler	$8.02	$9.22 if used in 85% eff. COP 0.85
#2 Fuel Oil boiler	$24.51	$28.84 if used in 85% eff. COP 0.85



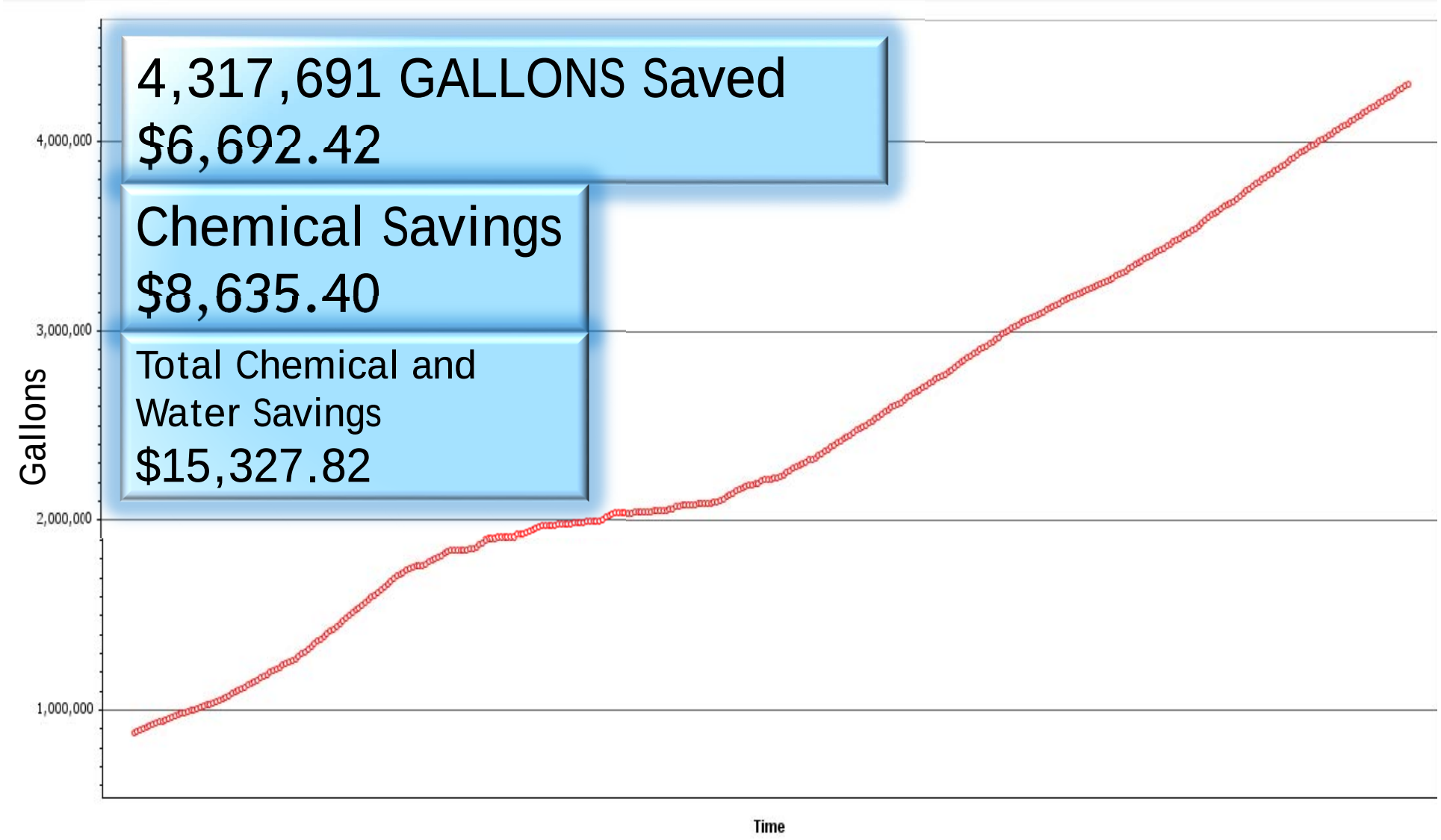
COP TREND DATA



HEATING RESULTS TO DATE (09-21-14)



COOLING RESULTS TO DATE (09-21-14)



WATER SAVINGS TO DATE (09-21-14)

May 13TH 2013
To
Sep, 21th 2014

$ $291,219

Cumulative Savings Since Installation

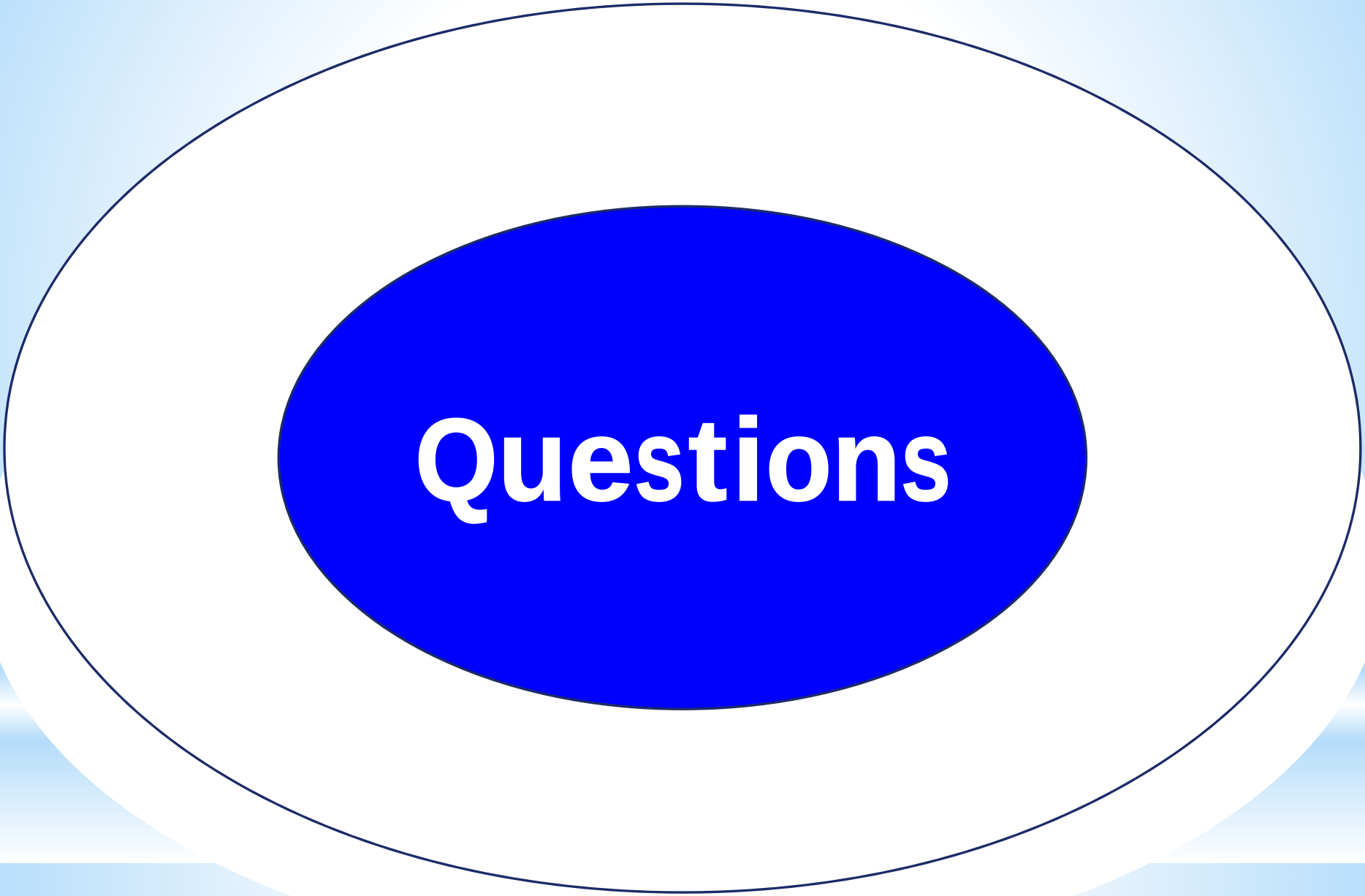
$ 218,412

Annual Savings Rate

0 YEARS?

2.52 YEARS

Payback


Questions