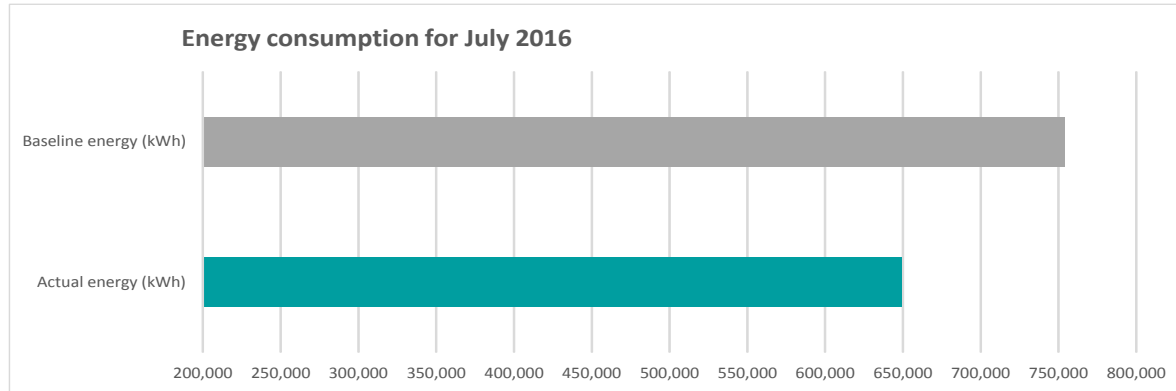


## Intelligent Efficiency at Work: Data Driven HVAC system Optimization

How Systems Level Integration and **Intelligence** can reduce energy consumption and operating costs

Firas Obeido,  
Chief Technology Officer,  
Smart Automation Energy

# Energy Efficiency project savings (July 1<sup>st</sup> – July 31<sup>st</sup> 2016)



**BASELINE ENERGY**  
for July 2016 (kWh)

**752,217**

**ACTUAL ENERGY**  
for July 2016  
(kWh)

**649,440**

**ADJUSTED**  
**ENERGY** for July  
2016 (kWh)

**2,653**

**FINAL SAVINGS**  
for July 2016  
(kWh)

**105,430**

**FINAL ENERGY**  
**SAVINGS %**

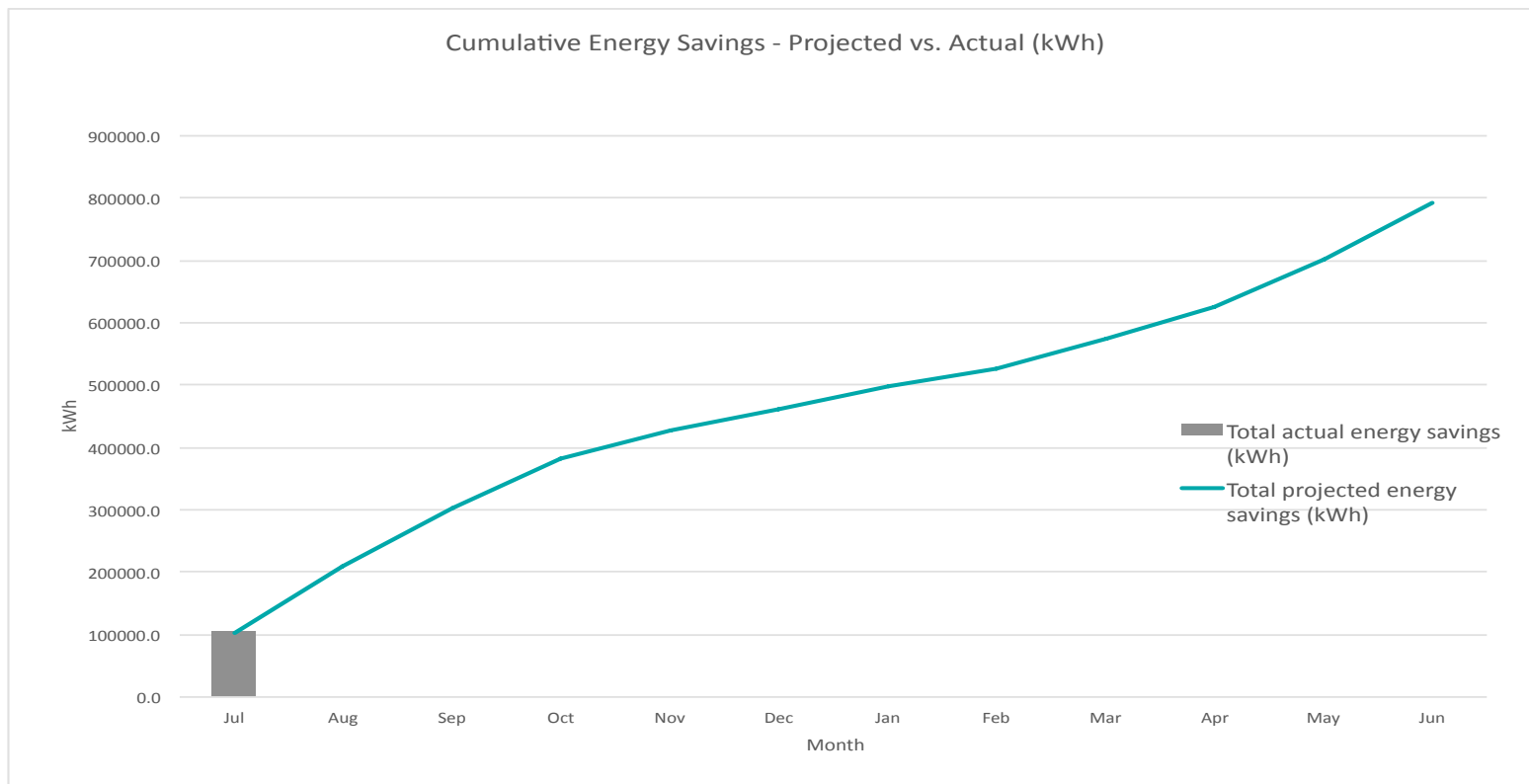
**14%**

**FINAL ENERGY COST**  
**SAVINGS (AED)**

**46,916**

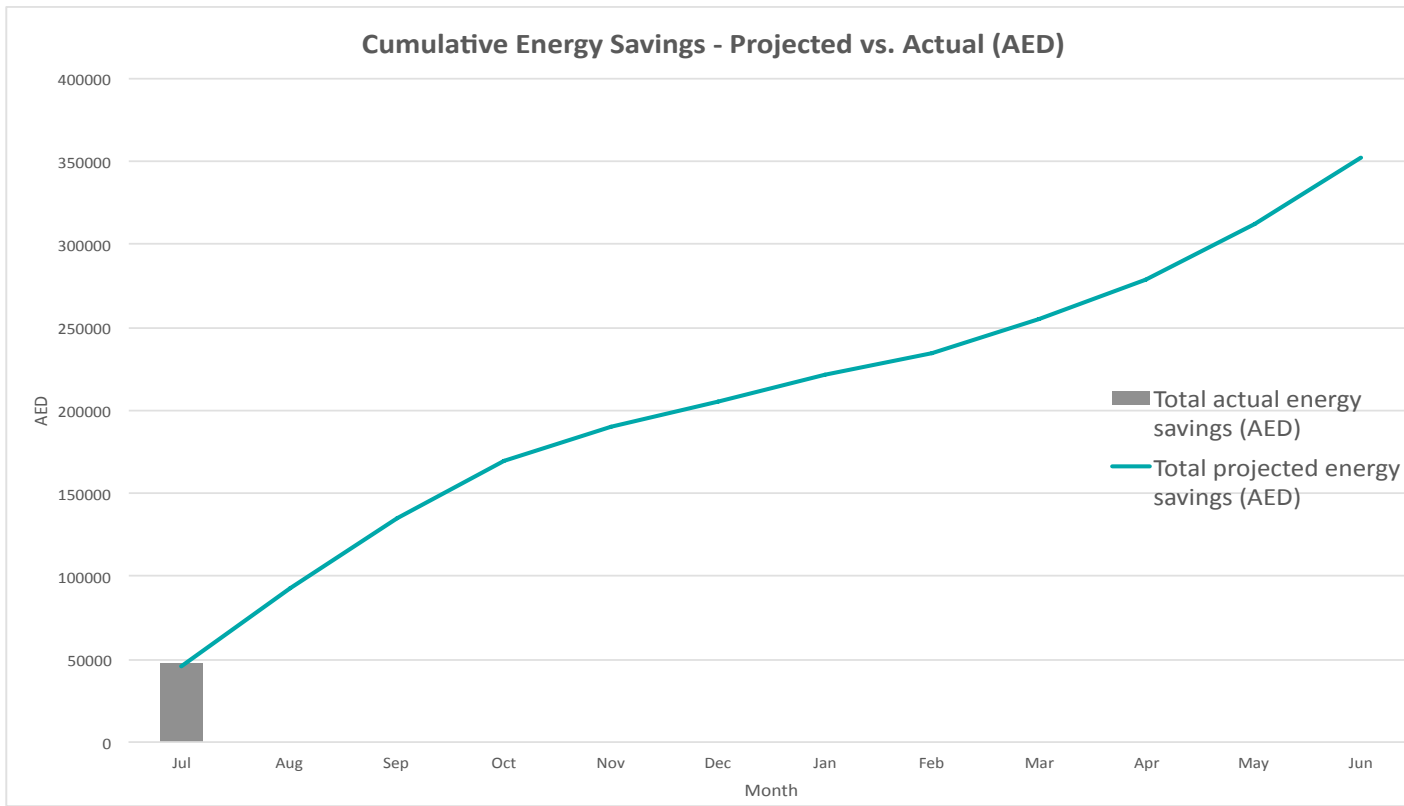
# Cumulative Monthly Energy Savings

Projected energy savings of AED 352,000 by June 30<sup>th</sup> 2017

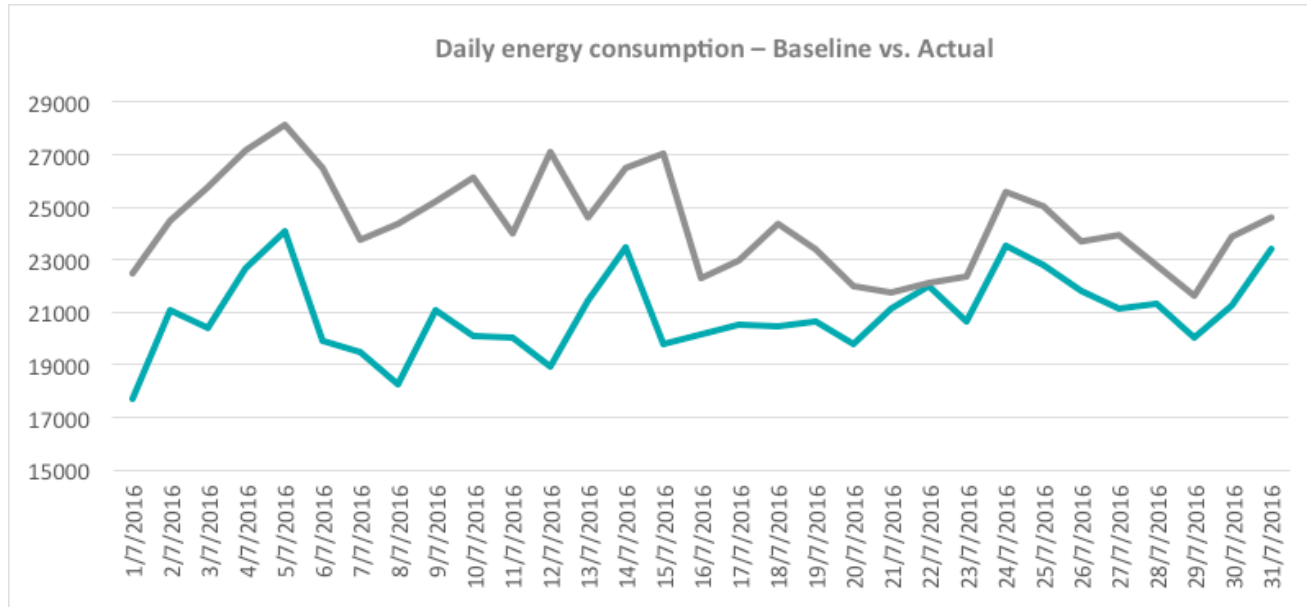


# Cumulative Monthly Energy Cost Savings

Projected energy savings of AED 352,000 by June 30<sup>th</sup> 2017



# Daily energy consumption – Baseline vs. Actual (kWh)



Energy savings during the first 13 days of July were higher than the energy savings during the last 17 days of July

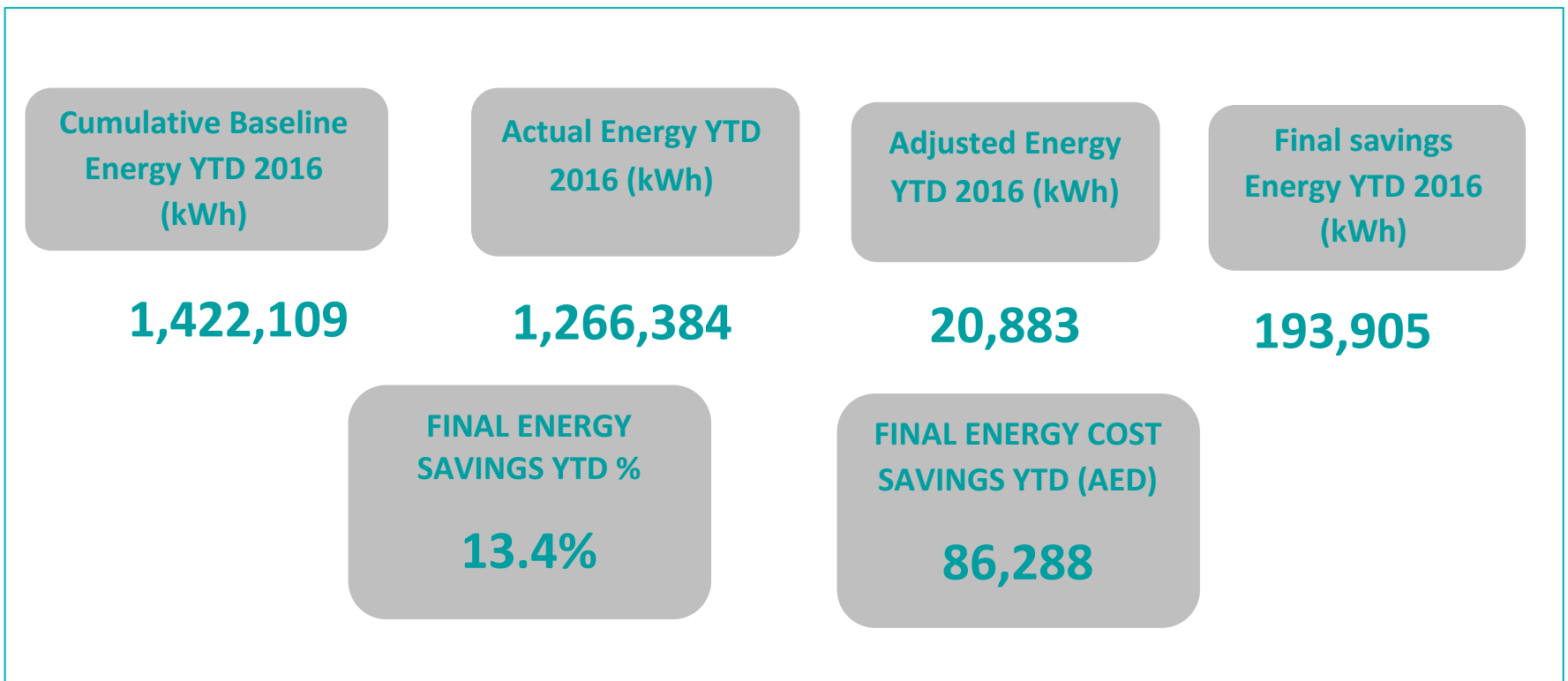
This is due to the unplanned FAHU-2 exhaust fan shutdown during the last 17 days of the month

Reduced electrical energy consumption due to exhaust fan OFF for the duration of 18 days is 10399.3 kWh.

As for the increase in cooling energy consumed due to NO heat recovery is 13052.7 kWh.

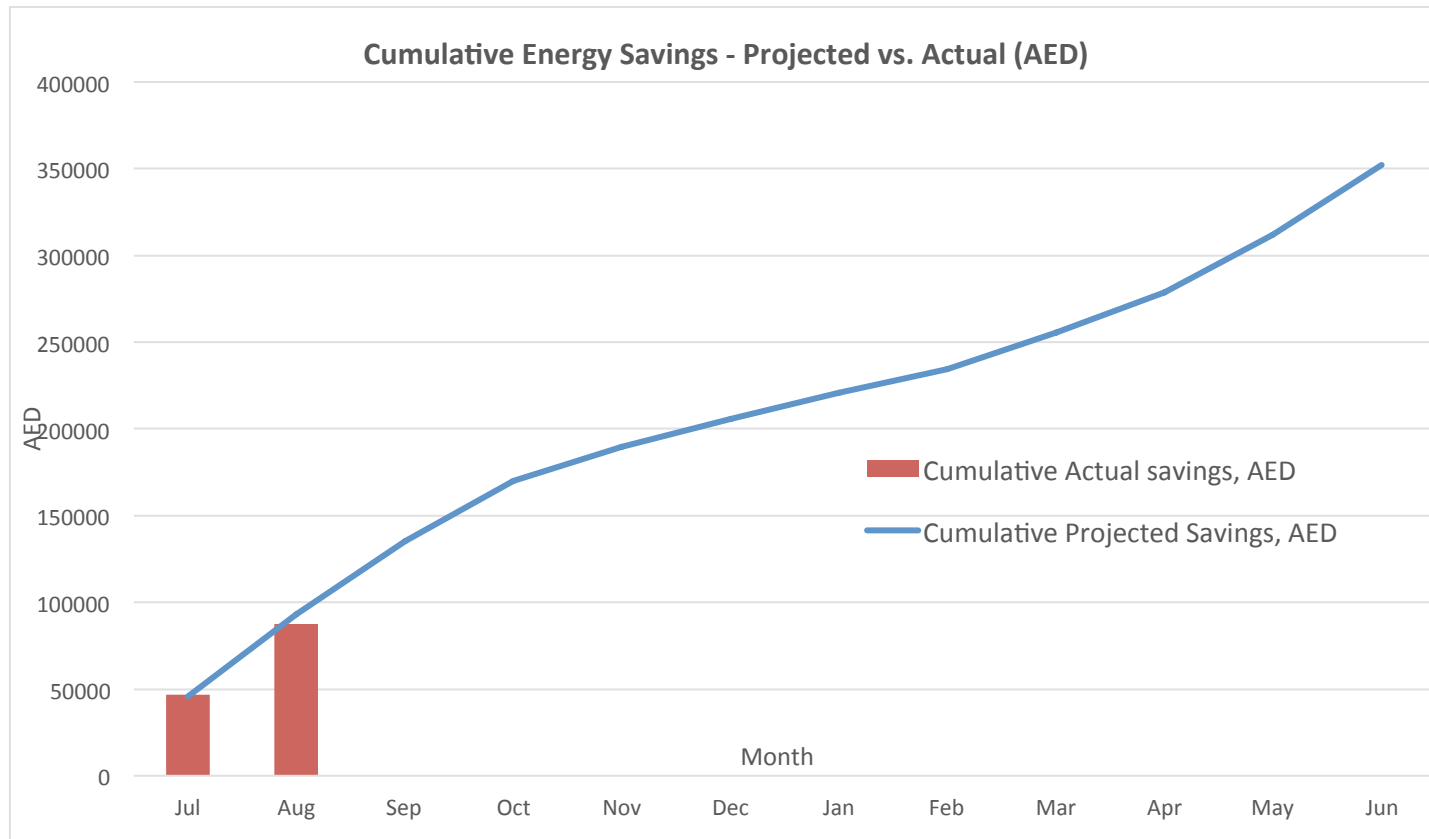
With a reduction in electricity consumption and an increase in cooling consumption, the overall addition to the monthly energy savings is equal to  $13052.7\text{kWh} - 10399.3\text{ kWh} = 2653\text{ kWh}$ .

# Energy Efficiency project savings (Aug. 1<sup>st</sup> – Aug. 31<sup>st</sup> 2016)

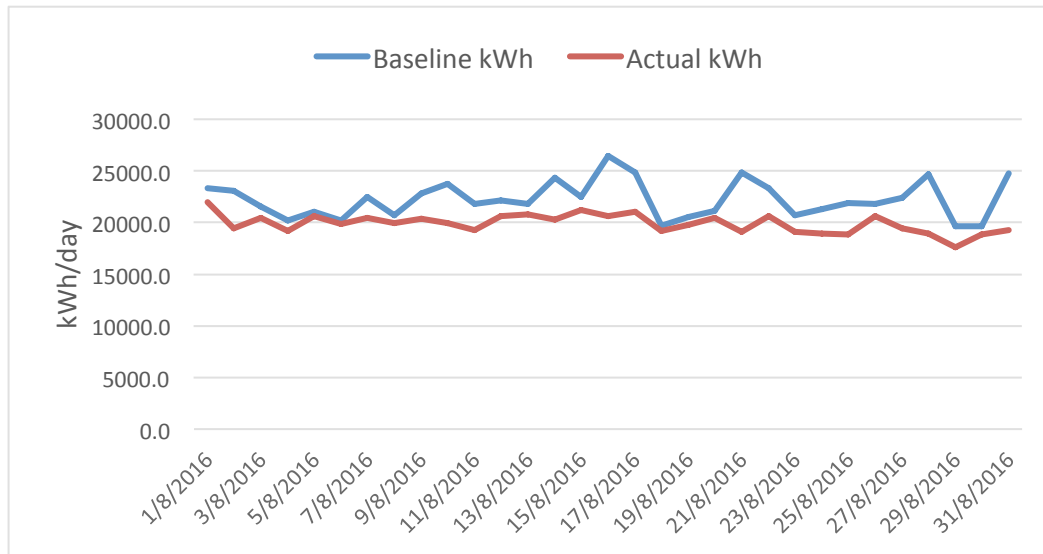


# Cumulative Monthly Energy Cost Savings

Projected energy savings of AED 352,000 by June 30<sup>th</sup> 2017



# Daily energy consumption – Baseline vs. Actual (kWh)



Energy savings during the first 13 days of July were higher than the energy savings during the last 17 days of July

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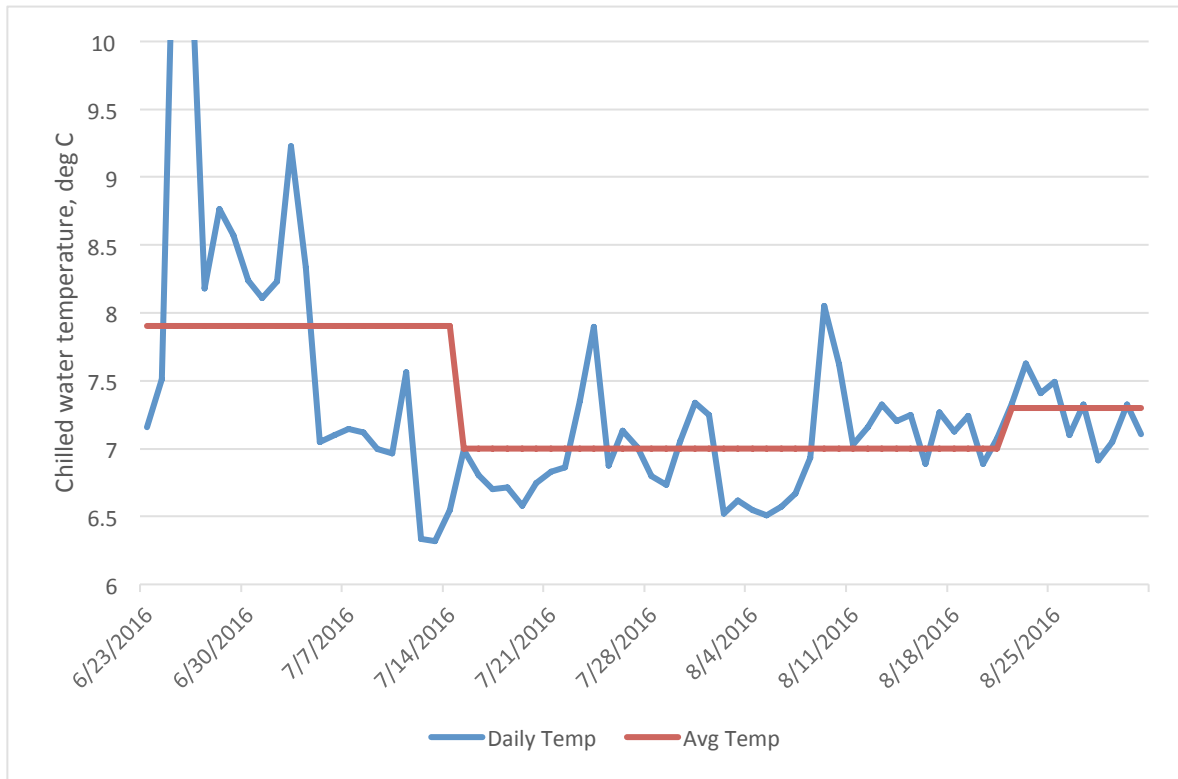
As for the increase in cooling energy consumed due to NO heat recovery is 13052.7 kWh.

With a reduction in electricity consumption and an increase in cooling consumption, the overall addition to the monthly energy savings is equal to  $13052.7\text{kWh} - 10399.3\text{kWh} = 2653\text{kWh}$ .





# Reduction of chilled water temperature

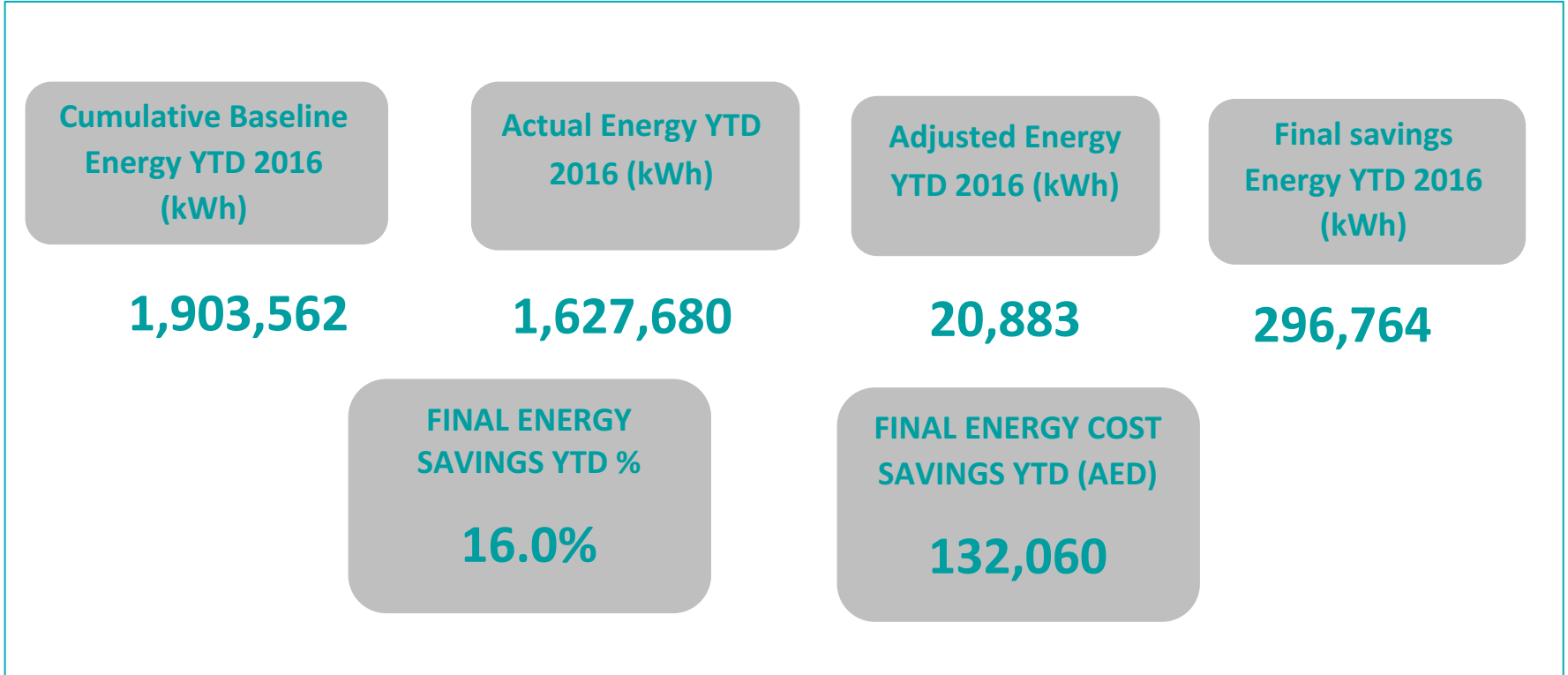


Non routine Adjustment of energy savings based on static factor – reduction of chilled water temperature setpoint

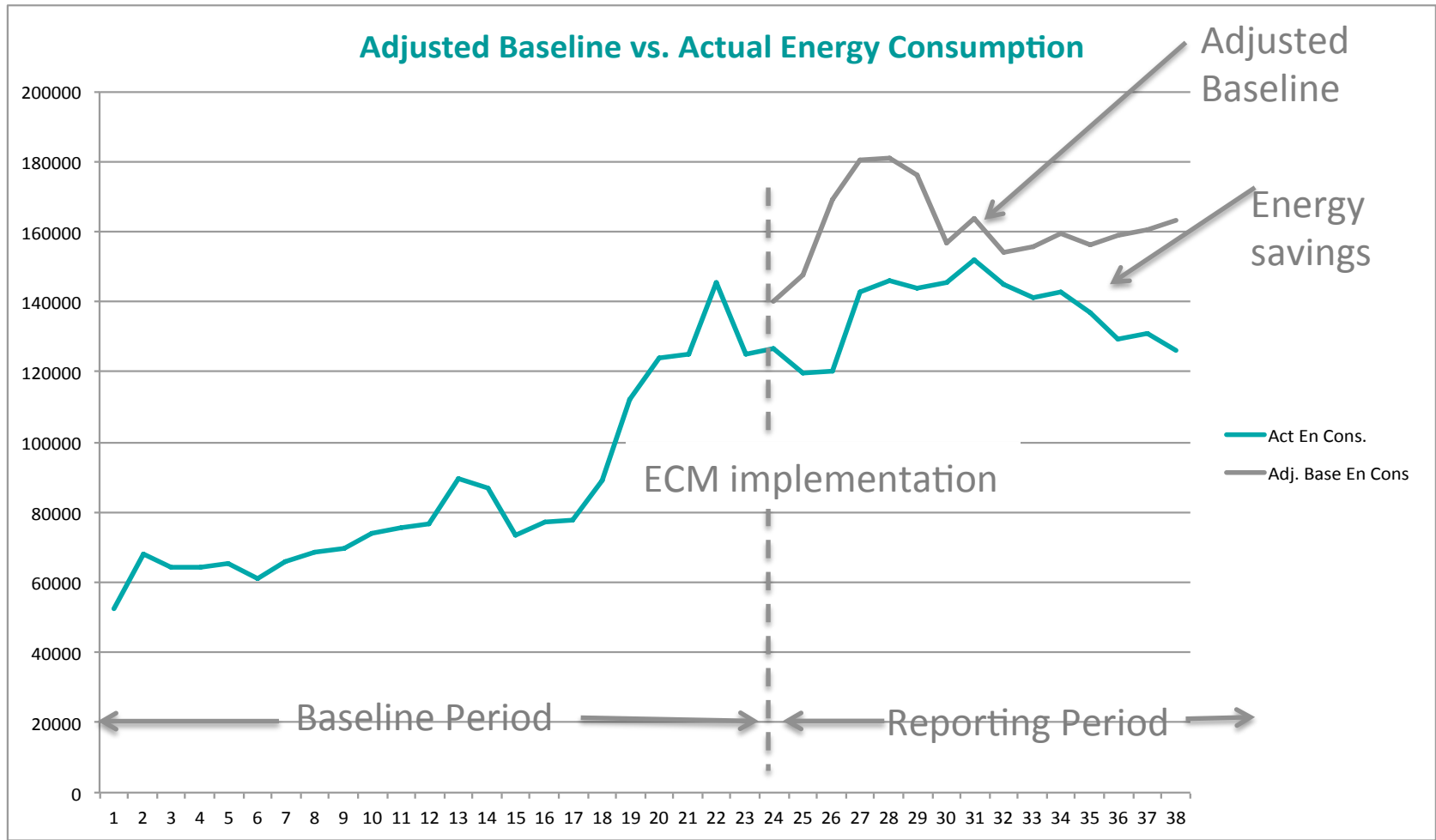
Between 15<sup>th</sup> July & 21<sup>st</sup> August 2016, rescheduling in chiller operation resulted in lower chilled water temperature from 7 deg C to 6 deg C. The temperature setpoint was restored to 7 deg C on 22<sup>nd</sup> of August.

Increased energy consumption from 15<sup>th</sup> July to 21<sup>st</sup> August 2016 of 18,180 KWh (8,090.2 AED).

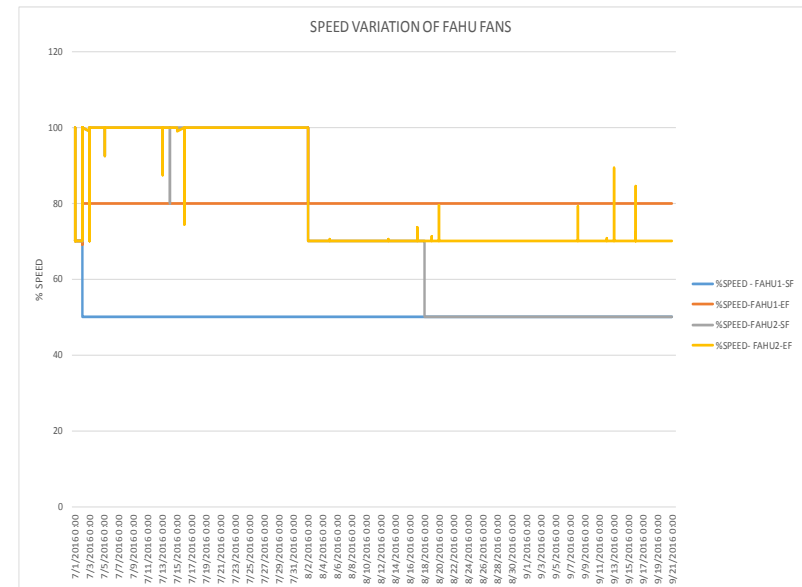
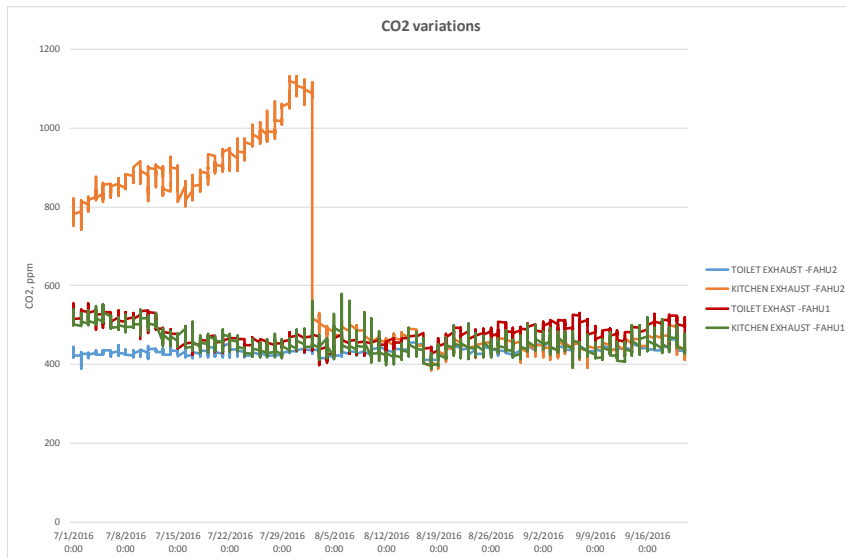
# Energy Efficiency project savings (July 1<sup>st</sup> – Sep. 20<sup>th</sup> 2016)



# Adjusted baseline vs. Actual energy consumption



# CO2 levels vs. FAHU fan speed



- CO2 levels are much lower than ASHRAE standards (900 ppm -1100ppm).
- FAHUs supply fan speed no less than 50%.
- FAHUs extract fan speed no less than 70%

## Challenges

- Each chiller has different set point.
- Temperatures across chillers and headers are not reliable.
- Number of chillers operating during the day and night remain the same even if cooling load is different.
- No chiller optimization.

## Recommendations

- Continuously monitor temperatures for each chiller
- Upgrade BMS system
- Install of CPM

## Impact

- Full visibility of HVAC system.
- Continuous commissioning
- Collection and analysis of operational data to further optimize energy consumption.

# Questions?

## Smart Automation Energy LLC

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