

# KDC Energy Conservation

## AMRE-SACEA JOINT MEETING



To be the global leader in sustainable gold mining

16 Aug 2011

Wynand Oosthuysen



**GOLD FIELDS**

---

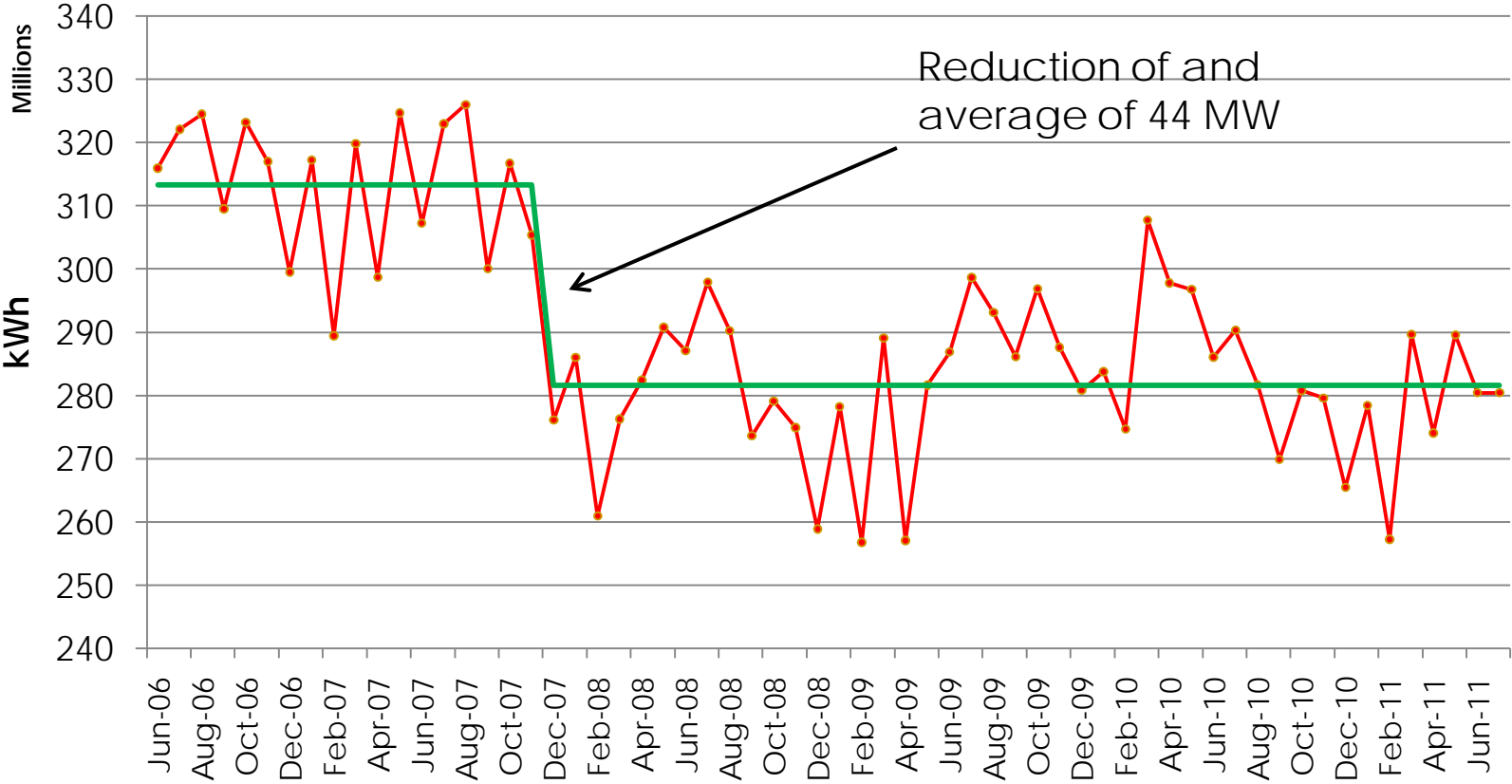
# Content

- Impact of Electricity on KDC
- Escalation on Electricity Cost
- Make-up of the Bill
- Counter measures taken



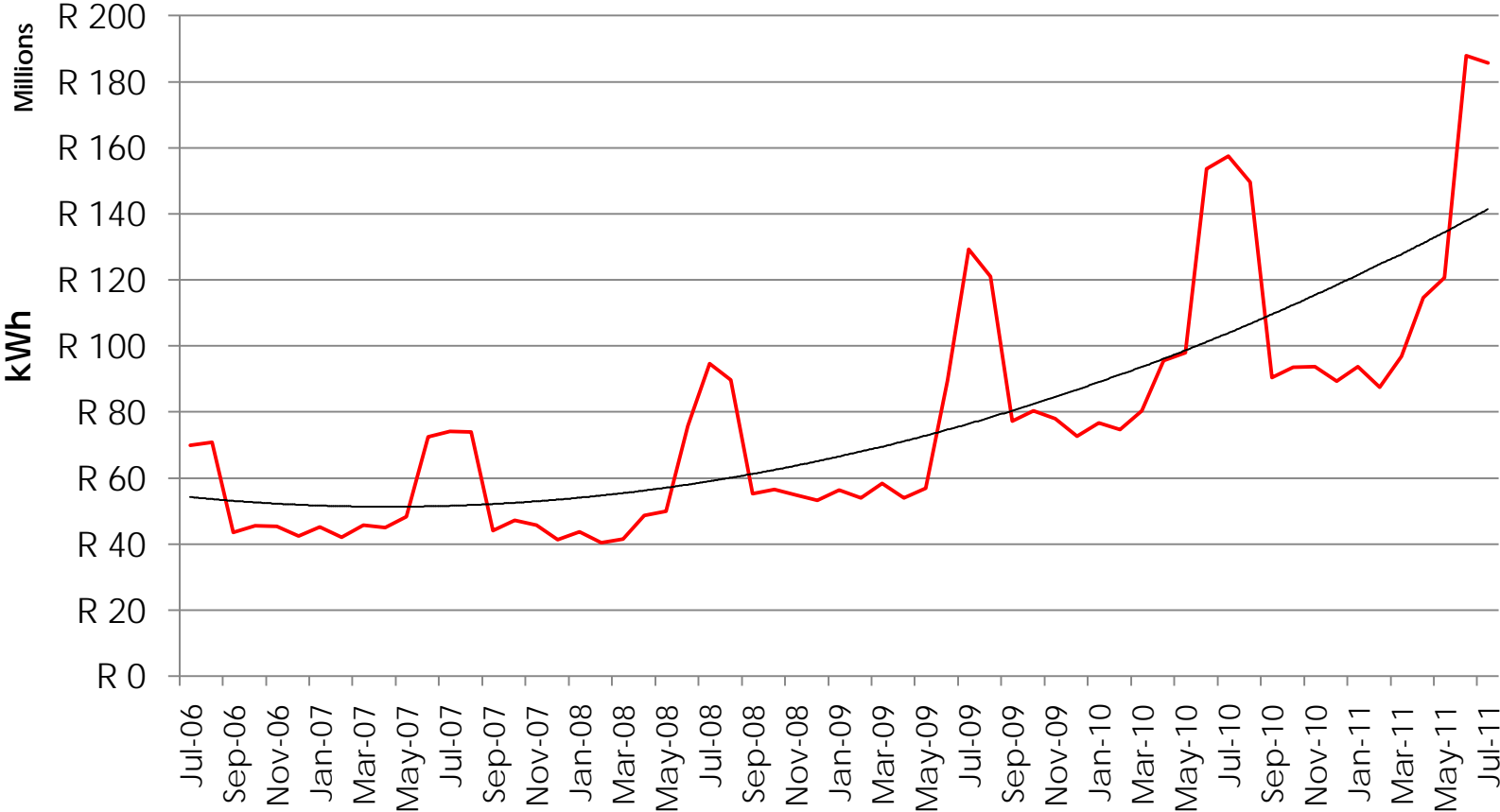
# Impact of Electricity on KDC

## KDC Energy Consumption



# Impact of Electricity on KDC

## KDC Energy Cost

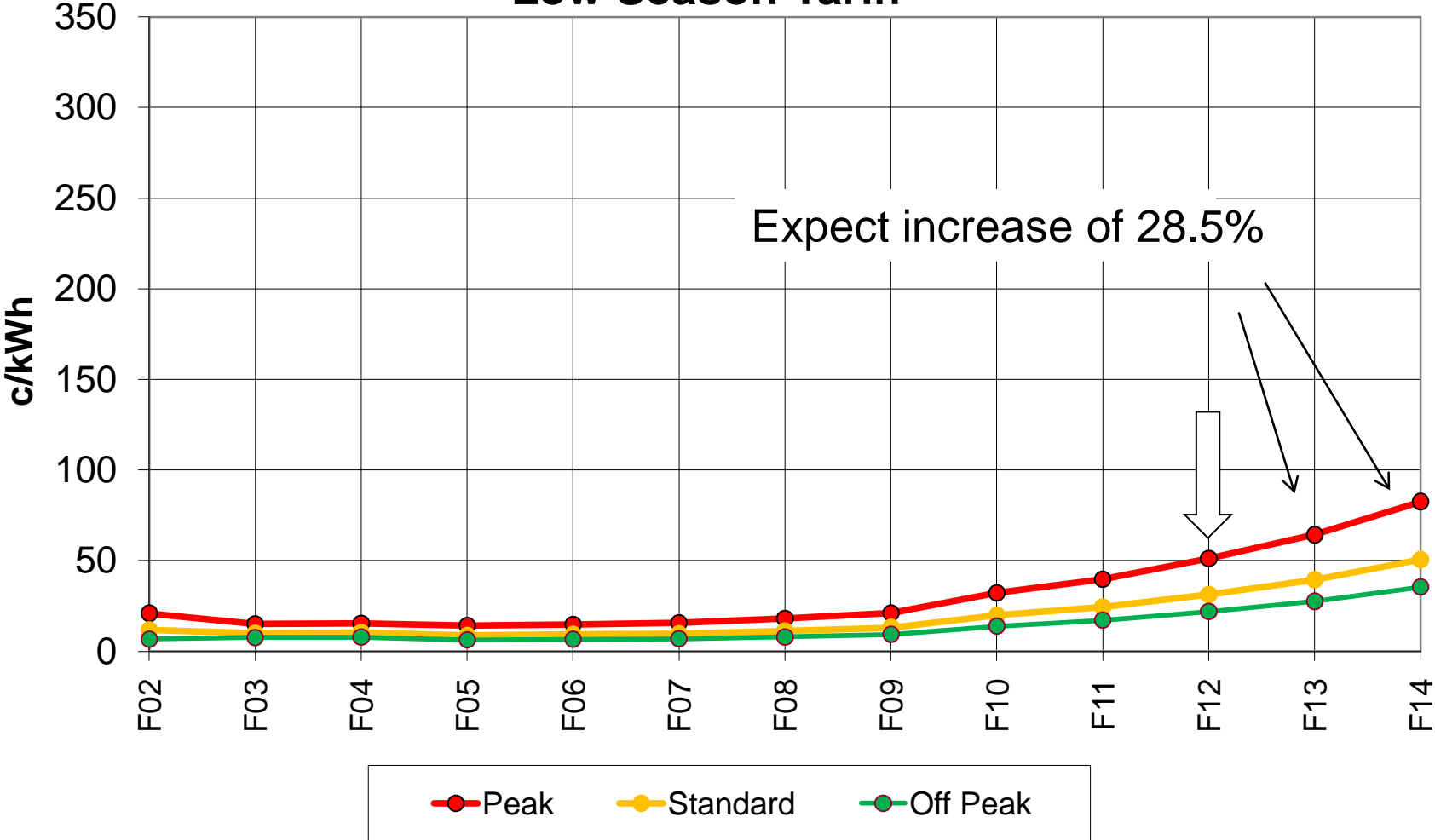


Electricity cost increase year on year even though the energy consumption is decreasing.



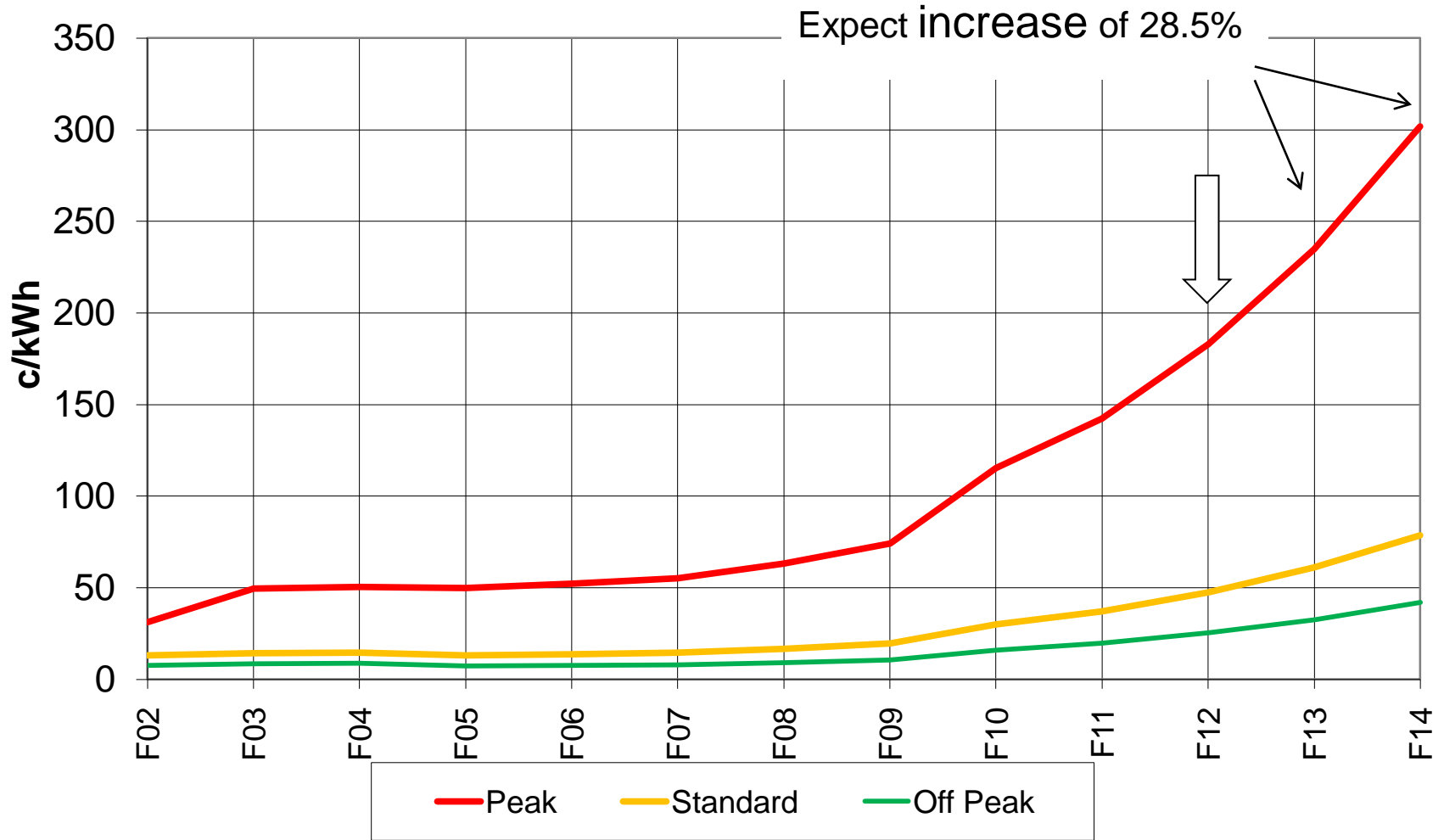
# Escalation on Electricity Cost

## Low Season Tariff

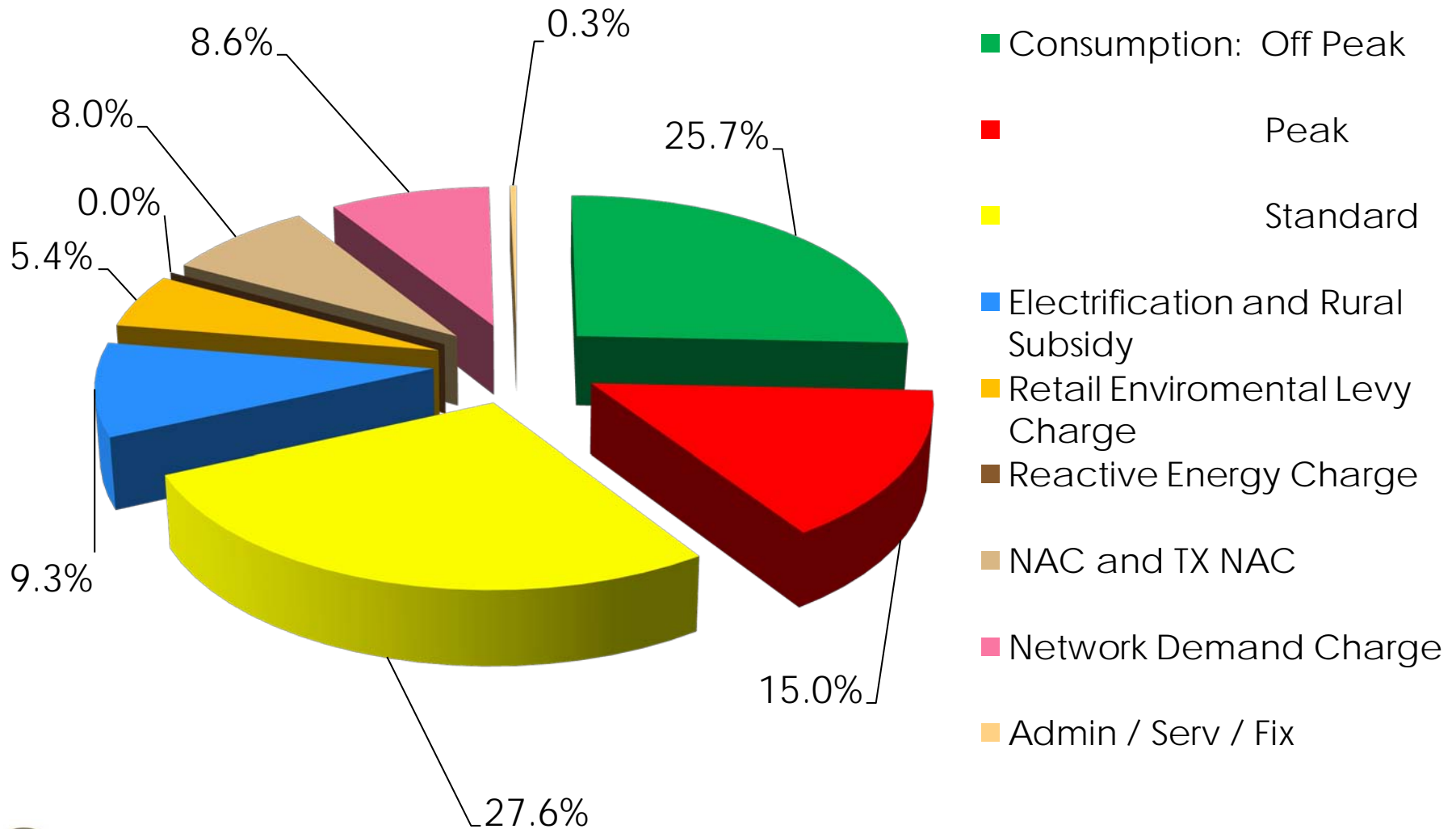


# Escalation on Electricity Cost

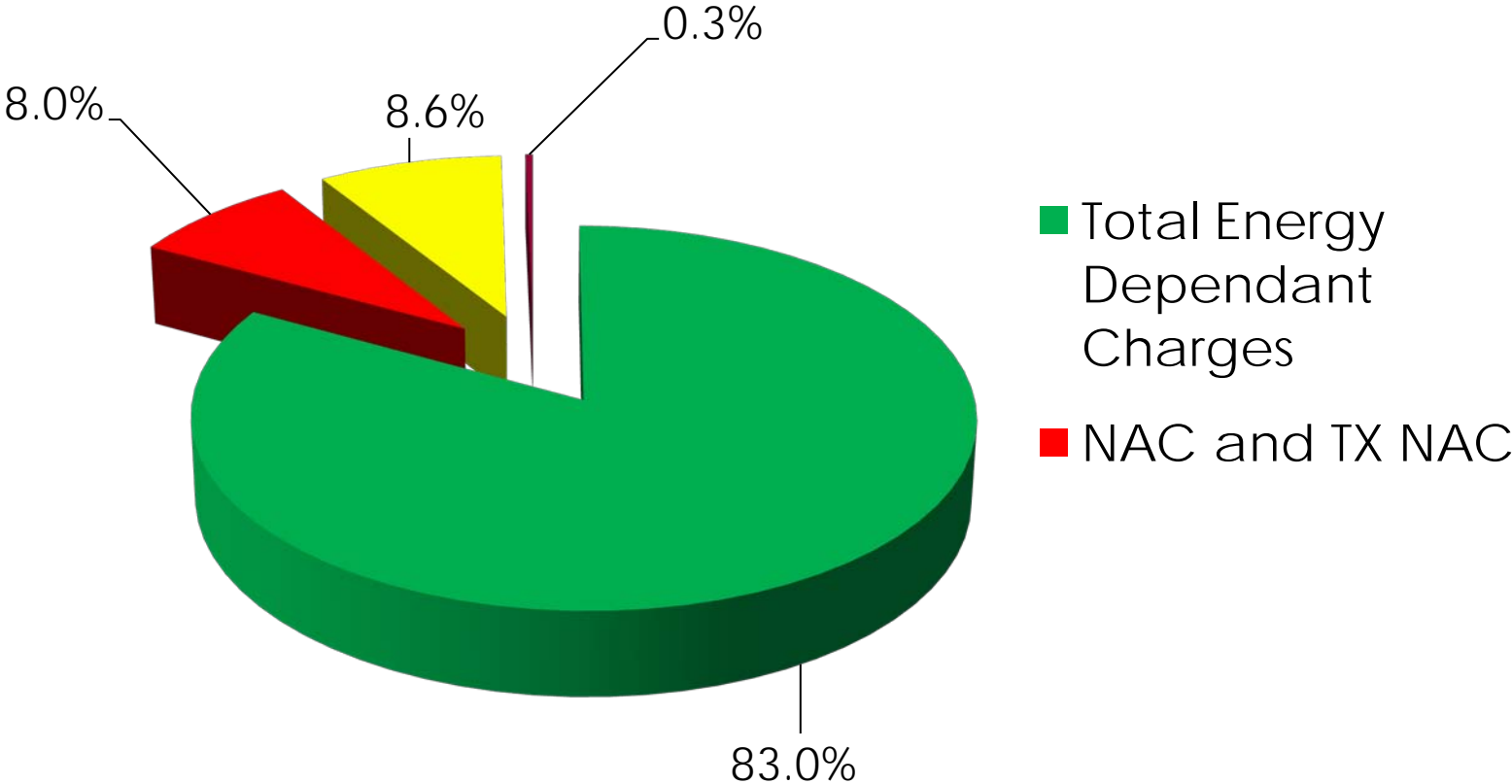
## High Season Tariff



# Make-up of the Bill



# Make-up of the Bill



# Counter measures taken

---

## Completed Initiatives:

- Pump scheduling.
- Geyser Load switches in low density residential areas.
- In line heater at high density residential areas.
- *Energy efficient lighting.*
- *Guide vane control on main ventilation fans.*
- *Re-evaluate power factor correction installations.*
- *Compressed air load control.*
- KDC East 1# Water System Optimization
- Energy recovery turbines K3 & D5 -  $\pm 6.5$  MW
- Introduction / extension on closed loop cooling.
- Extensive installation of ventilation seals.



# Completed Initiatives

## Pump Scheduling at 5 Shaft KDC West

### Intelligent Pump Scheduling and Control

#### Opportunities



- East 5#

Scheduling out of Eskom evening peak time i.e. 6pm to 8pm

**4 Stages to surface with 6 pumps per stage/level into dams on 52L, 42L, 23L and IPC with current dam capacity**

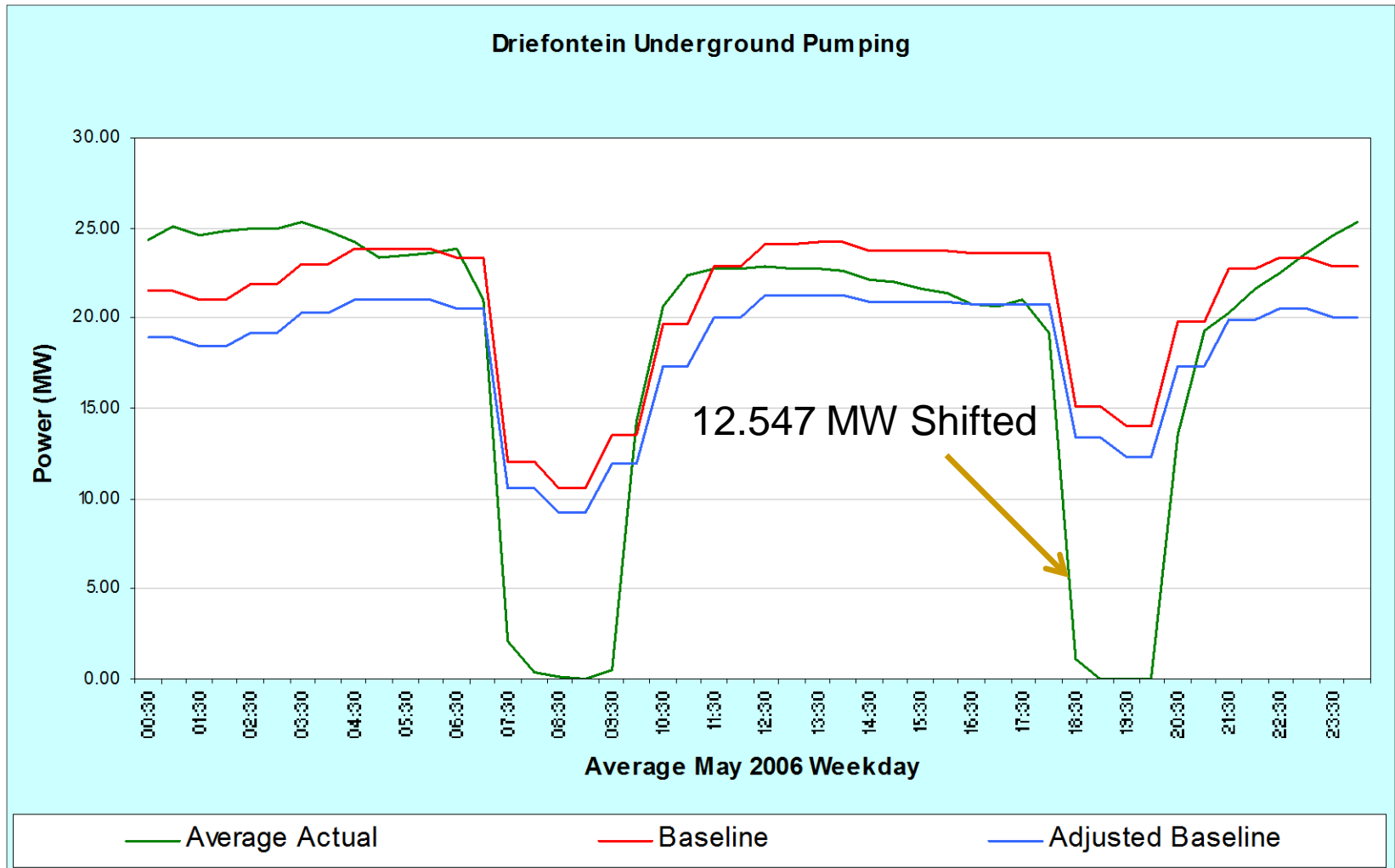
**Max Demand Load Shift**

**8.22 MW**



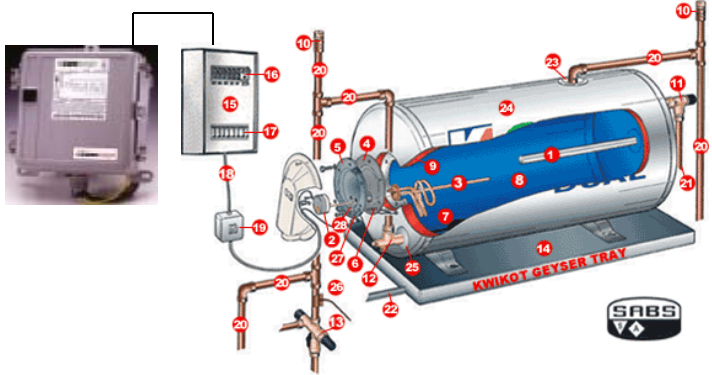
# Completed Initiatives

## Pump Scheduling at 5 Shaft KDC West



# Completed Initiatives

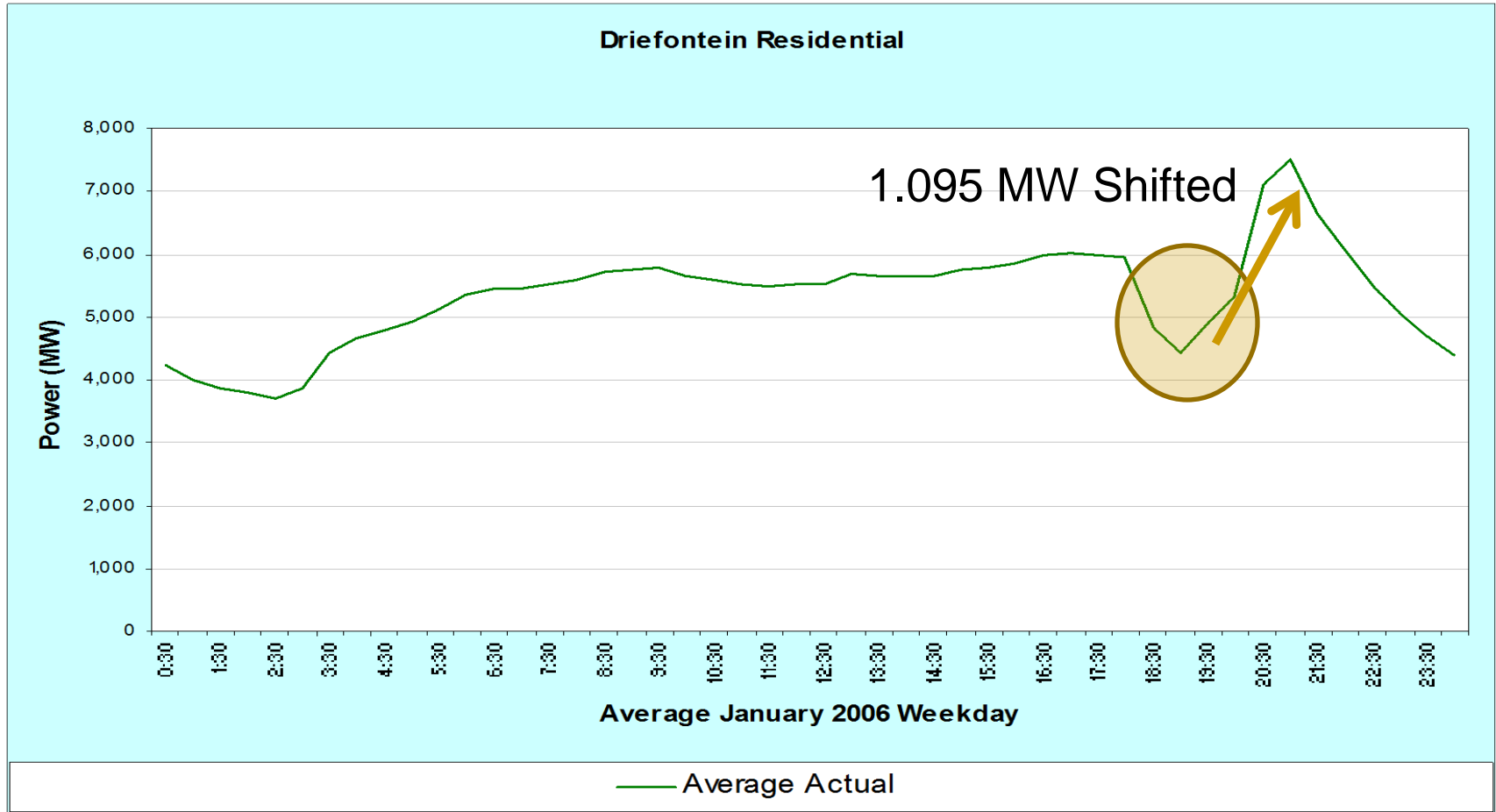
Geyser Load switches in low density residential areas-

Village Geyser Control	
<p><b>Opportunities</b></p>  <p>The diagram illustrates a geyser control system. On the left is a grey meter cabinet. To its right is a control panel with a digital display and several buttons, numbered 15, 16, and 17. Further right is a geyser unit labeled 'KWIKOT GEYSER TRAY' with a 'SABS' logo. The geyser is connected to a network of pipes and valves, with various components numbered from 1 to 28. The geyser itself is blue and silver, with a red heating element visible inside.</p>	<ul style="list-style-type: none"><li>• East Village (~976)</li><li>• Phomolong Village (~215)</li><li>• Letsasing Village (~354)</li><li>• West Village (~160)</li><li>• Single Quarters (~16)</li><li>• Other (~9)</li></ul> <p><b>TOTAL ~ 1,730</b> Households</p>
<p><b>Max Demand Load Shift between 18h00-20h00</b></p>	<p><b>1.06 MW</b></p>



# Completed Initiatives

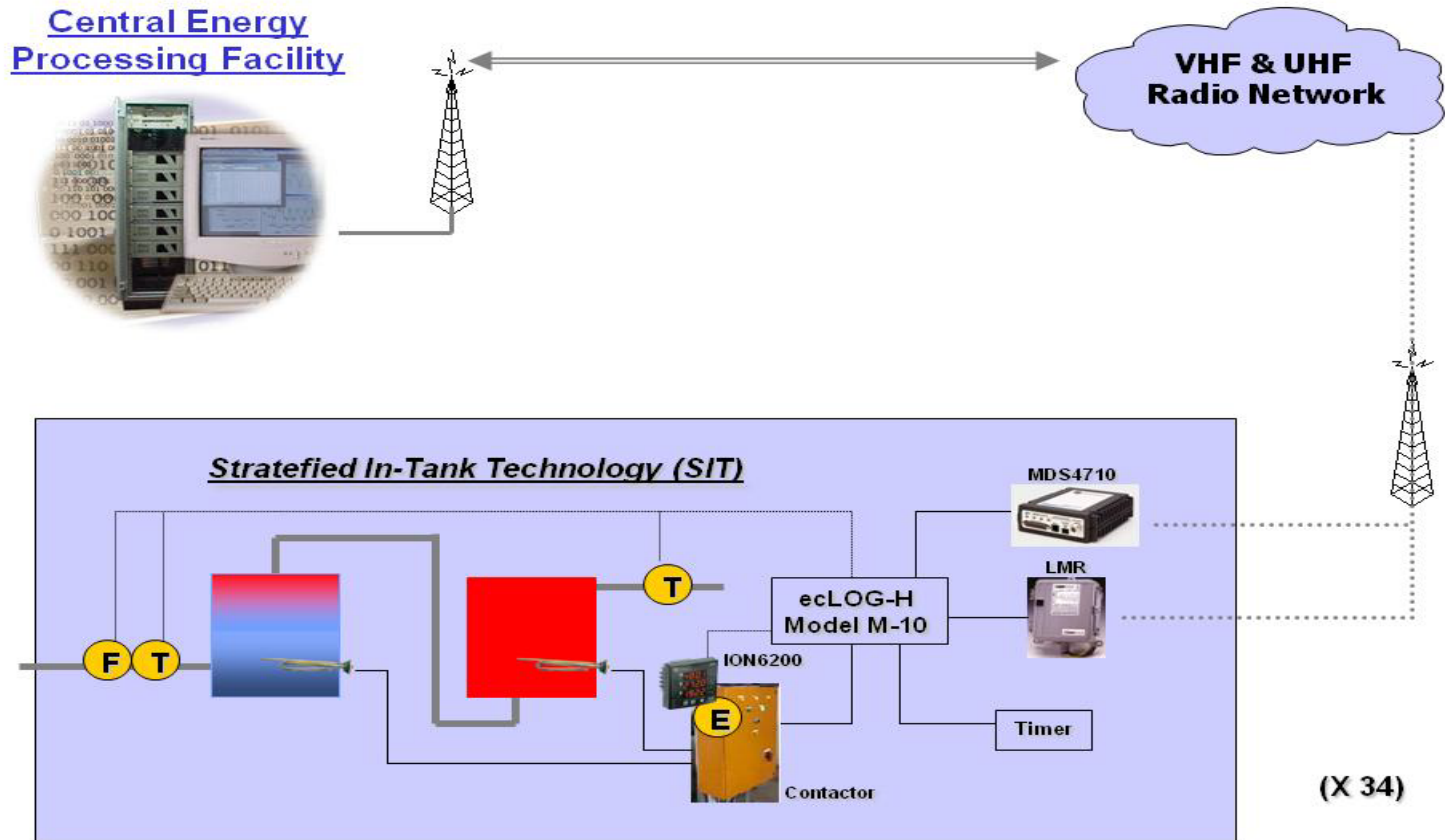
## Geyser Load switches in low density residential areas-



# Completed Initiatives

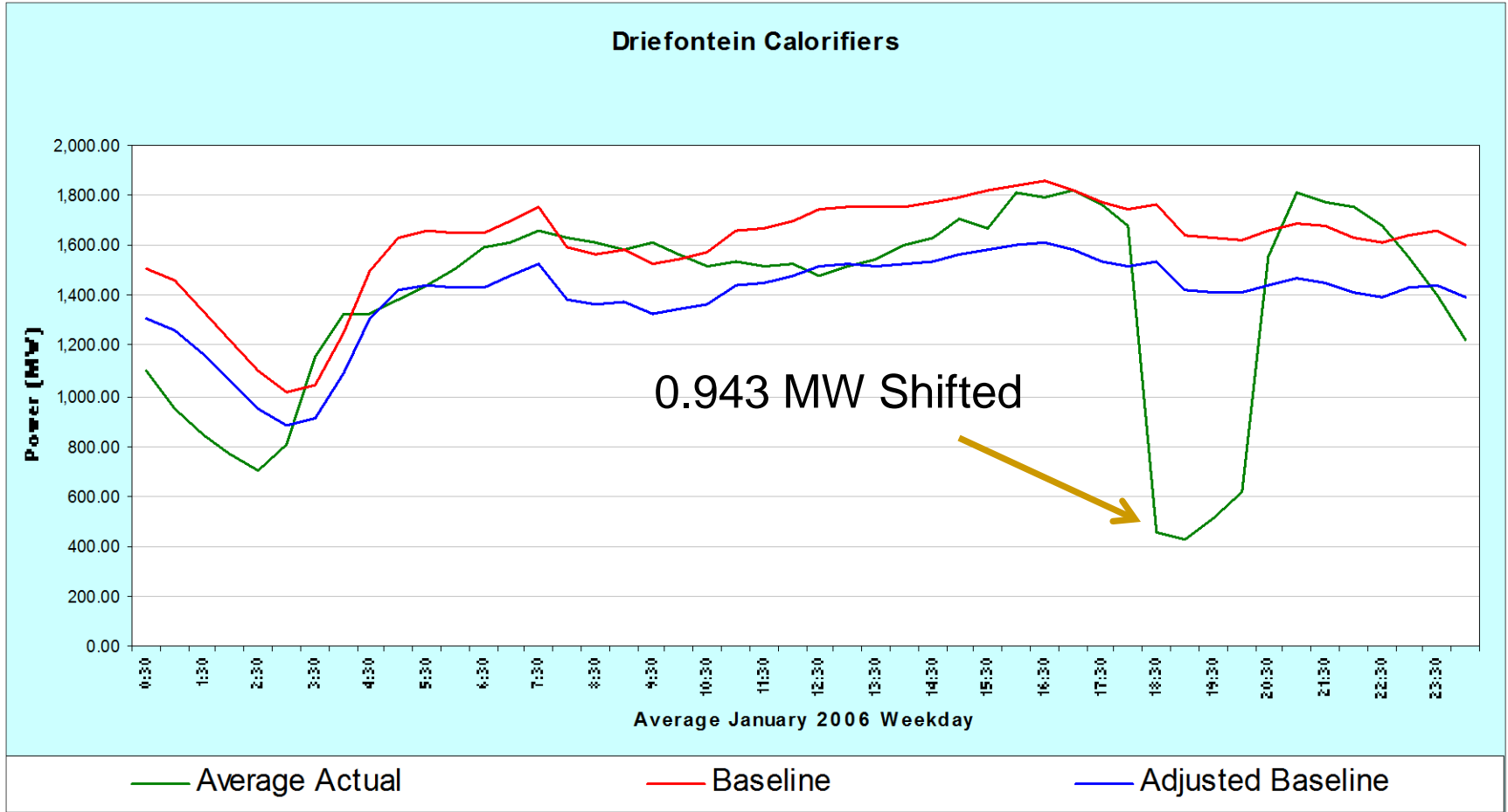
In line heater at high density residential areas.

## Hostel Hot Water Heating



# Completed Initiatives

In line heater at high density residential areas.



# Completed Initiatives

Energy efficient lighting.

Original installed lighting capacity on KDC West

SITE	M&V Measured Installed Capacity [kW]
GENERAL& OFFICES	341.2
HOSTELS	2453.3
HOUSES	4868.7
SHAFTS	830.5
<b>TOTAL</b>	<b>8493.7</b>

Post implementation installed lighting capacity on KDC West

SITE	M&V Measured Installed Capacity [kW]
GENERAL& OFFICES	214.797
HOSTELS	835.014
HOUSES	876.366
SHAFTS	605.928
<b>TOTAL</b>	<b>2532.105</b>

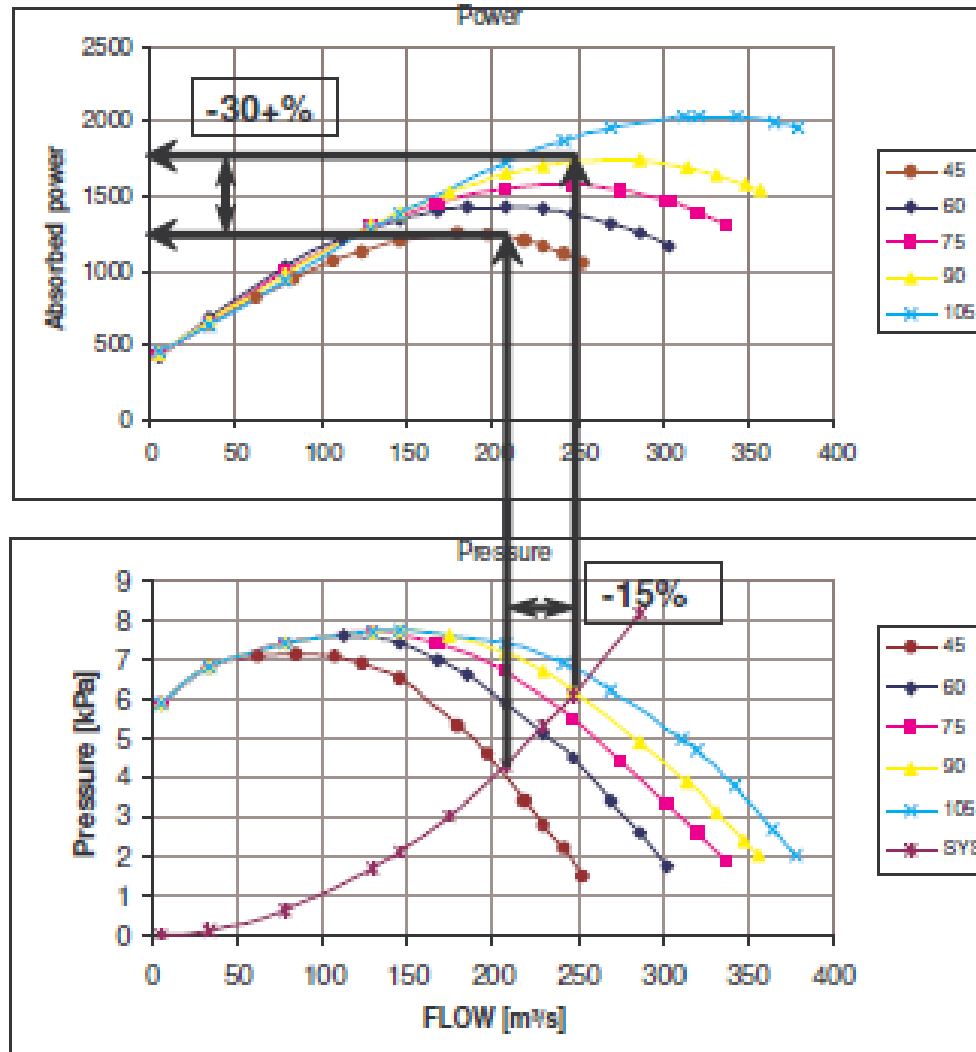
Reduction in installed capacity was 5961.6kW

At a load factor of 33.33% (8 hours/day) resulted in an average savings of 1.987MW



# Completed Initiatives

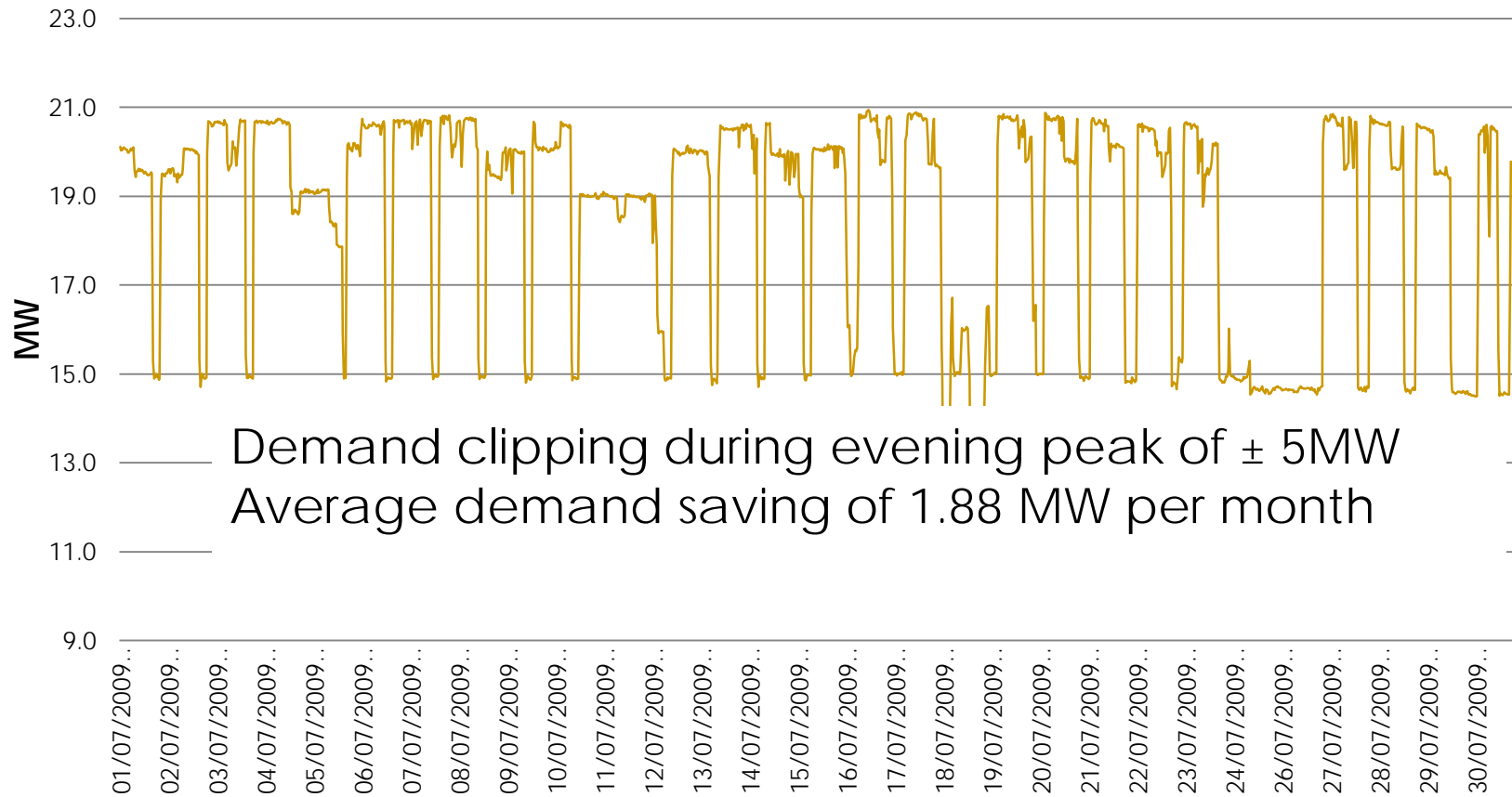
## Guide vane control on main ventilation fans



# Completed Initiatives

## Guide vane control on main ventilation fans

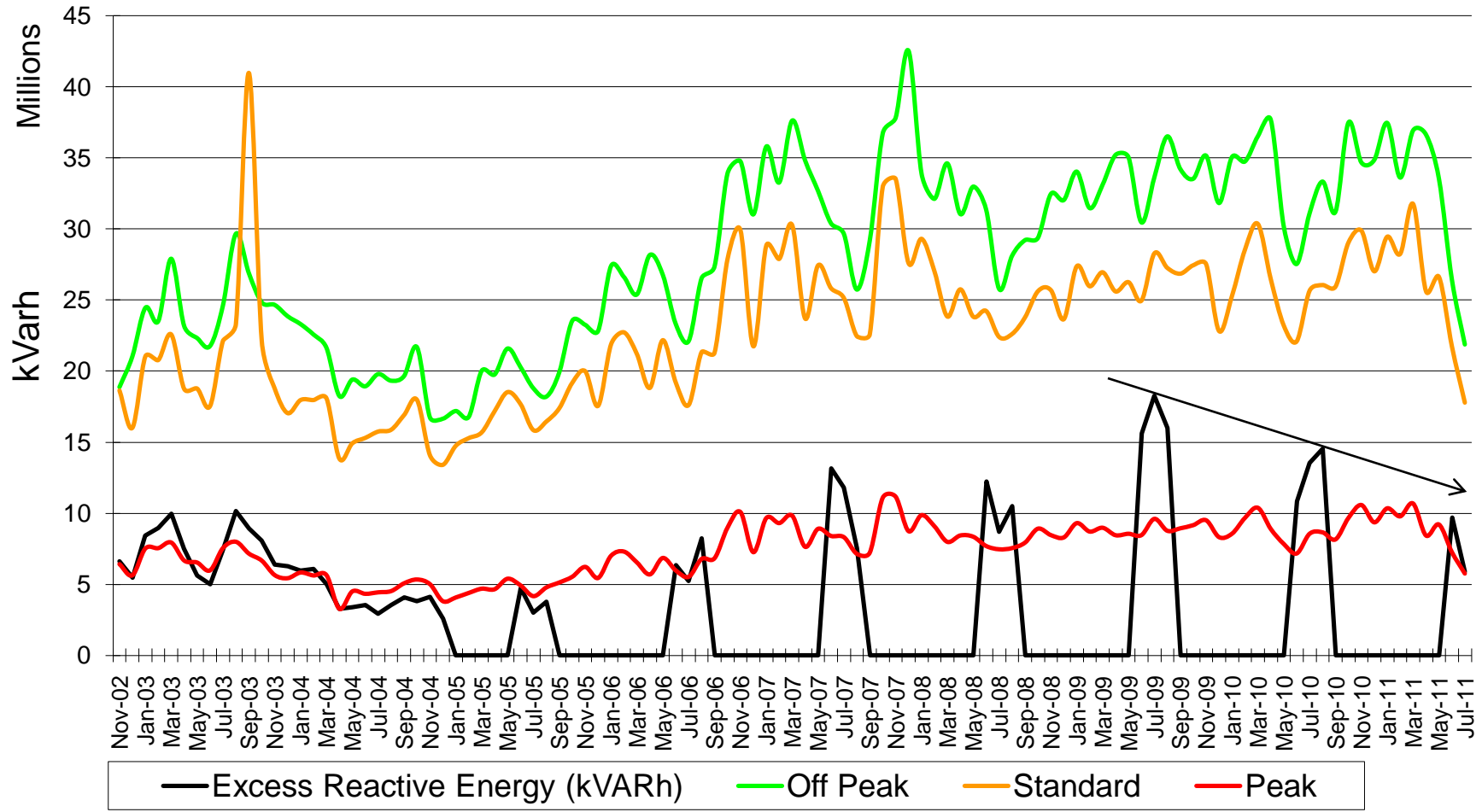
### KDC West Main Ventilation Fan Demand



# Completed Initiatives

## Re-evaluate power factor correction installations

### KDC West - Reactive Energy - Total Mine



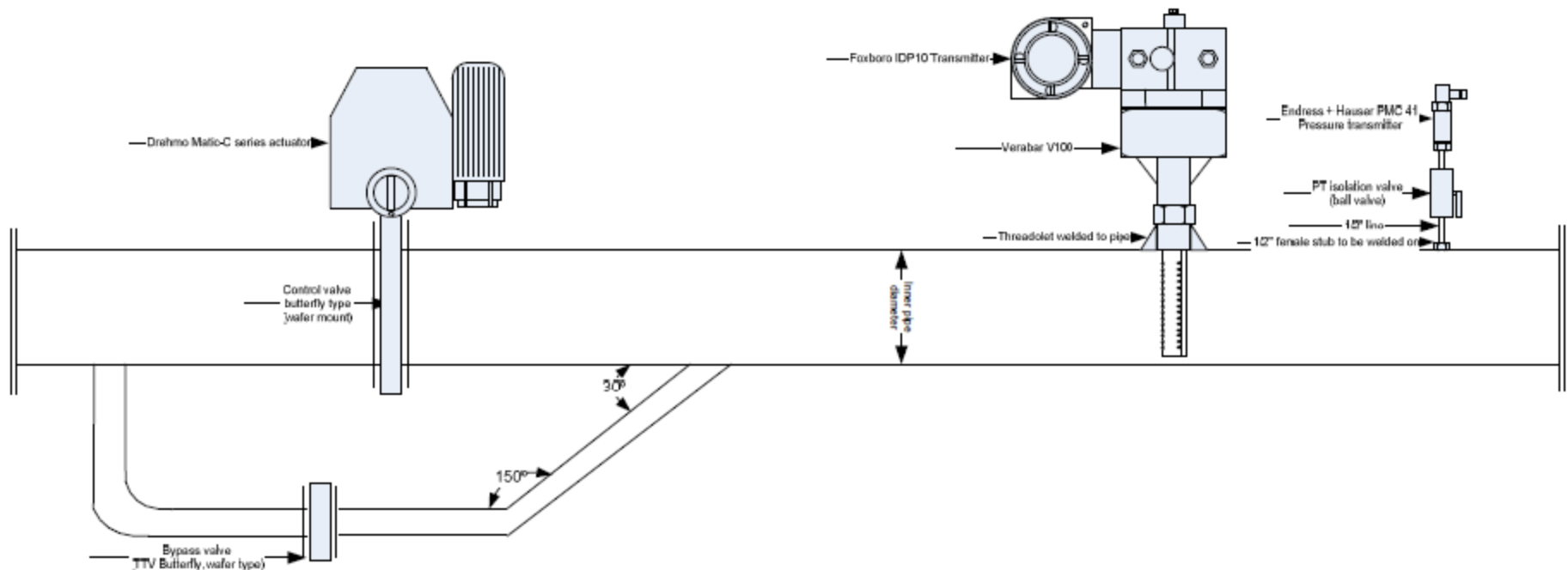
16.6 Mvarh to 12.9 MVarh to 7.7 MVarh



# Completed Initiatives

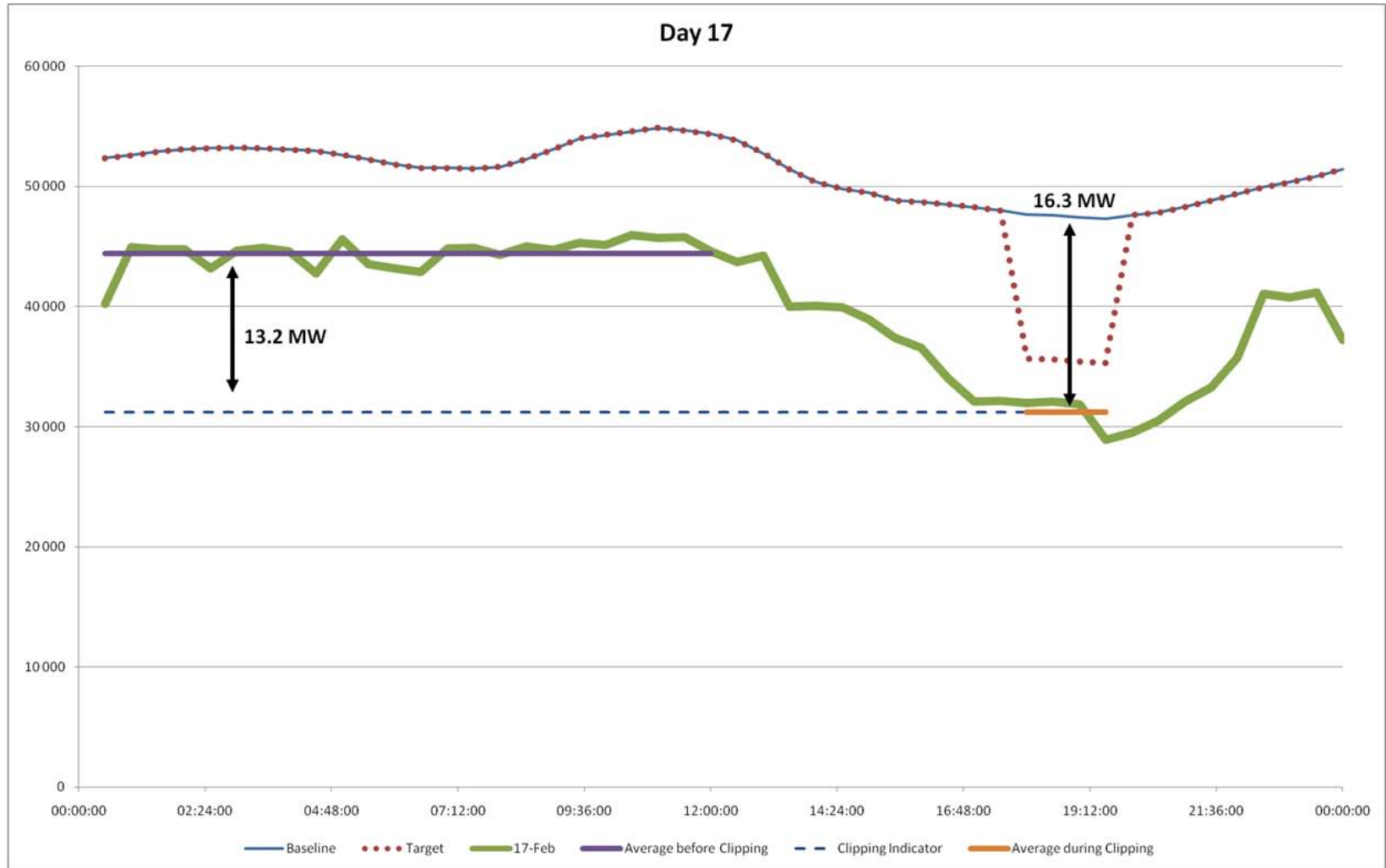
## Compressed air load control.

- 50 Valve installation done on various shafts.
- Compressor guide vane control upgraded.
- Individual compressor load sharing and between compressor houses



# Completed Initiatives

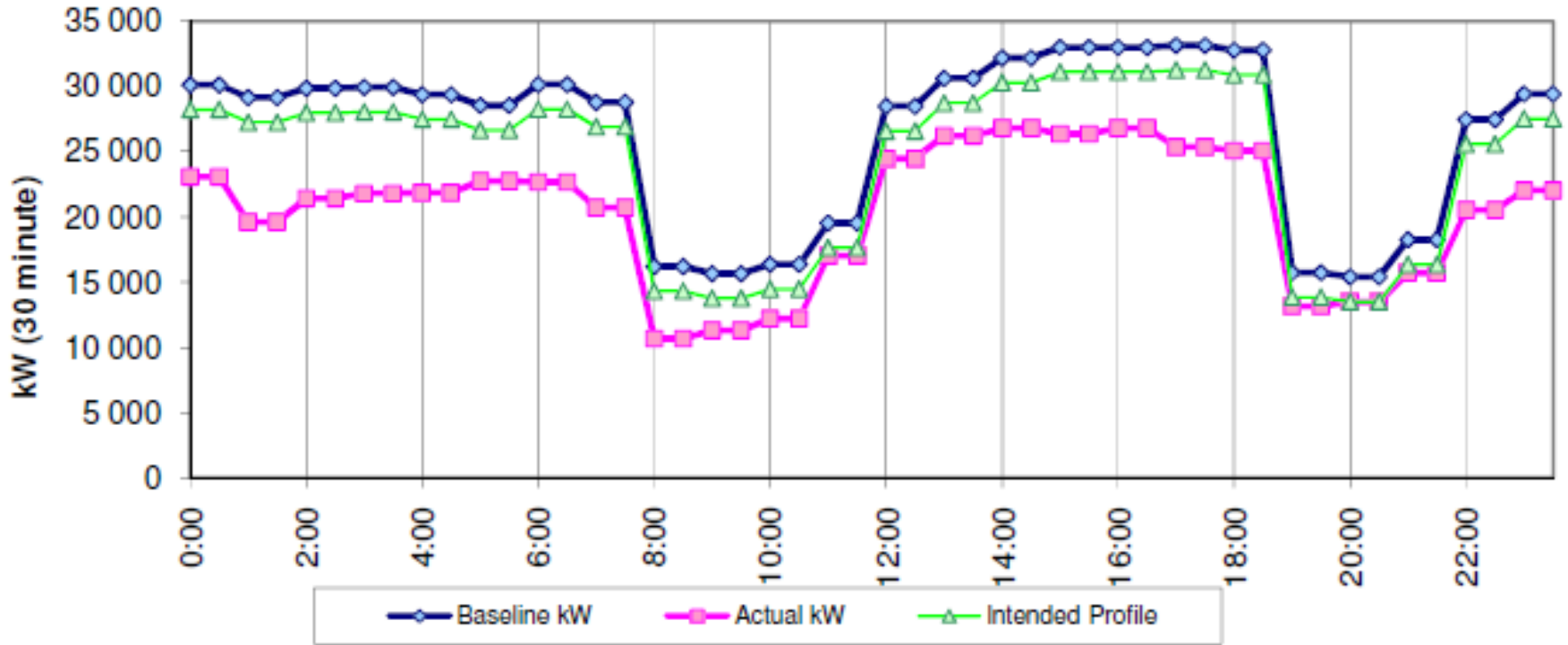
## Compressed air load control.



# Completed Initiatives

## KDC East 1# Water System Optimization

Average weekday demand profile



3.219 MW Average Weekday saving



# Counter measures taken

---

## New Initiatives:.

- More Energy recovery turbines at K4 21 lev. – 0.5 MW.
- Reverse flow pumps at KDC West 4 shaft 2 MW
- Refrigeration plant load shifting K4 & D5 – 9 MW.
- Introduction of an Ice Plant at K3 - 7.65 MW
- DSM Air project at K7 - 1.5 MW
- Heat pumps at industrial change houses – 1.5 MW
- Additional Geyser Load switches in low density residential areas – 1.26 MW
- Compressor intake filter refurbishment – 2.2 MW.
- Concentrated Solar Power (CSP) for Gold Plant
- Compressed air leak detection and fixing at KDC West.
- KDC fans Impeller efficiency – axial flow fans.
- Heat recovery from compressors.
- 3CPS.



# New Initiatives

## Heat recovery from Compressors



Existing In-Line Heaters (ILH) are only on standby. Their electrical energy consumption are replaced by the thermal energy from the compressor heat recovery system.

Valve opens when flow to showers is zero, and vice versa

Change House Calorifier

Valve A normally open and Valve B closed.  
When no hot water in Storage tank or when no discharge pressure on Pump 4, then Valve A closed and Valve B open.



# New Initiatives

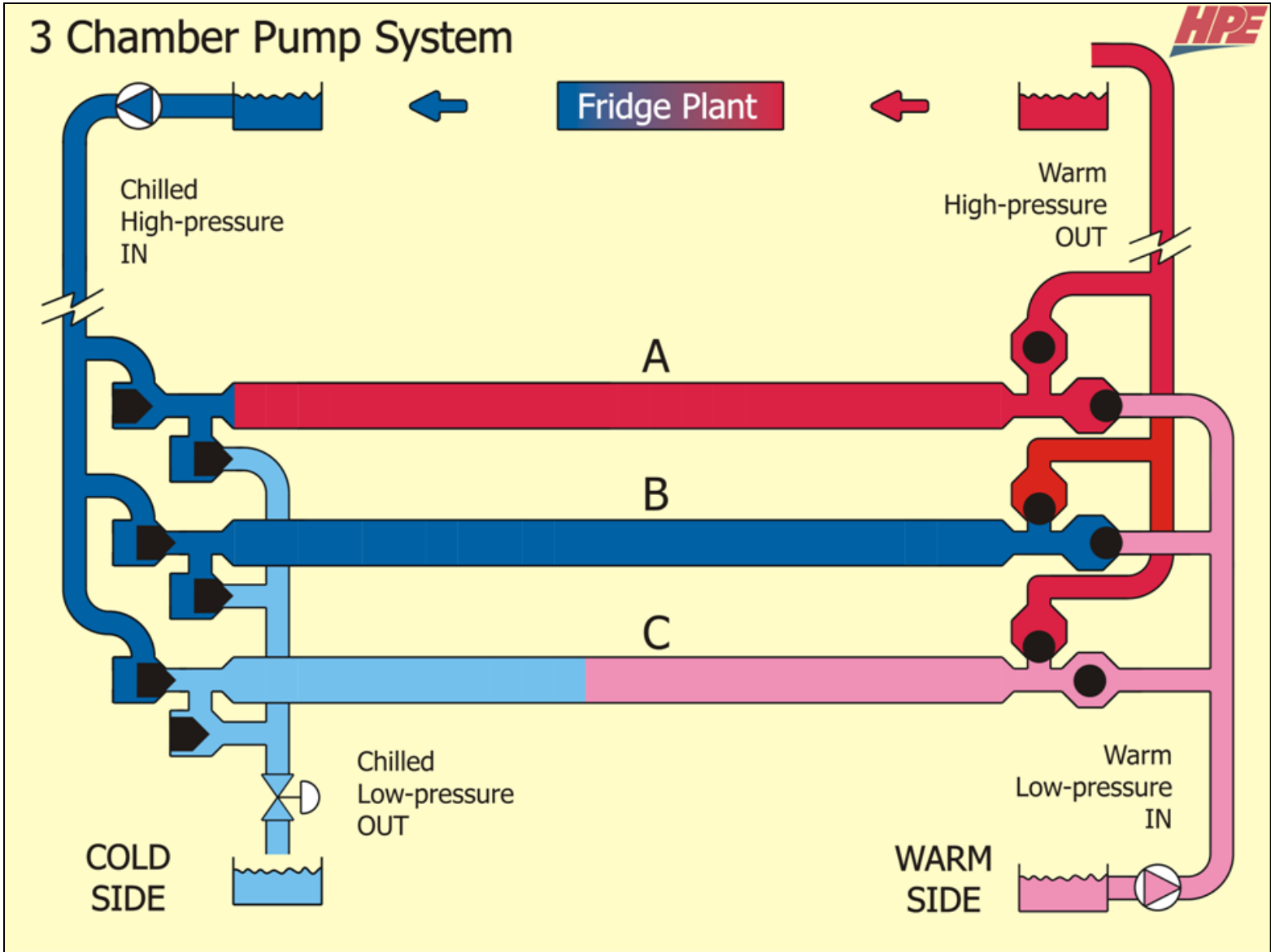
---

## 3CPS

- KDC West 5 Shaft - 4.337 MW
- KDC West 1 Shaft – 5.843 MW
- KDC East 4 Shaft – 3 MW



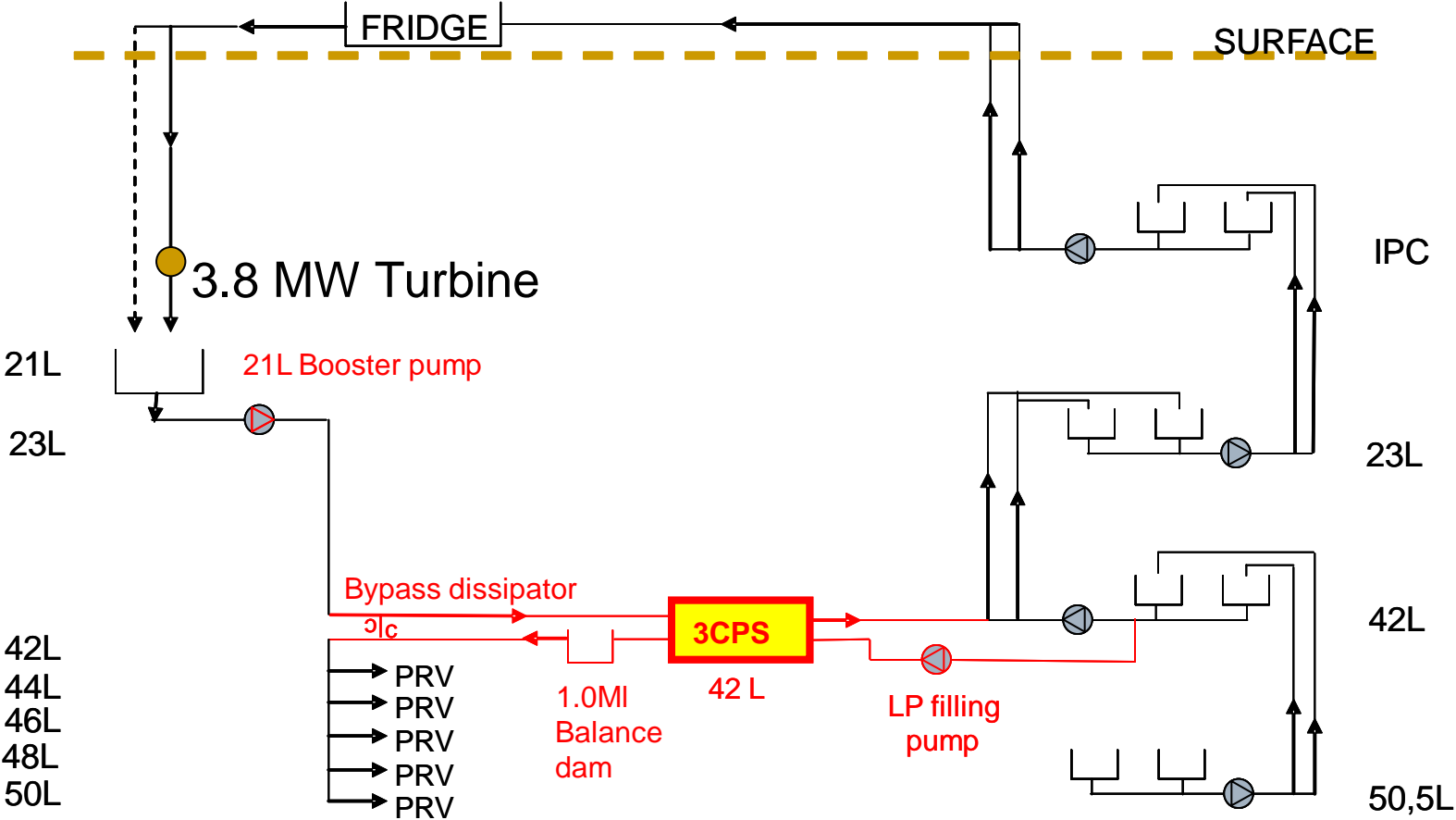
# New Initiatives



# New Initiatives

3CPS.

## KDC West 5# 42L--De-watering reticulation after 3CPS



---

Questions ?

