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Automate Utility System Operations Efficiency Improvement Decisions

Real time optimization & closed loop constraint control

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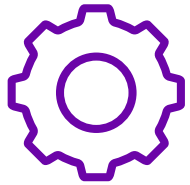
PETRONAS GAS BERHAD

PGB

- Leading gas infrastructure and centralized utilities company in Southeast Asia
- Utilities production serves customers across many industries with a wide range of products to meet their specific needs.
- Utilities production is conducted at two complexes namely Utilities Kertih (UK) in Terengganu and Utilities Gebeng (UG) in Pahang.
- Strategically located adjacent to the Kertih Integrated Petrochemical Complex and Gebeng Industrial Area respectively
- Fueled by natural gas, the plant has combined export capacity of 330 MW of electricity and up to 1,320 tph of steam

Leading Centralized Utilities Company



Challenge

- PETRONAS digital transformation journey & sustainability agenda, adopt advanced operational optimization, reliable operation at low-cost supply of utilities, low carbon economy

Solution

- Deployed the latest AVEVA Process Optimization for first principle modeling & real time optimization and AVEVA APC Closed loop constraint control to further reduce the human intervention

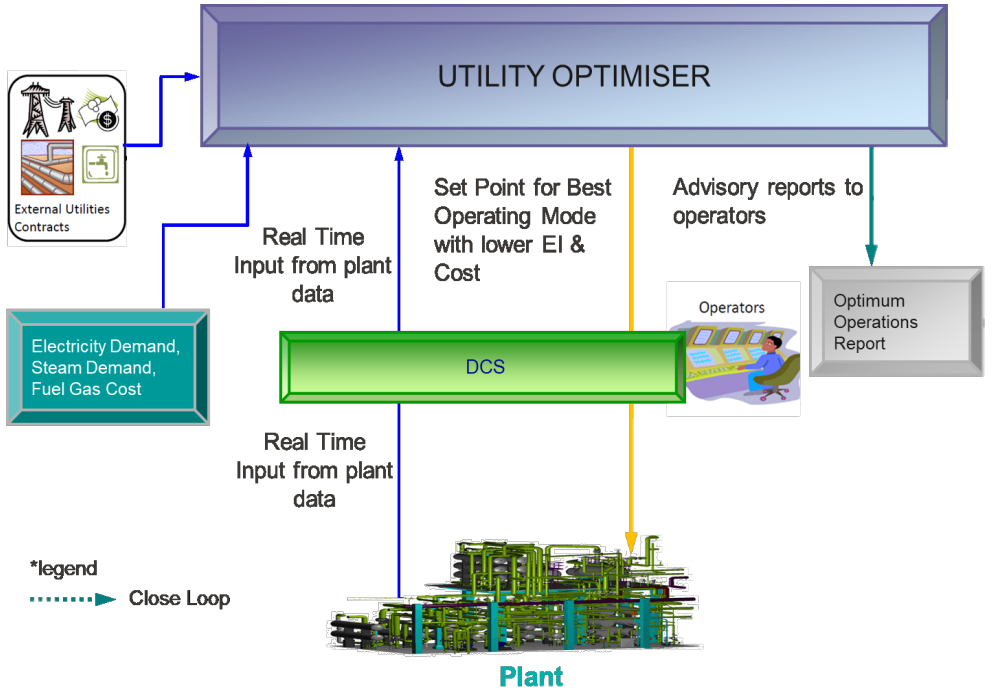
Benefits

- Fuel reduction over 0.6% , CO_2 reduction over 5,500 tons per year, increase in Engineer and Operator's productivity

Business challenge

Operating Utility system with advisory decisions has following challenges

- Plant energy demand and requirement changes frequently
- Engineer relied on manual calculation (MS Excel) to perform analysis to optimize energy consumption
- Furthermore, human intervention (panel operators) is needed to execute the outcome which is prone to human error
- The advisory mode adds human element and hinders to achieve expected reduction in greenhouse gas emissions.
- Operator needs make judgement of all the constraints before manually following the targets.



Real Time Utility Optimizer Concept (Closed Loop)

AVEVA Utility Closed Loop Optimisation

AVEVA Utilities Optimization has FOUR (4) main components

Real Time System. The real time system automates the sequence and schedule tasks to be performed on process model.

1) Process Model

- Able to model behavior of unit operations (Boilers, Steam Turbines, Gas Turbines, Deaerator etc.) over a wide range of operation.
- Auto Tuning capability for reconciliation of model to Realtime process conditions.
- Objectives and constraints prediction and handling

2) External Inputs

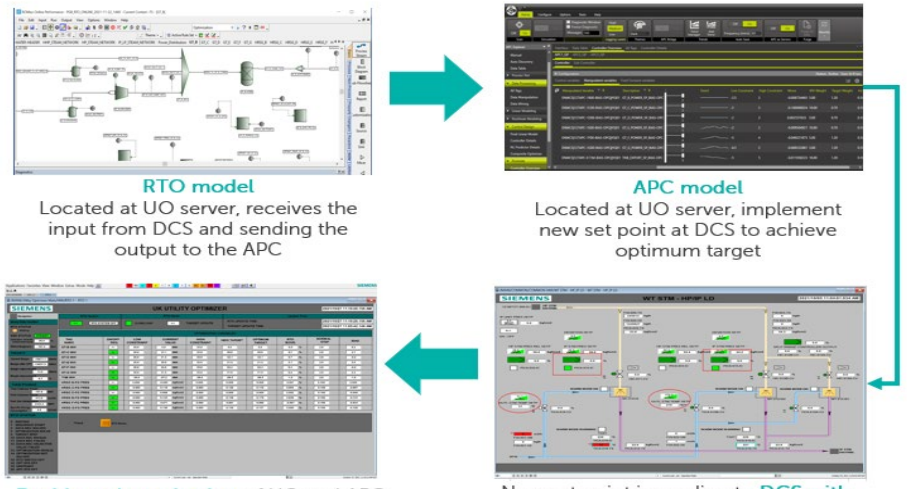
- Electricity, Fuel & Steam real-time process values and costs
- Data Screening and material balance based Gross Error Detection

3) Optimiser

- Optimization engine that takes plant and economic input and predicts optimum operating point.

4) Constraint Control

- Optimum targets are implemented by AVEVA APC for constraint control.



RTO model
Located at UO server, receives the input from DCS and sending the output to the APC

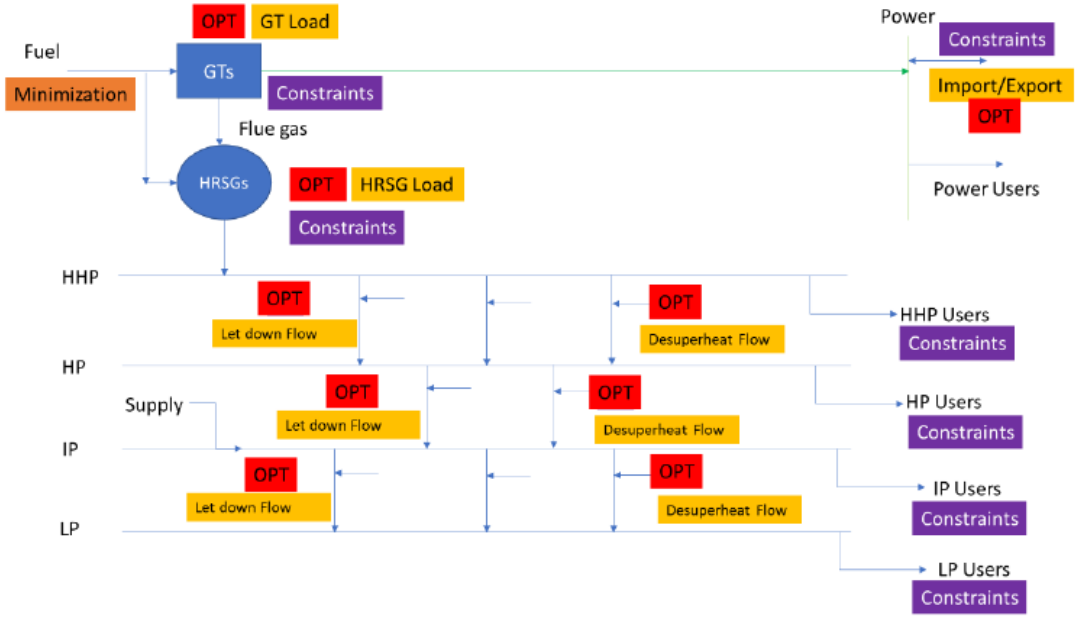
APC model
Located at UO server, implement new set point at DCS to achieve optimum target

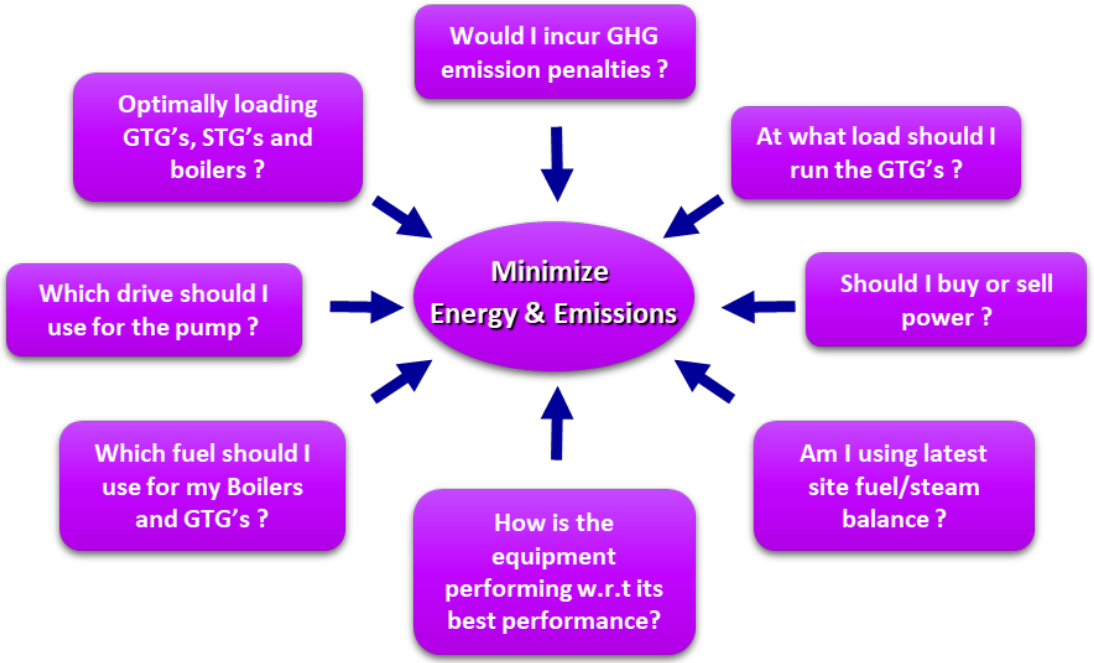
Dashboard monitoring of UO and APC status

New set point is sending to DCS with incorporating bias at DCS set point. Bias is tuning at APC model based on the equipment performance

Case Study

The goals are to optimise unit performance to lower operational cost and carbon footprint with challenges in cogeneration efficiency as well as equipment constraints.

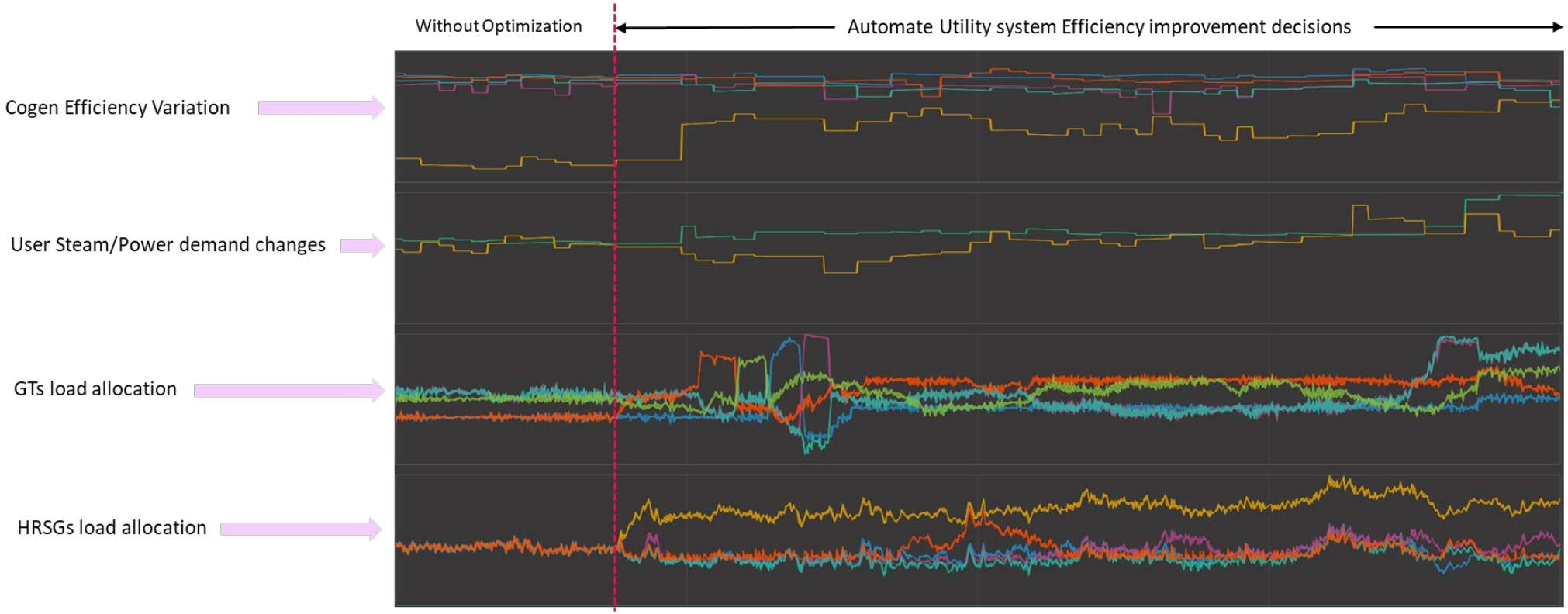




The power is generated through gas turbines by firing fuel and steam is generated through heat recovery and supplementary fuel firing.

Impact/Savings

Fuel reduction over **0.6%** by maximizing cogeneration efficiency (more effective load allocation), CO_2 reduction of over **5,500** tons per year,



Takeaways

- Real time optimization and closed loop constraint control technology has become a standard to elevate process performance.
- Constraint control helps to automate operations efficiency improvement decisions to reap the maximum benefits from the process/utilities.
- Real time optimization and closed loop constraint control has become the “must have” technology for the digitalization journey.
- For the Utility optimization, constraint control will pave the way to close the loop for real time optimization targets without the need for operator’s interference

“ An ideal solution is a software that has thermodynamics properties which runs automatically using sophisticated optimization algorithm while considering real time plant data. To further minimize human intervention, a closed loop also is installed to execute optimization outcome through AVEVA closed loop constraint control ”

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