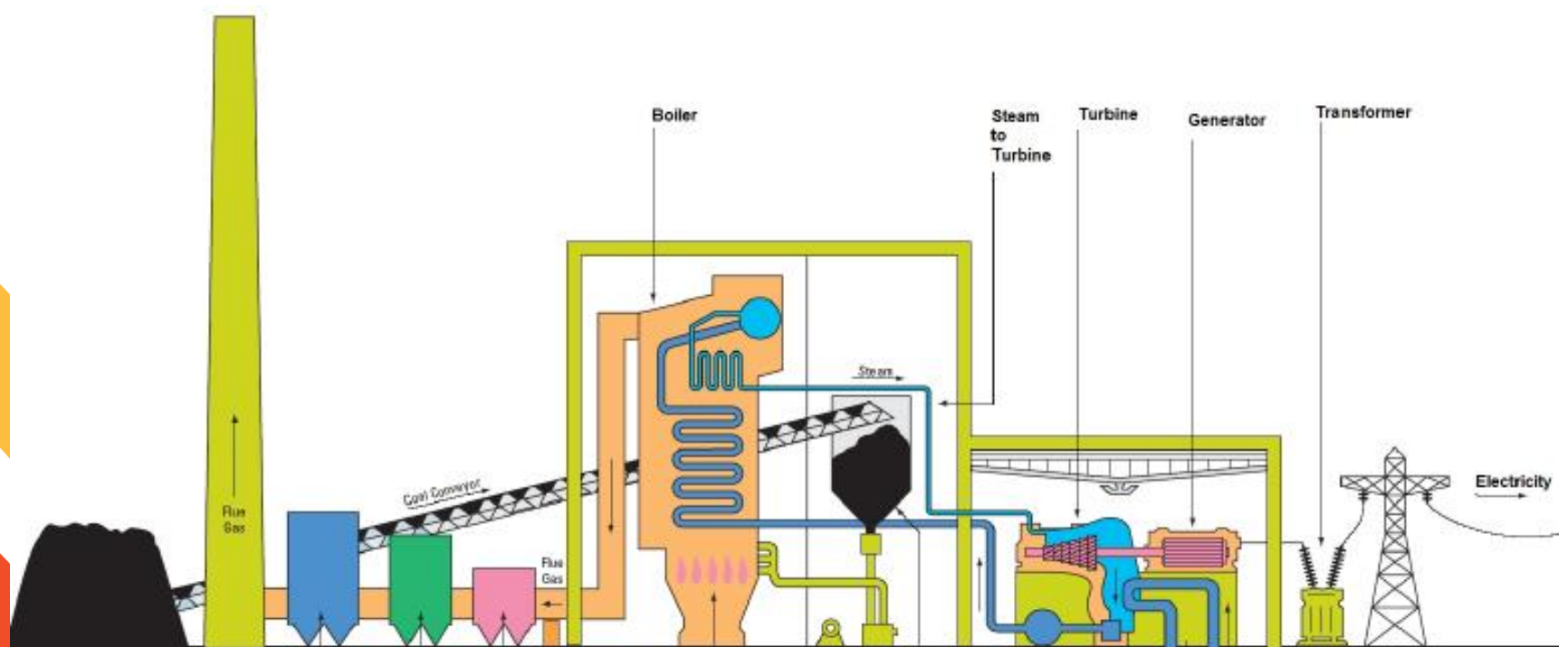
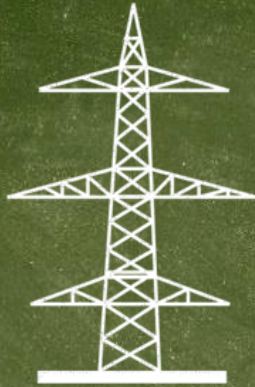


Eltrix™

Power Plant Performance Analytics





Grid Automation



**Advanced
Metering
Infrastructure**



Energy Analytics



SMART GRID



Our journey



Born in
1998



Helping utilities across the globe enable smart grid and Energy analytics



200+ engineers
with offices in India, USA
and UAE



**Research &
Technology award**
for Innovative product
development



Partners and Customers in
over 70 countries



Kalkitech ELTRIX
Intelligent Power Plant
Decision Support Solutions
(2008)



Kalkitech SYNC
Communication
Solutions
(2004)



Communication products used in :

- AMR/AMI
- Substation Automation
- Distribution Automation
- Disturbance Recording and RAS
- Wide Area Monitoring



Optimization products used in :

- Plant Performance Monitoring, Analysis and Optimization
- Energy Accounting and Scheduling

Extensive global industry experience



SIEMENS



هيئة كهرباء ومياه دبي
Dubai Electricity & Water Authority



ALSTOM



GE Energy



elster

NEC



altus

Honeywell



HYUNDAI

Rockwell Automation



Innovation in Power Plant Analytics

- Approx 70% of power generation based on fossil fuels
- For the foreseeable future high dependence on coal/lignite
- Average efficiency of coal/lignite plants <30%

 ***High cost of generation***

High environmental impact – GHG emissions

- *Kalkitech helps generation plants monitor and improve efficiency*
- *Installed successfully in a number of power plants in India, Middle East and South East Asia*



Business Drivers

- PAT
- Emissions regulations – COP21
- Fuel cost reduction, increased competitiveness
- Short term power markets, operational flexibility (wide range load following)
- Equipment life extension



Solutions

Plant Performance Monitoring and Analysis

Equipment Performance Analysis
Stress and Lifetime Monitoring

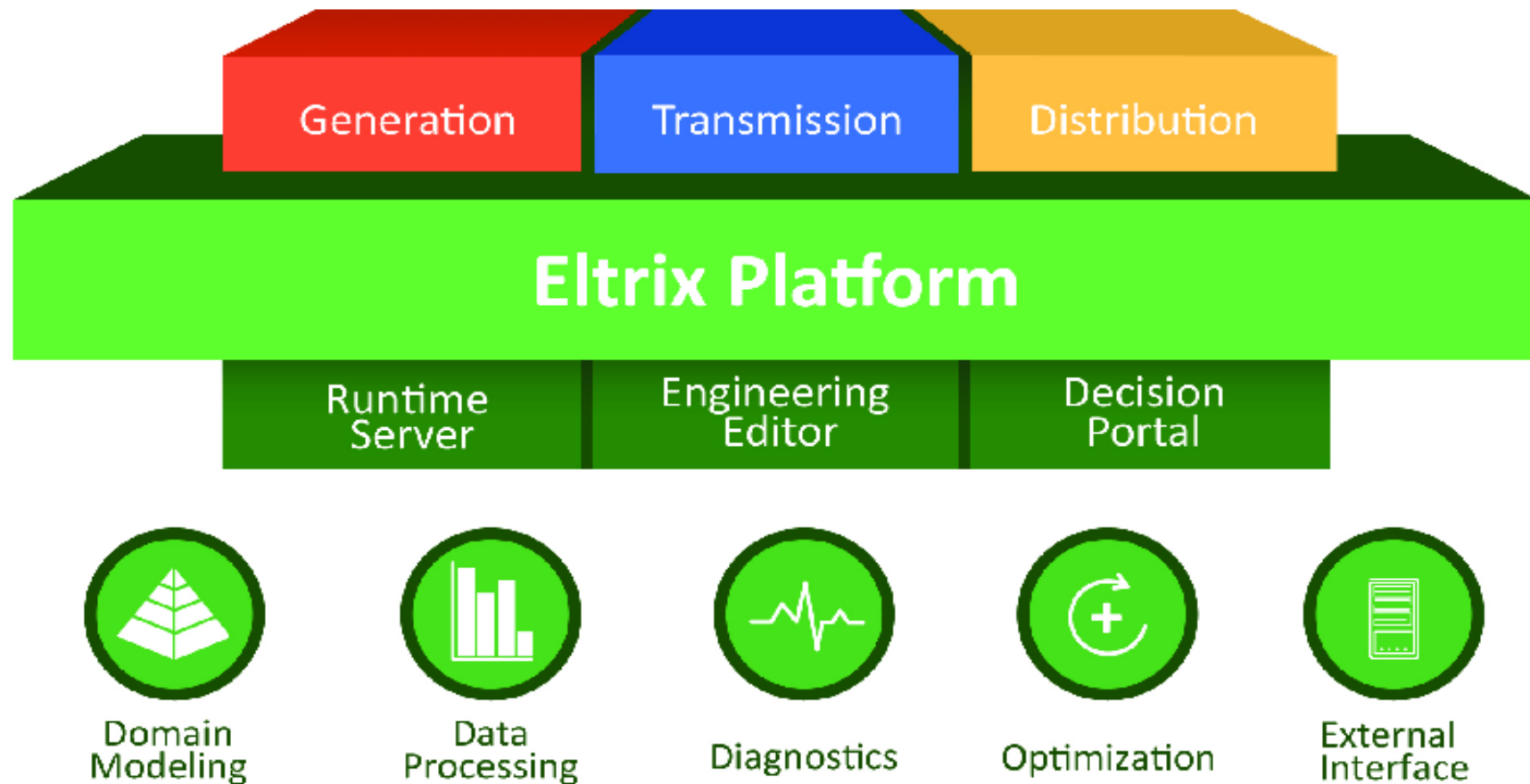
Diagnostics

Equipment Performance Analysis
Alarm Analysis and RCA

Energy Billing & Settlement

Tariff Modeling (ABT)
Invoicing
Fuel demand model
Renewable forecasting & settlement

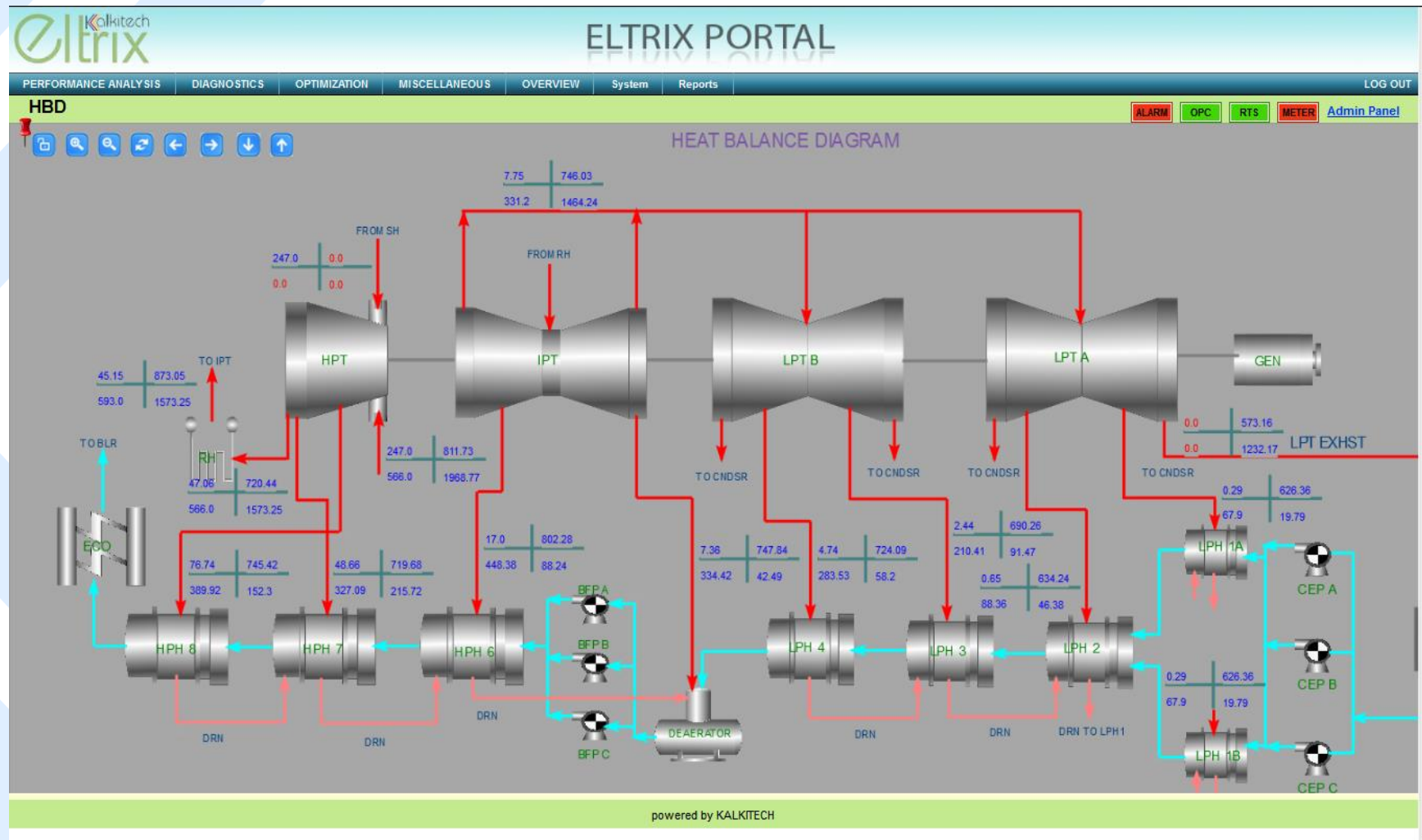
ELTRIX Platform

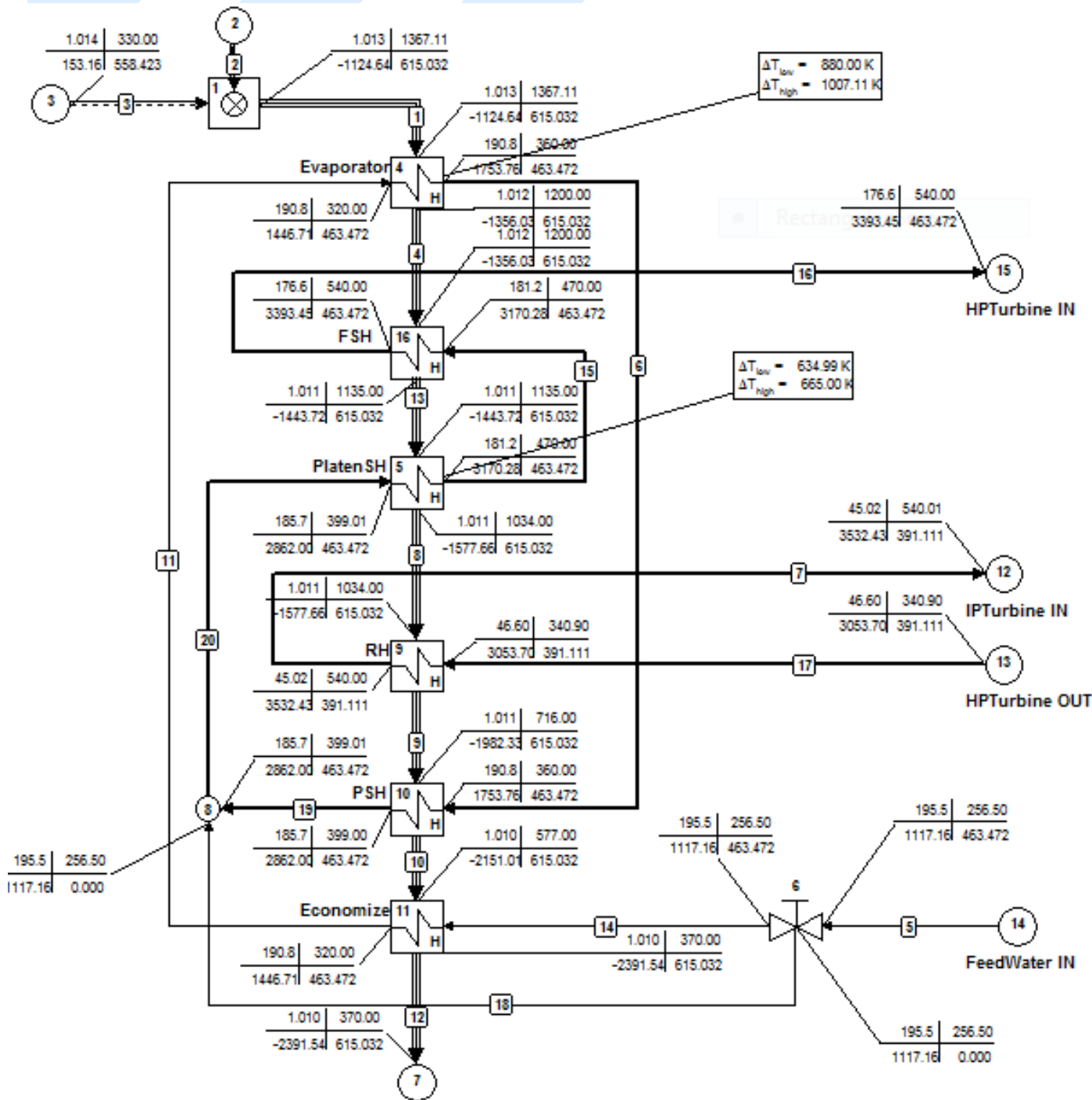


Eltrix Performance Models

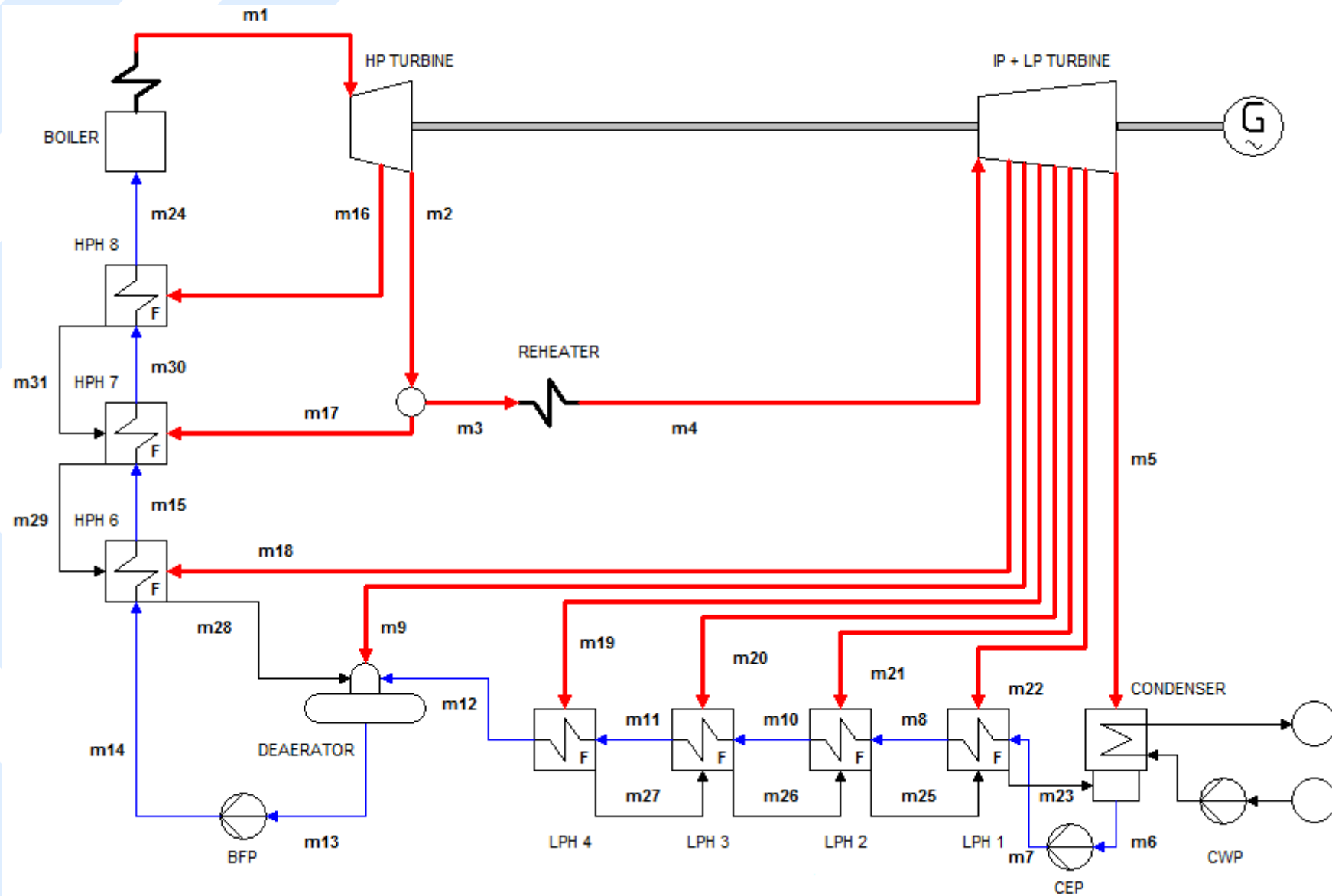
- Air Heater Performance and Combustion Analysis
- Boiler Efficiency by ASME Heat Loss and Input/Output Methods
- Condenser Performance
- Controllable Losses and Heat Rate
- Cooling Tower Performance
- Fan Performance
- Feedwater Heater Performance
- Full Cycle Mass and Energy Balance
- Generator Performance
- Heat Exchanger Performance
- Pump Performance
- Steam Turbine Performance
- Stress and Life time Monitoring

Heat Balance Diagram





p	T
h	ϕ_m
p - Pressure [bar]	
T - Temperature [°C]	
h - Enthalpy [kJ/kg]	
ϕ_m - Mass flow [kg/s]	
ΔT_{low} - Low end temp. diff. [K]	
ΔT_{high} - High end temp. diff. [K]	



Mileage of my car



1. Displacement
2. Weight
3. Gearing
4. Aerodynamics
5. Induction
6. Intake and Exhaust Restrictions
7. Rolling Resistance
8. Mechanical Resistance
9. Altitude
10. Temperature
11. Driver

Quick acceleration and heavy braking
Excessive idling
Driving at higher speeds
Cold weather and frequent short trips
Cargo or cargo racks
Towing
Running electrical accessories
Driving on hilly or mountainous terrain



Performance Monitoring

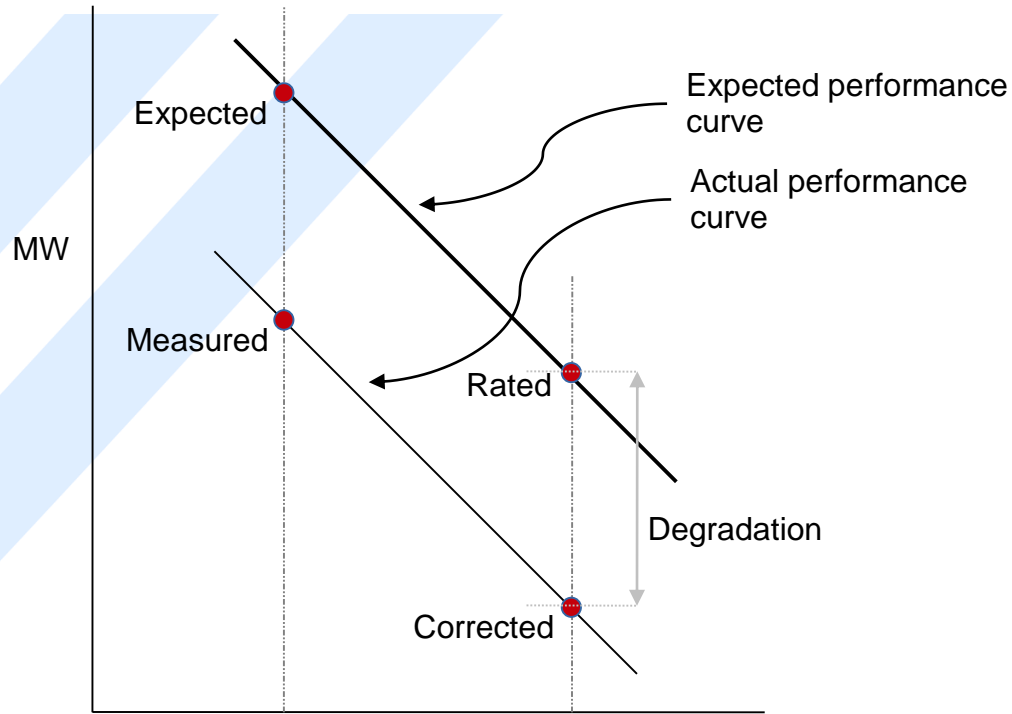
- Continuously evaluating the production capability and efficiency of a power plant and its equipment over time using measured plant data
- Continuously evaluate the degradation of the plant and equipment
- To provide plant operators information to help them identify problems, improve performance, and make economic decisions about scheduling maintenance and optimizing plant operation
- Performance monitoring system can tell plant operators how much the plant performance has changed and how much each piece of equipment in the plant contributed to that change.



How good is my performance?

- Compare current performance of plant (Where you are) and equipment to its expected performance (Where you should be)
- For performance monitoring to be meaningful, one must compare current performance to expected performance, and track that comparison over time
- Degradation is defined as the shortfall in equipment performance caused by mechanical problems in the equipment (such as wear, fouling and oxidation), but not by changes to setpoints under control of the plant operators

- What is expected performance?

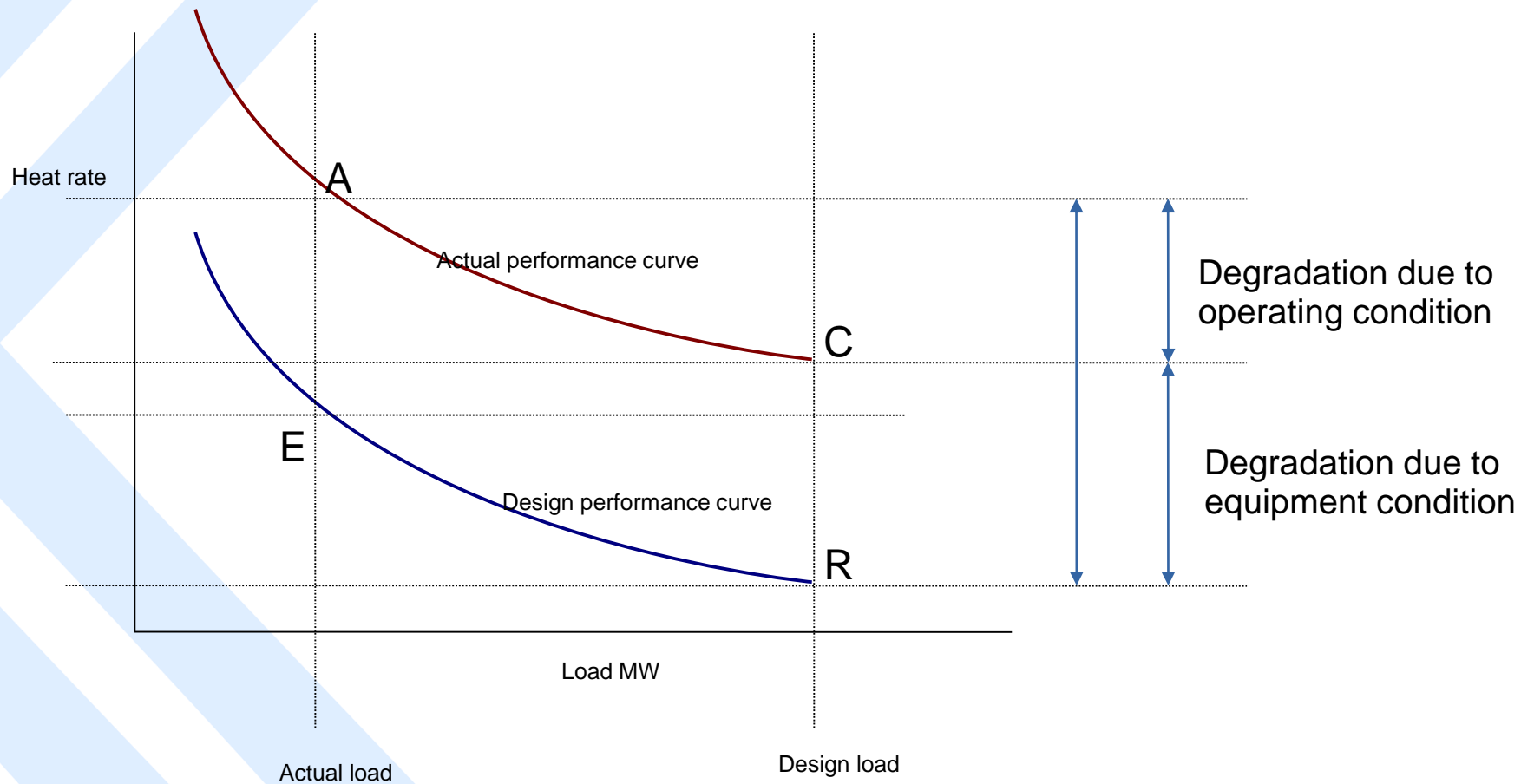


Rated, expected, measured, corrected power

- Expected performance:
 - curve based methods for corrected
 - model based methods for expected

Corrected Performance

- Tracking changes in performance over time is difficult, as the measured values of most performance parameters vary due to changes in plant operating conditions
- One method to account for this, is to correct the current performance to a standard operating condition, usually the reference operating conditions
- To “correct” means to account for the performance variations that would be expected due to changes in environmental conditions and control set points
- The corrected performance is the performance is what would be expected if the current (degraded) engine were operating at the reference operating conditions. Corrected performance remains constant and equal to rated value. Thus, any change in a corrected value represents a change in the equipment performance capability.



Total performance degradation = Degradation due to operating condition + Degradation due to equipment condition

$$(A - R) = (A - C) + (C - R)$$

Model Based Performance Analysis

Advantages:

- Interaction of various operating conditions can be modeled
- Allow wide variations in operating conditions
- Can compute impacts for parameters for which no curves are available
- Give detailed information about the expected performance not available from curves
- Assumption that overall effect of changes in all operating parameters can be computed by multiplying the correction factors together is not valid over a wide range of operating conditions

Critical factors

- Uncertainty analysis
- Accuracy of measurements and results
- Corrected performance indicators

It's complicated!



Conventional approach is not satisfactory.....



Gencos want to meet and exceed
PAT Heat Rate targets

Need a simple solution that helps
them with this...

An Alternate Business Model ...

Performance Analytics-as-a-Service

Subscription based model

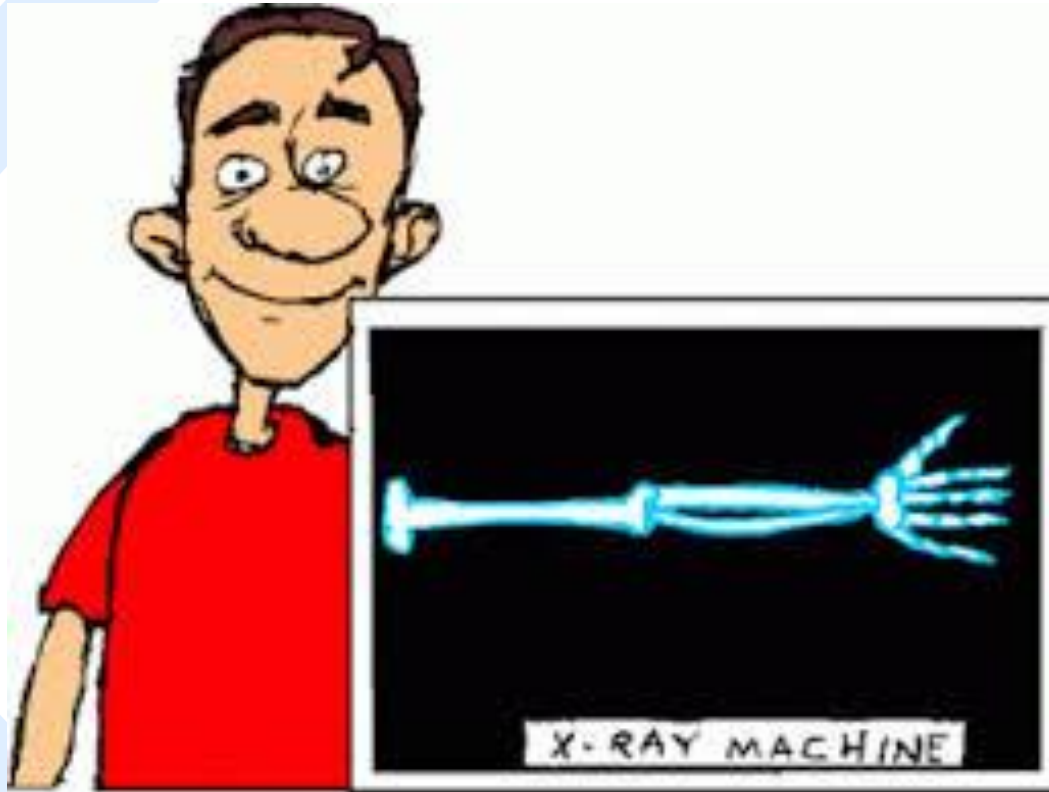
No capital investment!

Pay as you go

Scalable to entire fleet



Situational awareness

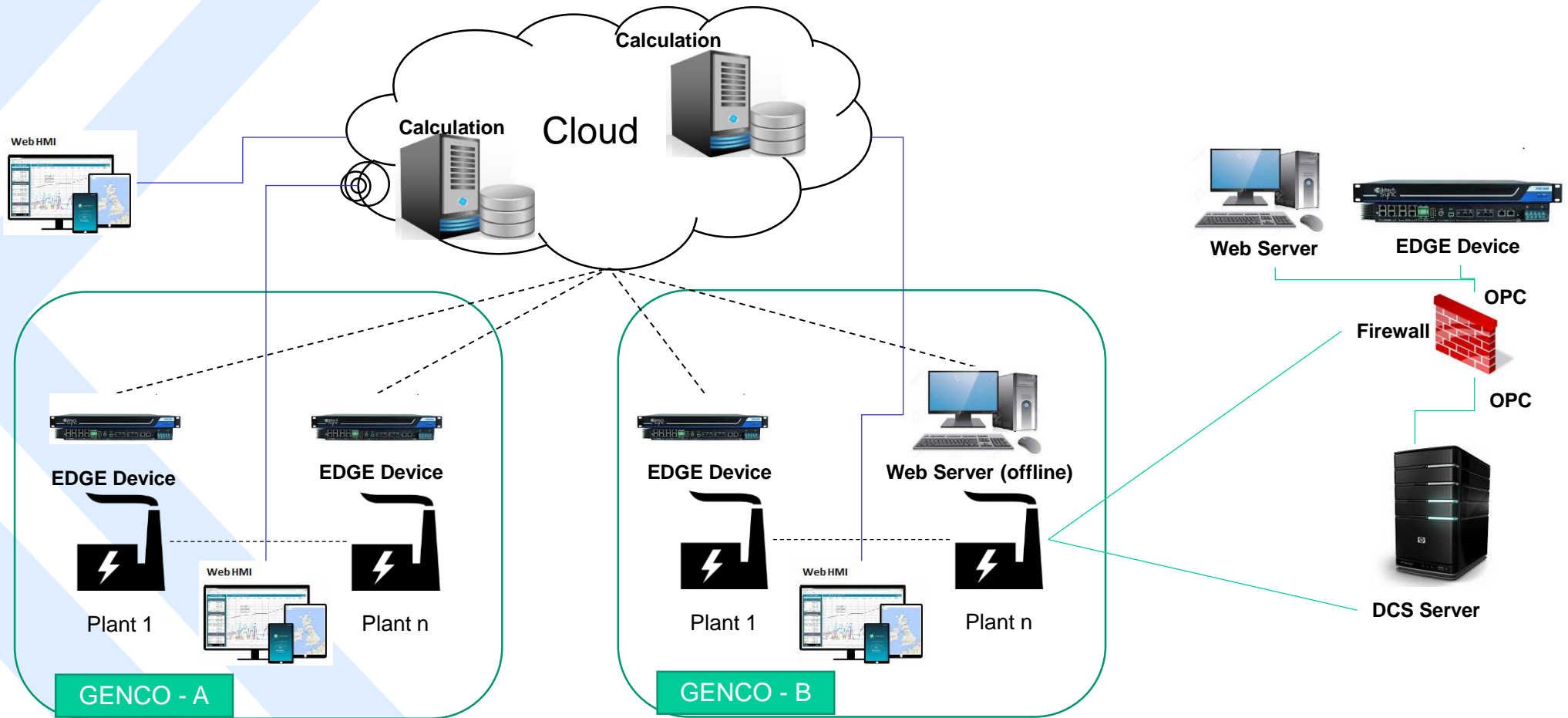


You don't build or buy an X-ray machine...get one taken from a diagnostic centre

<https://kalki.io>



Architecture



Thank You