



# Optimisation of O&M Efficiency at Qatar Power using the PI System

Presented by Parasram Borkar  
Sr Engineer- Commercial & Performance

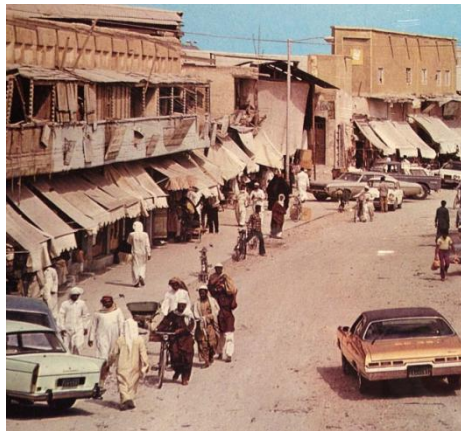


# Enlighten the life in Middle East



- Imagine Life without Power and Water

# Enrich the life in Qatar

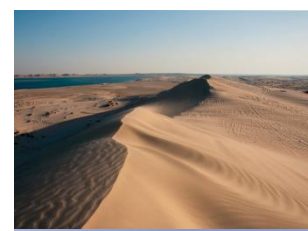


**Transformation**

THEN



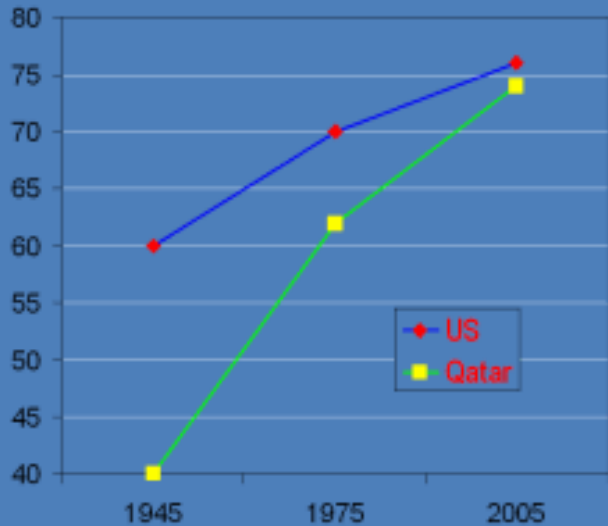
NOW



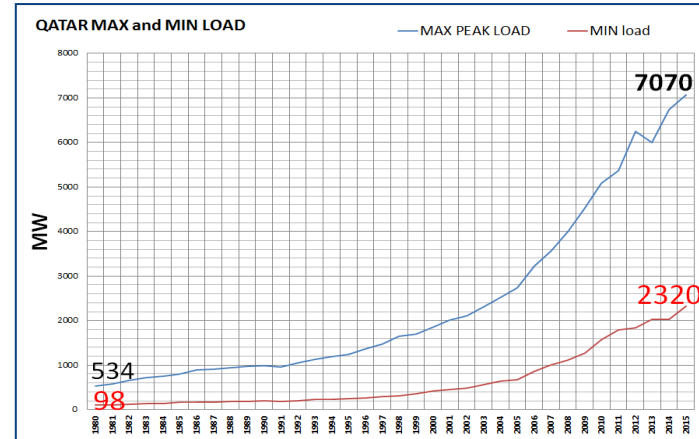
Energy, Power & Water plays the vital role in Qatar's Development and Transformation

# Changing Life Expectancies in Qatar

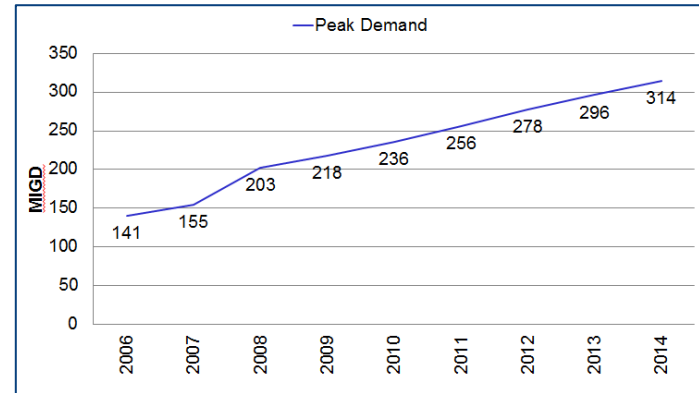
## Changing Life Expectancies



Power and Water plays a vital role



Power Demand

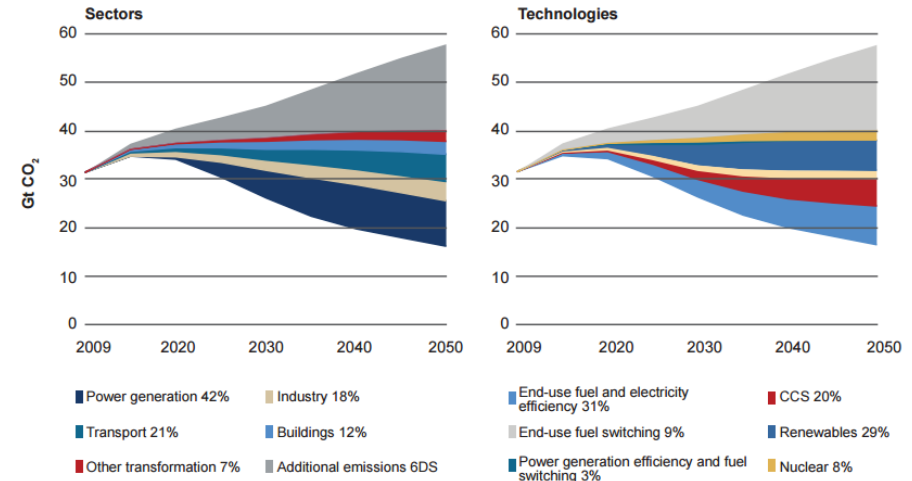


Water Demand

# Changing Scenarios in Qatar

- Exponential growth and demand in power and water sector
- Rising demand for energy resource conservation due to climate change and green gas reduction
- Government initiated various energy and efficiency measures

Energy efficiency investments provide a large contribution to emissions savings—approximately 40 percent—due to their low cost and high returns.



Energy Technology Perspectives 2012: Global contributions to emissions reductions in the 2°C scenario, by sector and technology © OECD/IEA, 2012, fig. 1.9, p. 39.

- Optimisation of O&M Efficiency at Qatar Power
- PI System plays important role in improving O&M performance

# Agenda

- About Qatar Power Company
- Business Environment and Challenge
- Case Study to improve O&M efficiency
- PI System Capabilities to solve Qatar Power's Business Challenges
- Results Obtained and Business Impact
- Future Plan and next step
- Summary and Conclusion

# Qatar Power Company



Ras Laffan-B Independent Water and Power Plant (IWPP)  
Plant Capacity: Power 1025 MW and Water 60 MIGD  
Company: Q Power Q.S.C, P O Box 22664, Doha, State of Qatar

# Qatar Power Company

- Long term PWPA with Kahramaa ( regulator of Qatar)
- IWPP project company, responsible for facility O&M for 25 years under BOOT agreement
- It is consortium of Engie (GDF Suez), Chubu Electric and Qatar Electricity and Water Company
- Commissioned full facility of 1025MW Power and 60MIGD Desalination Water in year 2008.
- State of art technology in power and water production
- Implemented PI System in year 2012





# Plant Configuration

Commercial Operation Start : Jun 2008

## Capacity

- 1025 MW Net
- 60 MIGD (272700 m<sup>3</sup>/day)

## Plant Design

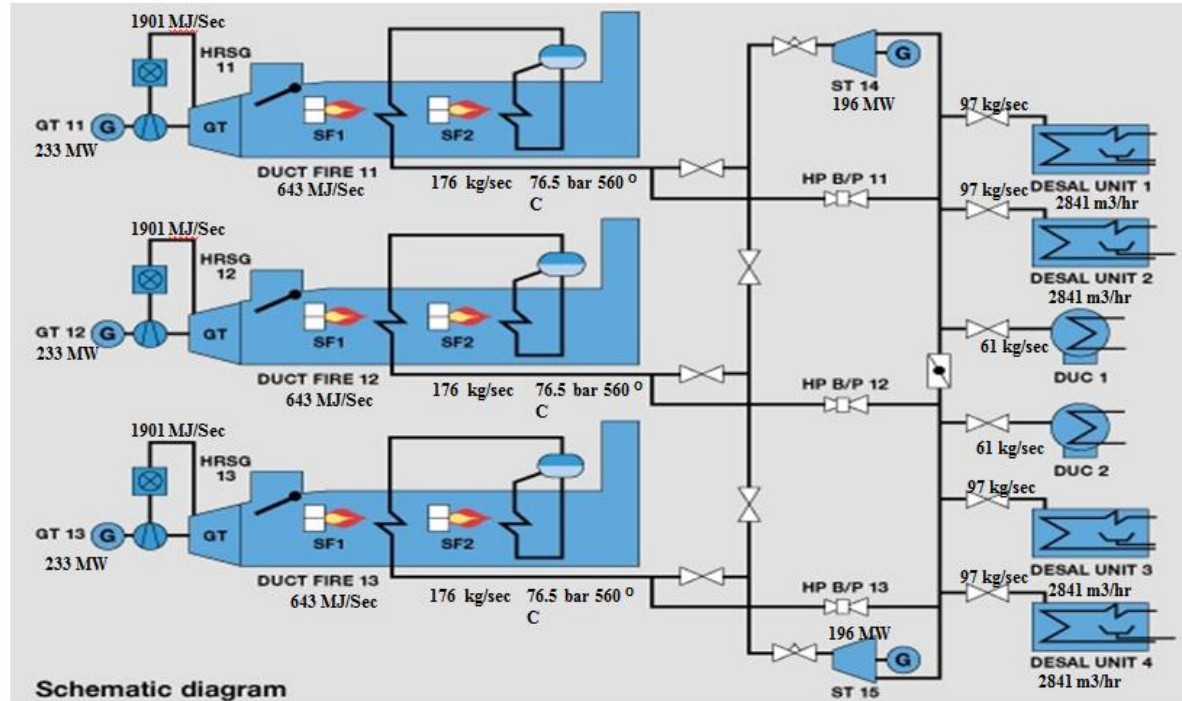
- 3 GT 237.35 MW
- 2 ST 221 MW
- 4 MSF 15.13 MIGD

## Plant Technology

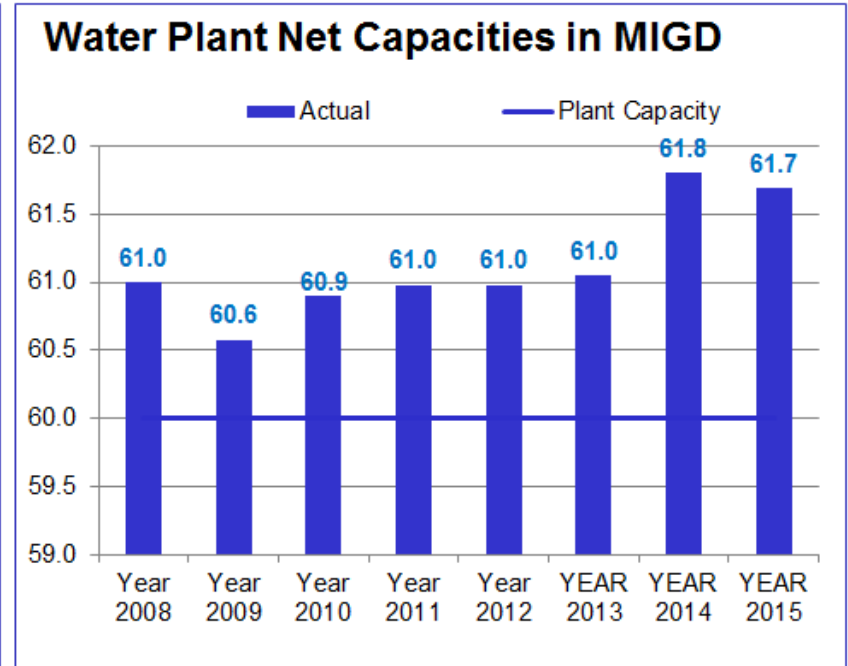
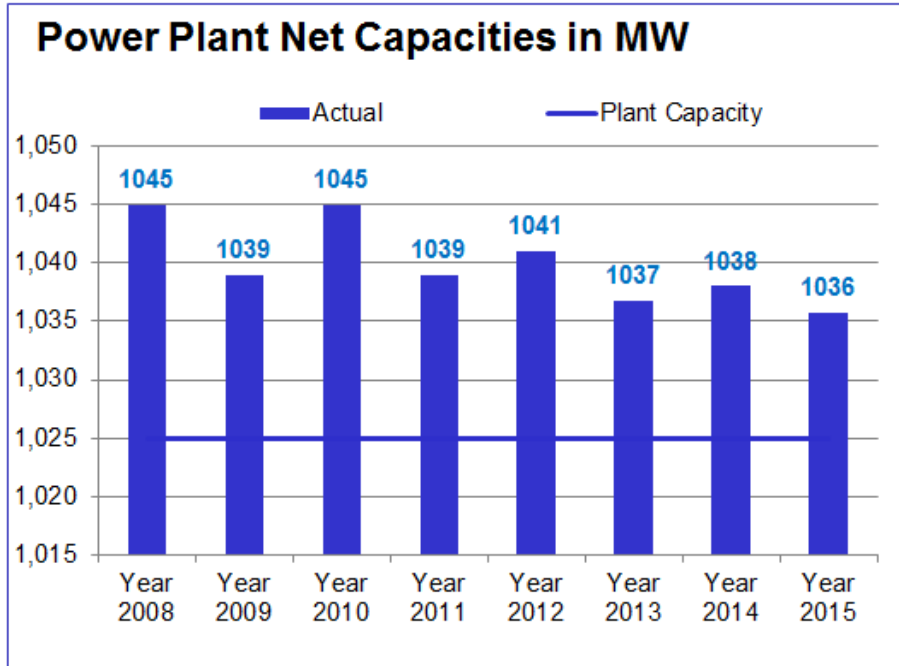
- GT : 94.3A-Siemens
- ST : M30-40-M2A-Siemens
- MSF : Doosan

## Plant Net Efficiency

- At Ref Conditions
- Facility : 40.29 %
  - GT : 37.45 %
  - MSF PR : 8.26



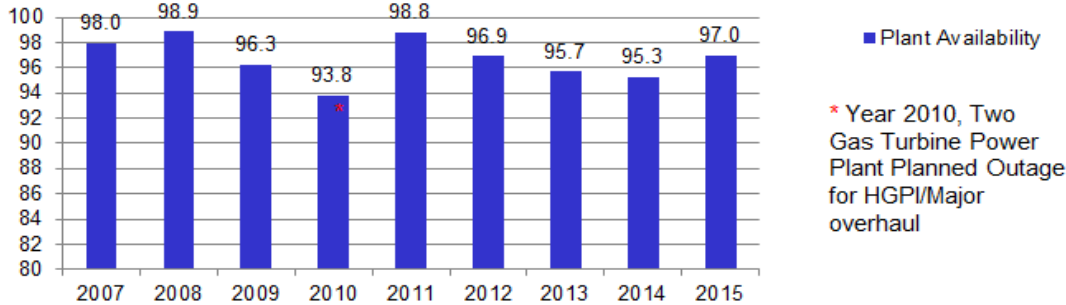
# KPI - Plant Dependable Capacity Tests



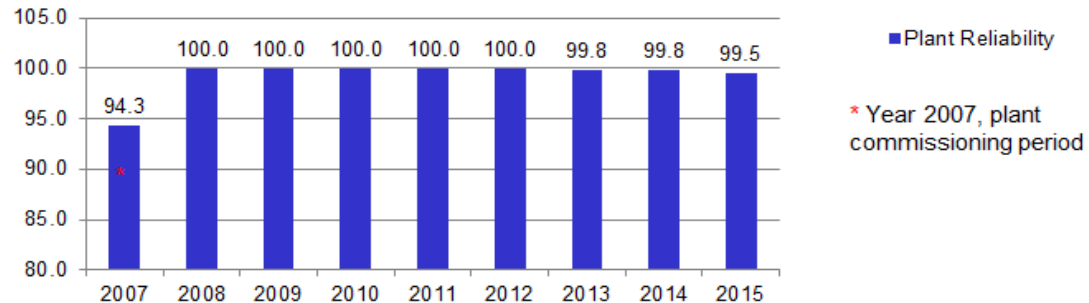
# KPI - Power Plant Availability and Reliability

## Power Plant Annual Availability-%

2015 figs are till YTD- July-15



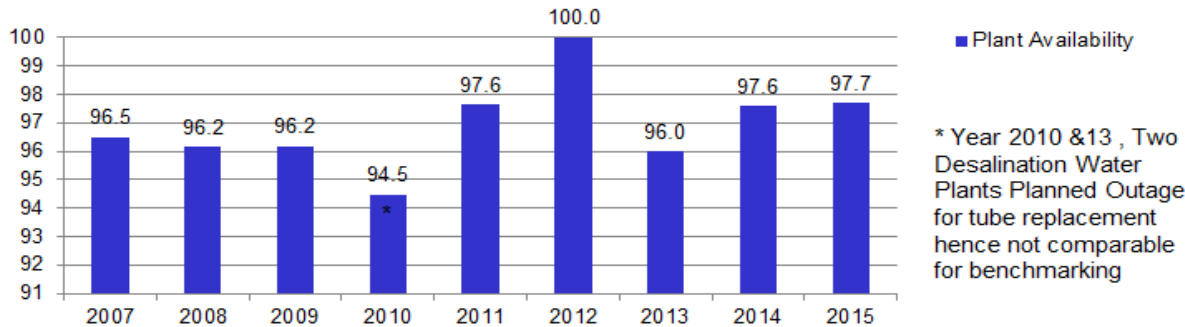
## Power Plant Annual Reliability-%



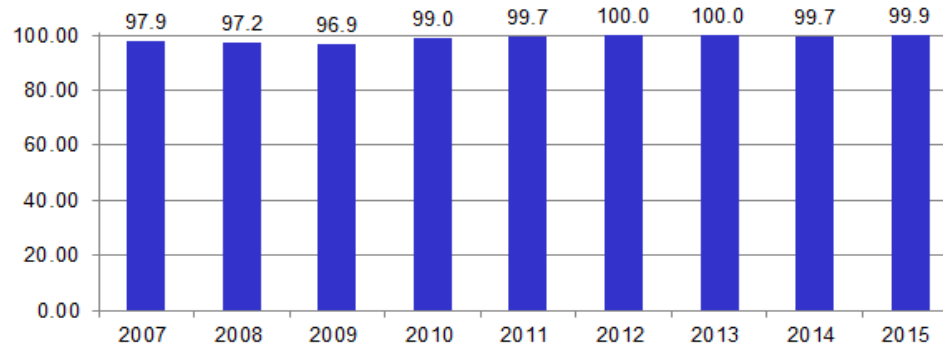
# KPI - Water Plant Availability and Reliability

## Water Plant Annual Availability-%

2015 figs are till YTD- July-15



## Water Plant Reliability in %

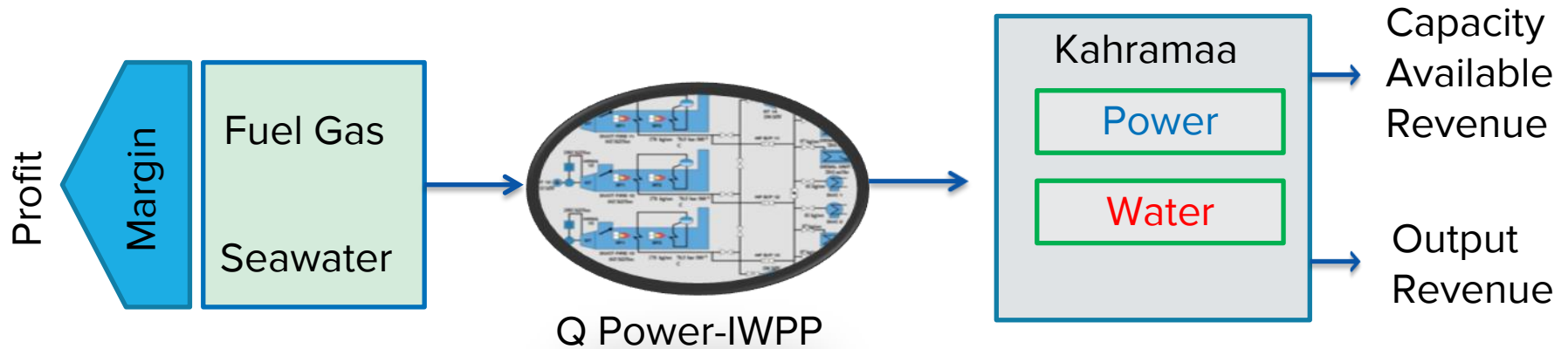


# Awards and Recognition

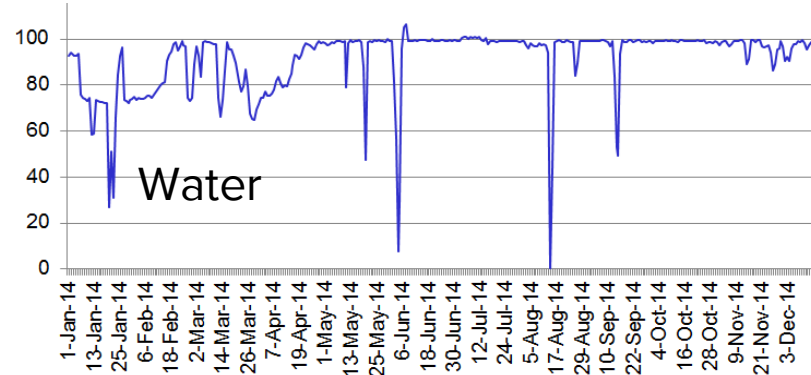
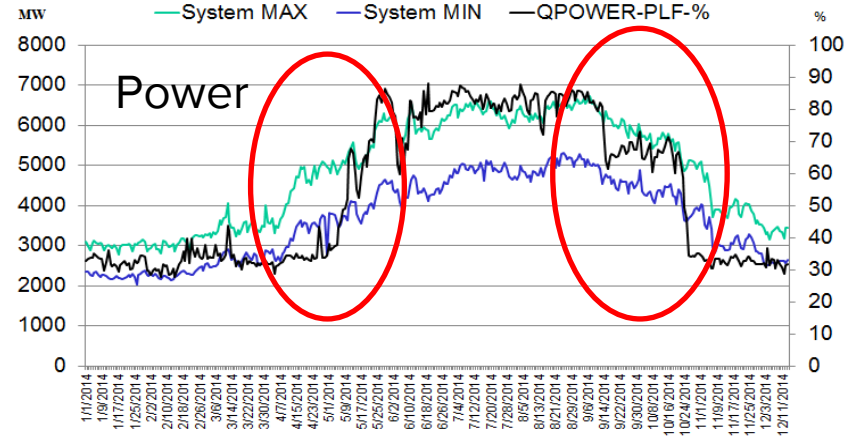
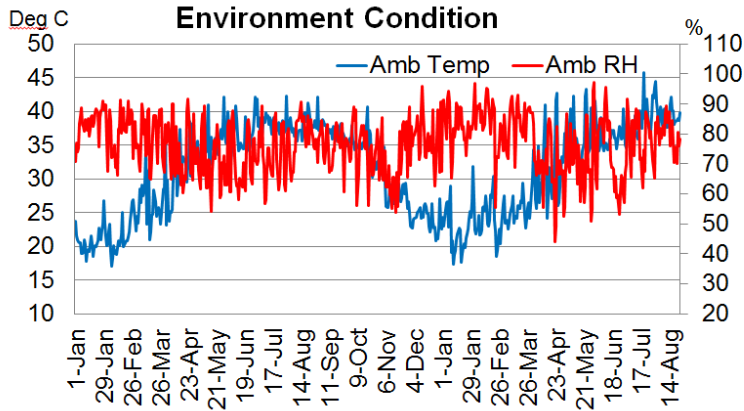


# Business Environment

- Company income through PWPA
- Fuel gas and seawater used for power and water generation is not directly pass-through under PWPA
- Efficient O&M is vital for higher profit and to avoid penalties.



# Business Environment



- Adverse & Harsh Climate Conditions- RH – 90% Temp-45 °C
- Annual system demand variation (summer-winter) - 230%
- Daily system peak and low power demand- 45%
- QPower Water Demand-100%
- QPower Power demand in Winter-30%
- QPower Power demand in Summer-98%



# Business Challenges

- Meet Health and Safety Target
- Meet Power and Water Demand
- Maintain higher Plant Capacity available all the time
- Efficient O&M at all operating scenarios
- Deterioration in Plant Efficiency factor over the period
- Deterioration in fuel and seawater margins
- Availability of real time plant information
- Availability of historical plant data and archival
- Real time analysis and Management information system

# Business Challenge & PI System

- Implemented PI System and tools to find solutions to Business Challenges
- Application implemented in real-time

# HSE: Monitoring Heat Stress Index

## Past

- Difficult to monitor Heat Index.
- Conventional manual monitoring.
- Difficult decision making
- Missing Controls
- No people awareness

## Present

- Online Monitoring of Heat Index through PI System
- Real time messaging and notifications
- Easy decision making
- System controlled measures
- People awareness
- Dash Board and displays

# HSE: Monitoring Heat Index - PI ProcessBook



## QATAR POWER COMPANY, RAS LAFFAN-B, IWPP

8/28/2015 8:40:11

- POWER ISLAND
- KPI DASH BOARD
- GT 11 OVERVIEW
- GT 12 OVERVIEW
- GT 13 OVERVIEW
- HRSG 11 OVERVIEW
- HRSG 12 OVERVIEW
- HRSG 13 OVERVIEW
- ST 14 OVERVIEW
- ST 15 OVERVIEW
- FUEL GAS SYSTEM
- FEED WATER SYSTEM
- WATER STEAM SYS
- STM WTR CHEMISTRY

<b>POWER DISPATCH</b>	865 MW	<b>LTA MAN HOURS</b>	4,216,382 Hrs	<b>WATER DISPATCH</b>	10918 m3/hr
<b>POWER GENERATION</b>	924 MW	<b>LTA MAN DAYS</b>	3,452 Days	<b>POTABLE WATER</b>	10228 m3/h
<b>FREQUENCY</b>	50.02 Hz	<b>HEAT INDEX</b>	54	<b>DISTILLATE</b>	708 m3/h
<b>AMBIENT TEMP</b>	37.80 °C	<b>WIND SPEED</b>	3.11 m/s	<b>WATER PRODUCTION</b>	11293 T/h
<b>AMBIENT RH</b>	59.88 %	<b>AMBIENT PRESSURE</b>	1002.07 mbara	<b>Avg SEAWATER DT</b>	9.31 Deg C

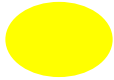
- WATER ISLAND
- WATER ISLAND KPI
- MSF 21 OVERVIEW
- MSF 22 OVERVIEW
- MSF 23 OVERVIEW
- MSF 24 OVERVIEW
- DESAL OVERVIEW
- DWPS OVERVIEW
- PWPS OVERVIEW
- SEA WATER SUPPLY
- REMIN SYSTEM
- PWPS ELECTRICAL
- ELECTRICAL SYSTEM
- AIR COMPRESSOR

	OUTPUT	EFF	PRODUCTION										GOR	PR												
<b>GT 11</b>	203 MW	35.46 %	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
<b>GT 12</b>	204 MW	35.49 %	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
<b>GT 13</b>	204 MW	35.56 %	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
<b>ST 14</b>	161 MW	20.28 %	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
<b>ST 15</b>	154 MW	19.48 %	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
<b>PLANT</b>	924 MW	39.07 %	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
<b>GROSS PLF</b>	84.83 %		37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60

ENVMT AIR HUMIDITY ENVMT AIR TEMP

# HSE: Monitoring Heat Index - Notifications

## Category



This message was sent with High importance.

From: PI\_AFServer@QATARPOWER.NET  
To: Parasram Borkar  
Cc:  
Subject: Danger level- Normal Category -Heat Index > 39 to 49 ( Level-III)

Heat Stress Index Value : 42

Ambient Temp: 39 Deg C Relative Humidity: 30 %

Severity Category : **Danger ( Normal Category-Level -III)**

Heat Syndrome : Sunstroke, Heat Cramps or Heat Exhaustion likely, Heat

Work Rest Period Minutes : 30:10

Water Requirements ( 1 cup = 1/4 liter ) : 1 Cup every 15 minutes

Controls: **Work Under Shade**

Notification Name : Heat\_Stress\_Level\_3a

Triggering Condition : Heat Index >= 39

System Name :QATQPRAF01

Notification Start Time : 7/17/2014 8:30:00 AM Arab Standard Time (GMT+03:00:00)

Target Path : Heat Index

Regards,

From: PI\_AFServer@QATARPOWER.NET  
To: Parasram Borkar  
Cc:  
Subject: Danger level- High Priority Category -Heat Index > 50 to 53 ( Level-III)

Heat Stress Index Value : 52

Ambient Temp: 35 Deg C Relative Humidity: 70 %

Severity Category : **Danger ( High Priority Category-Level -III)**

Heat Syndrome : Sunstroke, Heat Cramps or Heat Exhaustion likely, Heat Stroke possible with prolonged exposure a

Work Rest Period Minutes : 20:10

Water Requirements ( 1 cup = 1/4 liter ) : 1 Cup every 10 minutes

Controls: **Elevated Work and Confined Space Works under direct sunlight to be Stopped.**

Notification Name : Heat\_Stress\_Level\_3b

Triggering Condition : Heat Index >= 50 AND Heat Index < 53

Notification Start Time : 8/27/2015 10:05:00 PM Arab Standard Time (GMT+03:00:00)

Target Path : Heat Index

Regards,

Parasram Borkar  
PI System Admin  
+974 55840366

This message was sent with High importance.

From: PI\_AFServer@QATARPOWER.NET  
To: Parasram Borkar  
Cc:  
Subject: Extreme Danger ( Severity Level-IV) Heat Stress Index : > = 54.

Heat Stress Index Value : **54 .**

Ambient Temp: 37 Deg C Relative Humidity: 60 %

Severity Category : **Extreme Danger ( Level -IV)**

Heat Syndrome : **Heat Stroke or Sunstroke imminent**

Controls: **All Work under direct sunlight to be stopped**

Notification Name : Heat\_Stress\_Level\_4

Triggering Condition : Heat Index >= 54

Notification Start Time : 8/28/2015 7:15:00 AM Arab Standard Time (GMT+03:00:00)

Target Path : Heat Index

Regards,

Parasram Borkar  
PI System Admin  
+974 55840366

# HSE: Monitoring Heat Index – Asset Framework

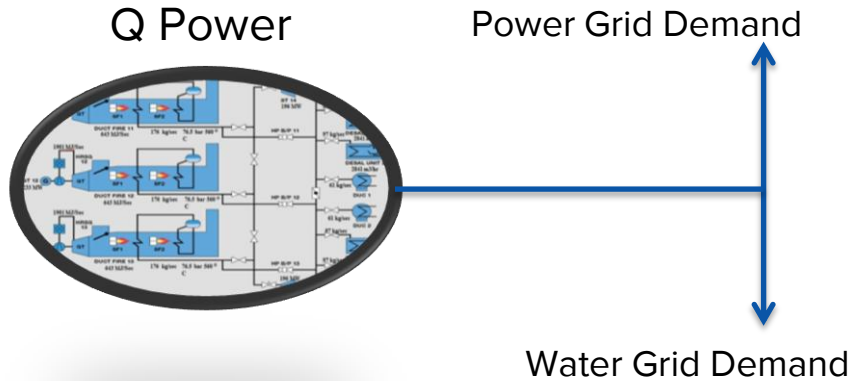
The screenshot displays the PI System Explorer interface for the 'QPOWER\_DB' database. The left-hand pane shows a hierarchical tree of elements under 'QPOWER', including GT11, GT12, GT13, Heat Exchanger, Heat Index, ST 14, and ST 15. The right-hand pane shows a table of data points for the 'Heat Index' asset.

Name	Value	Time Stamp	Description	Data Reference
AMB_RH	50 %	8/28/2015 9:03:26.324 AM	Ambient Relative Hu...	Formula
AMB_TEMP	38 °C	8/28/2015 9:03:26.324 AM	Ambient Temp rounded	Formula
GT11_RH	53.8199844360...	8/28/2015 9:03:26.324 AM	Relative Humidity	PI Point
GT12_RH	55.8399810791...	8/28/2015 9:03:26.324 AM	Relative Humidity	PI Point
GT13_RH	52.7099838256...	8/28/2015 9:03:26.324 AM	Relative Humidity	PI Point
Heat Index	49	8/28/2015 9:03:26.324 AM	Heat Index Calculated	Formula
Heat Index 10	35 %	8/28/2015 9:03:26.324 AM	Heat Index	Table Lookup
Heat Index 20	37 %	8/28/2015 9:03:26.324 AM	Heat Index	Table Lookup
Heat Index 30	41 %	8/28/2015 9:03:26.324 AM	Heat Index	Table Lookup
Heat Index 40	43 %	8/28/2015 9:03:26.324 AM	Heat Index	Table Lookup
Heat Index 50	49 %	8/28/2015 9:03:26.324 AM	Heat Index	Table Lookup
Heat Index 60	54 %	8/28/2015 9:03:26.324 AM	Heat Index	Table Lookup
Heat Index 70	54 %	8/28/2015 9:03:26.324 AM	Heat Index	Table Lookup
Heat Index 80	54 %	8/28/2015 9:03:26.324 AM	Heat Index	Table Lookup
Heat Index 90	54 %	8/28/2015 9:03:26.324 AM	Heat Index	Table Lookup
RH	59.1499862670...	8/28/2015 9:03:26.324 AM	Relative Humidity	PI Point
Temp	37.7899627685...	8/28/2015 9:03:26.324 AM	Ambienttemp	PI Point

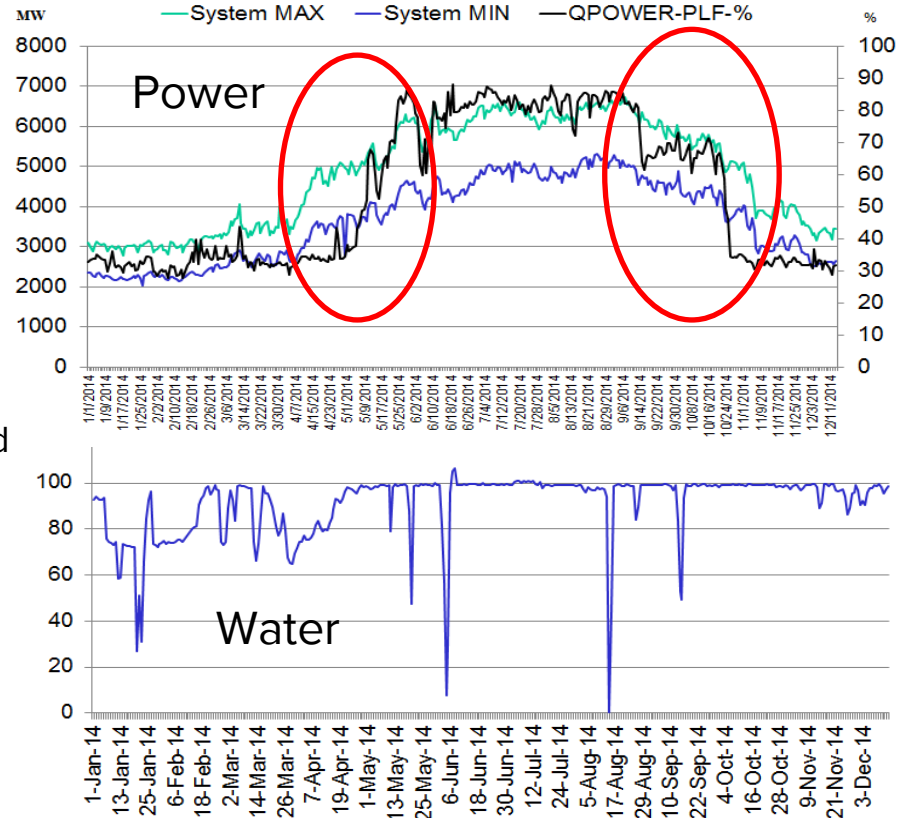
# HSE Performance Achievements

- No heat stress related incidents.
- Achieved 4.2 million man-hours in 3,452 days without LTA

# Plant O&M Optimisation

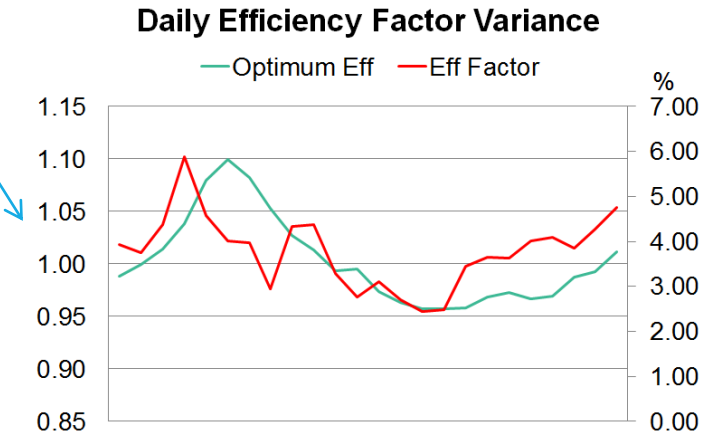
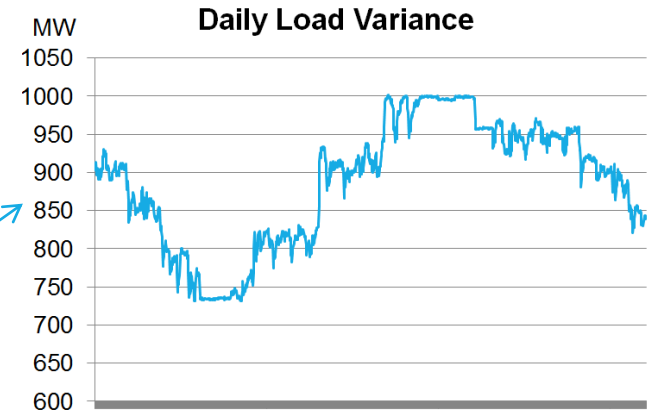
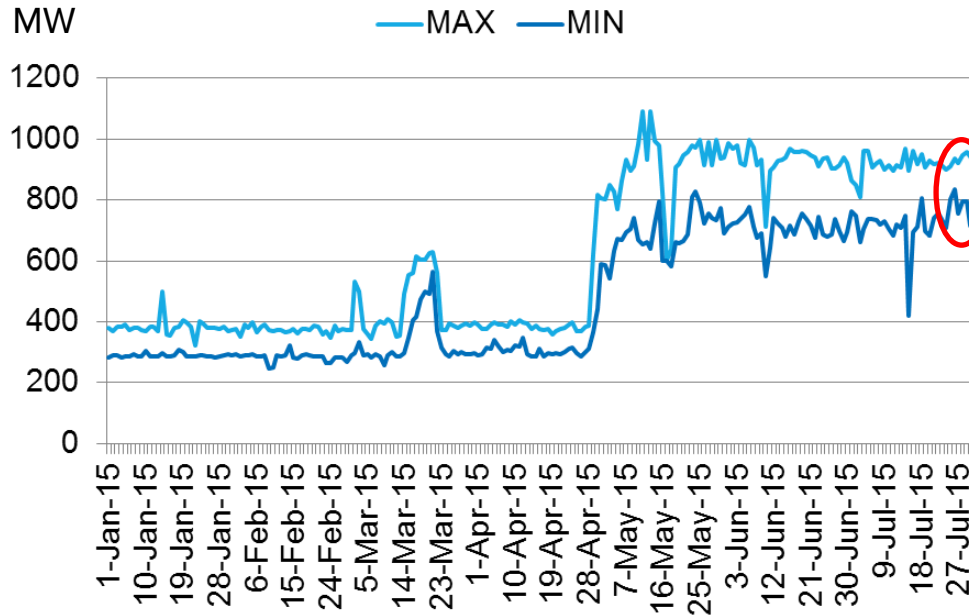


- Difficult to optimise Plant Configuration
- Inherent Energy Losses
- Plant efficiency deterioration
- Plant life and maintenance issues
- Lower fuel and seawater margins
- Real time data archival and analysis





# Plant O&M Optimisation



# Plant O&M Optimisation - Dash Boards



## QATAR POWER COMPANY, RAS LAFFAN-B, IWPP

8/28/2015 10:18:09

- POWER ISLAND
- KPI DASH BOARD
- GT 11 OVERVIEW
- GT 12 OVERVIEW
- GT 13 OVERVIEW
- HRSG 11 OVERVIEW
- HRSG 12 OVERVIEW
- HRSG 13 OVERVIEW
- ST 14 OVERVIEW
- ST 15 OVERVIEW
- FUEL GAS SYSTEM
- FEED WATER SYSTEM
- WATER STEAM SYS
- STM WTR CHEMISTRY

<b>POWER DISPATCH</b>	<b>920 MW</b>	<b>LTA MAN HOURS</b>	<b>4,216,382 Hrs</b>	<b>WATER DISPATCH</b>	<b>10946 m3/hr</b>
<b>POWER GENERATION</b>	<b>979 MW</b>	<b>LTA MAN DAYS</b>	<b>3,452 Days</b>	<b>POTABLE WATER</b>	<b>10254 m3/h</b>
<b>FREQUENCY</b>	<b>50.03 Hz</b>	<b>HEAT INDEX</b>	<b>54</b>	<b>DISTILLATE</b>	<b>711 m3/h</b>
<b>AMBIENT TEMP</b>	<b>38.04 °C</b>	<b>WIND SPEED</b>	<b>4.06 m/s</b>	<b>WATER PRODUCTION</b>	<b>11343 T/h</b>
<b>AMBIENT RH</b>	<b>62.05 %</b>	<b>AMBIENT PRESSURE</b>	<b>1002.12 mbara</b>	<b>Avg SEAWATER DT</b>	<b>9.32 Deg C</b>

- WATER ISLAND
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	OUTPUT	EFF		PRODUCTION	GOR	PR
<b>GT 11</b>	<b>218 MW</b>	<b>36.02 %</b>		<b>MSF 21</b>	<b>2796 T/h</b>	<b>7.64</b> 7.94
<b>GT 12</b>	<b>223 MW</b>	<b>36.49 %</b>		<b>MSF 22</b>	<b>2827 T/h</b>	<b>7.33</b> 7.64
<b>GT 13</b>	<b>224 MW</b>	<b>36.31 %</b>		<b>MSF 23</b>	<b>2812 T/h</b>	<b>8.08</b> 8.38
<b>ST 14</b>	<b>160 MW</b>	<b>20.33 %</b>		<b>MSF 24</b>	<b>2908 T/h</b>	<b>7.92</b> 8.22
<b>ST 15</b>	<b>154 MW</b>	<b>19.44 %</b>		<b>PLANT WTR</b>	<b>11343 T/h</b>	
<b>PLANT</b>	<b>979 MW</b>	<b>40.37 %</b>		<b>POTABLE WTR</b>	<b>10500 m3/h</b>	
<b>GROSS PLF</b>	<b>NO DAT%</b>			<b>DISTILLATE</b>	<b>840 m3/h</b>	

ENVRMT AIR HUMIDITY	ENVRMT AIR TEMP
30	50
31	51
32	52
33	53
34	54
35	55
36	56
37	57
38	58
39	59
40	60
41	61
42	62
43	63
44	64
45	65
46	66
47	67
48	68
49	69
50	70
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56	76
57	77
58	78
59	79
60	80
61	81
62	82

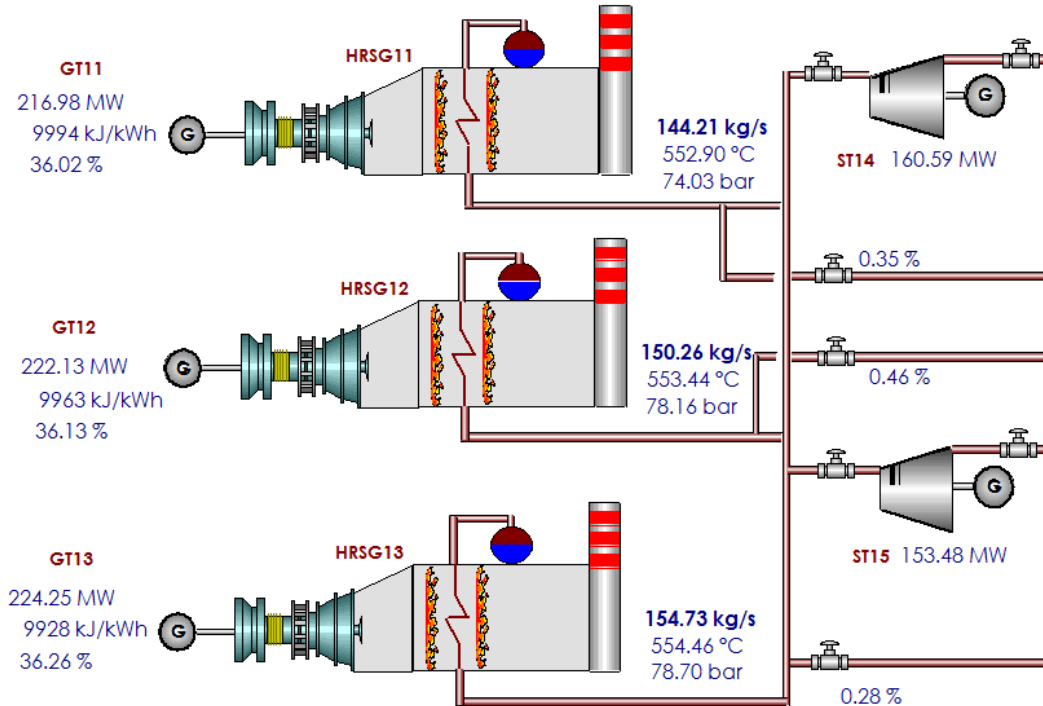
# Plant O&M Optimisation - PI ProcessBook



## Power Island Overview

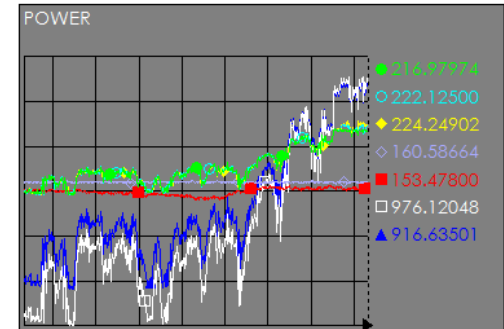
8/28/2015 10:19:29

- POWER ISLAND
- POWER ISLAND KPI
- GT 11 OVERVIEW
- GT 12 OVERVIEW
- GT 13 OVERVIEW
- HRSG 11 OVERVIEW
- HRSG 12 OVERVIEW
- HRSG 13 OVERVIEW
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- ST 15 OVERVIEW
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- WATER STEAM SYS
- DUMP CONDENSER
- COOLING TOWER
- AIR COMPRESSOR
- STM WTR CHEMISTRY
- ELECTRICAL AUX
- HEAT FLOW DIAGRAM



POWER DISPATCH 917 MW  
POWER GENERATED 976 MW  
PLANT NET EFFICIENCY 40.54 %  
PLANT AUX POWER 59 MW

To Desal Plant 11751.9 M<sup>3</sup>/Hr





# Plant O&M Optimisation - PI ProcessBook Report



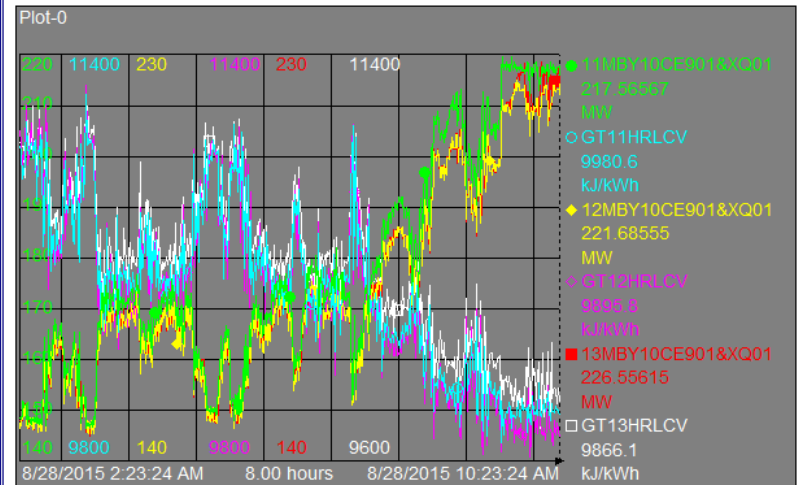
## Gas Turbine Report

8/28/2015 10:23:24

- POWER ISLAND
- POWER ISLAND KPI
- GT 11 OVERVIEW
- GT 12 OVERVIEW
- GT 13 OVERVIEW
- FUEL GAS SYSTEM
- FEED WATER SYSTEM
- WATER STEAM SYS
- DUMP CONDENSER
- COOLING TOWER
- AIR COMPRESSOR
- STM WTR CHEMISTRY
- ELECTRICAL AUX
- HEAT FLOW DIAGRAM

Parameter	Units	GT11	GT12	GT13
Ambient Temperature	°C	39.37	37.56	37.30
Ambient Pressure	mbar	1000.44	1000.30	1000.16
Ambient Humidity	%	56.54	63.94	59.72
Fuel LHV	MJ/Nm3	38.81	38.81	38.81
Power Output	MW	217.57	221.69	226.56
Heatrate LHV	kJ/kWh	9981	9896	9866
Thermal Efficiency	%	36.07	36.38	36.49
Evap Cooler Effectiveness	%	88.3	85.6	77.0
Evap Cooler ON / OFF		ON	ON	ON
Fuel Flow	kg/s	13.78	14.00	14.23
Air Flow	kg/s	614.0	617.5	610.7
Exhaust Flow	kg/s	645.2	645.2	640.2
Exhaust Temperature	°C	591.6	594.2	597.9

Parameter	Units	GT11	GT12	GT13
Flue Gas Stack NOx	mg/Nm³	22.40	25.77	31.12
Flue Gas Stack CO	mg/Nm³	4.59	4.74	2.44
Flue Gas Stack SO2	mg/Nm³	1.72	3.00	1.00



# Plant O&M Optimisation - PI ProcessBook



## Water Island Overview

8/28/2015 10:27:59

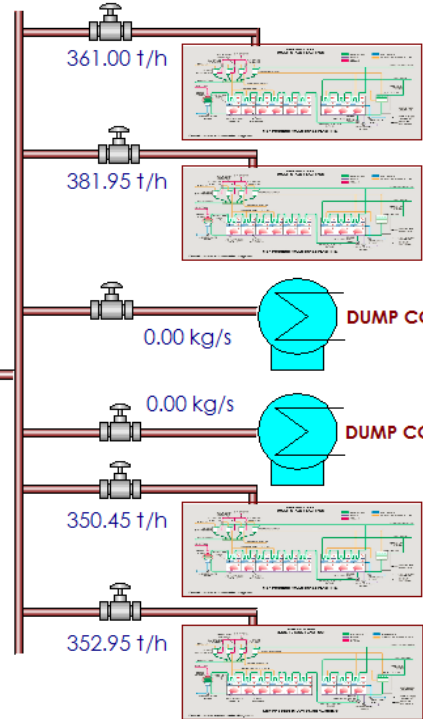
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- PWPS OVERVIEW
- SEA WATER SUPPLY
- REMIN SYSTEM
- PWPS ELECTRICAL
- ELECTRICAL SYSTEM
- AIR COMPRESSOR
- WATER CHEMISTRY

**MSF 21**

TBT	110.24 °C
BBT	44.68 °C
PROD	2809.45 t/h
STEAM	361.00 t/h
GOR	7.50
DIST/SW	0.12
SEA WATER	22200.00 m3/h
BLOW DOWN	5198 m3/h

**MSF 22**

TBT	109.96 °C
BBT	45.04 °C
PROD	2812.95 t/h
STEAM	381.95 t/h
GOR	7.46
DIST/SW	0.12
SEA WATER	22839.00 m3/h
BLOW DOWN	5250 m3/h



**MSF 21**

PROD	2765.00 T/h
GOR	7.95PR

**MSF 22**

PROD	2798.25 T/h
GOR	7.92PR

**MSF 23**

PROD	2839.20 T/h
GOR	4.4 uS/cm
PR	8.47

**MSF 24**

PROD	2919.00 T/h
GOR	201.9 uS/cm
PR	8.51PR

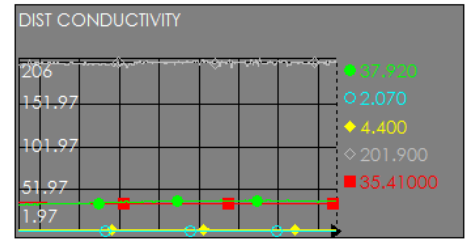
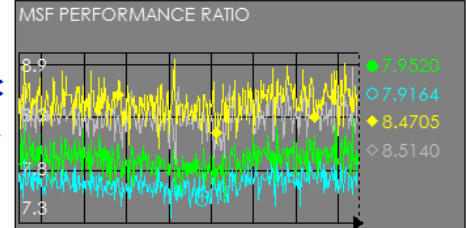
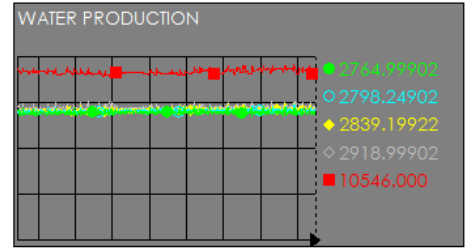
**MSF 23**

TBT	110.14 °C
BBT	44.71 °C
PROD	2781.80 t/h
STEAM	350.45 t/h
GOR	8.16
DIST/SW	0.14
SEA WATER	20616.00 m3/h
BLOW DOWN	5357 m3/h

Avg SW DT **9.31 Deg C**  
 WATER PRODUCTION 11133  
 WATER DISPATCH 10960 m3/hr

**MSF 24**

TBT	110.28 °C
BBT	44.17 °C
PROD	2921.10 t/h
STEAM	352.95 t/h
GOR	8.20
DIST/SW	0.12
SEA WATER	23580.00 m3/h
BLOW DOWN	5358 m3/h



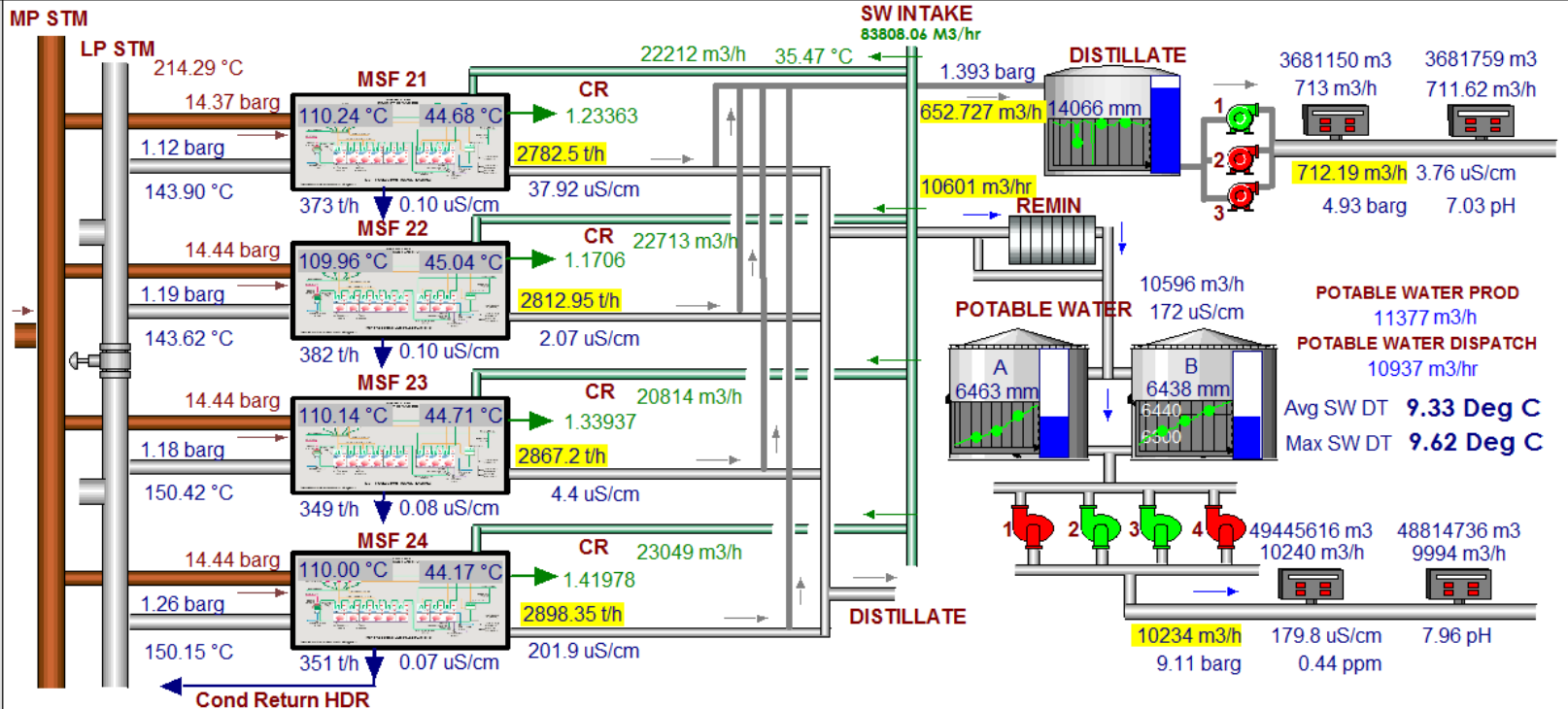
# Plant O&M Optimisation - Water Plant Monitoring



## DESALINATION PLANT OVERVIEW

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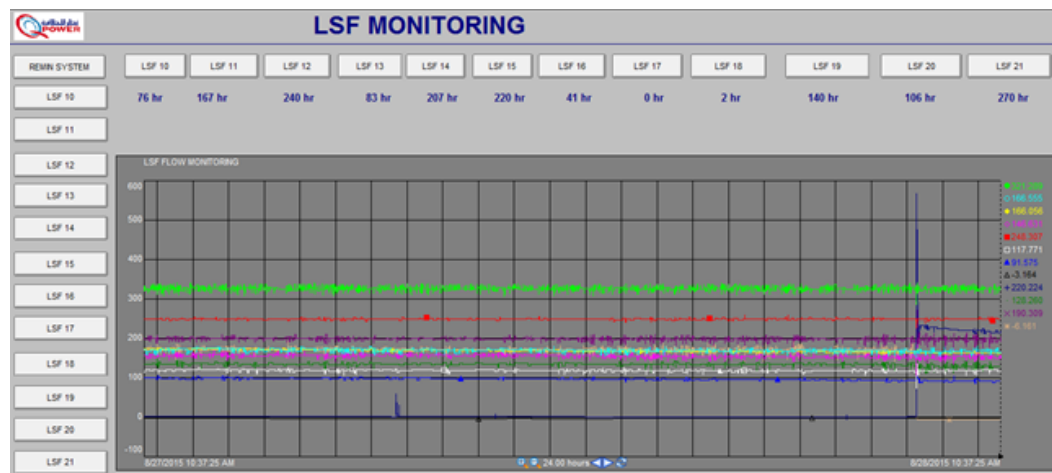
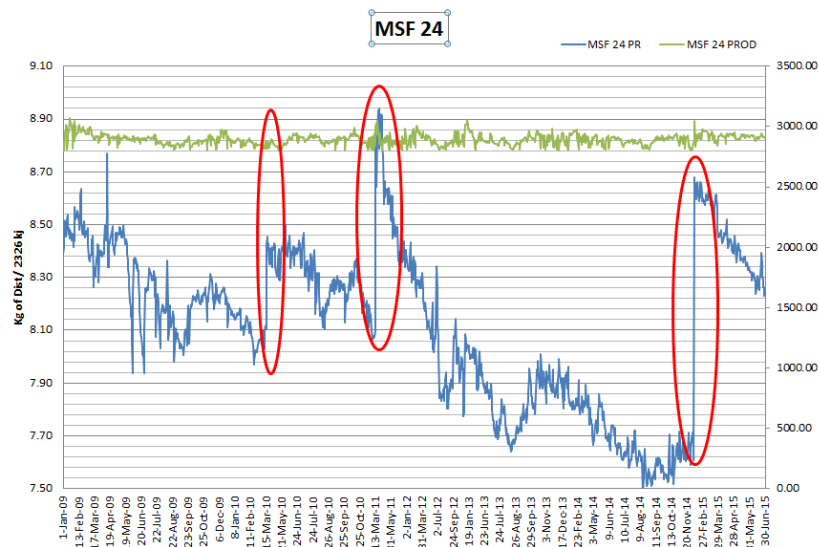
- WATER ISLAND
- WATER ISLAND KPI
- MSF 21 OVERVIEW
- MSF 22 OVERVIEW
- MSF 23 OVERVIEW
- MSF 24 OVERVIEW
- DESAL OVERVIEW
- DWPS OVERVIEW
- PWPS OVERVIEW
- SEA WATER SUPPLY
- REMIN SYSTEM
- PWPS ELECTRICAL
- ELECTRICAL SYSTEM
- AIR COMPRESSOR
- WATER CHEMISTRY







# Plant O&M Optimisation - Performance/Conditioned based Maintenance



Online Monitoring of equipment performance used for performance & condition based maintenance of distillers, lime stone filters and major pumps, GT suction filters etc.

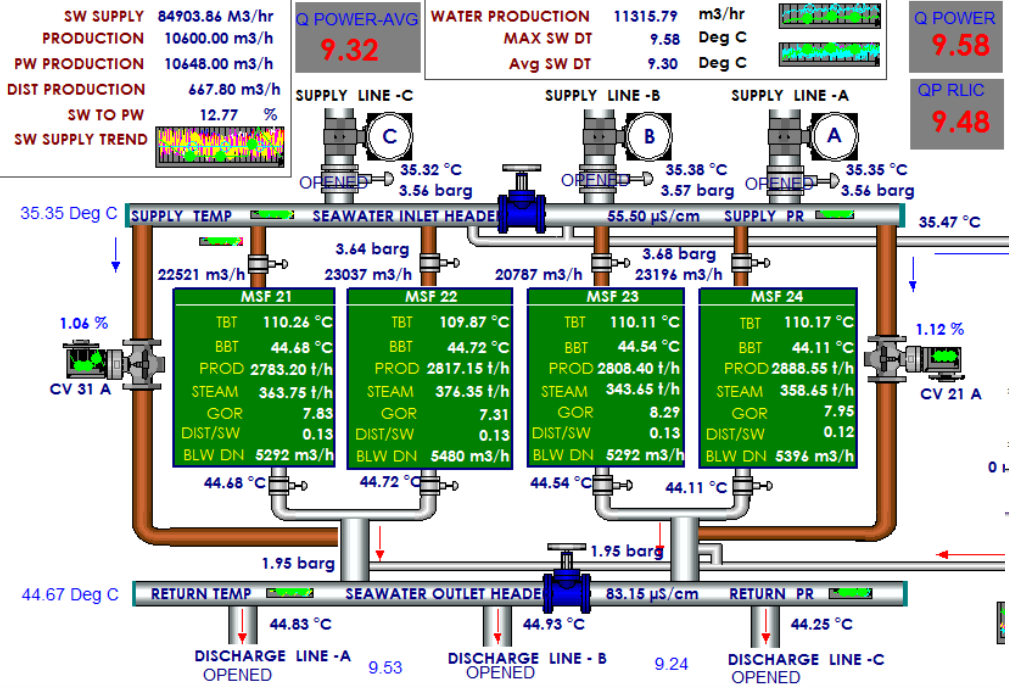
# Seawater Margin Improvement



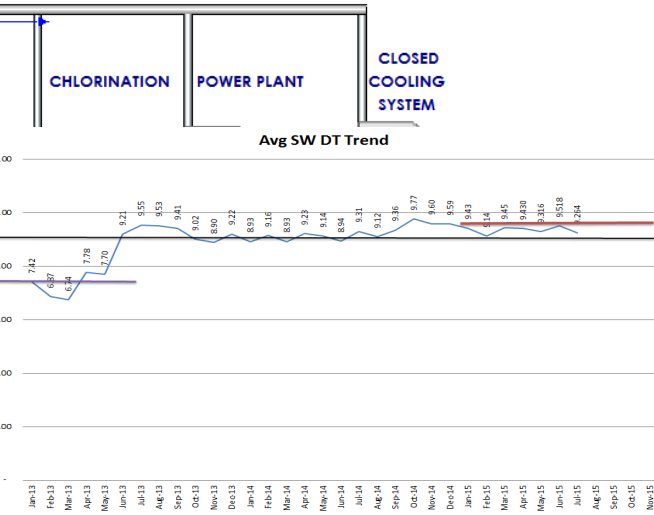
## SEA WATER SUPPLY AND COOLING WATER DISCHARGE

8/28/2015 11:14:14

- WATER ISLAND
- WATER ISLAND KPI
- MSF 21 OVERVIEW
- MSF 22 OVERVIEW
- MSF 23 OVERVIEW
- MSF 24 OVERVIEW
- DESAL OVERVIEW
- DWPS OVERVIEW
- PWPS OVERVIEW
- SEA WATER SUPPLY
- REMIN SYSTEM
- PWPS ELECTRICAL
- ELECTRICAL SYSTEM
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- WATER CHEMISTRY



<b>MAX SW DT</b>	9.58	Deg C	[Trend Chart]
<b>Avg SW DT</b>	9.30	Deg C	[Trend Chart]
<b>SW BYPASS</b>	-4610	M3/Hr	[Trend Chart]
	-7.32	%	[Trend Chart]
<b>SW INLET TEMP</b>	35.35	Deg C	[Trend Chart]
<b>SW RETURN TEMP</b>	44.67	Deg C	[Trend Chart]
<b>MAX SW RETURN TEMP</b>	44.93	Deg C	[Trend Chart]
<b>SW CONDUCTIVITY RISE</b>	49.81	%	[Trend Chart]
<b>SW PR DROP</b>	1.71	barg	[Trend Chart]



# Plant O&M Optimisation - Monthly KPI Reporting



## QATAR POWER COMPANY, RAS LAFFAN-B, IWPP

8/28/2015 10:38:40

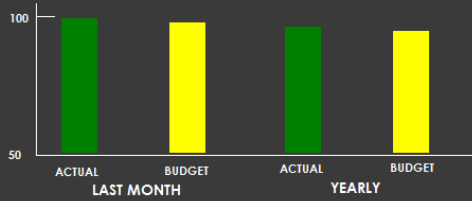
- POWER ISLAND
- POWER ISLAND KPI
- GT 11 OVERVIEW
- GT 12 OVERVIEW
- GT 13 OVERVIEW
- HRS 11 OVERVIEW
- HRS 12 OVERVIEW
- HRS 13 OVERVIEW
- ST 14 OVERVIEW
- ST 15 OVERVIEW
- FUEL GAS SYSTEM
- FEED WATER SYSTEM
- WATER STEAM SYS
- STM WTR CHEMISTRY

<b>POWER DISPATCH</b>	916 MW	<b>AMBIENT TEMP</b>	38.13 °C	<b>WATER DISPATCH</b>	57.76 MIGD
<b>POWER GENERATION</b>	976 MW	<b>AMBIENT RH</b>	60.40 %	<b>POTABLE WATER</b>	54.03 MIGD
<b>FREQUENCY</b>	50.02 Hz	<b>AMBIENT PRESSURE</b>	1002.07 mbara	<b>DISTILLATE</b>	3.76 MIGD
<b>POWER FACTOR</b>	0.98	<b>WIND SPEED</b>	5.35 m/s	<b>WATER PRODUCTION</b>	60.03 MIGD
<b>LTA MAN HOURS</b>	4,216,382 Hrs	<b>LTA MAN DAYS</b>	3,452 Days	<b>HEAT INDEX</b>	54.00

- WATER ISLAND
- WATER ISLAND KPI
- MSF 21 OVERVIEW
- MSF 22 OVERVIEW
- MSF 23 OVERVIEW

### POWER COMMERCIAL AVAILABILITY

LAST MONTH		YEARLY	
ACTUAL	BUDGET	ACTUAL	BUDGET
99.89 %	98.38 %	97.02 %	95.13 %



## MONTHLY PERFORMANCE REPORTS

- KPI DASH BOARD
- JANUARY
- FEBRUARY
- MARCH
- APRIL
- MAY
- JUNE
- JULY
- AUGUST
- SEPTEMBER
- OCTOBER
- NOVEMBER
- DECEMBER

- JANUARY
- FEBRUARY
- MARCH
- APRIL
- MAY
- JUNE
- JULY
- AUGUST
- SEPTEMBER
- OCTOBER
- NOVEMBER
- DECEMBER

### META - R Power Analytical Performance Review ~JUN-2015

- Input KPIs sheet -

MONTH: JUN-2015

	Current Month V1		YTD V1		YTD	Current Month V2		YTD V2		FY Forecast		
	Actual	Budget V1	Actual	Budget V1		Actual	Budget V2	Actual	Budget V2	Forecast	Year 2014	
Net Maximum Electrical Capacity (MW)	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0	
Net Maximum Water Capacity (MG)	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	
Net Dependable Power Capacity (MW)	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0	
Net Dependable Water Capacity (MG)	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	
Contract Power capacity (MW)	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0	1,025.0	
Contract Water capacity (MG)	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	
<b>Availability</b>												
<b>Commercial availability (%) Contract Year 1</b>												
Commercial Power Availability (%)	100.0%	98.1%	96.5%	94.6%	90.7%	100.0%	98.1%	96.5%	96.2%	96.4%	97.3%	97.4%
Commercial Water Availability (%)	100.0%	97.8%	97.3%	94.4%	95.7%	100.0%	97.3%	97.3%	96.1%	96.0%	96.9%	97.5%
<b>Technical Power availability (%)</b>												
- Planned outage	0.0%	0.0%	2.8%	3.5%	0.0%	0.0%	0.0%	2.8%	2.8%	1.7%	1.4%	1.4%
- Unplanned outage	0.0%	1.7%	0.0%	1.8%	0.2%	0.0%	1.7%	0.0%	0.9%	1.0%	1.3%	1.1%
- External unavailability	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
<b>Technical Water availability (%)</b>												
- Planned outage	0.0%	0.0%	2.6%	3.3%	4.9%	0.0%	0.0%	2.6%	2.6%	1.6%	1.3%	1.3%
- Unplanned outage	0.0%	1.8%	0.1%	1.9%	0.1%	0.0%	1.9%	0.9%	1.9%	1.4%	1.0%	0.9%

# Plant O&M Optimisation – Real-time KPI Monitoring

## Power Plant KPI

Key Performance Indicator	Unit	Design	Current Value	Average	Minimum	Maximum	Std Dev
GROSS POWER GENERATION	MW	1090	974.13	892.13	722.42	987.70	80.26
POWER EXPORT	MW	1025	914.62	832.53	663.07	927.93	80.08
PLANT EFFICIENCY	%	40.29	40.57	38.56	34.22	41.43	1.87
PLANT EFFICIENCY FACTOR		1	1.09	1.09	1.09	1.18	0.05
PLANT LOAD FACTOR	%	100	89.23	89.23	89.18	90.26	0.29
GT 11 LOAD	MW	233	216.89	192.37	135.02	221.70	26.29
GT 11 EFFICIENCY	%	36.76	35.79	34.96	31.35	36.68	1.29
GT 12 LOAD	MW	233	220.29	193.34	134.60	226.61	27.19
GT 12 EFFICIENCY	%	36.76	36.24	35.06	31.24	36.93	1.38
GT 13 LOAD	MW	233	223.00	193.79	134.99	229.50	27.66
GT 13 EFFICIENCY	%	36.76	36.36	35.08	31.25	37.02	1.40
ST 14 LOAD	MW	220	159.69	160.21	158.23	162.22	0.41
ST 15 LOAD	MW	220	152.27	152.43	137.56	157.40	1.82
HRSG 11 STEAM TEMP	Deg C	566.6	549.66	555.29	547.20	563.58	4.05
HRSG 11 STEAM FLOW	Kg/Sec	176.9	143.40	143.32	139.26	146.59	1.02
HRSG 11 STEAM PRESSURE	Bar	88.7	73.81	74.49	72.92	75.71	0.49
HRSG 11 FLUE GAS EXIT TEMP	Deg C	146.7	140.56	156.26	149.38	140.83	4.00

## Water Plant KPI

Key Performance Indicator	Unit	Design	Current Value	Average	Minimum	Maximum	Std Dev
TOTAL WATER PRODUCTION	M3/Hr	11462.5	11207.56	11161.73	11146.38	11207.56	21.76
TOTAL WATER EXPORT	M3/Hr	11362.5	10940.63	11117.83	10823.01	11308.68	105.42
PW DISPATCH	M3/Hr		97.10	97.07	96.82	97.24	0.09
DISTILLATE DISPATCH	M3/Hr		717.83	786.67	611.45	938.86	118.27
WATER PLANT LOAD FACTOR	%	100	10940.63	10956.70	10940.63	10967.21	8.74
MSF21 DIST PROD	M3/Hr	2840.9	2787.05	2778.87	2661.05	2911.30	24.74
MSF21 STEAM CONSUMPTION	TPH	336.9	362.55	363.10	347.20	373.80	3.68
MSF21 SW INTAKE	Ton/Hr	22500	22797.00	22665.37	21360.00	24102.00	328.13
MSF21 DISTILLATE COND	uS	<25	38.31	35.09	28.65	40.29	2.77
MSF21 BRINE HEATER PR	Bar		0.78	0.78	0.77	0.78	0.00
MSF21 GOR	Kg Dist/ Kg Steam	8.43	7.61	7.63	7.53	7.69	0.06
MSF21 COVERSION FACTOR	%		0.13	0.12	0.12	0.13	0.00
MSF21 TBT	Deg C	110	110.26	110.26	109.95	110.44	0.09
MSF21 BBT	Deg C	43.8	44.68	45.01	44.43	45.83	0.29
MSF21 ANTIFOAM	L/Hr	0.027	82.98	81.71	77.44	121.54	1.36
MSF21 ANTISCALANT	L/Hr		146.91	141.18	133.95	171.54	2.03
MSF22 DIST PROD	M3/Hr	2840.9	2801.75	2801.86	2714.60	2911.65	21.77
MSF22 STEAM CONSUMPTION	TPH	336.9	376.75	377.46	362.00	386.10	2.93

Process displays, AF Asset Model and reports are build in-house within short time.

# Plant O&M Optimisation - Performance Reports

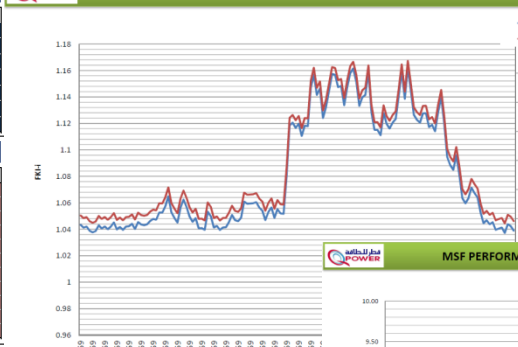
STATION STATUS REPORT									
PRODUCTION	GENERATION	DISPATCH	POWER SYSTEM CONDITION		WEATHER CONDITION				
LOAD	MW	949.58	890.05	FREQUENCY	HZ	50.04	TEMPERATURE	Deg C	38.09
POTABLE WATER	M3/HR	10314	10232	POWER FACTOR		0.98	RELATIVE HUMIDITY	%	61.32
POTABLE WATER	MIGD	54.45	54.02						
DISTILLATE WATER	M3/HR	756	715	220 KV BUS VOLTAGE	LV	226	WIND SPEED	m/sec	5.03
DISTILLATE WATER	MIGD	4.0	3.8						
PRODUCT WATER	M3/HR	11070	10947	AUXILIARY POWER	MW	60	RAIN FALL	kg/m2	42.00
PRODUCT WATER	MIGD	58.4	57.8						

POWER PLANT STATUS REPORT									
PARAMETER	UNIT	GT 11	GT 12	GT 13	ST 14	ST 15	TOTAL		
ACTIVE LOAD	MW	212.64	212.91	212.91	160.78	156.0	955.21		
REACTIVE LOAD	MVAR	40.28	38.22	38.64	19.17	34.82	172.12	DC-14 kg/sec	0.00
FREQUENCY	HZ	50.02	50.03	50.03	50.04	50.03	50.04	DC-15 kg/sec	0.00
POWER FACTOR		0.97	0.97	0.98	0.97	0.95	0.98		
IGV POSITION	%	95.70	95.7	79.08					
OTC TEMP	Deg C	559.33	553.6	564.26					
IGN	HR	70105.2	72493	62676	33584	34405			
NO OF STARTS	HR	109	135	107	88	70			
OPERATING HOURS	HR	68322	69973	60481	33584	34405			
FUEL GAS FLOW	NM3/HR	60968	60680	60584			227100		
EFFICIENCY	%	32.35	32.55	32.60			39.01		

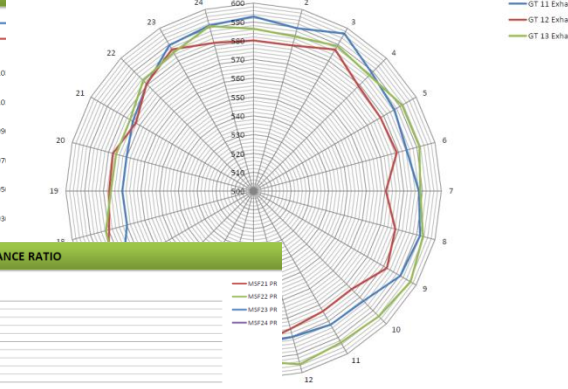
WATER PLANT STATUS REPORT									
PARAMETER	UNIT	DESIGN	MSF 21	MSF 22	MSF 23	MSF 24	TOTAL		
DISTILLATE PROD.	M3/HR	2865.94	2762.90	2821.70	2812.25	2838.50	11235.35	SW U/L- A	35.42
DISTILLATE PROD.	MIGD	15.13	14.59	14.90	14.85	14.99	58.31	SW U/L- B	35.51
DISTILLATE COND.	M3/HR	<25	38.37	2.01	4.40	203.34	62.03	SW U/L- C	35.38
STEAM CONS.	T/H	336.89	363.40	378.85	345.05	356.45	1443.75	SW O/L- A	44.83
TOP BRINE TEMP	Deg C	110.00	110.26	109.85	110.12	109.96	110.05	SW O/L- B	44.93
SW U/L TEMP	Deg C	35.00	35.84	35.48	35.32	34.66	35.32	SW O/L- C	44.28
SW SUPPLY	M3/HR	22500.00	22299.00	23559.00	20718.00	22983.00	84038.38	Avg SWOT Deg C	9.25
N% DIT CONVERSION	%	12.737	12.390	11.977	13.974	12.350	13.37	OP SW DT	9.30
ISOR	RATIO	8.567	7.608	7.448	8.358	7.963	7.98	SW TEMP CV-21	1.12
PR	kg dist/2326 kl	8.26	7.96	7.61	8.32	8.09	7.95	SW TEMP CV-31	1.06
Corrected PR	kg dist/2326 kl	8.26	8.06	7.73	8.24	7.98	8.00		

POWER PLANT CONDITION MONITORING									
PARAMETER	UNIT	GT 11	GT 12	GT 13	TANK LEVELS				
SUCTION FILTER DP	mbar	8.84	9.73	8.22	POTABLE WATER-A	MM	6480.38		
COALESCER FILTER DP	mbar	0.22	0.36	0.16	POTABLE WATER-B	MM	6467.17		
PULSE FILTER DP	mbar	6.57	7.68	6.30	DISTILLATE WATER	MM	14052.22		
FINE FILTER DP	mbar	1.68	1.28	1.39	DM WATER	MM	12.53		
AMB TEMP	Deg C	40.19	37.93	37.66					
AMB RH	%	54.65	63.33	58.77					
Wet Bulb Temp-Calc	Deg C	31.28	30.99	29.87					
EVAP COOLER EFF	%	89.27	79.97	72.92					
AMB PRESSURE	mbar	999.56	999.62	999.30					
COMP U/L TEMP	Deg C	32.24	32.38	31.98					
COMP O/L TEMP	Deg C	433.73	433.68	435.68					
COMP O/L PR	bar	15.61	15.57	15.26					
COMP CHAMBER DP	mbar	455.52	480.48	433.08	NOX : mg/Nm3	23.05	24.87	33.17	
GT EXHAUST TEMP	Deg C	586.19	583.59	591.74	SO2 : mg/NM3	1.52	1.68	0.80	
GT STACK TEMP	Deg C	586.14	583.54	591.74	CO : mg/NM3	4.96	4.47	7.41	

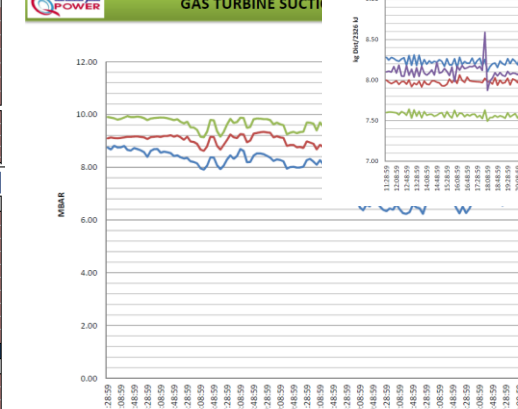
## PLANT HEAT RATE AND FACILITY K-FACTORS



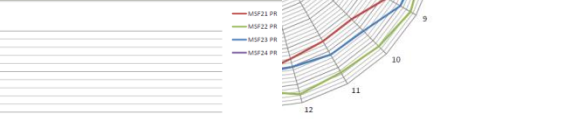
## GT EXHAUST TEMPERATURE PROFILE



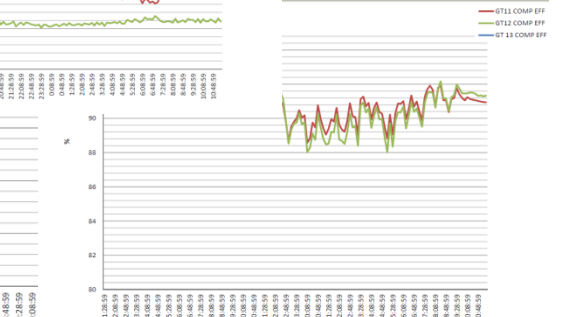
## GAS TURBINE SUCTION



## MSF PERFORMANCE RATIO



## PERFORMANCE ISENTROPIC-EFFICIENCY-%

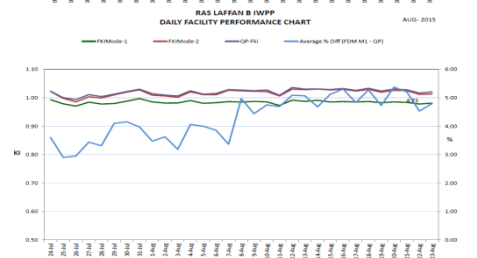
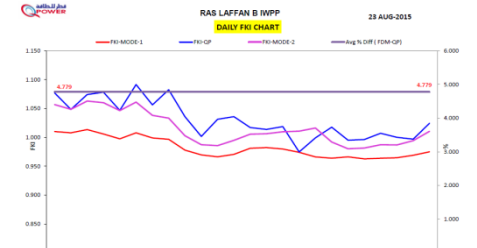
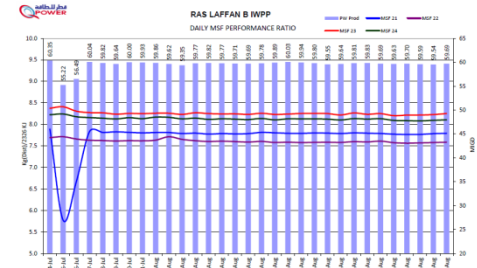


# Plant O&M Optimisation - Performance Reports

- Daily, Weekly and Monthly Performance reports
- Daily O&M meeting discussion on performance issues with real time data reporting
  - Plant Efficiency
  - Plant Loading
  - GT/MSF/HRSG Efficiency
  - GT Evaporative cooler efficiency
  - HRSG Main Steam Temp
  - HRSG Flue Gas Exit Temp
  - GT Comb Chamber Monitoring
  - Seawater Consumption
  - Chemical Consumption
  - MSF Distillate Conductivity
  - GT Suction Filter perf. Monitoring
  - Step Change and abnormality reporting

QATAR POWER COMPANY  RAS LAFFAN "B" IWPP

DAILY GENERATION AND PERFORMANCE REPORT					DATE	
GENERATION PLAN(MW):					DAILY: 22990	MONTHLY: 506140
POTABLE WATER (MG):					DAILY: 60	MONTHLY: 1290
<b>1 FACILITY PERFORMANCE</b>						
<b>POWER</b>						
GAS(GEN) GENERATION (MW)	DAILY	Aug-15	YEAR 2015	REMARK		
GAS(GEN) GENERATION (MW)	22216	204233	8932177			
NET GENERATION (MW)	21143	472840	3320863			
POWER IMPORT(MW)	0	0	29142			
COMMERCIAL AVAILABILITY (%)	100.00	100.00	97.93			
OPERATIONAL AVAILABILITY (%)	100.00	100.00	97.99			
FORCED OUTAGE RATE (%)	0.00	0.00	0.23			
PLANT LOAD FACTOR (%) Gross	91.33	89.12	62.79			
MAX NET HOURLY LOAD (MW)	967	971	1093			
MAX MIN HOURLY LOAD (MW)	790	689				
AUX POWER (MW)	1373	11393	309301			
<b>WATER</b>						
MSF DISTILLATE WATER PRODUCTION (MG)	59.89	1373.72	13633.81			
NET POTABLE WATER PRODUCTION (MG)	55.57	1266.84	12611.36			
DISTILLATE WATER TO DIST TANK	3.49	91.23	824.53			
PERFORMANCE RATIO (MG/1026 KJ)	7.83	7.84	8.09			
COMMERCIAL AVAILABILITY (%)	100.00	100.00	97.93			
OPERATIONAL AVAILABILITY (%)	100.00	100.00	97.84			
FORCED OUTAGE RATE (%)	0.00	0.00	0.23			
MAX HOURLY PRODUCTION (MG/HR)	11841	11892	11683			
MIN HOURLY PRODUCTION (MG/HR)	11018	10707				
<b>GAS CONSUMPTION (MMBTU)</b>						
GT GAS FIRING	157591	3513074	16335670			
SUPPLEMENTARY GAS FIRING	47328	1037747	12931331			
TOTAL GAS FIRING	202919	4549821	38536901			
<b>SEA WATER CONSUMPTION (KMS)</b>						
POTABLE WATER	2002	46038	418037			
POTABLE WATER DISPATCH (MG)	54.78	1264.40	12379.79			
DISTILLATE WATER DISPATCH (MG)	3.47	91.93	823.87			
TOTAL PRODUCT WATER DISPATCH (MG)	58.20	1355.93	13426.16			
<b>2 UNIT WISE PERFORMANCE</b>						
<b>POWER</b>						
GAS(GEN) GENERATION (MW)	GT 11	GT 12	GT 13	GT 14	GT 15	
GAS(GEN) GENERATION (MW)	4907	4932	4950	3816	3911	
LOW (Up to 80%)	69393	72165	82548	13477	34297	
NO OF STARTS (MG)	109	135	107	31	70	
AVAILABILITY (%)	100.00	100.00	100.00	100.00	100.00	
PLANT LOAD FACTOR (%)	87.79	88.20	88.91	71.95	73.75	
MAX HOURLY LOAD (MW)	230	244	239	181	180	
MIN HOURLY LOAD (MW)	178	178	178	150	158	
<b>WATER</b>						
GAS(GEN) WATER PRODUCTION (MG)	05.21	05.22	05.23	05.24		
PERFORMANCE RATIO (MG/1026 KJ)	14.68	14.83	14.95	12.24		
AVAILABILITY (%)	100.00	100.00	100.00	100.00		
<b>3 AVERAGE AMBIENT CONDITIONS</b>						
			DEVIATION w.r.t. PLAN			
AMBIENT TEMPERATURE(Deg C)	15.932		DAY	MONTH		
AMBIENT PRESSURE(Bars)	1.000		POWER	506140.0		
AMBIENT RH(%)	65.503		WATER	-9.2	1380.0	
SEA WATER (UL) TEMPERATURE(C)	30.714					
FREQUENCY	50.000					
POWER FACTOR	0.983					
FUEL LHV(SU/NG)	46796					
<b>4 POTABLE WATER STOCK</b>						
TANK A		TANK B		TOTAL STOCK		
Sea MG (Distillate)	6.22 M	14.49 MG	6.31 M	16.74 MG	29.23 MG	
Distillate Water Stock	14.09 M	5.12 MG	P W + Distillate		24.38 MG	



# Application of PI System Tools and Capabilities

## ProcessBook

- Real-time data analysis
- Dashboards
- Process Displays
- Equipment performance
- Trending
- Real-time deviation

## PI DataLink

- Real-time data analysis
- Online performance monitoring
- Reports
- Equipment performance
- Trending
- Excel add ins

## PI Coresight

- Real-time data analysis
- Dash Boards
- Equipment performance
- Trending
- Real-time decision making

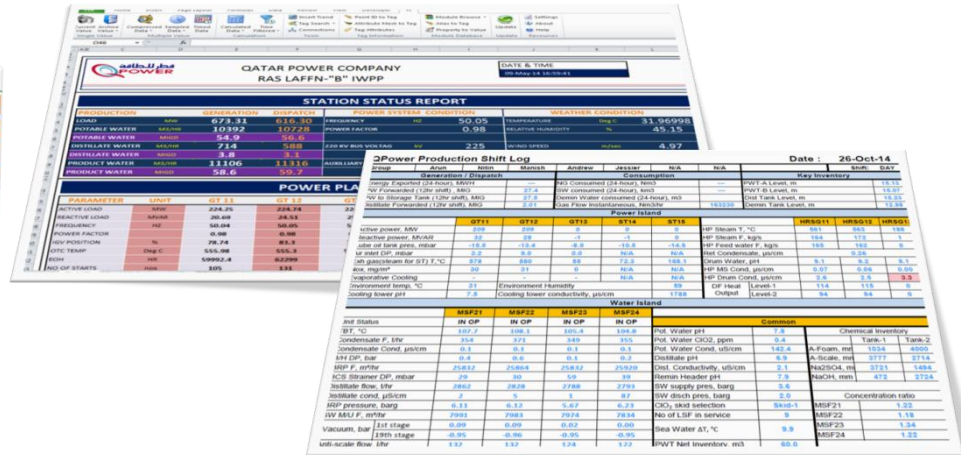
## PI Analytics AF Server

- Analytical
- Performance Calculation
- Heat stress Index
- Creating asset model analytics and notification

## Notifications

- Real-time messaging
- Notification on heat stress
- Alerting high deviations
- Equipment tripping's
- Start/stop notification

# Application of PI ProcessBooks and PI DataLink



- 24/7 access to plant data from Engineers desktop
- Applications can be build in house without in depth expertise in IT



# Application of PI Coresight



Mainly designed for Senior Management

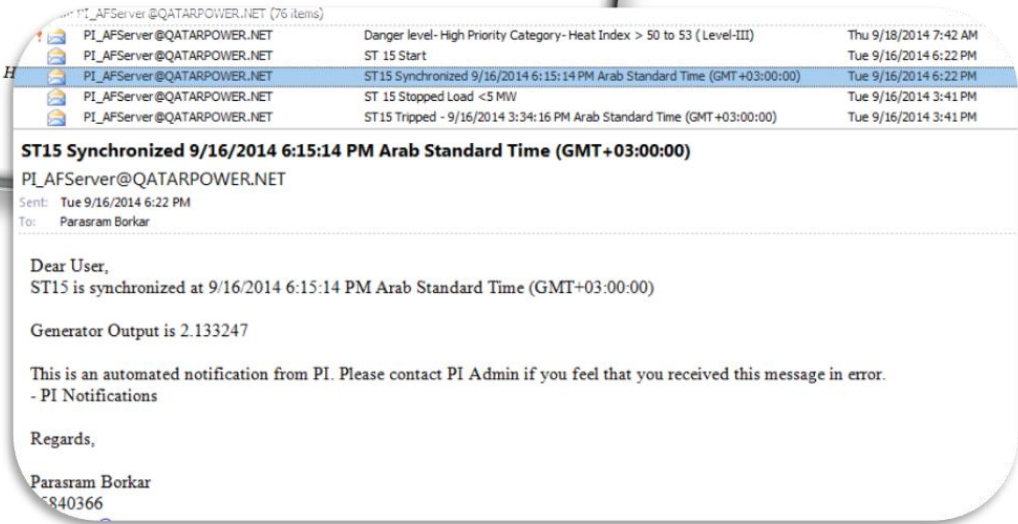
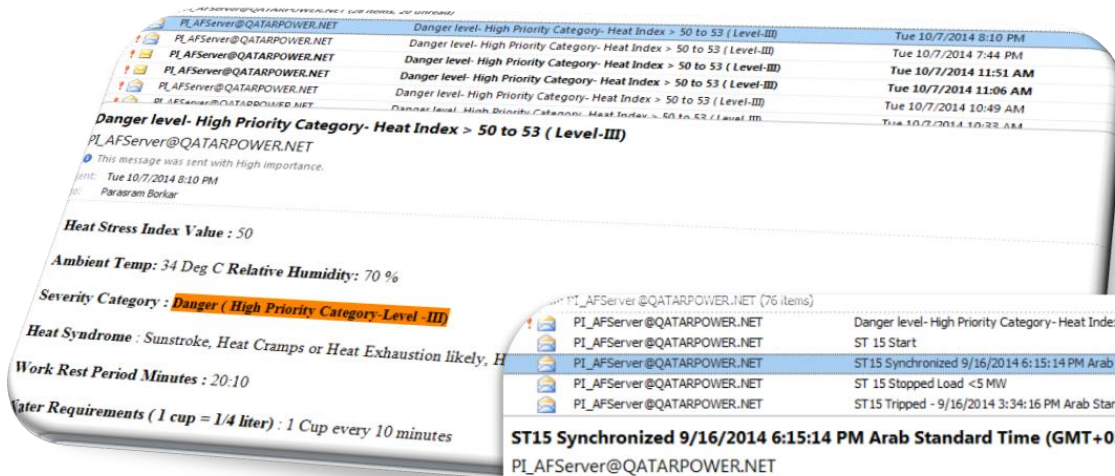
# Application of PI Server and Analytics

- Asset Model developed based on function and equipment
- Created templates for equipment performance analysis
- Used for HSE heat stress index calculation and notifications

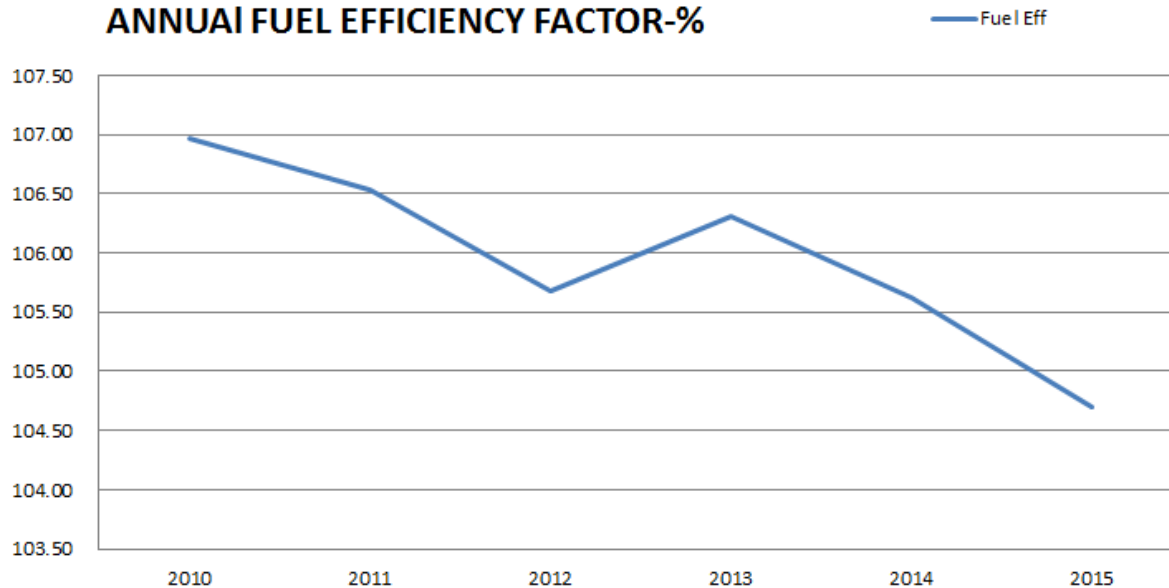
The screenshot displays the PI System Explorer interface. On the left, a tree view shows the hierarchy of elements, including 'Power Island', 'QATQPRPIS01 ModuleDB', 'QPPOWER', 'TARIFFMETER', 'Water Island', 'DWPFS Overview', 'Distillate Flows', 'Distillate Pump1', 'Distillate Pump2', 'Distillate Pump3', 'Distillate Tank', 'Electrical System', 'MSF 21', 'MSF 21 Brine Blowdown System', 'MSF 21 Brine Recirculation', 'MSF 21 Distillate System', 'MSF 21 Element Display', 'MSF 21 IP Steam and Vacuum System', 'MSF 21 LP Steam', 'MSF 21 Pumps', 'MSF 21 Sea Water Cooling and Make Up', 'MSF 21 Vent Gas System', 'MSF 22', 'MSF 23', 'MSF 24', 'MSF Common Systems', 'PwPFS Overview', 'Potable Water Pump1', 'Potable Water Pump2', 'Potable Water Pump3', 'Potable Water Pump4', 'Potable Water Tank', and 'Remineralization System'. The right pane shows the 'MSF 21' element details, including a table of parameters.

Name	Value	Description	Data Reference
Chemical Dosing		Chemical Dosing	<None>
Anti Foam Dosing	80.45999 l/h	Anti Foam Dosing	PI Point
Anti Scale Dosing	141.8999 l/h	Anti Scale Dosing	PI Point
Sodium Sulphate Dosing	81.71999 l/h	Sodium Sulphate Dosing	PI Point
Cooling Water		Cooling Water	<None>
Cooling Water Down Stream...	2.022 barg	Cooling Water Down Stream ...	PI Point
Cooling Water Down Stream...	40.95999 °C	Cooling Water Down Stream ...	PI Point
Cooling Water Recirculatin...	9.805599 pH	Cooling Water Recirculating ...	PI Point
Cooling Water Recirculatin...	0.417 barg	Cooling Water Recirculating ...	PI Point
Cooling Water Recirculatin...	9.507399 pH	Cooling Water Recirculating ...	PI Point
Cooling Water Through Co...	1293.75 T/h	Cooling Water Through Cond...	PI Point
DeSalination Gross Production	1290.25 T/h	DeSalination Gross Production	PI Point
DeSalination Water Producti...	2627.999 T/h	DeSalination Water Production	PI Point
IP Steam Parameters			<None>
IP Steam Flow	3147 T/h	IP Steam Flow	PI Point
IP Steam Pressure	14.56499 barg	IP Steam Pressure	PI Point
IP Steam Temperature	212.7299 °C	IP Steam Temperature	PI Point
LP Steam DeSuperheater		LP Steam DeSuperheater	<None>
DeSuperheater Down Stre...	119.13 °C	DeSuperheater Down Stream...	PI Point
DeSuperheater Down Stre...	117.255 °C	DeSuperheater Down Stream...	PI Point
DeSuperheater Up Stream...	1.131999 barg	DeSuperheater Up Stream Pr...	PI Point
LP Steam After DeSuperh...	118.305 °C	LP Steam After DeSuperheat...	PI Point
LP Steam to DeSuperheat...	144.75 °C	LP Steam to DeSuperheat ...	PI Point
LP Steam Parameters			<None>
LP Steam Flow	3.171 T/h	LP Steam Flow	PI Point

# Application of Notifications

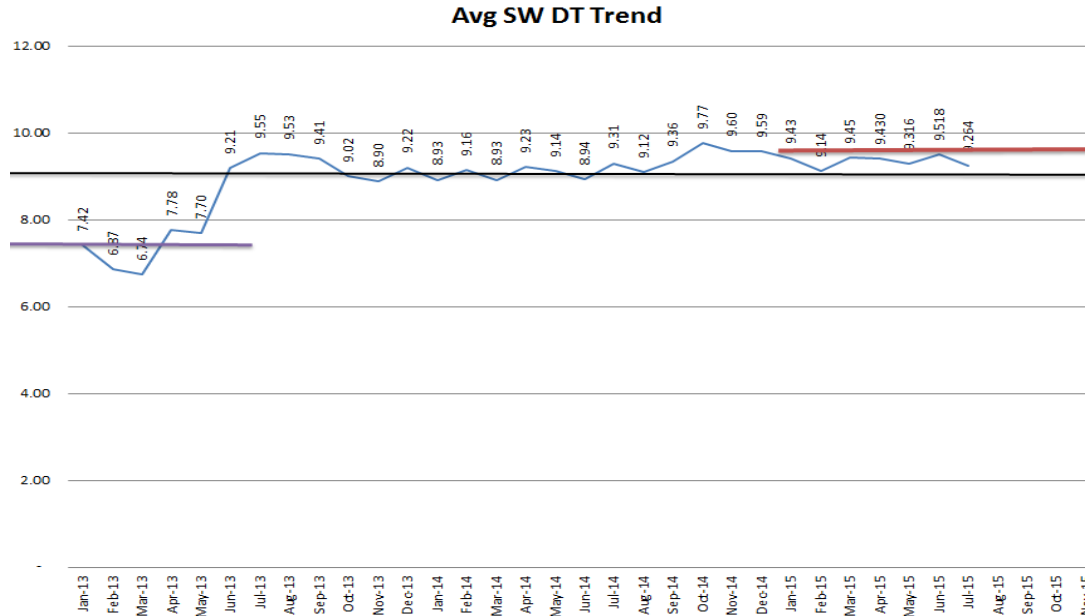


# Result Obtained - Fuel Gas Margin Improvement



- Continuous monitoring of O&M efficiency, the savings through fuel margin have improved.

# Result Obtained - Seawater Margin Improvement



- Continuous monitoring of seawater usage leads to savings of more than 1 million USD in first year

# Results Obtained and Business Impact

- HSE Performance Improved
- Availability and Reliability Improved
- Fuel efficiency Factor Improved- Fuel margin improved
- Seawater usage reduced- Seawater margin improved
- ROI of PI System implementation is achieved

At QPower, the PI System has been utilised in an effective way to improve the plant efficiency, troubleshooting, reducing seawater consumption and condition monitoring. This improved O&M capability and continue to maintain the plant in a healthy condition for higher reliability.

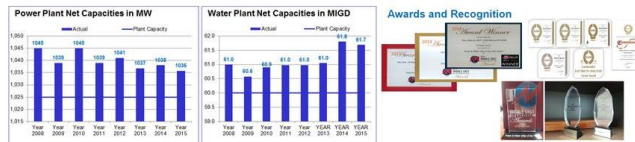
QPower utilised PI System for HSE performance improvement which is unique step towards protection of human resource occupational health hazards.

# Future Plan

- Event Frames
- PI Coresight with future data
- Building displays with PI ProcessBook and PI Coresight
- Continue to improve availability, reliability and plant efficiency through utilization of PI System tools
- Create value to the stake holders

# Summary

QPower: Emerged as a most trusted reliable and efficient source of power and water for the State of Qatar.  
Contributed to Qatar's national growth to fulfill Vision 2030.  
The PI System creates value to QPower's business through real-time KPI monitoring for financial benefits.



## BUSINESS CHALLENGES

- A. Availability of operational data across the company
- B. Improve the fuel and seawater margin
- C. Improve O&M efficiency
- D. Improve reliability, availability
- E. Improve HSE performance

## SOLUTION

- A. Implemented PI system infrastructure and historian with the powerful analytical tools
- B. Devised real time performance management system
- C. Integration of Offline FDM with PI DataLink

## RESULTS AND BENEFITS

- Real-time data availability. Implementation of dash-boards includes operational efficiency and KPIs for quick decision making
- Fuel Efficiency Factor improved by 0.98% resulting into fuel margin of 1.4 million USD/year (0.2%)
- Seawater margin improved by 1.3 million USD for year 2013 &14.
- Positive NPV with ROI – 8 months



# Contact Information

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Performance

Qatar Power Company



# Questions

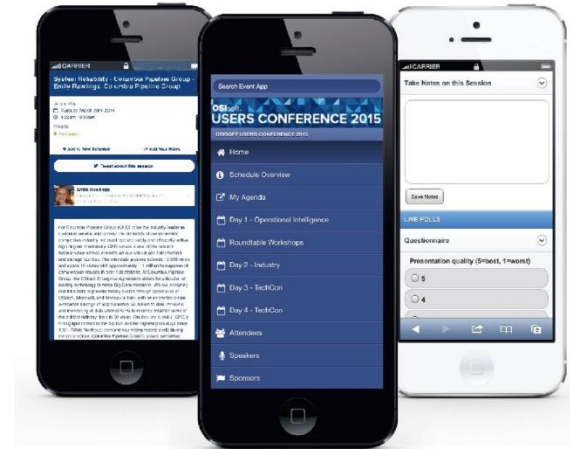
Please wait for the **microphone** before asking your questions



State your **name & company**

# Please don't forget to...

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감사합니다

谢谢

Danke

Merci

Gracias

Thank You

ありがとう

Спасибо

Obrigado