Shell Exploration & Production

Klimakur 2020

Shell's metodikk/verktøy for økt energieffektivitet

20-08-2009

Odd Bjarne Morch
Energy Strategy Leader

Innhold

- Shell EP's EE/GHG metodikk / verktøy og implementering i Upstream International Europe (UIE)
- Energy Efficiency Surveillance Tool (EEST)

Back-up slides for "pre-read"

3-2-1

3 HARD TRUTHS

DEMAND

SUPPLY

CO_2

2 SCENARIOS

SCRAMBLE

BLUEPRINTS

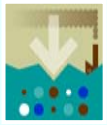
1 PREFERED APPROACH

BLUEPRINTS

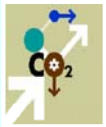
6 - REDUCTION PATHWAYS


Efficiency

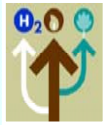
1. Increasing the efficiency of our operations, seeking to be first quartile


CCS

2. Establishing a substantial capability in CO2 Capture and Storage (CCS).


Technology

3. Continuing to research and develop technologies that increase efficiency and reduce emissions in hydrocarbon production.


Low CO_2 Energy

4. Aggressively developing low-CO2 sources of energy, including natural gas and low CO2 fuel options.

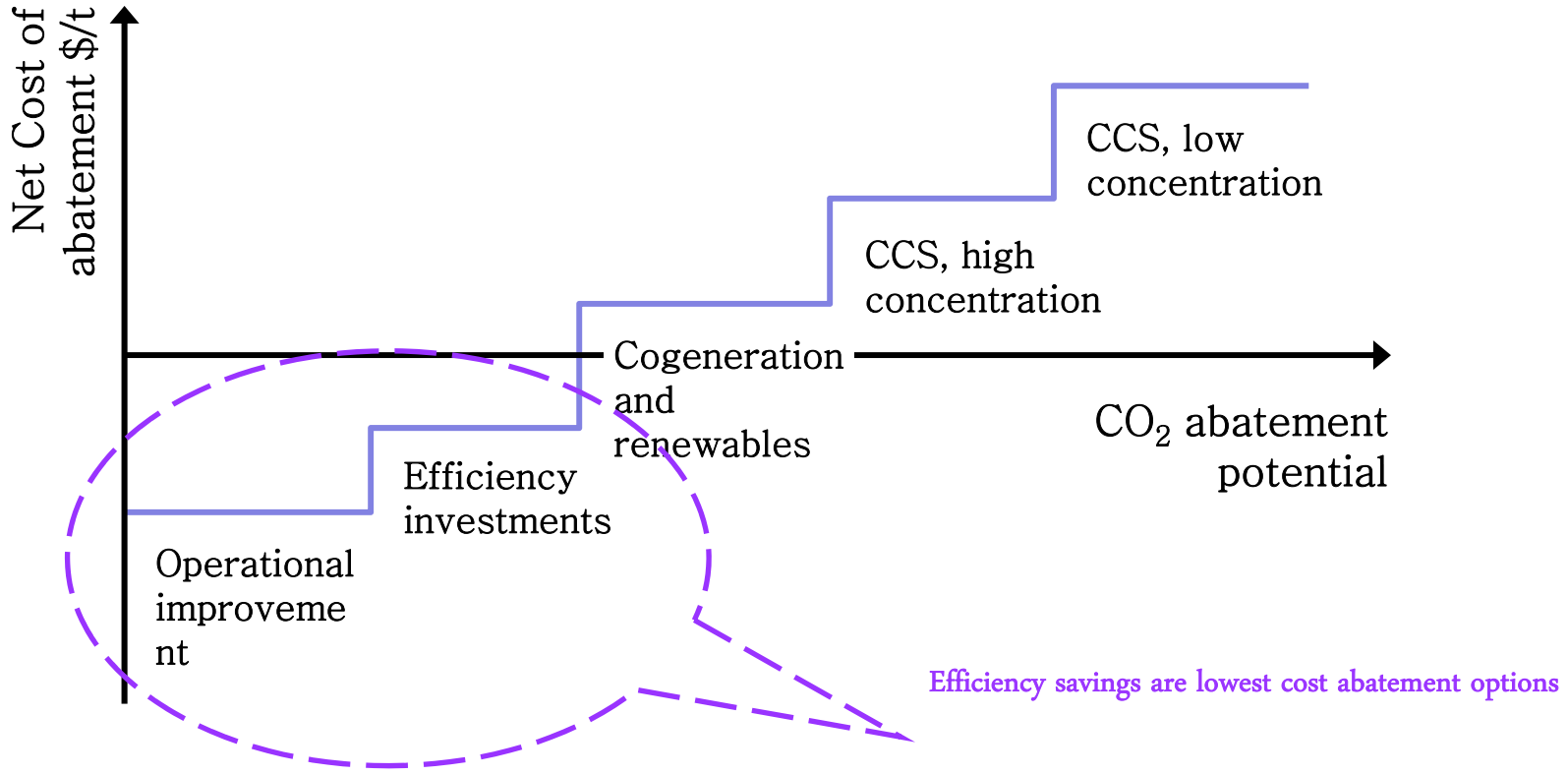

Customers

5. Helping manage energy demand by growing the market for products and services that help customers use less energy and emit less CO2.

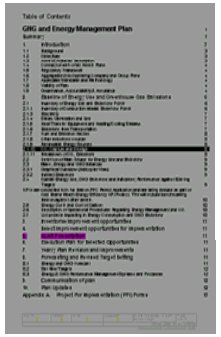

Advocacy

6. Working with governments and advocating the need for more effective CO2 regulation.

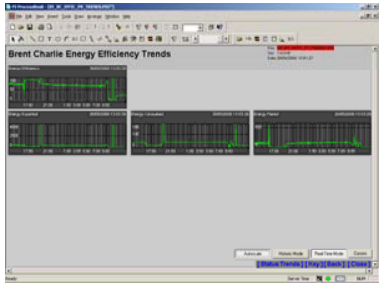
ROLE OF EFFICIENCY IN CO_2 ABATEMENT



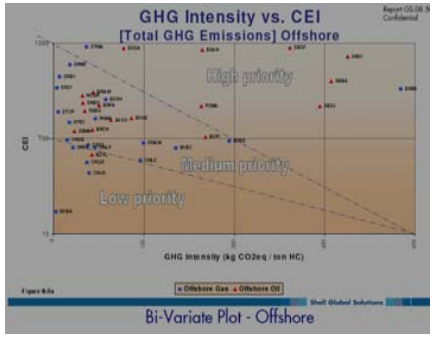
CO2 Reduce "Must Win" - Scope for Shell Europe



- Structured CO2 Reduction Plans for our Major Facilities:
  - ➢ Development of Greenhouse Gas and Energy Management Plans
    - ✓ The Strategy and Plan towards Top Quartile Performance – Asset C
    - ✓ 20 plans delivered in 2008, location specific



- Real-time Performance Data & Operational Decisions:
  - ➢ "Energy Efficiency Surveillance Tool" (EEST) roll out – Office/Field – Currently at 12 UK and 2 NO facilities
    - ✓ Enabling improved & more efficient operational decisions



- CO2 Baseline Benchmarking for all our facilities to drive TQ Performance:
  - ➢ Location performance against TQ Benchmark
  - ➢ Gap Analysis to drive identification of Improvement Proj
  - ➢ Ormen Lange and Draugen are TQ performing operation

- Managing 'CO2 performance' is the way we do things around here:
  - ➢ Implementation and Embedding into everyday Processes & Operational Decisions

Objectives - Energy Efficiency Surveillance Tool

*Improve Energy Efficiency in **existing Operations***

- Low Efficiency: **Root Cause** for unnecessary CO_2 Emissions
- **Where** to look?
- **What** to do?

*Energy Efficiency Surveillance Tool: **Goal***

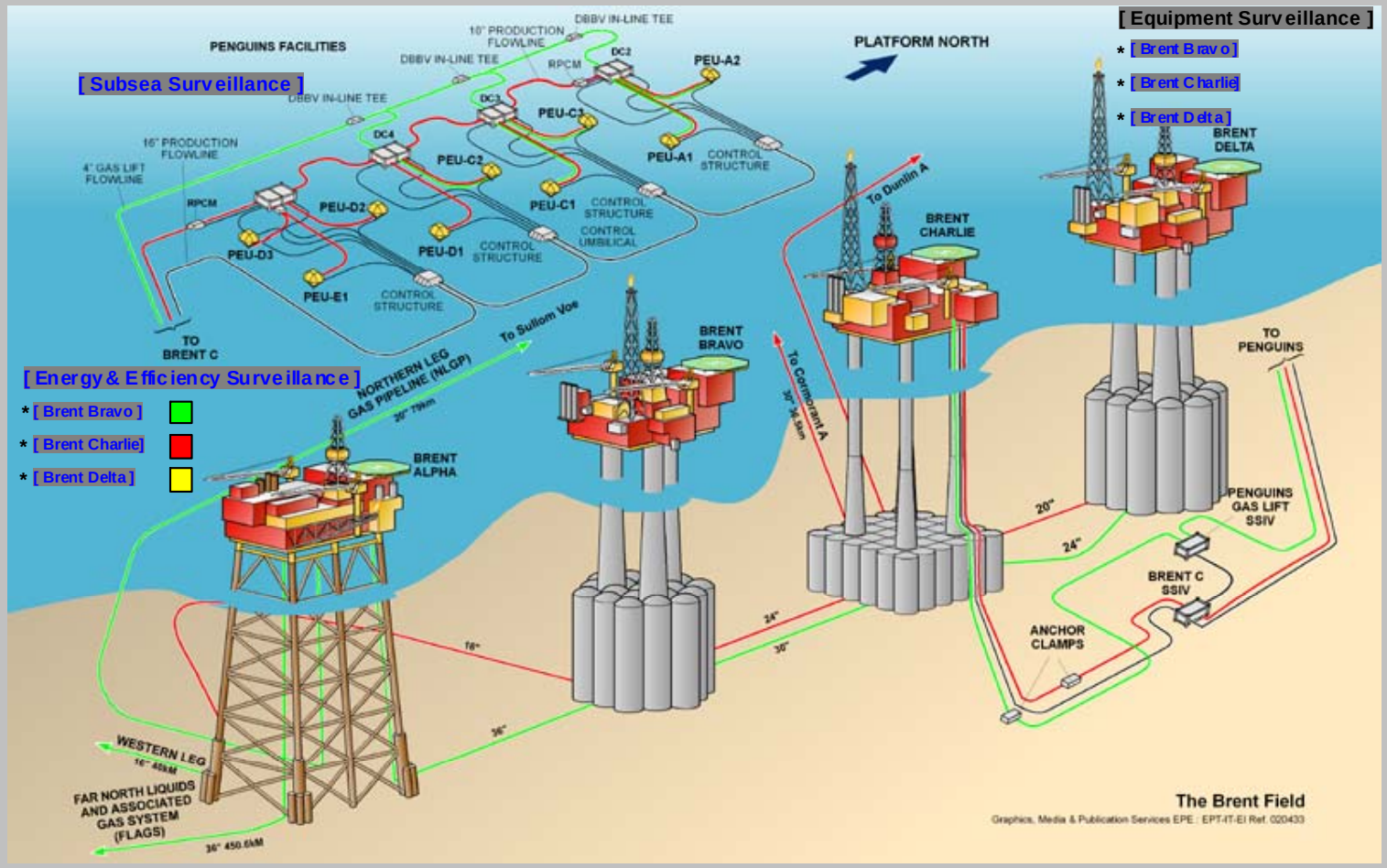
- Create **awareness** about Energy Efficiency in Operations;
- Provide **clear overview** of Energy Consumption;
- Provide **basic guidance** for identification of Improvement Opportunities.
- Provide (indicative) **Key Performance Indicators**.
- Visualisation of **energy consumption** and **energy efficiency** at an **installation real time** level

Asset HOME Page

Asset Home Page

File: AP_BF_OVERVIEW.pdi
Ver: 1.0.080
Date: 27/02/2009 12:27:15

Brent Field:



[Analysis Period]

Start Time:

End Time:

Data Reference Time:
Real-Time

Options:

Navigation

Topsides

Subsea

Surveillance Tools

[Key] [Back] [Close]

Asset Overview Page

Energy & Efficiency Surveillance Tool

File: EE_BRENT_OVERVIEW.PDI
Ver: 1.1
Date: 30/10/2008

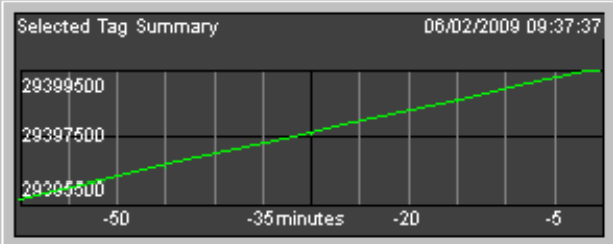
Brent Overview:

	Energy Summaries (%)			CO2 Emissions (T)		Energy Cost ($)		SSI	Notes
	Energy Efficiency	Energy Intensity	Energy Wasted	Daily Total	Year To Date	Daily Total	Year To Date	Alarm ONOC	Energy Intensity = Energy Consumed / Energy Exported
[Brent Bravo]	86.03 90.00	16.42 10.50	2.09 1.50	629 750	165,702	97,382 137,200	27,166,764		Platform : Batch Oil / gas export Gas lift Power Export
[Brent Charlie]	94.08 87.00	6.29 12.00	0.51 0.50	680 750	171,581	124,729 137,200	39,667,940		Platform : Batch Oil / gas export Gas lift Power Export
[Brent Delta]	84.10 90.00	18.93 12.00	1.79 0.75	618 730	143,993	97,133 137,200	29,399,472		Platform : Batch Oil / gas export Gas lift

[Analysis Period]
Start Time:
06/02/2009 08:37:37
End Time:
06/02/2009 09:37:37
Data Reference Time:
06/02/2009 09:37:37
Historic Mode
Real-Time

Options:
[Reset Totals]

Key:
Energy Summaries (%) - Value is total to midnight (previous day).
Emissions = Tonnes
Costs = $
= Alarm Summary
= Outside Normal Operating Conditions
= Fault
= Normal
= Alert
= Alarm



Tag: EE_COSTUSD_CT Cumulative total energy cost (in $)
Range: 0. - 100000000. $ Min/Max/Avg: (#,###,###) 29,395,638 / 29,399,472 / 29,397,607

Autoscal

[Cost Rates]

[Key] [Back] [Close]

Installation Overview Page

Status Summary Indicator (SSI)

Historical Mode Option

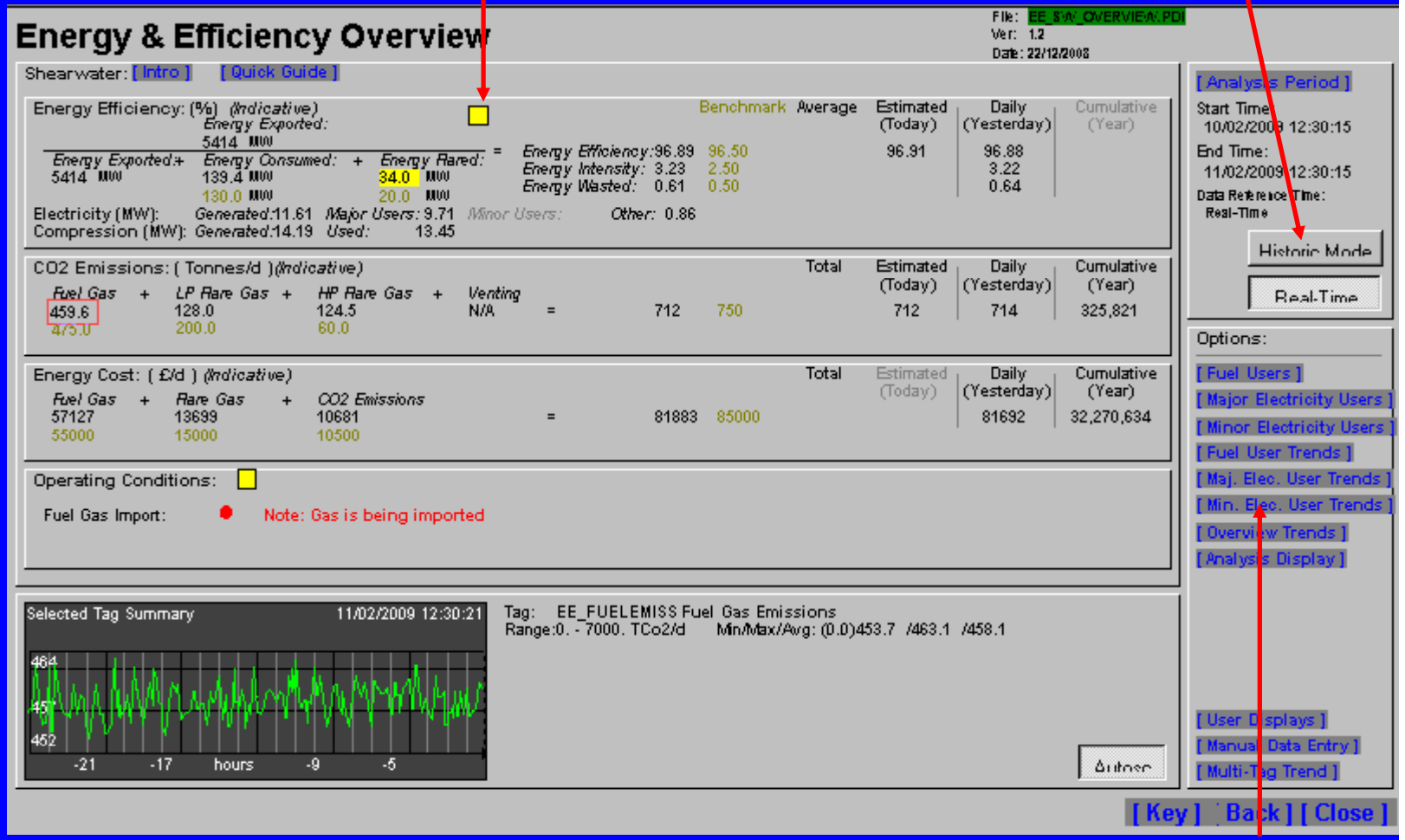
Section 1 (KPIs)

Section 2 (Emissions)

Section 3 (Costs)

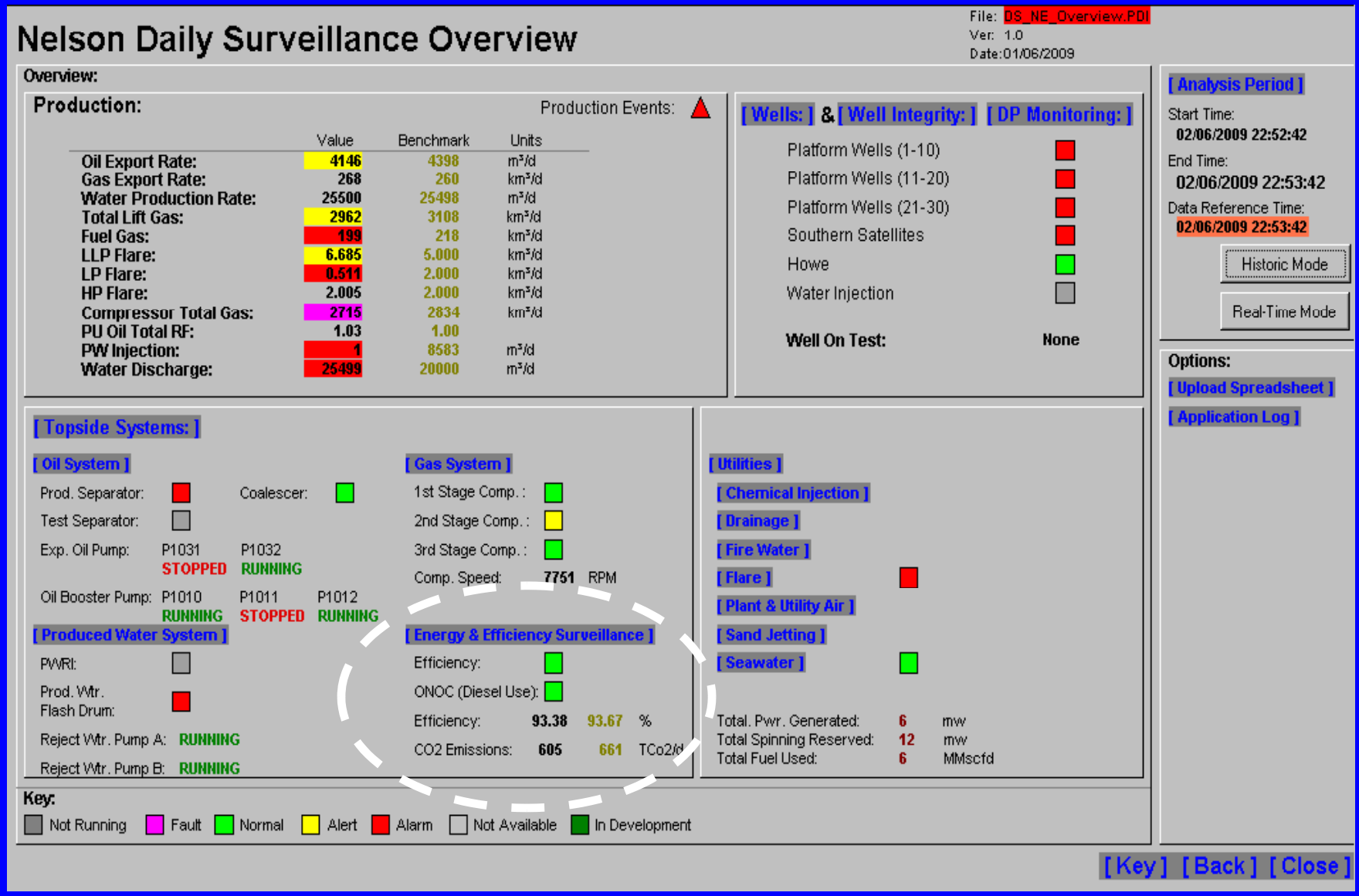
Section 4 (ONCOs)

Section 5 (Graphs)



Navigation Links

Next level….integrated



Can we further reduce the energy used for each boe produced?

Some areas to consider.....

- Process restarting procedures?
- Passing valves routines?
- Too much spinning reserve?
- Compressors running in recycle?
- Export Pumps or other ‘big movers’ may be oversized for current rates?

Thank you

Questions??

Back Up

- Flere skjermbilder for Energy Efficiency Surveillance Tool (EEST)
- EEST Quick User Guide
- Eksempler på bruk av verktøyet
- Shell CO2 Benchmarking

EPE EEST Overview Screen

PAN-EPE Summary

File: EE_EPE_PAN_OVERVIEW.PDF
Ver: 1.0.095
Date: 12/08/2009 15:08:57

Overview:

	Efficiency (%)	CO2 (Tonnes)		Yearly CO2 Totals (kTonnes)		Prev Day CO2 (T) shown as daily values	
	Actual	Prev Day	Benchmark	Current	Target		
[Gannet]	97,00	450	435	0,0	170	293 952	*Persons Yearly CO2*
[Shearwater]	95,23	888	750	0,0	290	29 319	*TV on standby for yr*
[Nelson]	95,36	2	719	0,0	223	66	*TV on standby for yr*
[Anasuria]	9,55	8	270	0,0	100	188 620	*Kms driven by F1 car*
[Curlew]	75,03	13	295	0,0	88	80	*Boils of a full kettle*
[Pierce]	90,18	398	400	1472101,6	165	13 095	*TV on standby for yr*
[Brent Bravo]	85,62	628	750	0,0	201	15 742 632	*Kms driven by F1 car*
[Brent Charlie]	93,53	791	750	0,0	205	19 755 750	*Kms driven by F1 car*
[Brent Delta]	88,23	616	730	0,0	205	403 510	*Persons Yearly CO2*
[Leman]	No Sample	0	450	0,0	192	0	*Boils of a full kettle*
[Sean]	96,40	190	45	0,0	72	4 752 438	*Kms driven by F1 car*
[Clipper]	97,46	446	500	0,0	118	104	*Miles by 10000 large cars*
[Draugen]	96,75	287	300	0,0	Pt Created	190 621	*Persons Yearly CO2*
[Ormen Lange]	99,54	113	80	0,0	Pt Created	1 057	*Tumble dryer on for 1 yr*

[Analysis Period]
Start Time:
End Time:
Data Reference Time:
Real-Time

Options:

[Key] [Back] [Close]

Analysis Page

Energy & Efficiency Surveillance Analysis

File: EE_SW_RESULTS.PDI
Ver: 1.1
Date: 30/10/2008

Shearwater:

Energy:	(MW)
Energy Exported:	5403
Energy Consumed:	138
Energy Flared / Vented:	35

Efficiency:	(%)
Energy Efficiency:	96.91
Energy Intensity:	3.24
Energy Wasted:	0.62

Emissions:	(Tonnes CO2/day)
Total:	836
Fuel Gas:	455.3
LP Flare:	131.4
HP Flare:	263.6

Flaring:	(m3/d)
Stripping Gas:	4172
LP Flare:	63803
HP Flare:	132230

Generation: (MW)	G8010	G8020	G8030	Total
Electrical Power Output:	5.71	0.00	5.70	11.52
Spinning Reserve:	2.77	0.00	2.76	5.52
Waste Heat Recovery:	3.67	0.00	3.48	7.32
Exhaust Heat:				104.8
Fuel Gas Power Used:	44	0	42	85.59

Compression:	K2410	K2420	K2430	Total
Engine Power Output (MW):	7.02	Calc Failed	6.81	13.92
Compressor Gas Power Used (MW):	6.79	Calc Failed	6.25	13.45
Design Polytropic Efficiency (%):	75.29	No Data	76.02	
Actual Polytropic Efficiency (%):	62.66	No Data	70.64	
Recycle Valve Position (%):	-0.00	98.73	15.75	
Recycle Flow (Mn sm3/d):	0.00	No Data	1.12	

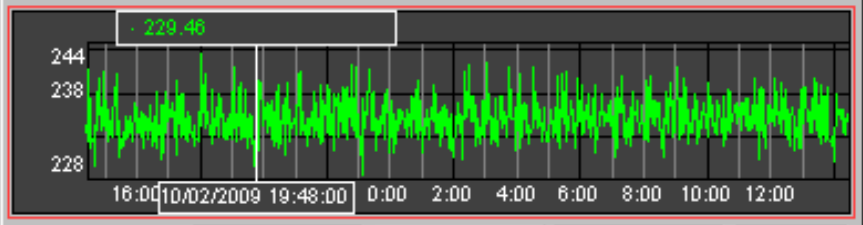
Power Users:	(MW)
Export Compression:	13.92
Condensate Export Pumps:	2.17
Seawater Pumps:	1.80
Cooling Medium Pumps:	1.22
Heating Medium Pumps:	0.27
Amine Pumps:	0.60
Gas Compressors:	3.56
Other Power Used:	0.86

Process KPI:		
Gas Export:	8236	kSm³/D
Condensate Export:	3422	Sm³/D
Gas Import:	229	kSm³/D
Fuel Gas Rate:	231000	Sm³/D

Tag Details: [Clear]

Tag: \\epukpi4\SW_MTR1175
Description: Current Imp Gas Stream 1 Std Vol Flow Rate
Range: 0 - 44400 KSm3/D
Comp: 0.5 KSm3/D (0.00113 %)

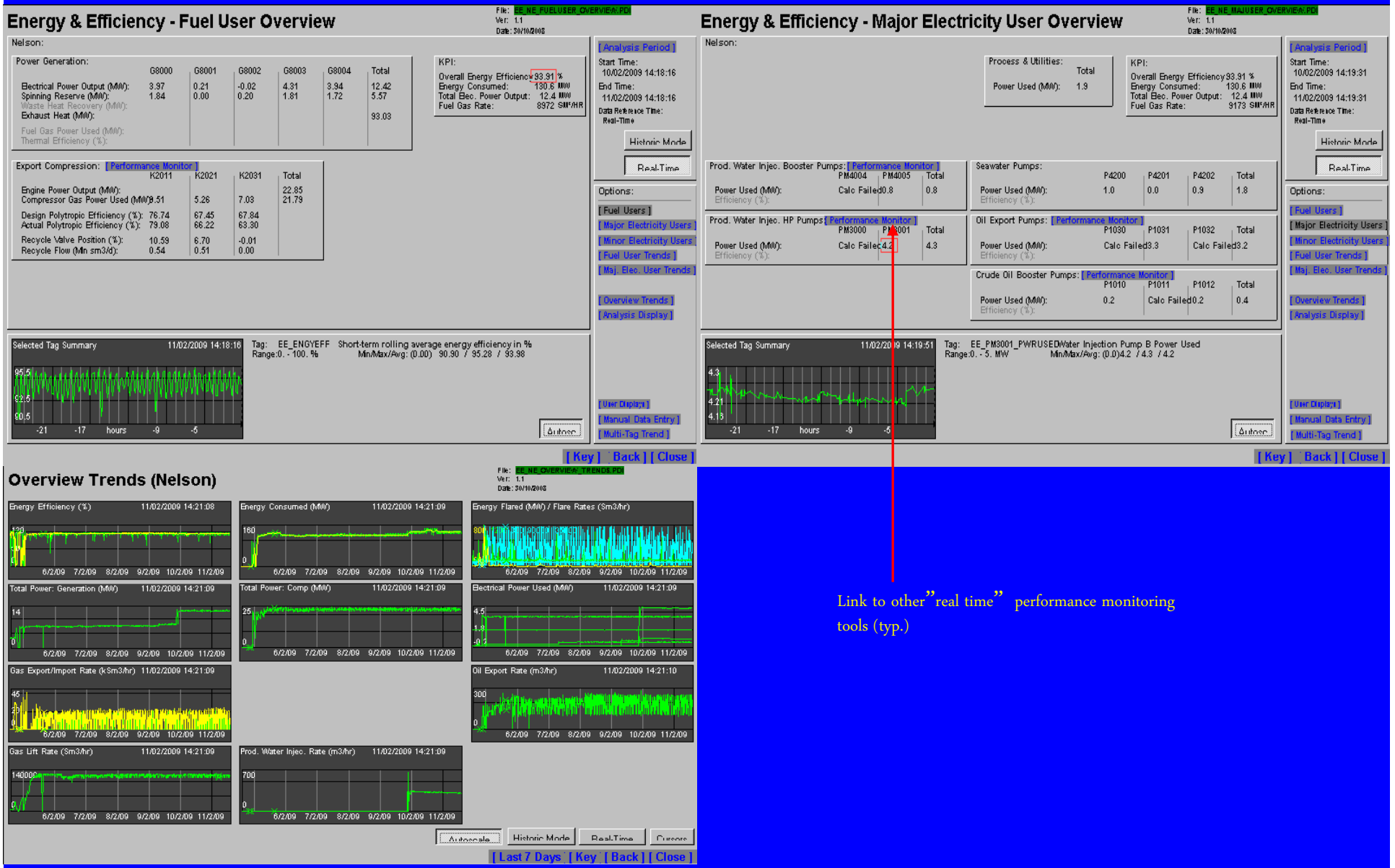
Data Ref Time: 10/02/2009 19:48:00



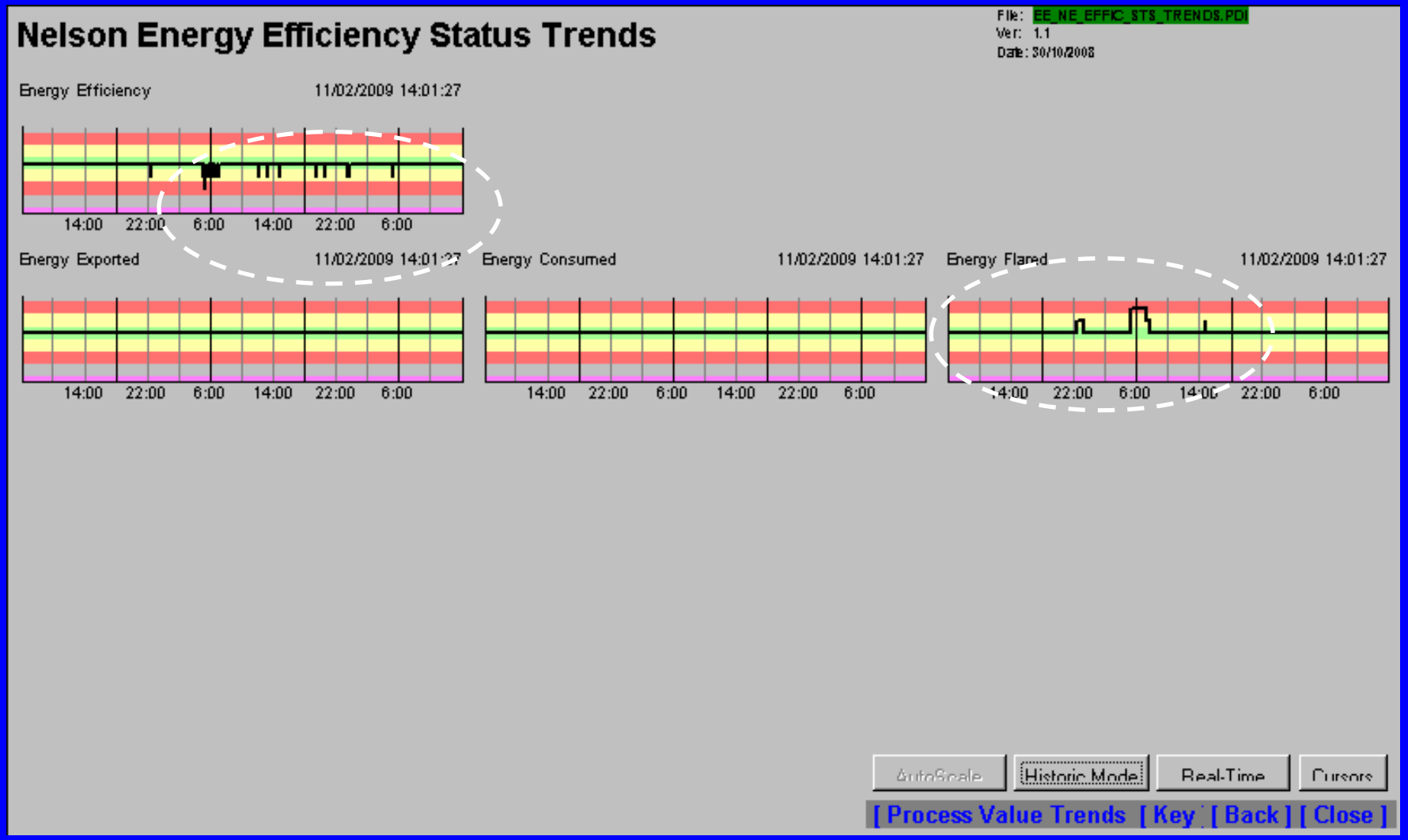
Autoscale | Historic Mode | Real-Time | Cursor

[Multi-Tag Trend] Back] [Close]

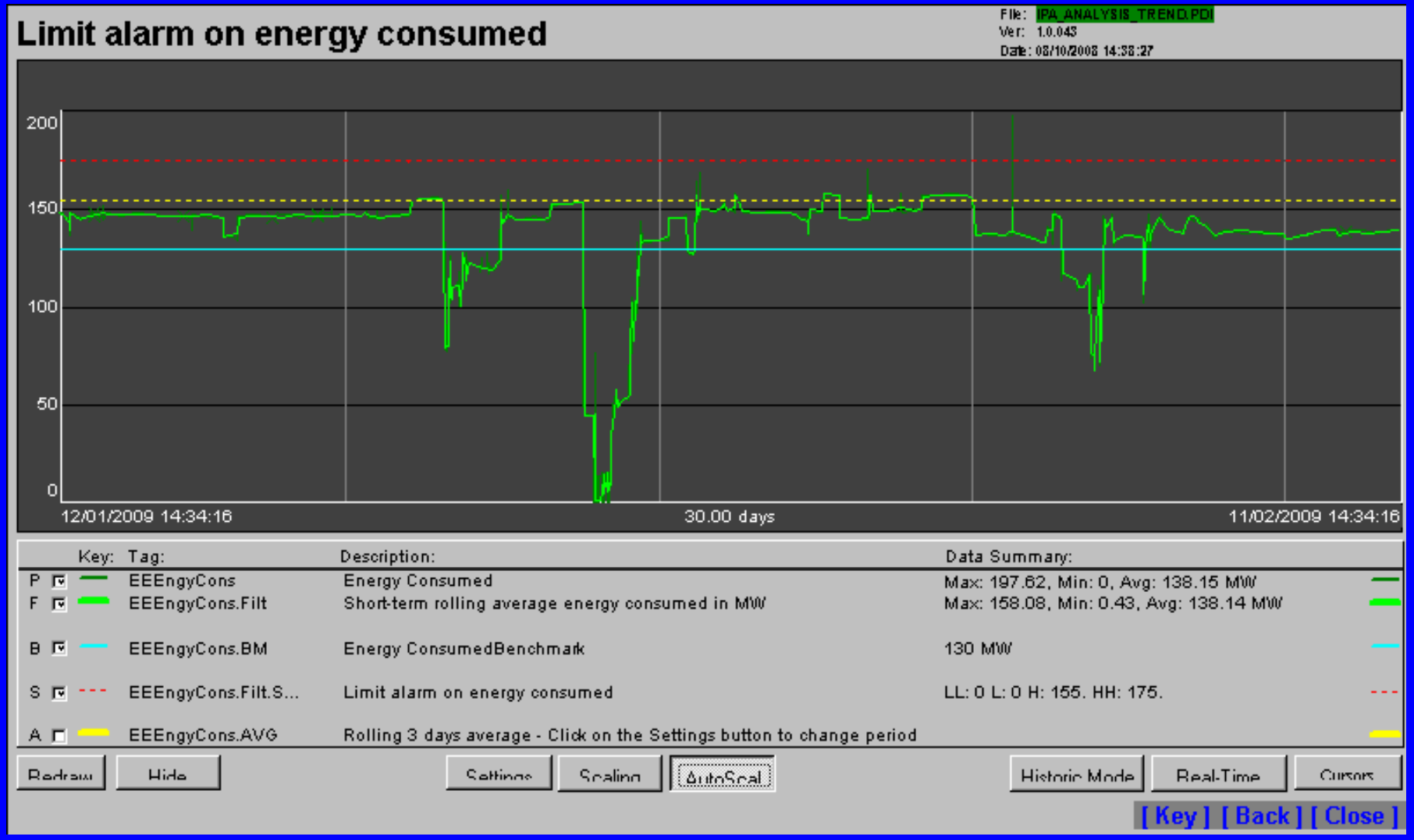
Screen Shots of examples of Screens



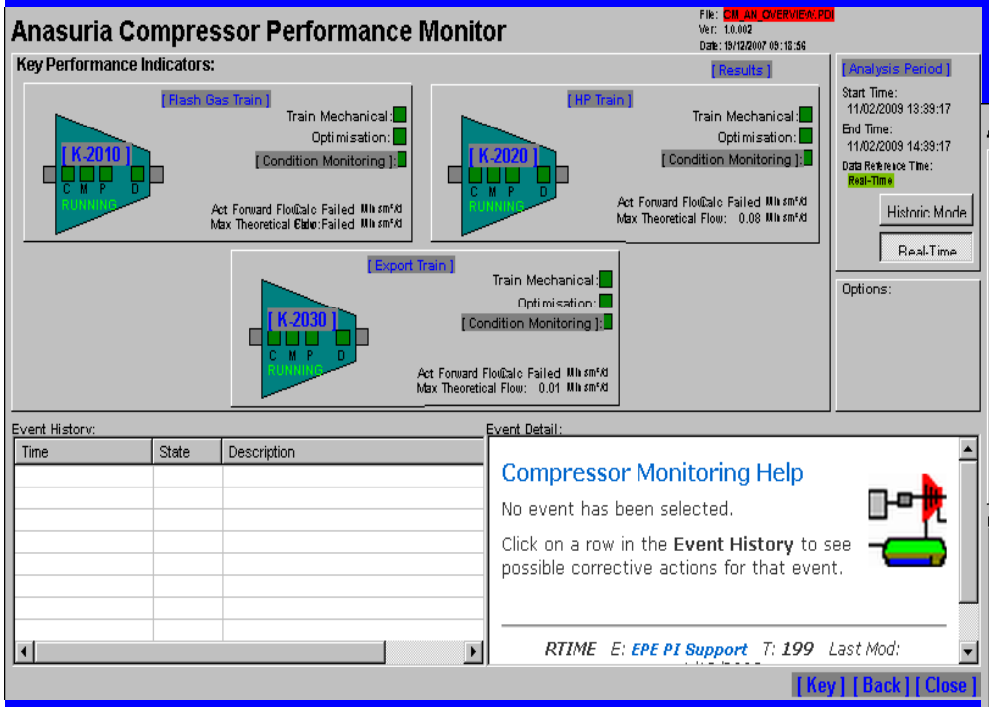
Status Summary indicator trend Page

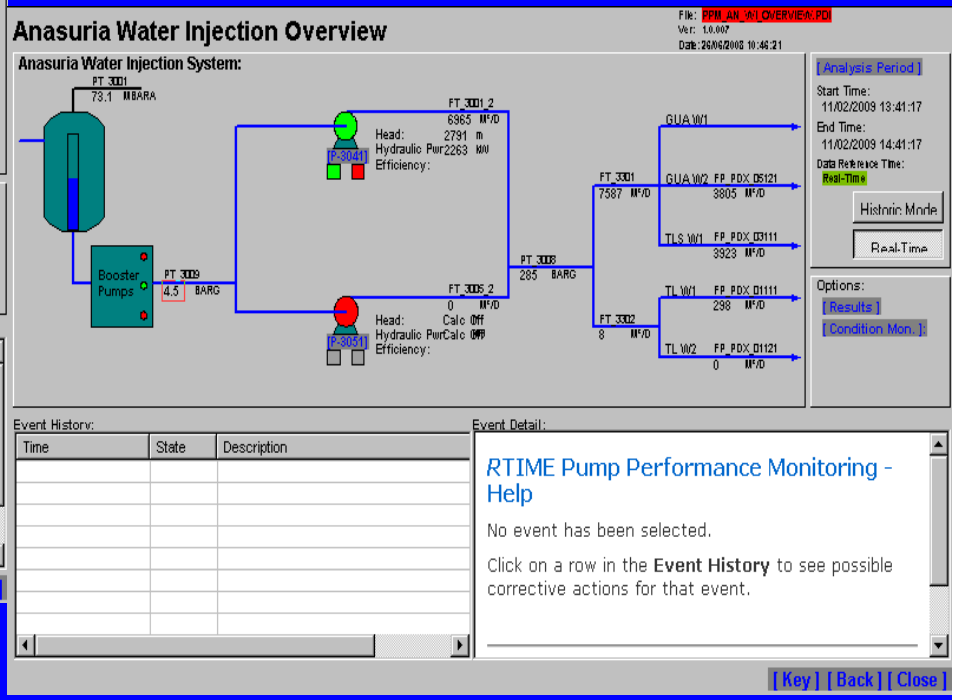


Full Page Trend



Screens for other real time Surveillance tools





User Quick Guide

Energy Efficiency Surveillance Tool Quick Reference Guide

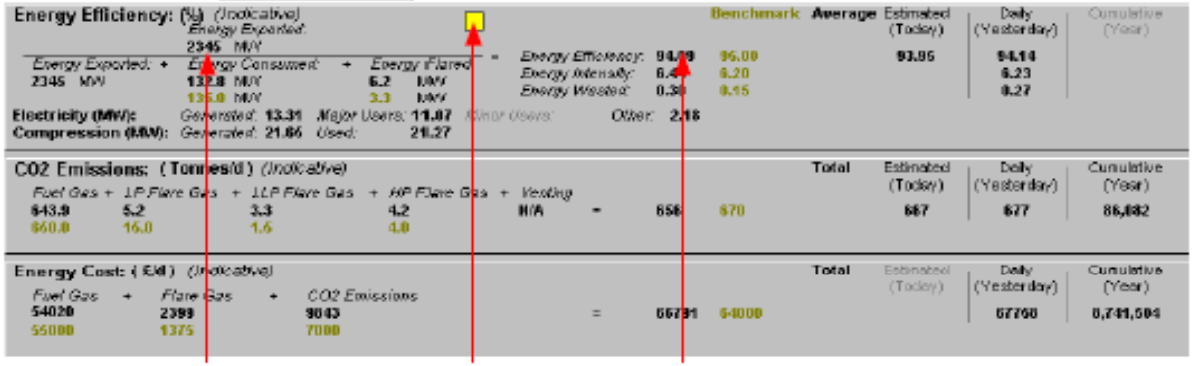
Asset Overview

	Energy Summaries			CO2 Emissions		Energy Cost		SSI	Notes
	Energy Efficiency	Energy Intensity	Energy Wasted	Daily Total	Year To Date	Daily Total	Year To Date	Alarm ONOC	* Energy Intensity = Energy Consumed / Energy Exported
[Nelson]	91.93 95.00	0.54 0.50	0.18 0.15	781 576	35,645	169,818 166,840	7,080,957		Platform: Oil / gas export Gas lift + Produced water re-injection

1 2 3 4 5 6

1 - Navigation link to Nelson Home page.
2 - Yesterdays KPI totals
3 - Benchmark figures
4 - Alarm/Alert status summary indicator. Green = Normal Yellow = Alert Red = Alarm
5 - Out of normal operating condition status summary indicator. Green = Normal Yellow = Alert
6 - Brief platform description, added so like for like platform comparisons can be made.

Installation Overview



1 2 3

1 - Main Efficiency KPI calculation using real time values.
2 - Alarm Status summary indicator (SSI), click on this to access the alarm status trends.
3 - Click on any data to create trend at bottom of page.

Using the Tool (Spinning Reserve)

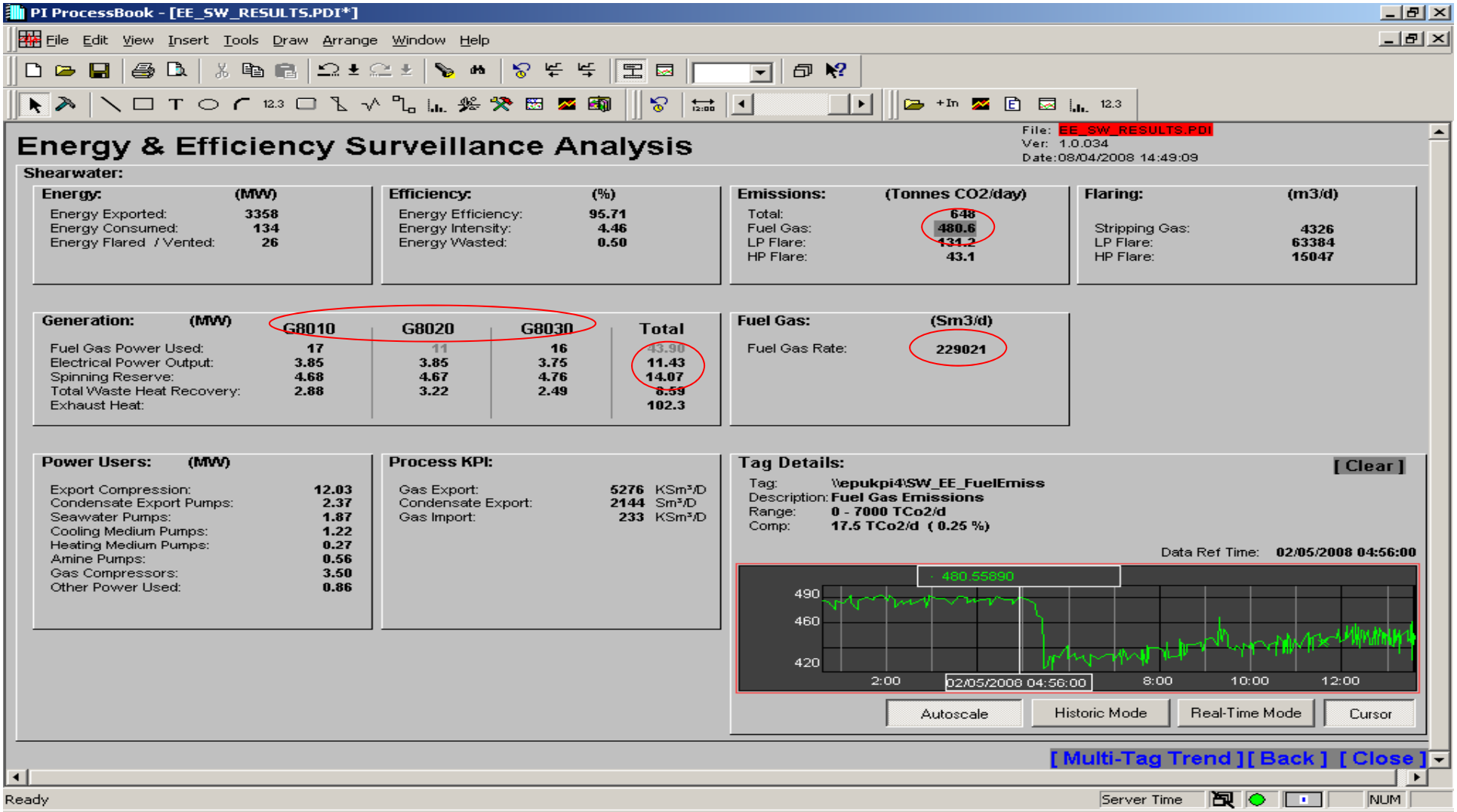
Comparison between running with a large spinning reserve and not

- *02 May 08 all three power turbines running at a specific installation, at approx 05:00 one turbine was shutdown dropping the spinning reserve from 14MW to 5 MW*

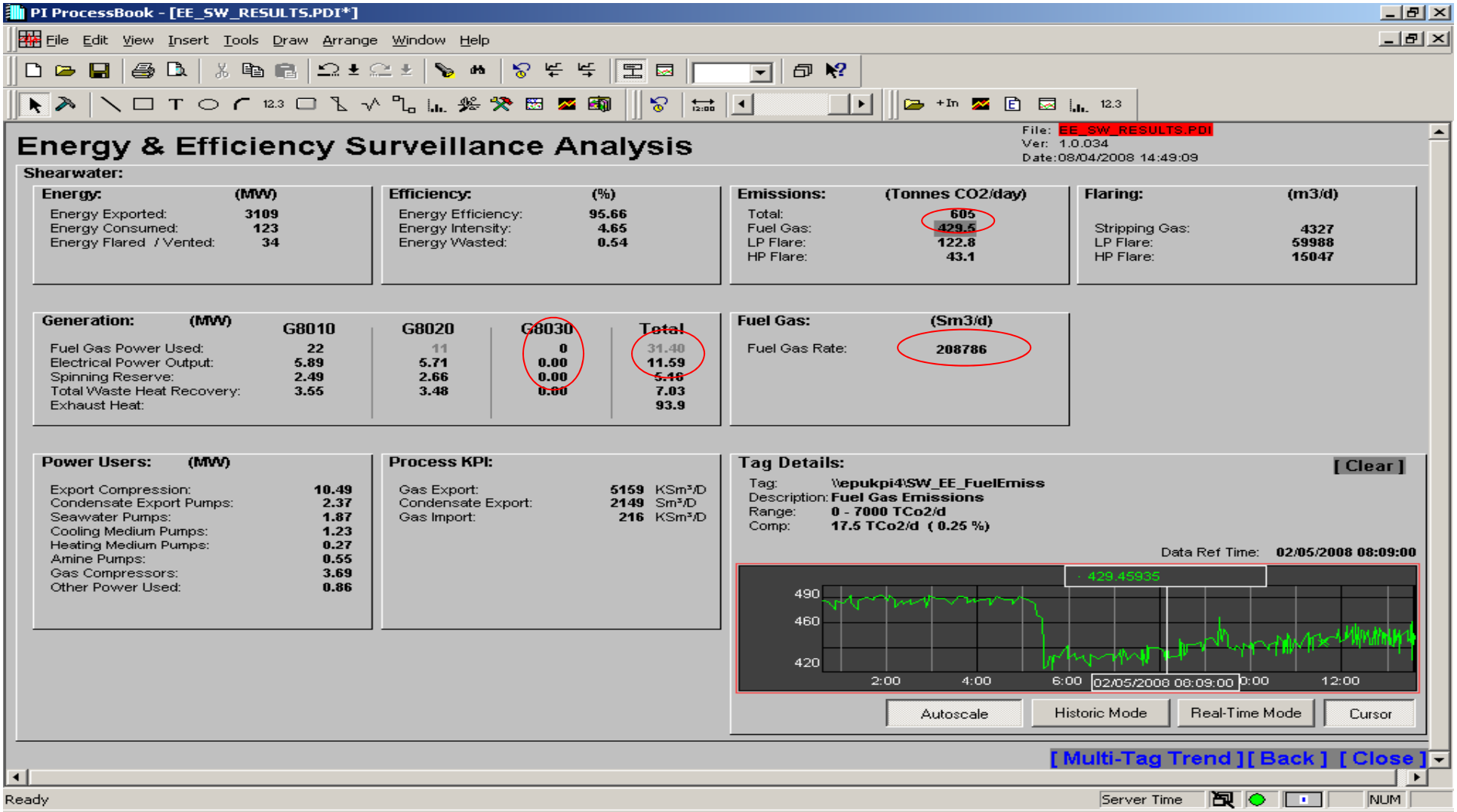
- *This in turn reduced the fuel gas Co2 emissions from approx 480 tCo2/day to 430 tCo2/day*

- *Also reduced fuel gas use rate from 229021 to 208786 Sm3/day*

- *See tool illustrations on the next slides....*



- Three power turbines running, electrical output of approx 3.8 MW each.
- Fuel gas rate 229021 sm3/day and Co2 from fuel gas of 481 tonnes/day.
- Total spinning reserve 14 MW.

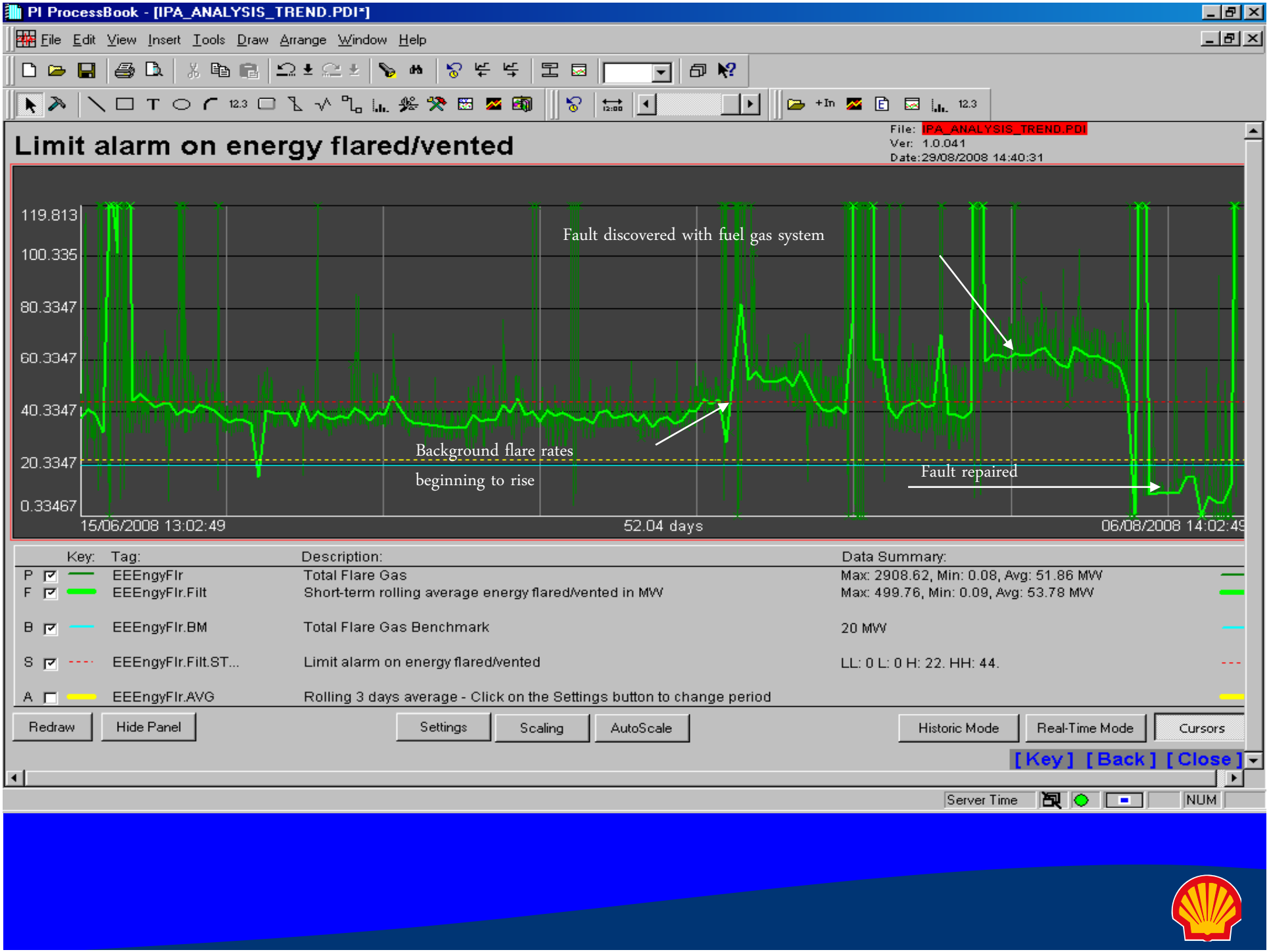


- Move cursor on trend across to point in time where the third generator has been shut down.
- Load on remaining two turbines 5.8 MW each, spinning reserve now 5.2 MW.
- Fuel gas rate reduced to 208768 sm3/day (20,253m3/day less) and Co2 from fuel gas reduced to 429.5 tonnes/day. (51 tonnes/day less)

Using the Tool (Passing valves)

- *The use of alarm/alert levels can inform the user of increased flaring and or fuel gas use*
- *The next slide shows the HP flare rate increase to above the alarm point*
- *Fault was traced to the fuel gas system*
- *Once this was repaired the normal background flare levels returned to below both alert and alarm points*

-See tool illustrations on the next slides....


PI ProcessBook - [IPA_ANALYSIS_TREND.PDI*]
File Edit View Insert Tools Draw Arrange Window Help
Limit alarm on energy flared/vented
File: IPA_ANALYSIS_TREND.PDI
Ver: 1.0.041
Date:29/08/2008 14:40:31
119.813
100.335
80.3347
60.3347
40.3347
20.3347
0.33467
Fault discovered with fuel gas system
Background flare rates
beginning to rise
Fault repaired
15/06/2008 13:02:49
52.04 days
06/08/2008 14:02:49
Key: Tag: Description: Data Summary:
P EEEngyFlr Total Flare Gas Max: 2908.62, Min: 0.08, Avg: 51.86 MW
F EEEngyFlr.Filt Short-term rolling average energy flared/vented in MW Max: 499.76, Min: 0.09, Avg: 53.78 MW
B EEEngyFlr.BM Total Flare Gas Benchmark 20 MW
S EEEngyFlr.Filt.ST... Limit alarm on energy flared/vented LL: 0 L: 0 H: 22. HH: 44.
A EEEngyFlr.AVG Rolling 3 days average - Click on the Settings button to change period
Redraw
Hide Panel
Settings
Scaling
AutoScale
Historic Mode
Real-Time Mode
Cursors
[Key] [Back] [Close]
Server Time
NUM

Background to Shell CO2 Benchmarking

- Shell Business Week 2006, Opening Address, Shell CEO Jeroen van der Veer

  "To achieve 1st quartile status in energy efficiency and CO2 Emission in two-thirds of our facilities by 2015".

- The Executive Committee of RDS requested businesses and Group CO2 to:
  - Understand our existing portfolio of emissions, future options and costs to mitigate
  - Assess the cost of CO2 mitigation for all new projects
  - Fully Comply with Existing Regulations and
  - Grow Organisational Competence
  - Provide a definition of 1st Quartile performance no later than July 2008.

The Shell CO2 Benchmarking Methodology

- The working principle of the benchmarking methodology is to compare the actual emissions with a Site Specific Standard Emission given for each facility. This is done by means of the Shell CO2 Efficiency Index:

  Shell CO2 Efficiency Index = 100 x (Actual GHG Emissions /Site Specific Standard Emission)

- The approach used to determine the Site Specific Standard Emission equation combines elements of first principles (thermodynamics and fluid flow principles) to establish the relationships between key variables, and coefficients/constants that were derived empirically using operational data from Shell operated facilities.

- The justification for a Site Specific Standard Emission based system is the need to normalise the differences across different facilities and locations. The Site Specific Standard Emission predicts a value for CO2 emissions based on factors or conditions that are outside operational control – typical examples are reservoir pressure, water cut, contaminants.

- The facilities participating in the benchmarking are compared against each other on the basis of the Shell CO2 Efficiency Index and from the Index value the top quartile threshold is defined.

The Site Specific Standard Emission Building Blocks

What? (Site Specific Standard Emission Component)	Why? (Asset Differentiation addressed)	How? (Parameter used to determine the Site Specific Standard Emission)
Hydrocarbon export systems (Compression & pumping)	Field maturity Fluid type Distance to custody transfer	Production Pressure Water cut
Artificial lift systems (Compression, ESPs, Beam Pumps)	Field maturity Reservoir characteristics	Power consumption Lift gas flow volume Lift gas pressure
Gas and Water re-injection (Compression & pumping)	Secondary recovery Produced gas disposal Produced water disposal	Gas volume injected Water volume injected Pressure
Gas conditioning systems	Contaminated gas stripping	CO2/H2S removed
Thermal Enhanced Oil Recovery	Steam Operations	Oil Steam Ratio Heat Recovery
Baseload	Utilities & Miscellaneous load	Fixed value