Americas
Asia Pacific
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E.ON AG

Fossil Generation Performance Report

Coal/Lignite Fired Generation (Study Years 2007 & 2008)

V6.0

March 2009

Présentation Benchmarking

Commission économique du 5 mai 2009

UMS Group | Performance Optimization

Remarque préliminaire :

Le benchmarking Eon est interne.
Les résultats sont strictement confidentiels et non diffusables.

Périmètre du Benchmarking 2008 :

- Unités charbon/lignite
- 27 centrales - 55 unités

Les Base de données (data pack) portent sur des informations techniques et économiques :

- Opération : exploitation, manutention, laboratoire
- Maintenance
- Sécurité
- Formation

Plan de travail :

- Collecte des données à partir du 4 janvier 2009
- Émission du rapport définitif par UMS (cabinet d'audit): le 3 avril 2009

Remarque préliminaire :

Le présent document reprend un nombre limité des planches issues du document de synthèse réalisé par UMS sous contrôle du CoC.

Comparaisons importantes à faire :

-Des disponibilités / indisponibilités par site et unités
-Des LTIF par site
-Des coûts de manutention site
-Des coûts d'opération / MWi
-Des coûts de maintenance / MWi
-Des respects des plannings de révision
-De la flexibilité des tranches
-Des formations

Certains indicateurs apparaisent également dans les indicateurs de qualité / service (CSL = Composite Service Level)

	GWhn	MWI	H fonct	nb unit bench	>500 MW	499<MW<300	<299 MW
R...	11000	2000	5500	4	4		
K...	7082	1940	3651	4		4	
G...	12506	1911	6544	4		4	
S...	8043	1711	4701	4	1	3	
M...	10370	1501	6909	4		4	
B...	10237	1500	6825	2	2		
S...	3120	1132	2756	2			
M...	7318	1062	6891	2	2		
Emile Huchet	**4097**	**1045**	**3921**	**3**	**1**	**1**	**1**
I...	1819	940	1935	2		2	
S...	5782	900	6424	2		2	
F...	3756	900	4173	4		2	
Hey...	4485	875	5126	1	1		
Provence	**2705**	**805**	**3360**	**2**	**1**		**1**
W...	4126	757	5450	1	1		
E...	4123	704	5857	3		1	2
C...	3403	563	6044	3			3
L...	1944	553	3515	1	1		
T...	4065	515	7893	1	1		
B...	2329	352	6616	1		1	
K...	1807	345	5238	1		1	
K...	1875	323	5805	1		1	
Lucy	**836**	**245**	**3412**	**1**			**1**
Hornaing	**729**	**240**	**3038**	**1**			**1**
P...	245	203	1207	1			1
G...	962	173	5561	2			2
T...	356	75	4747	1			1

Breakdown of Plant Level Functional Drivers

Plant Management

The Plant Management section shows the aggregate performance at the plant level. It benchmarks 4 key areas in regards to service level and effectiveness.

Service Level Drivers

- 25% - Unplanned Unavailability
- 25% - Availability
- 25% - Lost Time Injury Frequency
- 25% - Number of Environmental Incidents

Cost Driver

Total Adjusted O&M Cost (Non-Fuel) per MWh

Asset Management

Asset Management combines a trend of plant performance as well as cost efficiency compared to the amount of megawatt hours generated.

Service Level Drivers

- 20% - 3 Year Avg. Unplanned Unavailability
- 20% - 3 Year Avg. Availability
- 20% - Total O&M Cost (Non-Fuel) per MWh
- 40% - Performance Trend (Above 3 Service Level drivers combined trend)

Cost Driver

Total Adjusted Non-fuel O&M cost per MWI

Materials Handling

The Materials Handling section compares the impact that the handling of materials (fuels, ash & byproducts) has on lost MWh, as well as the unit's efficiency in handling fuel.

Service Level Drivers

- 75% - Unplanned Unavailability due to Materials Handling
- 25% - Byproduct Net Costs per net MWh

Cost Driver

Net Adjusted Materials Handling Costs per 100,000 Tons of Fuels Burned

Training

Training is benchmarked by type of training technical, safety, quality assurance, etc.

Service Level Drivers

Training hours by category per plant FTE

Safety & Health

Safety is compared at the plant level, and accounts for plant employees and contractors separately.

Service Level Drivers

Lost Time Injury Frequency (LTIF)

Total Recordable Injury Frequency (TRIF)

Miscellaneous Services

Miscellaneous Services are those activities which are non-core to the operation, maintenance, or engineering of the generation assets.

Service Level Drivers

No Service Level Drivers needed for single metric function

Cost Driver

Total Adjusted Miscellaneous Services Cost per Plant Total FTEs

Breakdown of Unit Level Functional Drivers

Thermal Efficiency

Thermal Efficiency is measured at the generating unit level. It is calculated as the ratio of Total Heat Input (excluding start up) divided by gross generation in the most recent study year.

Service Level Drivers

Thermal Efficiency (Heat Rate (Kj/KWh))
Energy Exported (GJ)

Operations

Operations section is utilized to make a comparison of the cost effectiveness and performance of the unit's operational activities.

Service Level Drivers

- **30%** - Unplanned Unavailability
- **30%** - Availability
- **15%** - Number of Environmental Incidents
- **15%** - Number of Hot Starts
- **10%** - Byproduct net costs

Cost Driver

Total Adjusted (Non-Fuel) Operating Cost per MWI

Maintenance

Maintenance measures a 3 Year Average of unit performance combined with maintenance work quality.

Service Level Drivers

- **40%** - 3 Year Avg. Unplanned Unavailability
- **40%** - 3 Year Avg. Availability
- **20%** - Ratio of Corrective to Total Maintenance Work Orders Issued in Most Recent Year

Cost Driver

3 Year Average Total Adjusted Maintenance Cost per MWI

Outage Planning & Management

Outage Planning & Management analyzes the cost efficiency of managing outages by comparing costs spent to plan outages vs. total cost of outages.

Service Level Drivers

- **33%** -Outage Schedule Deviation (delays)
- **33%** - Outage Budget Deviation (O&M and Capital)
- **33%** - Unplanned Unavailability within 90 days

Cost Driver

3 Year Average Total Adjusted Maintenance Cost per MWI

Environmental Control

The Environmental Control section benchmarks pollution violations and the effect control limits placed on unavailability.

Service Level Drivers

Unplanned Unavailability (due to environmental control limits)

Cost Driver

Total Adjusted Environmental Control Cost per GWh generated

Flexibility

The Flexibility section benchmarks the ability of a unit to come off or come on line in order to meet market demands.

Service Level Drivers

- **25%** Flexibility – (Hot Starts + Cold Starts) – Planned Outages – Unplanned outages)
- **25%** Commercial Starts – (Hot Starts + Cold Starts) – Unplanned outages)
- **25%** - Availability
- **25%** - Net Capacity Factor

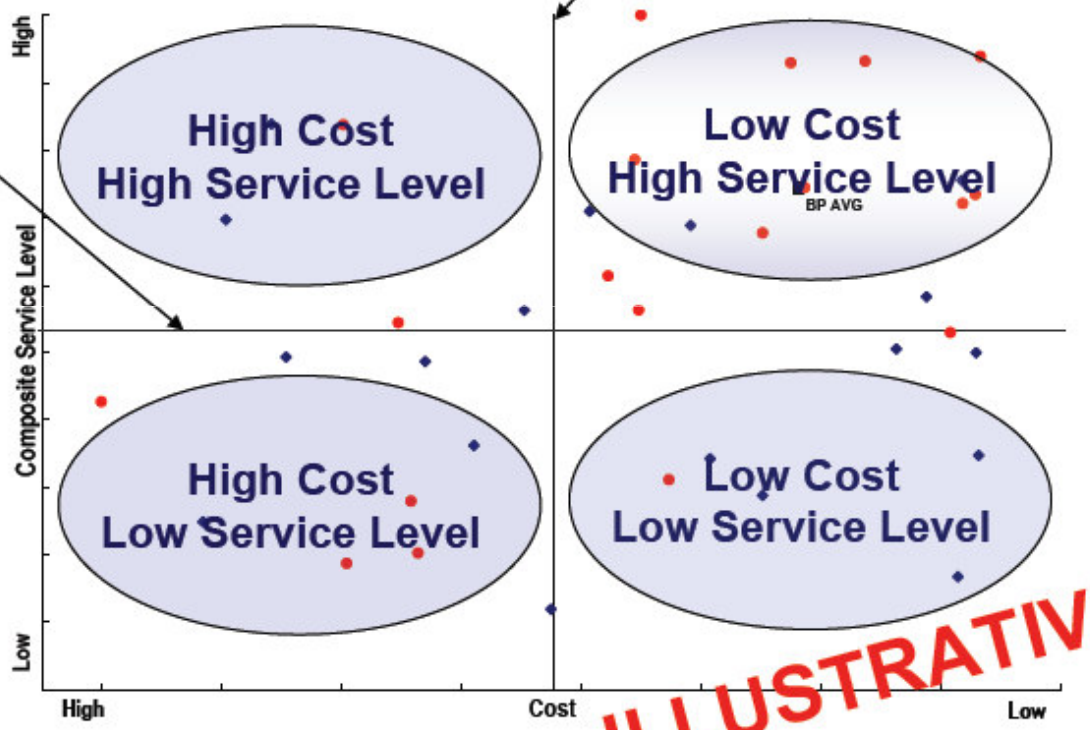
Cost Driver

Total Adjusted (Non-Fuel) Operating Cost per MWI

How to read scatter charts.

Peer Group's average cost (2007 & 2008 combined)

Peer Group's average service level (2007 & 2008 combined).



ILLUSTRATIVE

Exemple de Système de normalisation des indicateurs de qualité –
Plant management :Application aux centrales de 0 à 499 MW

Plant Management

The Plant Management section shows the aggregate performance at the plant level. It benchmarks 4 key areas in regards to service level and effectiveness.

Service Level Drivers

- **25%** - Unplanned Unavailability
- **25%** - Availability
- **25%** - Lost Time Injury Frequency
- **25%** - Number of Environmental Incidents

Cost Driver

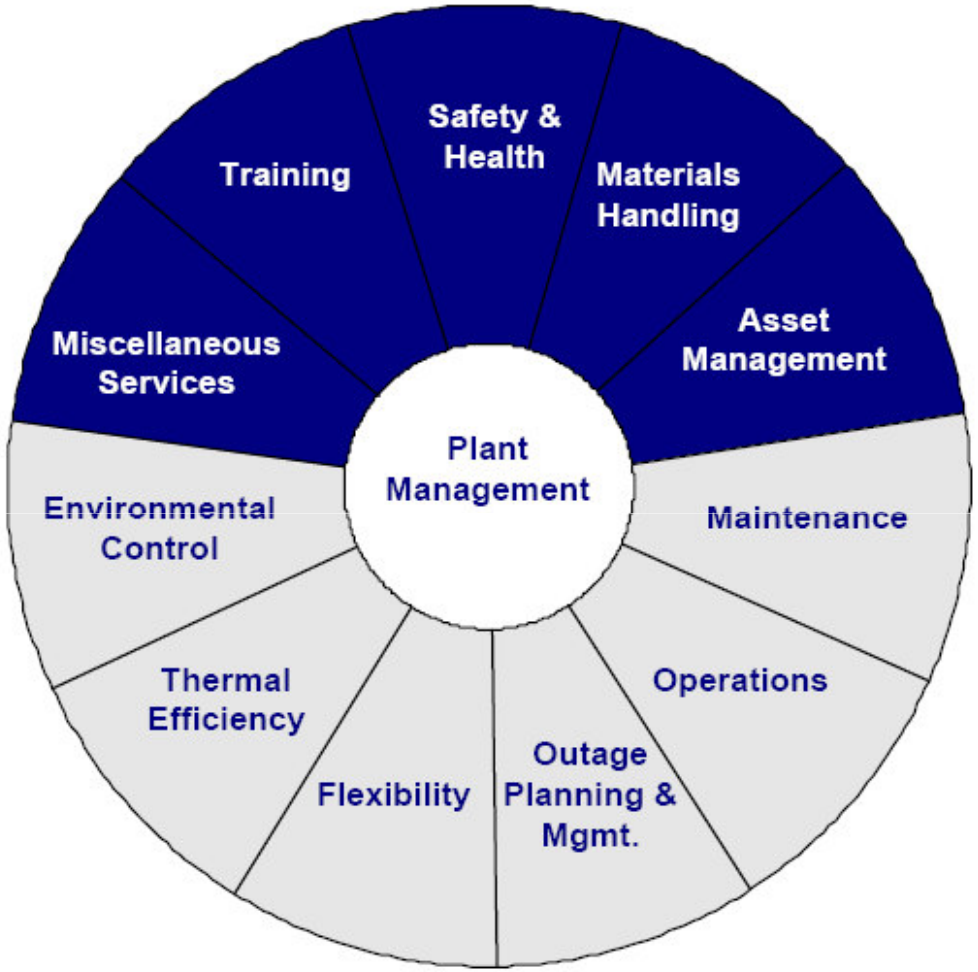
Total Adjusted O&M Cost (Non-Fuel) per MWh

	indispo non prog. (%)		dispo (%)		LTIF (%)		Nb incidents envir.		SLD
	brute	normée	brute	normée	brute	normée	brute	normée	normée
K…	5	1,78	94	2,00	2	1,75	0	2,00	2,00
Lucy	4	2,00	82	1,00	6,8	1,15	0	2,00	1,48
Hornaing	12,1	0,20	80	0,83	6	1,25	0	2,00	0,76
P…	13	0,00	70	0,00	0	2,00	1	1,00	0,27
G…	7	1,33	90,5	1,71	0	2,00	0	2,00	1,82
T…	8	1,11	84	1,17	16	0,00	2	0,00	0,00

E.ON Fossil Generation Benchmarking Functional Areas of Focus

Plant Level Functions

Unit Level Functions



Note: Materials Handling benchmarked for Coal and Lignite Plants Only

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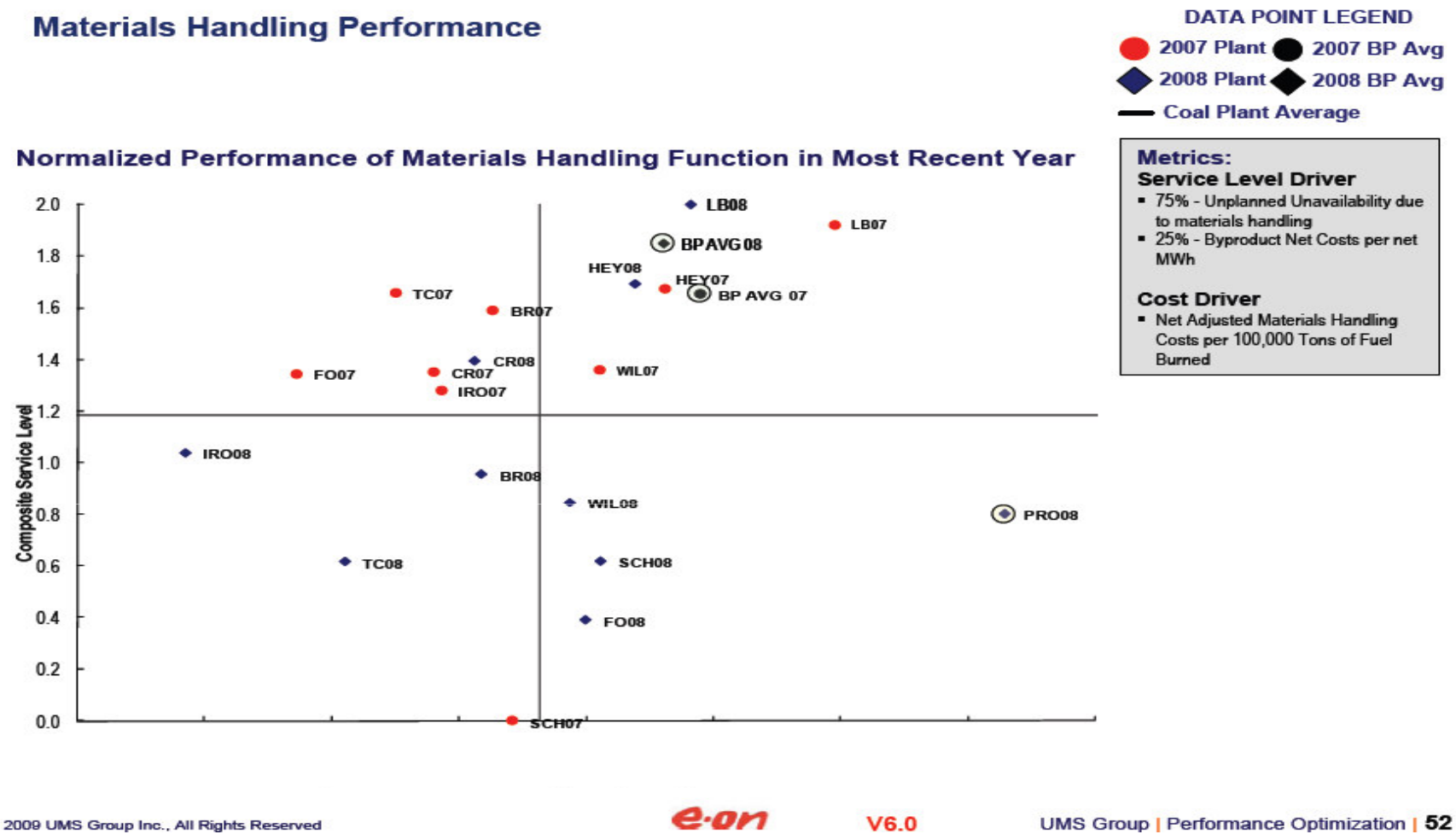
PLANT SUMMARY CHARTS — COAL/LIGNITE PLANTS 500-999 MW

Materials Handling Performance



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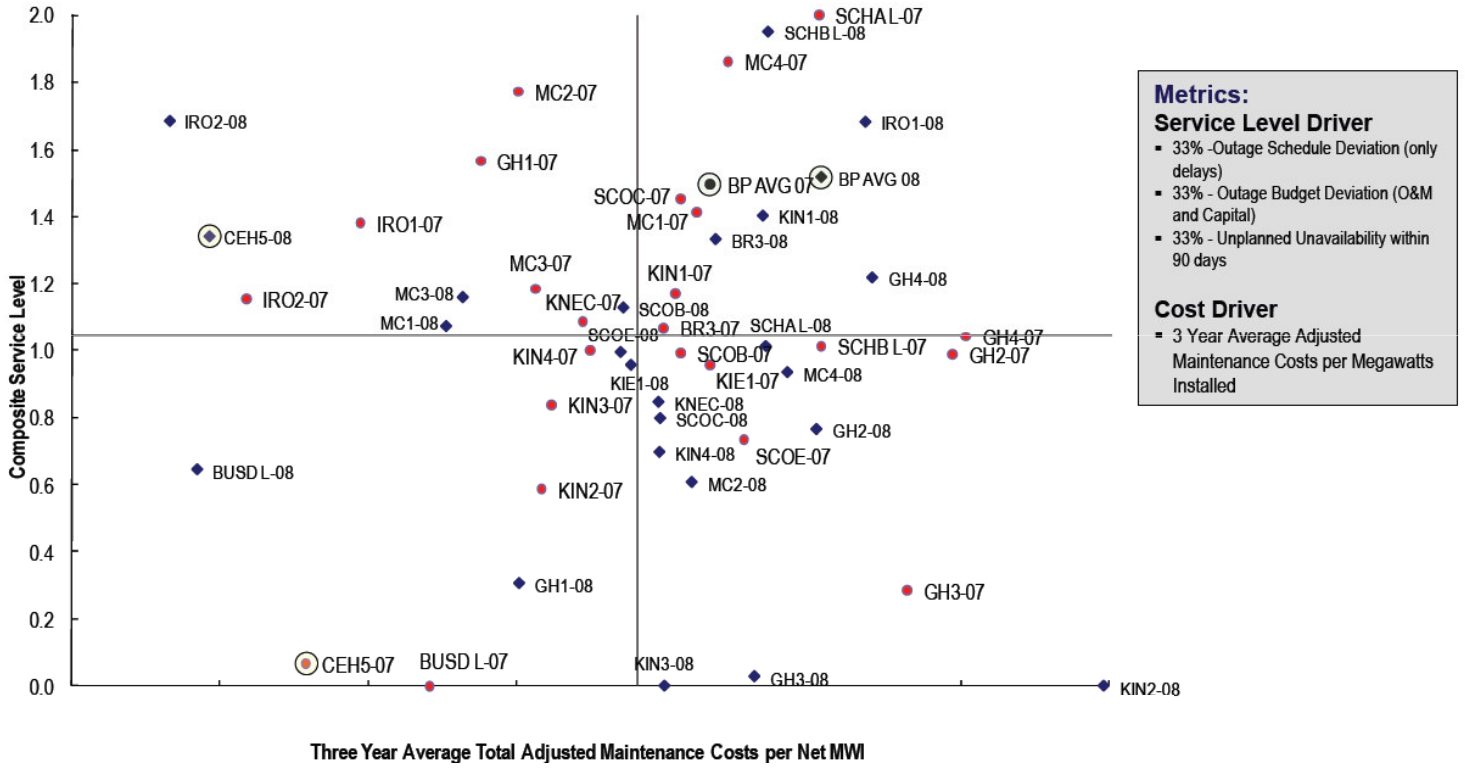
Analyse : Coût de manutention maîtrisé
Recettes liées à la vente de cendre de P5
CSL impacté par la mise en décharge des cendres du LFC de P4
Importantes indisponibilité fortuites liées à la manutention sur Pro4

UNIT LEVEL CHARTS — COAL/LIGNITE UNITS 300-499 MW

Outage Planning & Management Performance

DATA POINT LEGEND
- 2007 Unit
- 2007 BP Avg
- 2008 Unit
- 2008 BP Avg
- Coal Unit Average

Normalized Performance of Outage Planning & Management Function



Metrics:

Service Level Driver
- 33% -Outage Schedule Deviation (only delays)
- 33% - Outage Budget Deviation (O&M and Capital)
- 33% - Unplanned Unavailability within 90 days

Cost Driver
- 3 Year Average Adjusted Maintenance Costs per Megawatts Installed

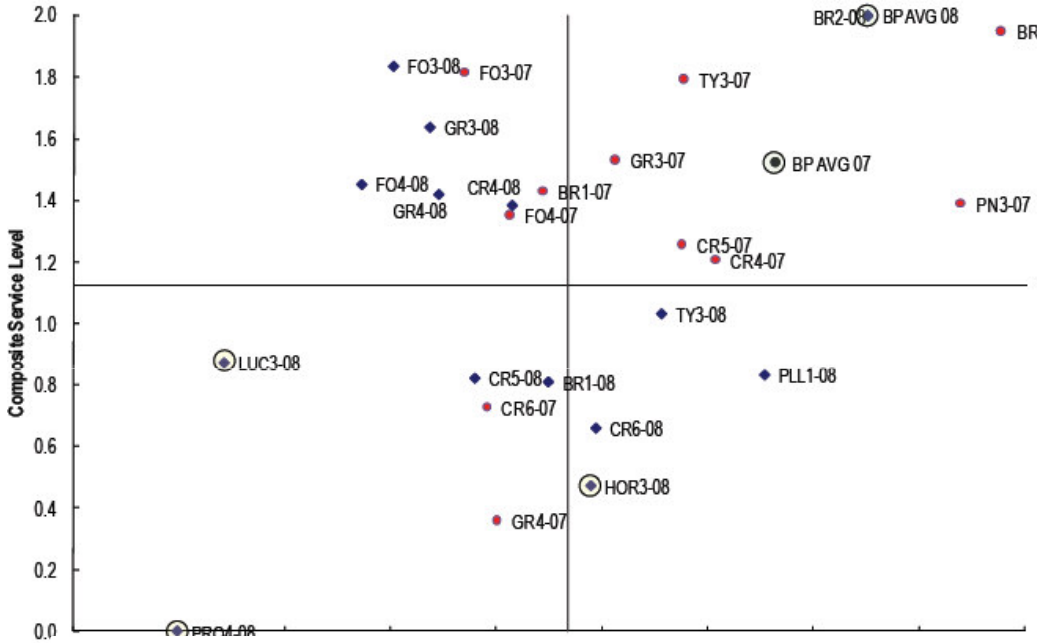
Analyse : Coût de maintenance élevés sur EH5
Dépassement dates de révision

UNIT LEVEL CHARTS — COAL/LIGNITE UNITS 0-299 MW

Maintenance Performance

DATA POINT LEGEND
- 2007 Unit
- 2007 BP Avg
- 2008 Unit
- 2008 BP Avg
- Coal Unit Average

Normalized Performance of Maintenance Function



Metrics:

Service Level Driver
- 40% - 3 Year Avg. Unplanned Unavailability
- 40% - 3 Year Avg. Availability
- 20% - Ratio of Corrective to Total Maintenance Work Orders Issued in Most Recent Year

Cost Driver
- 3 Year Average Adjusted Maintenance Costs per Megawatts Installed

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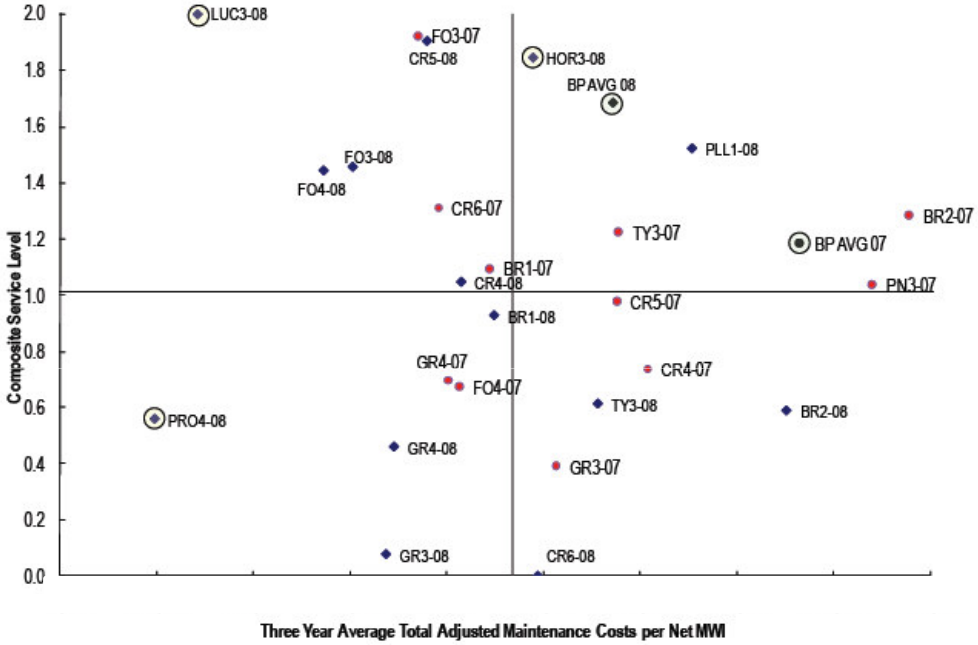
Analyse : Niveau du CSL bas lié à une disponibilité faible sur 2006-2008 (RG Luc3) et problème d'indispo fortuites (Hor3)
Coûts maintenance élevés sur Luc3 (RG), correct sur Hor3
Les LFC sont hors épure du fait des dispo faibles et indipo fortuites élevées

UNIT LEVEL CHARTS — COAL/LIGNITE UNITS 0-299 MW

Outage Planning & Management Performance

DATA POINT LEGEND
2007 Unit · 2007 BP Avg
2008 Unit · 2008 BP Avg
Coal Unit Average

Normalized Performance of Outage Planning & Management Function



Metrics:

Service Level Driver
- 33% -Outage Schedule Deviation (only delays)
- 33% - Outage Budget Deviation (O&M and Capital)
- 33% - Unplanned Unavailability within 90 days

Cost Driver
- 3 Year Average Adjusted Maintenance Costs per Megawatts Installed

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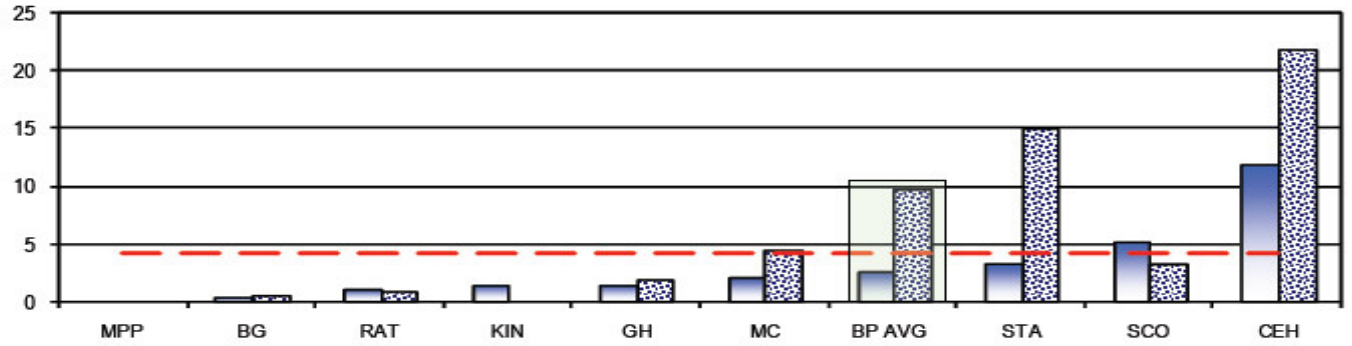
Analyse : Bon niveau de CSL sur Hor3 & Luc3 : respect programme révision, budget révision et indispo fortuite en sortie révision
Coûts maintenance élevés sur Luc3 (RG), correct sur Hor3
Les LFC sont hors épure du fait des dispo faibles et indipo fortuites élevées

PLANT SUMMARY CHARTS — COAL/LIGNITE PLANTS 1000+ MW

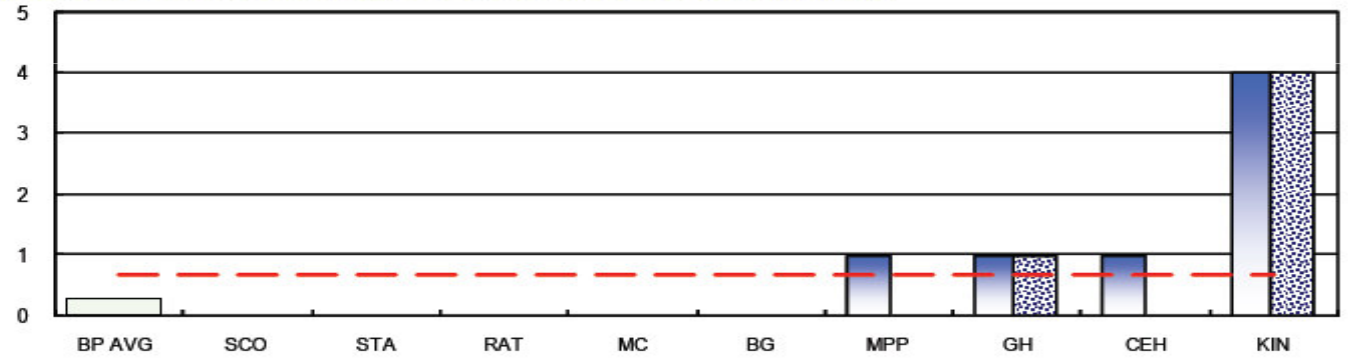
Plant Management Service Level Drivers

COLUMN CHART LEGEND
2007 Plant | 2008 Plant
Coal Unit Average

Lost Time Injury Frequency (LTIF) in Most Recent Year



Number of Environmental Incidents in Most Recent Year



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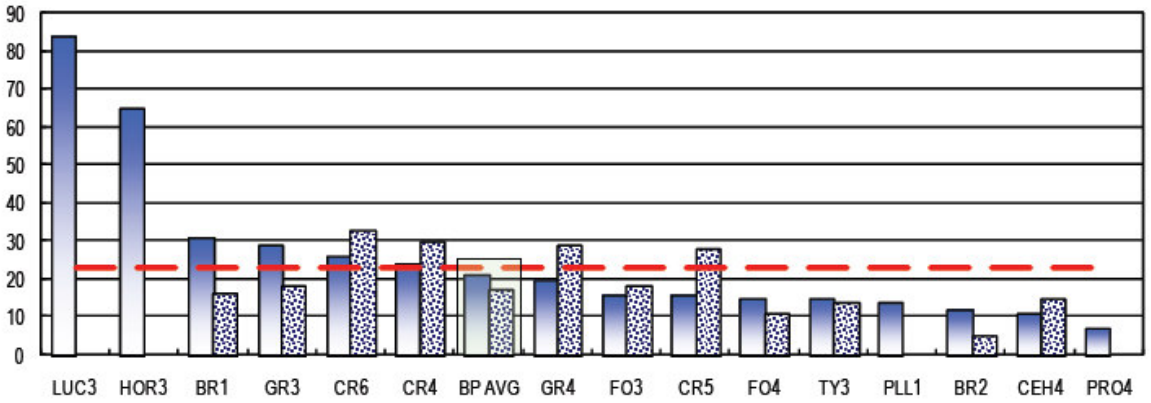
Analyse : Résultats sécurité très pénalisants
1 incident environnemental sur LFC - EH4

UNIT LEVEL CHARTS — COAL/LIGNITE UNITS 0-299 MW

Operations Service Level Driver and Cost Driver

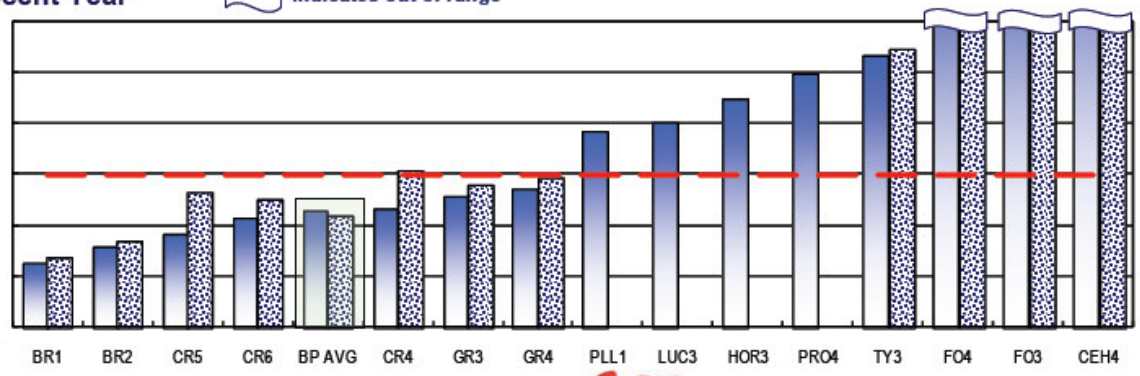
COLUMN CHART LEGEND
2007 Unit 2008 Unit
Coal Unit Average

Number of Hot Starts in Most Recent Year



Total Adjusted (non-fuel) Operating Costs per Net Megawatts Installed in Most Recent Year

Indicates out of range



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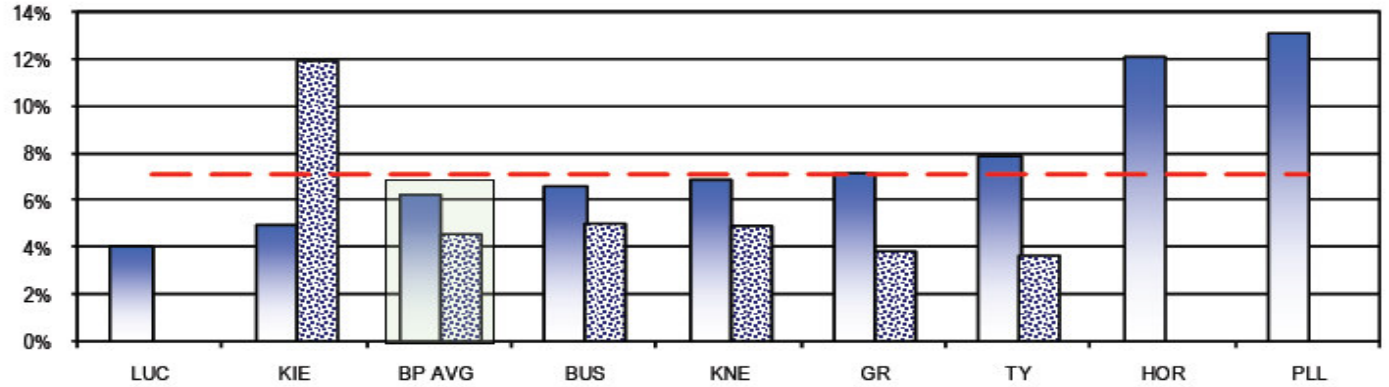
Analyse : Nombreux démarrages sur Luc3 – Hor3 (moyenne x 4)
Coût des opérations élevé : voir annulation processus de normalisation

PLANT SUMMARY CHARTS — COAL/LIGNITE PLANTS 0-499 MW

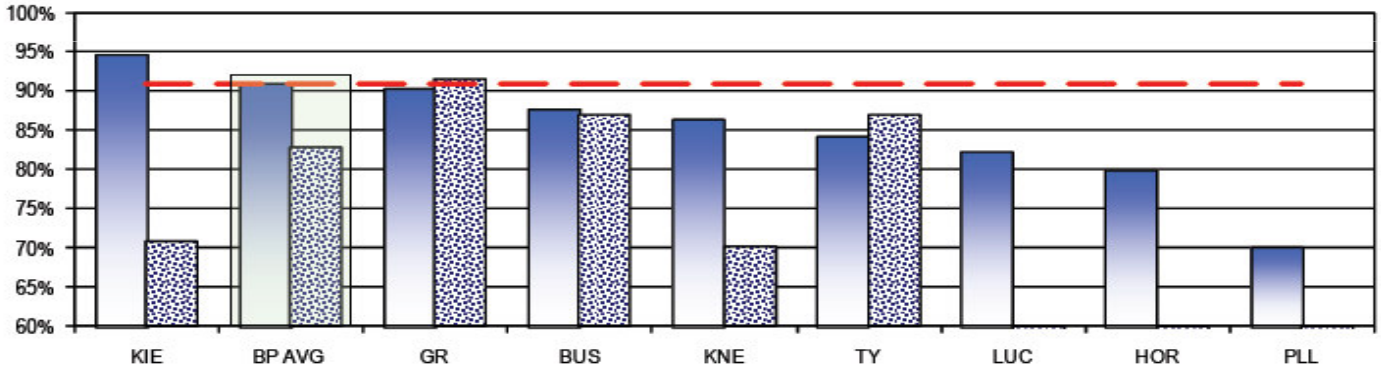
Plant Management Service Level Drivers

COLUMN CHART LEGEND
2007 Plant | 2008 Plant
Coal Unit Average

Total Unplanned Unavailability in Most Recent Year



Availability in Most Recent Year



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Analyse : Indisponibilité fortuite élevée sur Hornaing, bonne sur Lucy
Disponibilité sous la moyenne en 2008 :
RG sur Lucy
Indispo fortuite élevée sur Hor

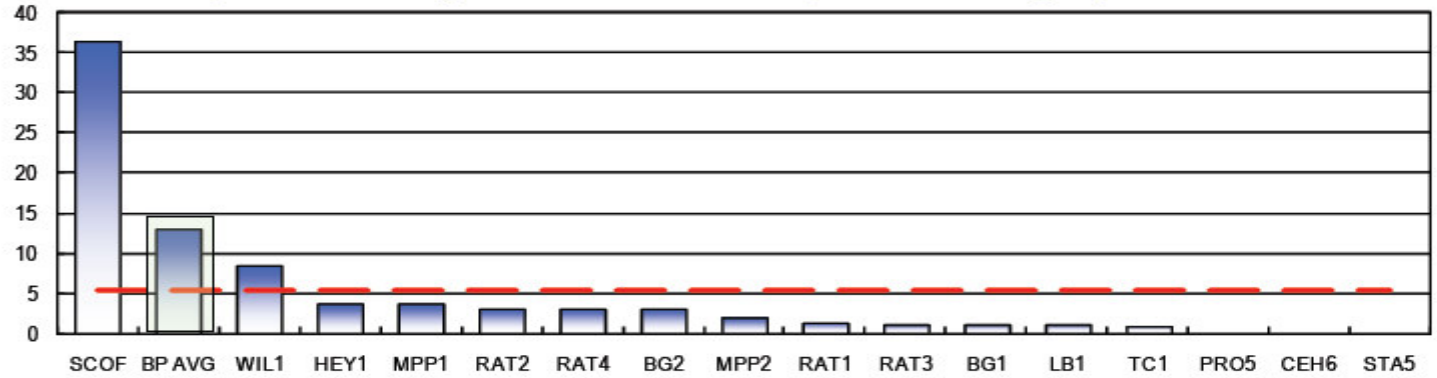
UNIT LEVEL CHARTS

COAL/LIGNITE UNITS 500+ MW

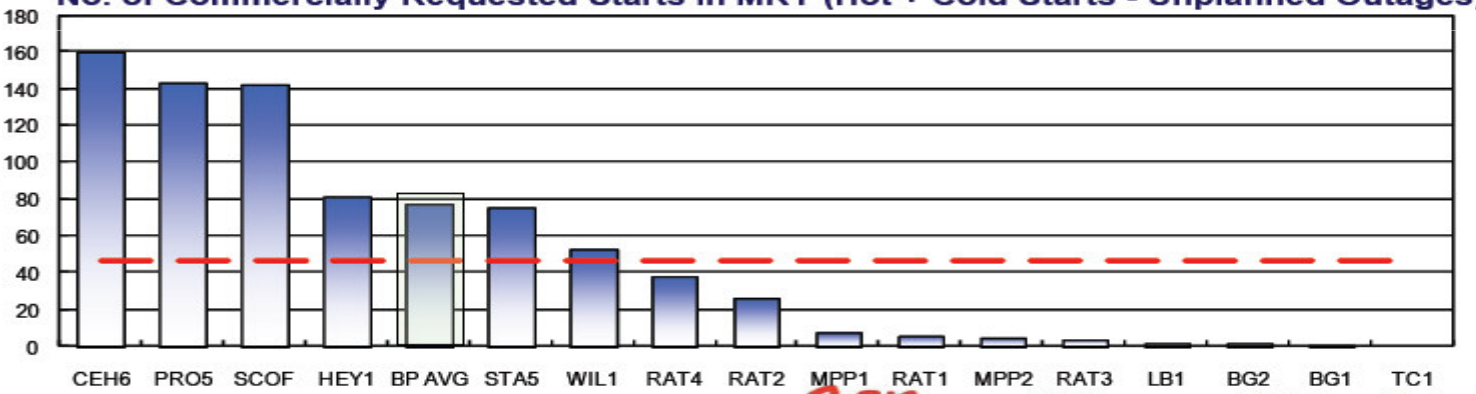
Flexibility Service Level Drivers

COLUMN CHART LEGEND
2007 Unit 2008 Unit
Coal Unit Average

Starts/Trip Ratio - MRY (Hot + Cold Starts / Unplanned Outages)



No. of Commercially Requested Starts in MRY (Hot + Cold Starts - Unplanned Outages)



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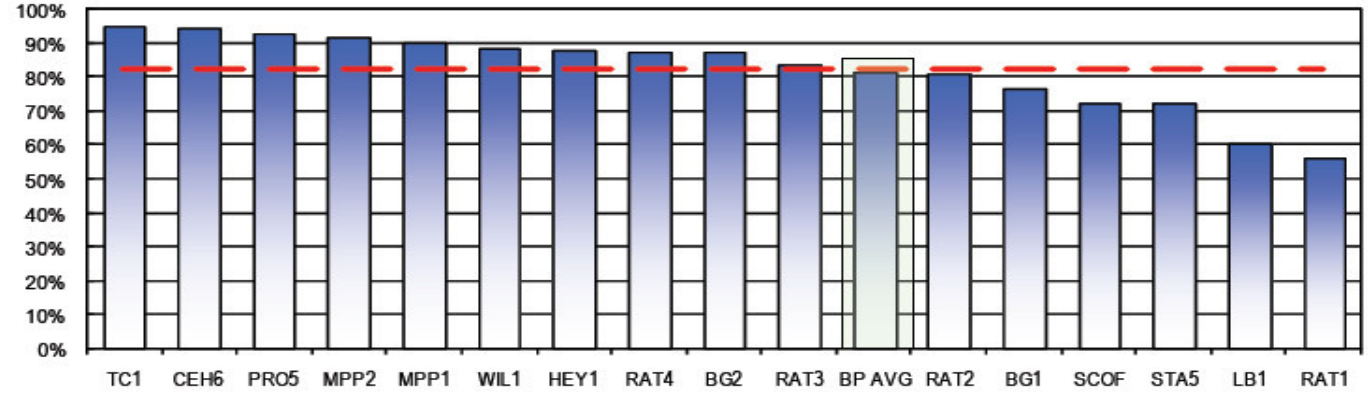
Analyse : Très bon ratio déclenchements/démarrages
Très bon niveau de démarrages sur demande marché

UNIT LEVEL CHARTS — COAL/LIGNITE UNITS 500+ MW

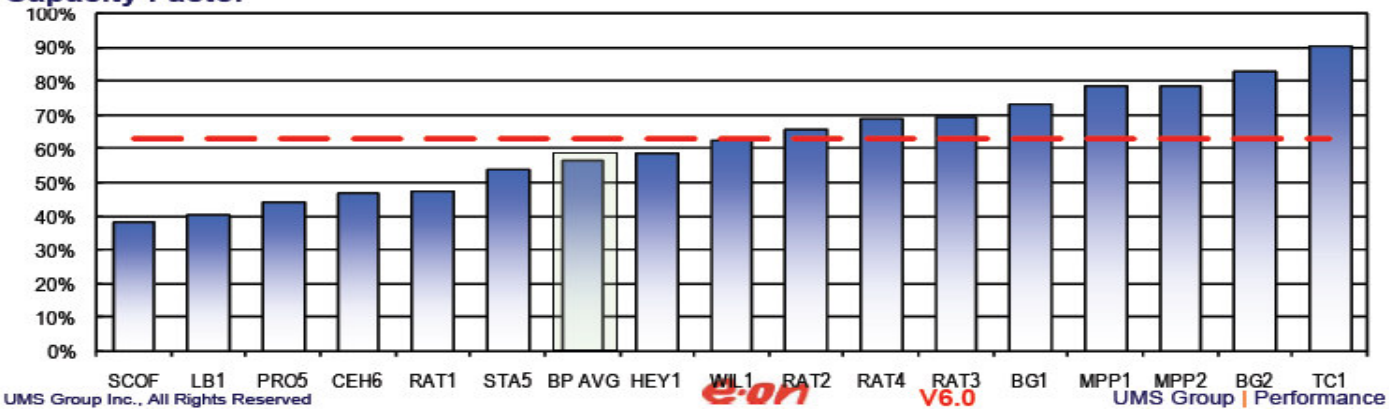
Flexibility Service Level Drivers

COLUMN CHART LEGEND
2007 Unit
2008 Unit
Coal Unit Average

Availability



Capacity Factor



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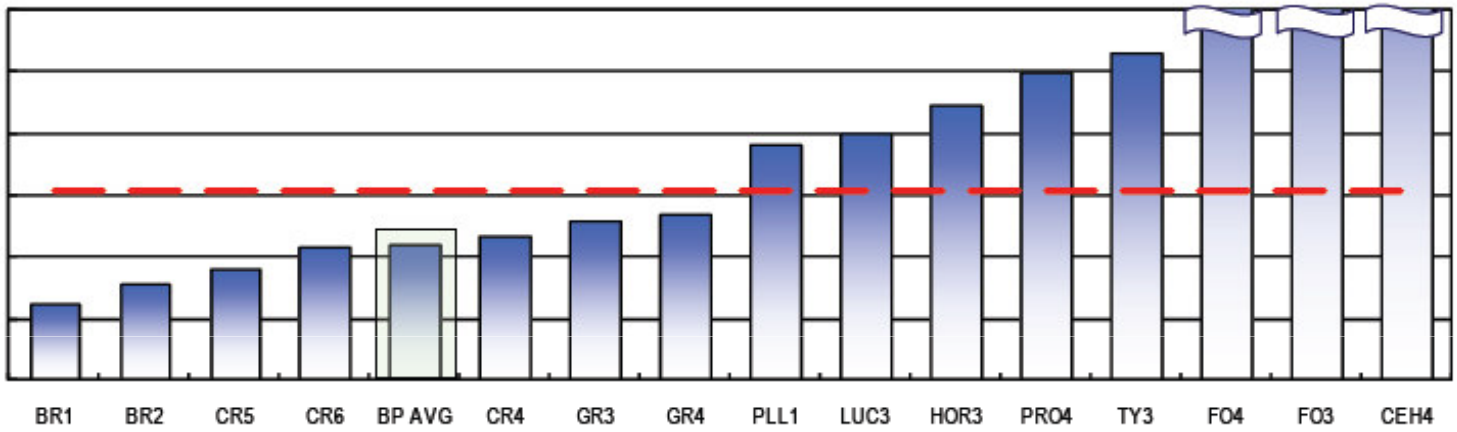
Analyse : Très bon niveau de disponibilité en 2008
Très faible facteur de charge

UNIT LEVEL CHARTS COAL/LIGNITE UNITS 0-299 MW

Flexibility Cost Level Drivers

COLUMN CHART LEGEND
2007 Unit 2008 Unit
Coal Unit Average

Total Adjusted Operations Costs per MWI



Indicates out of range

Analyse : Coût des opérations élevé

Conclusions :

- Les centrales SNET font apparaître des coûts dans la fourchette haute des tranches analysées :
  - Réunion prévue au CoC pour analyser le système de comparaison des coûts
- Les SLD : « Service Level Driver » / mesure de qualité sont souvent bons :
  - Indisponibilités fortuites bonnes (hors LFC et Hor 3)
  - Disponibilités bonnes (hors LFC et groupes avec RG car arrêts longs)
  - Vente de cendres avec recettes significatives
- La SNET présente également des points importants à améliorer :
  - Sécurité : LTIF, aujourd'hui TRIF
- Certains points sont à revoir :
  - Analyse des coûts de maintenance : attention à l'impact disponibilité
  - Analyse des coûts d'exploitation
  - Analyse des coûts de personnel