



PERFORMANCE INDICATORS & MONITORING

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INDOGERMAN ENERGY PROGRAM

PERFORMANCE INDICATORS

- **PLANT LOAD FACTOR**
- **SPECIFIC COAL CONSUMPTION**
- **SPECIFIC OIL CONSUMPTION**
- **AUXILIARY POWER CONSUMPTION**
- **OVERALL THERMAL EFFICIENCY**
- **D.M. WATER CONSUMPTION**
- **STATION HEAT RATE**

PERFORMANCE INDICATORS

- **FORCED OUTAGE/UNAVAILABILITY**
- **OPERATING AVAILABILITY**
- **PLANNED MAINTENANCE/PLANNED UNAVAILABILITY**
- **PARTIAL UNAVAILABILITY**
- **LOW LOAD**

PLANT LOAD FACTOR

PLF is the ratio of energy during a period to the product of installed capacity and the period

Private Sector Generating Stn. Units

SGS, Torrent Power	110 MW Unit-I	104.14 %
Budge Budge, CESC	250 MW Unit-II	103.05%

PLANT LOAD FACTOR

■ Central sector generating Stn. unit

❖ NTPC Dadri	210 MW Unit-II	101.80%
❖ NTPC Korba	500 MW Unit -IV	100.04%

■ State sector generating Stn. Unit

❖ (RRVUPNL	-195 MW Unit at Kota	100.15%
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National Level- 78.75% exist. Yr , 77.03% pre Yr.

PLANT LOAD FACTOR

- ✓ STRATEGY
- ❖ MANAGEMENT OF ALL RESOURCES
- ❖ TECHNICAL PLANNING
- ❖ AVAILABILITY OF EFFICIENT EQUIPMENTS & AUXILIARIES
- ❖ SKILLED & TRAINED MANPOWER

SPECIFIC COAL CONSUMPTION

Quantity of coal required to generate one unit of energy (kg/ kwh)

ALL INDIA-	0.731 kg/ kwh	(2007-08)
	0.715 kg/ kwh	(2006-07)
NORTHERN REGION	0.706 kg/ kwh	(2007-08)
EASTERN REGION	0.738 kg/ kwh	(2007-08)

STRATEGY-

- proper mixing of coal & air, proper pulveration of coal, clean heating surfaces in boiler
- improvement in combustion technology, low un- burnt, better waste recovery in air preheater & economizer, leakages from furnace, better maintenance practices.

SPECIFIC OIL CONSUMPTION

Quantity of oil required to generate one unit of energy (ml/kwh)

ALL INDIA 1.47ml/kwh (2007-08)



STRATEGY



start up & shut down time reduction



Avoiding low load boiler operation,



Avoiding frequent boiler light up

SPECIFIC OIL CONSUMPTION

- **Minimizing unit tripping**
- **Monitoring & check of Control & Instrumentation**
- **Better maint. practices.**

AUXILIARY POWER CONSUMPTION

APC IN INDIAN THERMAL POWER STATIONS	6 to 14%
AUXILIARY POWER CONSUMPTION	8.17% (2007-08)
	8.29% (2006-07)
❖ Pvt. Sector Trombay stn. of TATA Power	4.30% Lowest !!!
❖ Central Sector Station Talcher STPS	5.34% Lowest
❖ State Sector Station Chandrapur STPS	7.40% Lowest
❖ 500 MW Group out of diff. capacity group	6.13% Lowest

AUXILIARY POWER CONSUMPTION

✓ STRATEGY

- Variable frequency drive for PA Fans & ID Fans & CEPs
- Air in-leaks in draft system (O₂ measurement) blanketing
- Replacement of inefficient BFPs as a part of R& M of the old plants.
- Clipping of one stage from the multi stage BFPs to balance the pressure drop requirements between HP heaters, economiser and boiler drum etc.
- Use of higher pressure in the deareator to commensurately reduce BFP power consumption (reduced head developed)
- Running of two CEPs instead of 3 CEPs (3 CEPs are run to avoid tripping due to lower frequency in some of the power plants)
- Application of variable speed drivers
- Installation of hydraulic turbine instead of feed regulating section to avoid pressure drops and to generate additional power

AUXILIARY POWER CONSUMPTION

- **operating only 4 mills instead of 5 mills in 210 MW units and modification/retrofitting of the existing XRP type of mills.**
- **blade angle reduction, shutting of CTs' cells in conjunction with favorable weather conditions and replacing existing aluminum cast and GRP blades with FRP**
- **Depending on the needed quantum of cooling water flow, the weather condition, condenser cleanliness and as fore bay level variation, it is possible to reduce CW pump energy consumption by incorporating two speed motors**
- **avoiding idle running of conveyors & crushers**
- **incorporating soft starter - energy savers etc.**

D.M.WATER CONSUMPTION

DM WATER CONSUMPTION-3% TO 12% OF TOTAL WATER

- ✓ **STRATEGY**
- ❖ **ATTENDING LEAKAGES OF WATER & STEAM**
- ❖ **CBD KEPT MINIMUM AS PER REQUIREMENT**
- ❖ **CBD PASSING VALVE ATTENDED PROMPTLY.**

D.M. WATER CONSUMPTION

- ❖ **CONTROLLING SILICA CONTENT**
- ❖ **SHIFT-WISE MONITORING OF DM WATER CONSUMPTION**
- ❖ **1% SAVING POTENTIAL IN MAKE UP WATER CONSUMPTION**

STATION HEAT RATE

- ❖ **unit heat rate is ratio of turbine heat rate (kcal/kwh) to boiler efficiency**
- ❖ **design station heat rate is ratio of sum of unit heat rates to sum of unit capacities.**
- ❖ **operating station heat rate is the sum of product of specific coal consumption (kg/kwh), g.c.v. of coal (kcal/kg)& product of specific oil consumption (ml/kwh), g.c.v. of oil (kcal/ litre)**

STATION HEAT RATE

HEAT RATE DEVIATION(%) IS THE RATIO OF DIFFERENCE BETWEEN OPERATING HEAT RATE & DESIGN HEAT RATE TO DESIGN HEAT RATE

Yr.	Stns. nos.	Cap. MW	Wtd .average Design SHR Kcal /kwh	Wtd.aver. Opg.SHR Kcal /kwh	% Operating SHR Dev.w.rt Design SHR
2006-07	56	38611	2398	2861	19.31%
2007-08	53	37830	2379	2706	13.73%

IMPROVEMENT

5.34% IN OSHR

STATION HEAT RATE

NORTHERN REGION

2603.2 KCAL/KWH LOWEST !!!

Good performing stations in the country

Anpara	0.49% OSHR deviation
Rayalseema	2.57% OSHR deviation
Vijay Wada	2.59% OSHR deviation
Ib Valley	3.35% OSHR deviation
North Chennai	4.21% OSHR deviation
Bakreshwar	4.345% OSHR deviation

STATION HEAT RATE

STRATEGY

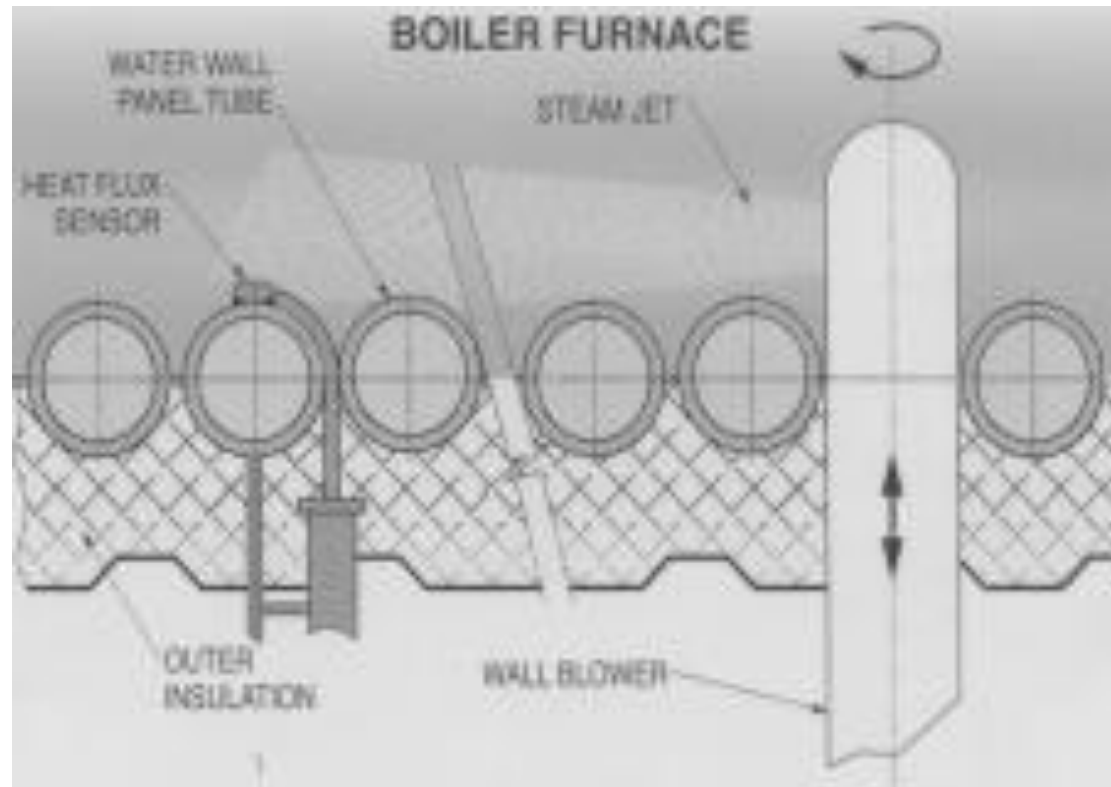
- **REPAIR OF DAMAGED INSULATION**
(un- insulated steam pipe of 150 mm dia 100m length, carrying saturated steam at 8 kg/cm² waste 25000 liters furnace oil in a year)

STATION HEAT RATE

- **STEAM LEAKS & CONDENSATE LEAKS ATTENDING(A 3 MM DIA HOLE IN PIPE CARRYING 7 KG/CM2 STEAM WASTE 30KL OF FUEL OIL PER YEAR)**
- ❖ **REDUCTION OF SCALE FORMATION IN WATER TUBES OF BOILER**
- ❖ **REDUCING CONDENSER HEAT LOSS**
- ❖ **CONDENSER PERFORMANCE IMPROVEMENT**
 - ❖ **REGULAR & EFFECTIVE TUBE CLEANING**
 - ❖ **ON- LINE ASSESSMENT OF AIR INGRESS**
 - ❖ **PERFORMANCE OF COOLING TOWER**

STATION HEAT RATE

❖ WALL BLOWING SYSTEM OPTIMISATION SYSTEM



STATION HEAT RATE

- Each blower operates once / twice or thrice in a day depending on the heat flux value.
- value compulsorily in the third cycle, irrespective of their heat flux Blowers, which are not operated in the first two cycles, are Operated.
- Each blower operates at least once in a day and avoids permanent adherence of the deposits on water wall surface

BENEFITS

SH/ RH Spray reduction,
Steam consumption reduction

STATION HEAT RATE

- **IMPROVEMENT IN HR TEMP**
 - **BOILER FLUE GAS EXIT TEMP REDUCTION**
 - **SLAG FORMATION REDUCTION IN BOILER**
 - Coal in use having less ash fusion temperature(1170-1230 degree cent.) than design value (say 1400 degree cent.)
slagging index higher so lower heat absorption in SH divisional panels mainly.
- chemical injection on fire side- **heat absorption increased**

FORCED OUTAGE/ UNAVAILABILITY

Ratio of sum of product of each MW capacity & duration of each outage to the product of total MW capacity & total hours of outage

**ALL INDIA F.O.LOSS 7.71% OF MAX. POSSIBLE GENERATION
(2007-08)**

**ALL INDIA F.O.LOSS 8.14% OF MAX. POSSIBLE GENERATION
(2006-07)**

TOTAL FORCED OUTAGES 6426

BOILER PROBLEMS 3145 / 6426 F.O.(48.94%)

FORCED OUTAGE/ UNAVAILABILITY

- ❑ **SHORT DURATION F.O.(UPTO 3 HRS) 1898/ 6426**
- ❑ **LONG DURATION F.O.(OVER 25 DAYS) 18657/ 6426**
- ❑ **LOSS OF GENERATION LONG DURATION F.O 18657MU(2007-08)**
- ❑ **LOSS OF GENERATION LONG DURATION F.O 19768MU(2006-07)**

PLANNED MAINT./PLANNED UNAVAILABILITY

RATIO OF SUM OF THE PRODUCT OF MW CAPACITY OF EACH UNIT & DURATION OF SHUTDOWN TO THE PRODUCT OF TOTAL MW CAPACITY & TOTAL DURATION.

OVERALL AVG. BOILER O/H	23 DAYS
AVG. BOILER O/H IN STATE SECTOR	21 DAYS
OVERALL AVG. TURBINE O/H	54 DAYS

OPERATING AVAILABILITY

- ❖ **O.A. (%) = 100-F.O%.-P.M.%**
- **OPERATING AVAILABILITY 89.3% May, 2007**
- **OPERATING AVAILABILITY 84.76% (2007-08)**
- **OPERATING AVAILABILITY 83.72% (2006-07)**

OPERATING AVAILABILITY

SECTOR	OPERATING AVAILABILITY(%)
CENTRAL	88.34
STATE	81.41
PRIVATE	94.63

OPERATING AVAILABILITY

MAKE

OPERATING AVAILABILITY(%)

BHEL/BHEL

86.06

BHEL/ ABL

70.50

RUSSIA/RUSSIA

76.68

OTHERS

85.70

PARTIAL UNAVAILABILITY

**RATIO OF SUM OF PRODUCTS OF REDUCTION
IN OUTPUTS OF OPERATING UNITS DUE TO
CONSTRAINTS TO THE PRODUCT OF TOTAL MW
REDUCTION & OPERATION OF UNITS AT
REDUCED LOAD.**

$$\text{PU(\%)} = \text{OA(\%)} - \text{PLF(\%)}$$

ALL INDIA LOSS OF GENERATION

6.54% (2007-08)

6.88% (2006-07)

PARTIAL UNAVAILABILITY

- ENERGY LOSS DUE TO MAIN EQUIP. P.U. 2.16%
- ENERGY LOSS DUE TO AUXILIARIES. P.U 1.05%
- UNAVAILABILITY DUE TO LOW SYSTEM DEMAND 0.24%

PARTIAL UNAVAILABILITY

STRATEGY MUST HAVE BEEN TO ATTEND

- **pressure parts leakages/drum pressure restriction in boiler**
- **milling system in boiler auxiliaries**
- **start up/shut down of turbine**
- **regenerative system in turbine auxiliaries**
- **hydrogen pressure/ purity in generator**
- **grid system**
- **poor quality/ wet coal**
- **low system demand**

LOW LOAD

- **LESS GENERATION DUE TO SYSTEM LOAD VARIATION(LOW SYSTEM DEMAND)**
- **NON-UTILISATION OF AVAILABLE UNITS DUE TO THEIR COMPLETE SHUT DOWN FOR WANT OF LOAD (RESERVE SHUT DOWN)**

PERFORMANCE IMPROVEMENT & MONITORING OF TPS

- **Reducing dry flue gas loss**
- **Optimized soot blowing & LRSB Operation**
- **Replacement of AH Baskets, seals & sector plates**
- **Minimization of tempering air**
- **Excess air optimization**
- **Reduction in air ingress**
- **Cleaning of boiler surface & AH baskets during overhaul**
- **RH Spray reduction**

PERFORMANCE IMPROVEMENT & MONITORING OF TPS

➤ Turbine back pressure improvement

Condenser air tightness

CW Inlet temp. 16.5 degree centigrade optimum

Condenser tube fouling

CW Flow in condenser

TTD 5.5 degree centigrade optimum

Back pressure fall by 100 mm (Hg)-extra fuel
worth Rs. 6000,000/- per annum

■ Heat losses through steam

Cycle efficiency reduced by 1% with fall of inlet
steam temp @ 400 deg cent. Press @ 25 kg/ cm²

PERFORMANCE IMPROVEMENT & MONITORING OF TPS

1% main steam loss = 1.15% heat loss

1% Soot blowing = 0.8% heat loss

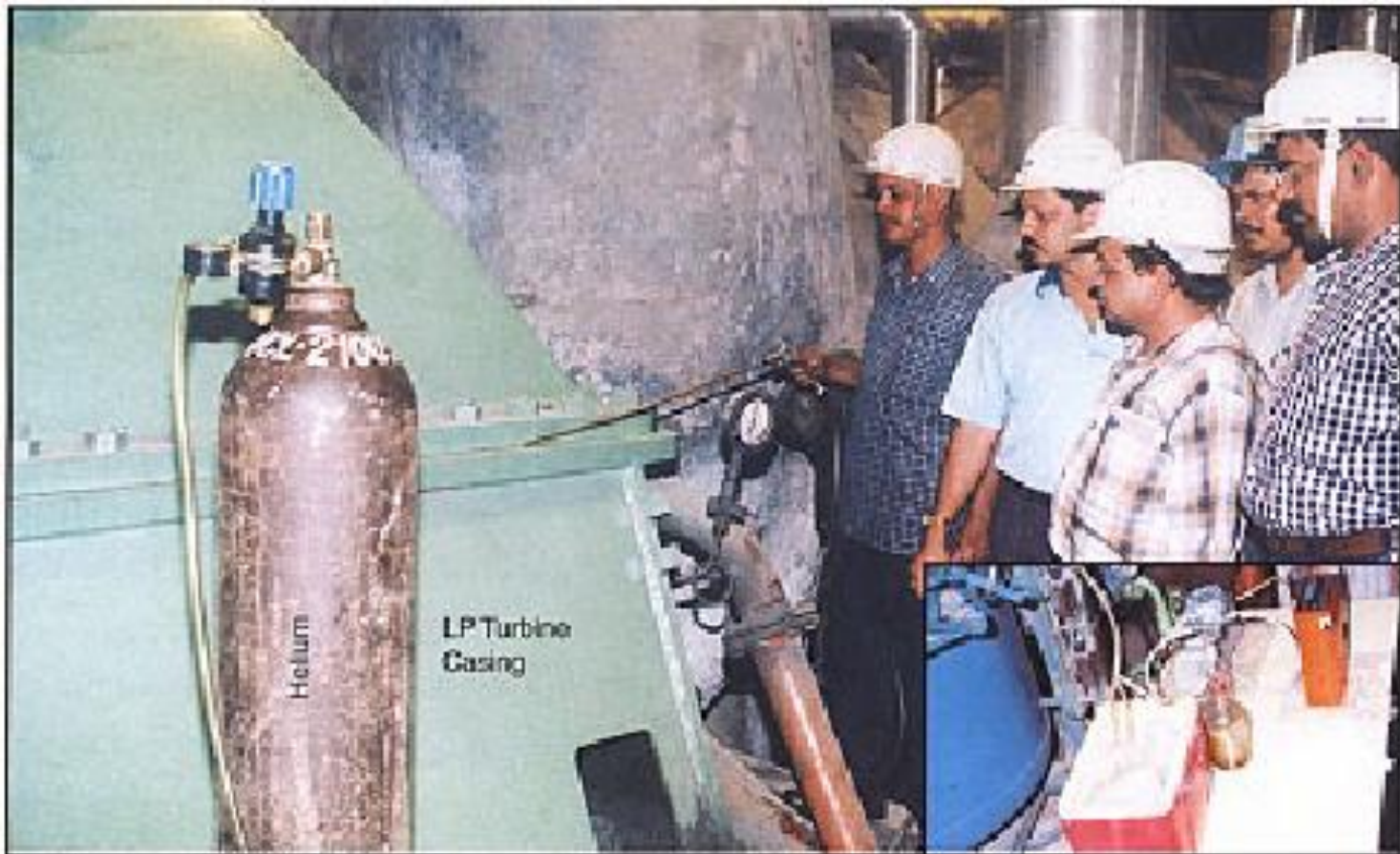
- **Heat loss through water**

1% condensate loss = 0.1% heat loss

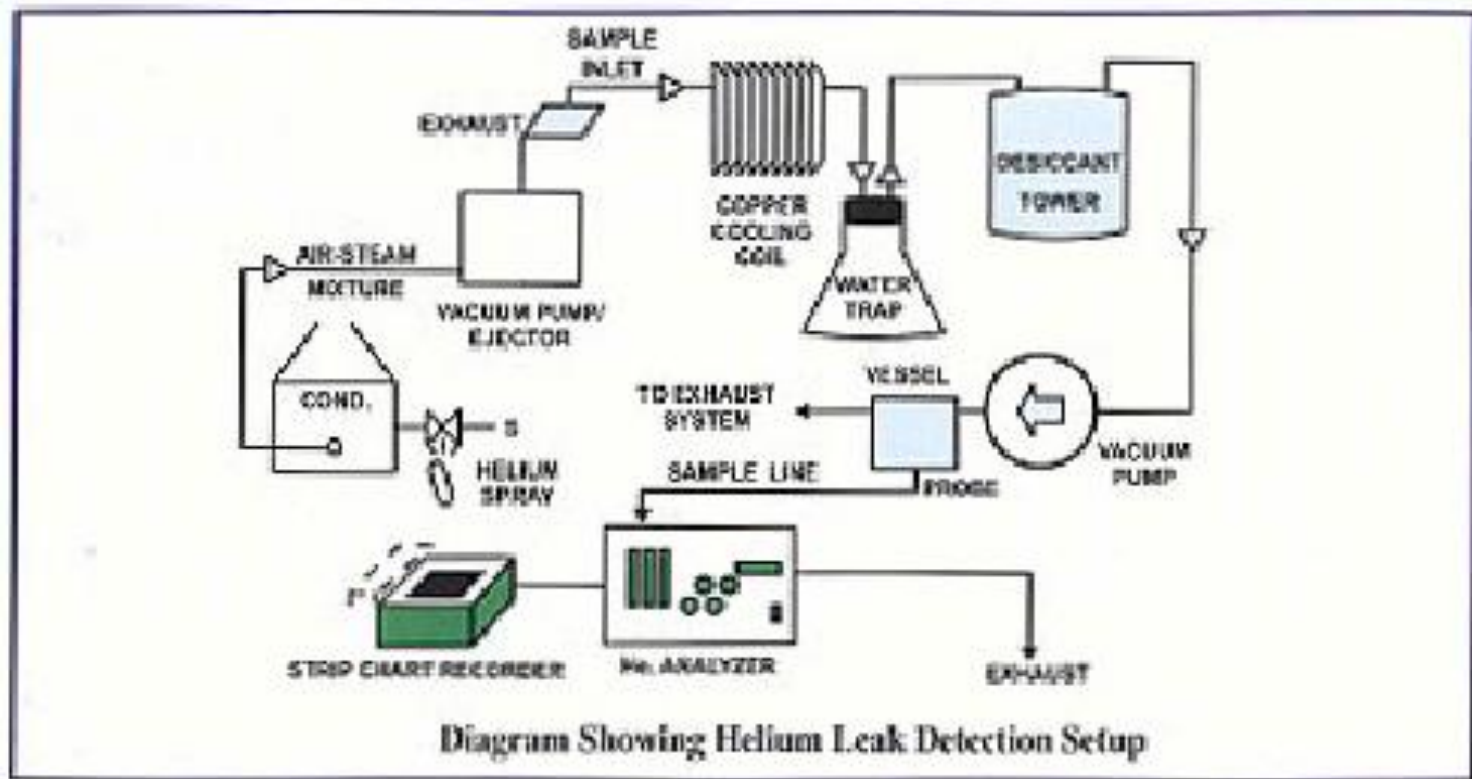
1% feed water loss after final heater = 0.4% heat loss

1% blow down = 0.25-0.5% heat loss

A Case Study - Air - in - Leak test by “Helium Leak Detector” (200 MW Unit)



A Case Study - Air - in - Leak test by “Helium Leak Detector”



A Case Study - Air - in - Leak test by “Helium Leak Detector”

PARA	UNIT	DESIGN DATA	CORR.OPGDATA		IMPROVEMENT
			bef.	After rect.	
Cond.Vacc.	mm Hg	694	667.3	676.7	9.40
Change in Vacc due to Air/dirty tubes	mm Hg	-	22.30	15.10	7.20
Change in vacc Due to CW Flow	mm Hg	-	4.40	2.20	2.20
Air vapor depres.	Deg.Cent.	4.5	6.47	3.56	2.91

A Case Study - Air - in - Leak test by “Helium Leak Detector”

- The improvement in Heat Rate 16.0 Kcal/ Kwh
by attending air in leak points
- Fuel saving 6400 tonnes / year
- CO2 Saving 8000 tonnes/ year
- Money saving R s. 50 lakhs / year
- Expenditure R s. 30,000 approx for test



GENERAL OVERVIEW POWER PLANT INFORMATION SYSTEM


BASICS AND PURPOSE



- **BASICS**

DEFINITIONS FOR PERFORMANCE INDICATORS LIKE FORCED OUTAGE RATE

- **PURPOSE**

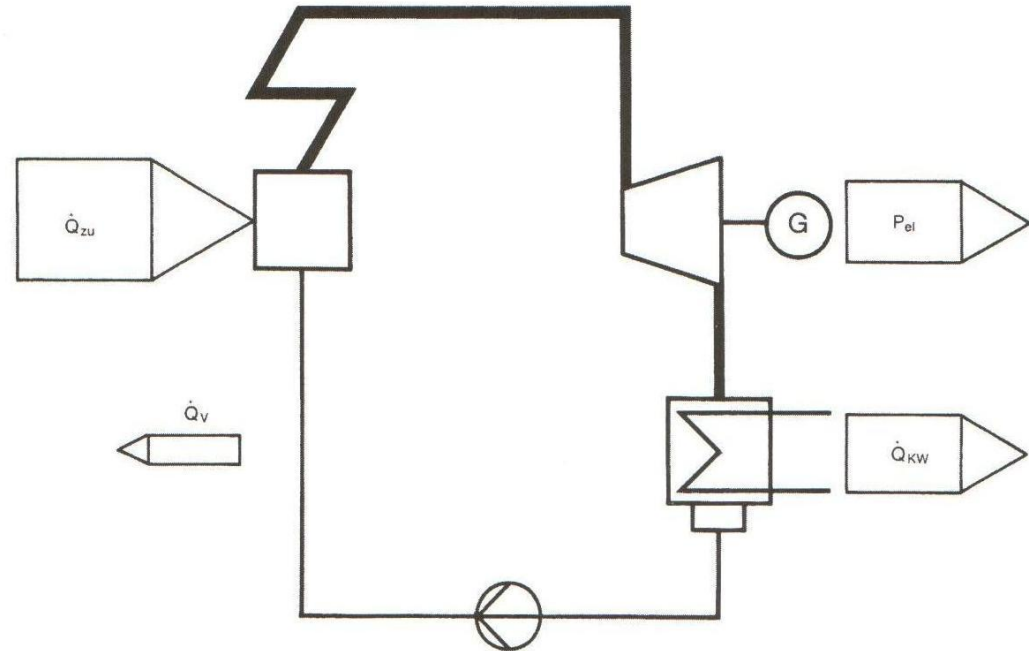


PROVIDING A SYSTEM ENABLING TO A TOOL FOR ANALYSING THE PERFORMANCE FOR DEVELOPING A BETTER OPERATION REGIME

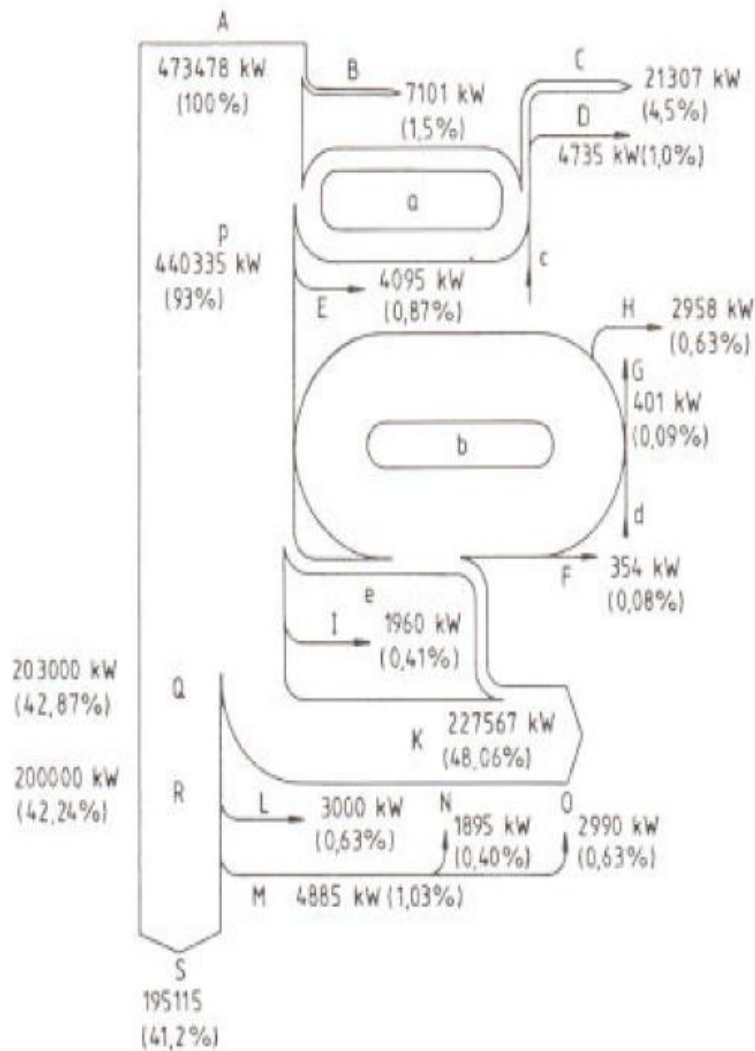
LOSSES IN ENERGY CONVERSION

- AVOIDABLE LOSSES, INFLUENCED BY TECHNICAL DEVICES
- NON AVOIDABLE LOSSES, NOT INFLUENCED BY TECHNICAL DEVICES

- \dot{Q}_{zu} - heat efficiency fed with fuel in KJ/s
- P_{el} - usable net electrical output in KW
- \dot{Q}_{KW} - heat efficiency in KJ/s removed with cooling water
- \dot{Q}_v - other losses in KJ/s

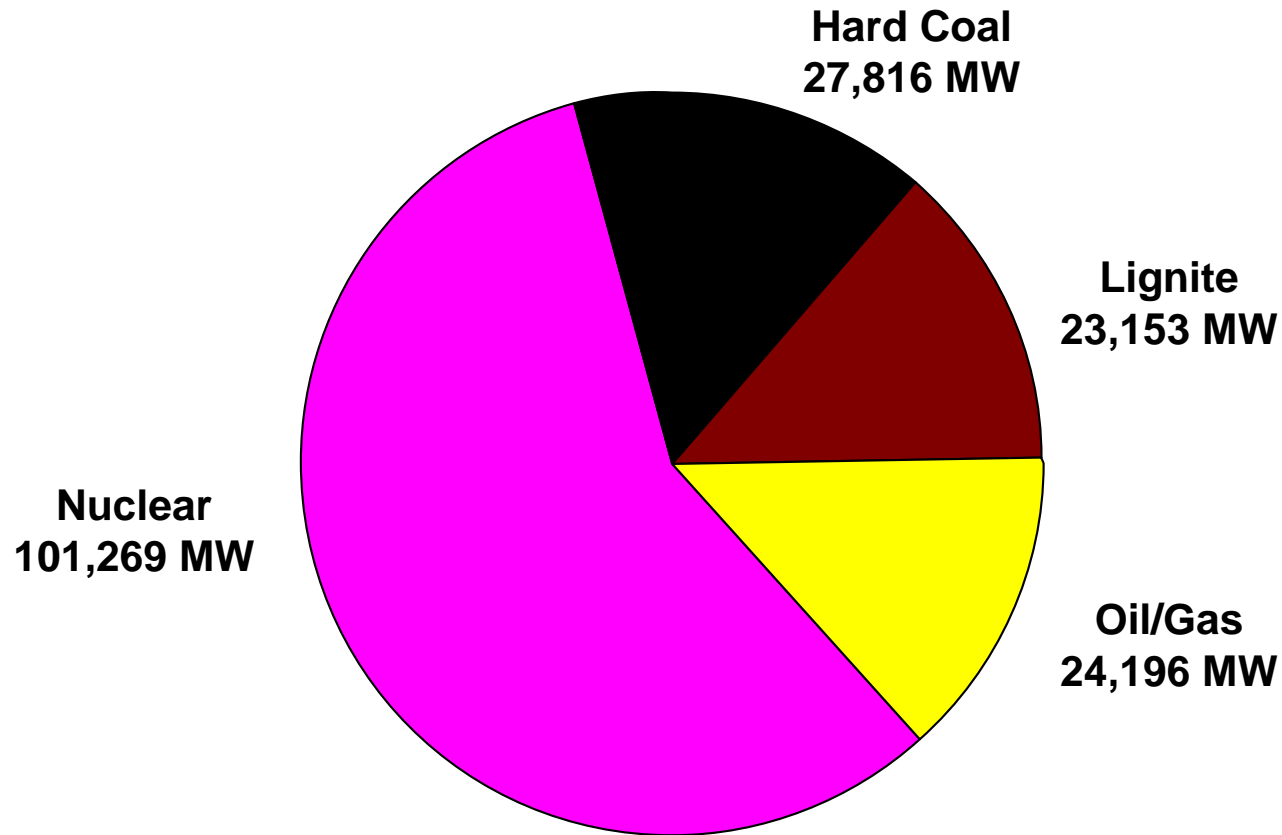


SANKEY DIAGRAM OF INDIVIDUAL LOSSES



- | |
|--|
| a) Flue gas - air preheating |
| b) Feed water preheating |
| c) Fresh air |
| d) Make-up water |
| e) Feed pump turbo set |
| A) Fuel energy input |
| B) Losses due to radiation and unburnt material |
| C) Exhaust gas loss |
| D) Ash losses |
| E) Pipe losses |
| F) Loss of the feed pump turbo set |
| G) Heat loss of the preheating installation |
| H) Circulation losses (water and steam) |
| I) Turbine losses |
| K) Thermodynamic cycle (water & steam) |
| L) Losses of generator |
| M) Auxiliary consumption, overall |
| N) Auxiliary consumption of the turbine installation |
| O) Auxiliary consumption of the steam generators |
| P) Steam generator output |
| Q) Turbine output |
| R) Generator output |
| S) Effective useful output |

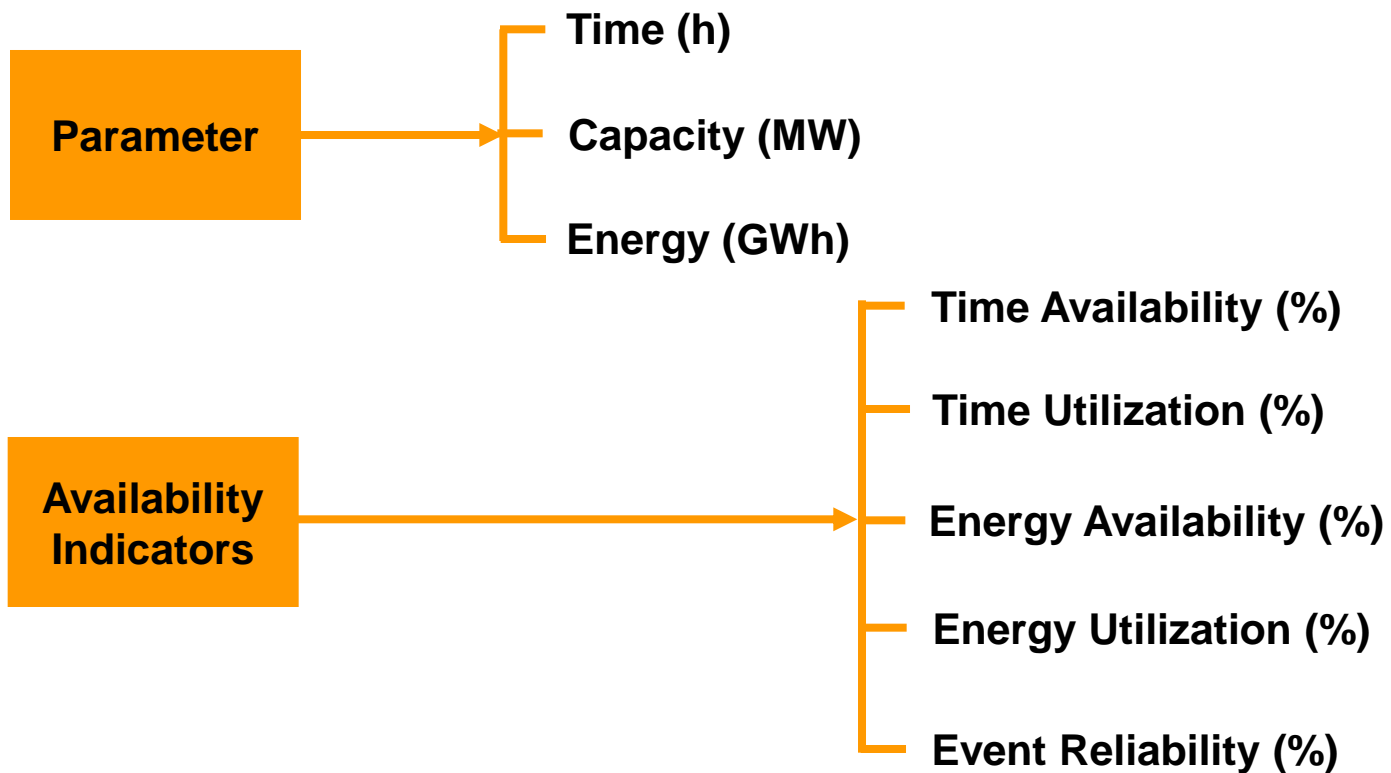
Analyzed Capacity Availability of Thermal Power Plants 1997-2006



**Total Capacity (gross)
176,434 MW**

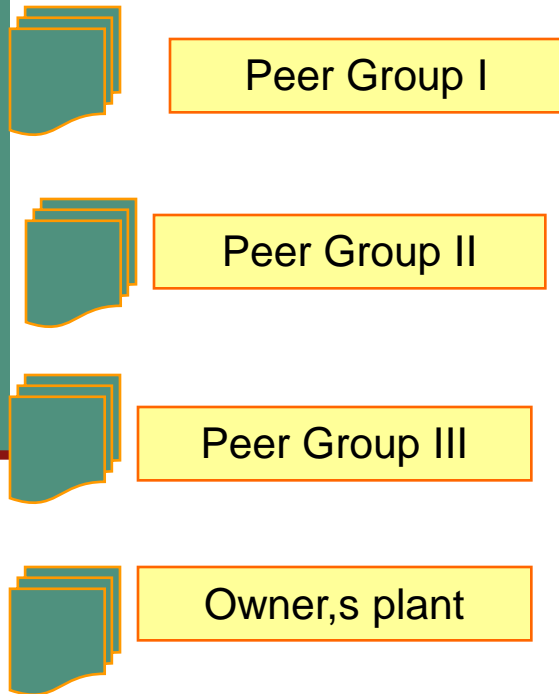
Availability of Thermal Power Plants

Parameter / Characterization

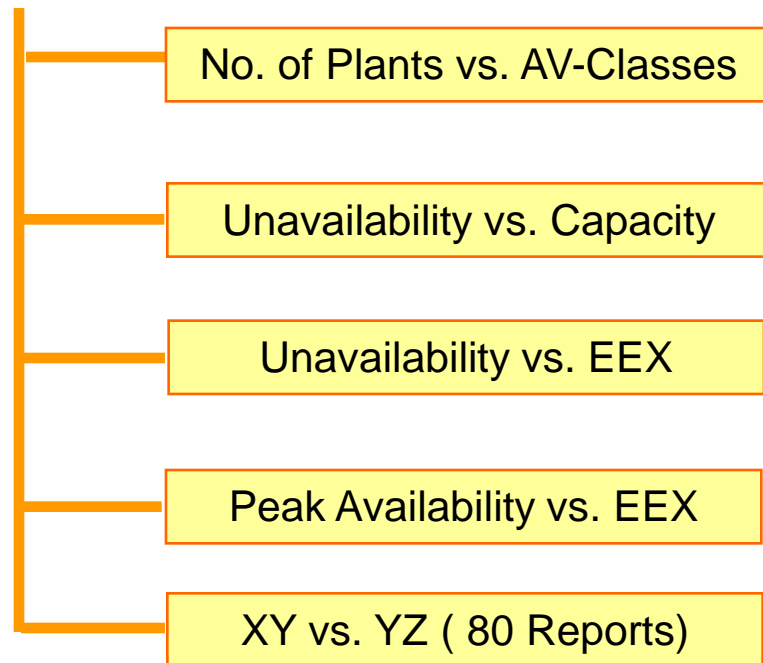


Online Evaluation via Internet (Under Construction)

Process of Data Selection (Definition of Collective)



Process of Layout Selection (at the time: about 80 layouts under discussion)



Definition of Time Periode

New defined Performance Indicators (under Discussion)

CO₂ – Indicator

(CO₂ - Kennwert)

CHP – Indicator

(KWK - Kennwert)

Scheduled Compliance

(Fahrplanteue)

Scheduled capacity

(Fahrplanleistung)

Load dispatcher outage rate

(Lastverteilerausfallrate)

Load dispatcher reliability

(Lastverteilerverlässlichkeit)

Energy Availability during peak time

(Arbeitsverfügbarkeit in
Peak-Zeiten)

Energy Reliability

(Arbeitsverlässlichkeit)

Time Availability during Peak Time

(Zeitverfügbarkeit in
Peak-Zeiten)

Time Reliability

(Zeitverlässlichkeit)

Commercial Reliability of Supply

(Kommerzielle Versorgungs-
zuverlässigkeit)

Power Plant Information System

Typical outcome of anonymous evaluation

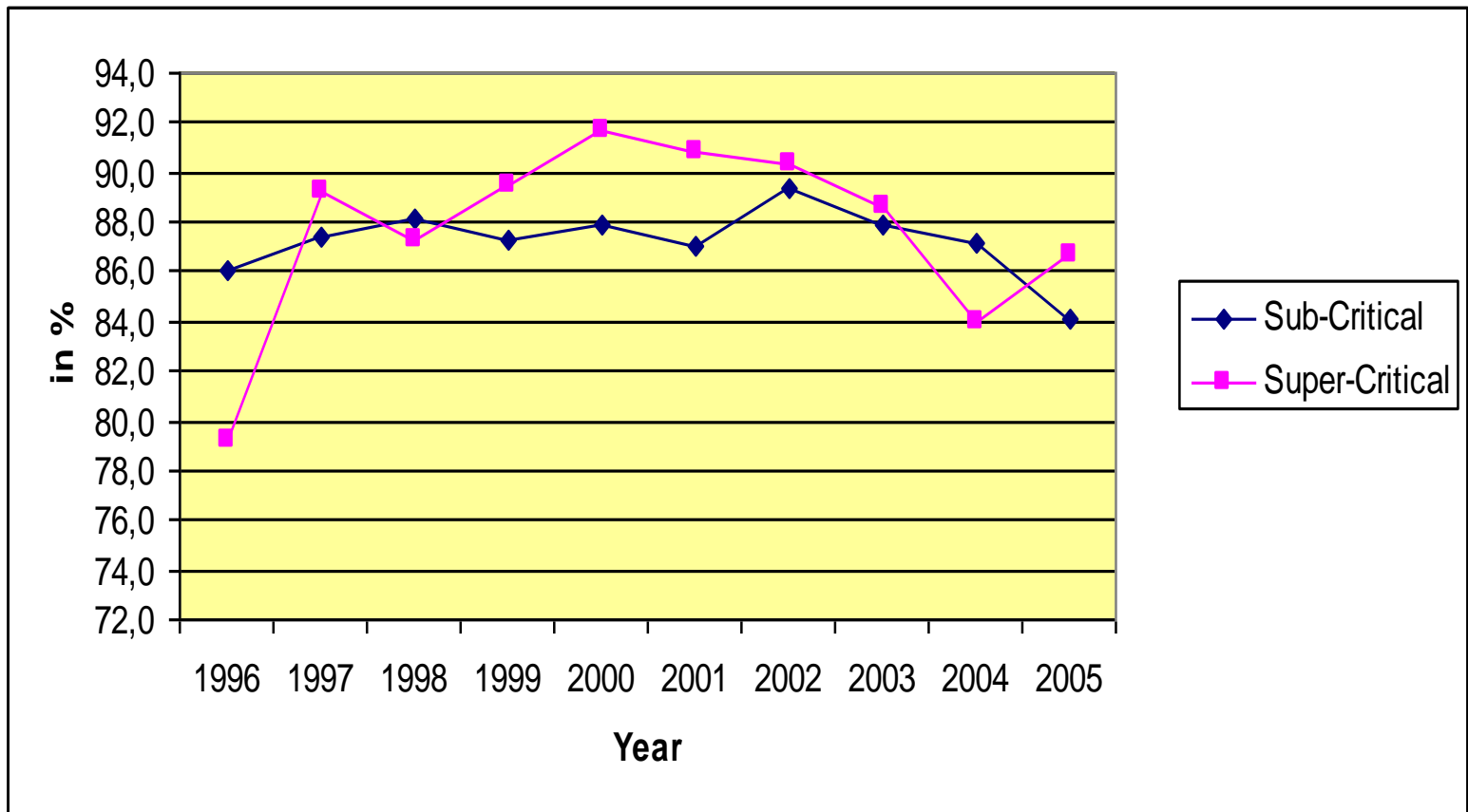
Fossil fired Units, total 1997-2005

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	96-05
Number/Unit Years	196	182	101	135	137	135	127	124	123	120	1.380
Capacity MW	51840	51107	34437	43408	45650	46787	44410	44841	44786	43643	450908
Time Availability %	84,9	87,4	88,6	88,2	89,1	90,3	90,8	90,2	88,0	85,7	88,1
Time Utilization %	59,7	58,8	63,1	59,9	61,0	63,5	66,0	69,7	68,1	67,0	63,2
Energy Availability %	84,8	86,9	88,1	87,7	88,7	88,0	89,6	88,3	86,6	85,0	87,3
Energy Unavailability %	15,2	13,1	11,9	12,3	11,3	12,0	10,4	11,7	13,4	15,0	12,7
Planned Part %	9,9	9,3	8,0	7,1	6,4	5,7	5,6	4,9	6,9	8,3	7,3
Unplanned Part %	5,3	3,8	3,9	5,1	4,9	6,3	4,8	6,8	6,5	6,7	5,4
postponable %	1,7	0,8	0,6	1,5	1,2	2,1	1,1	1,1	1,4	1,2	1,3
not postponable %	3,7	2,9	3,2	3,6	3,7	4,2	3,7	5,7	5,1	5,5	4,1
Energy Utilization %	52,5	51,1	57,7	53,3	55,7	57,6	59,4	63,5	62,4	61,7	57,3

Power Plant Information System

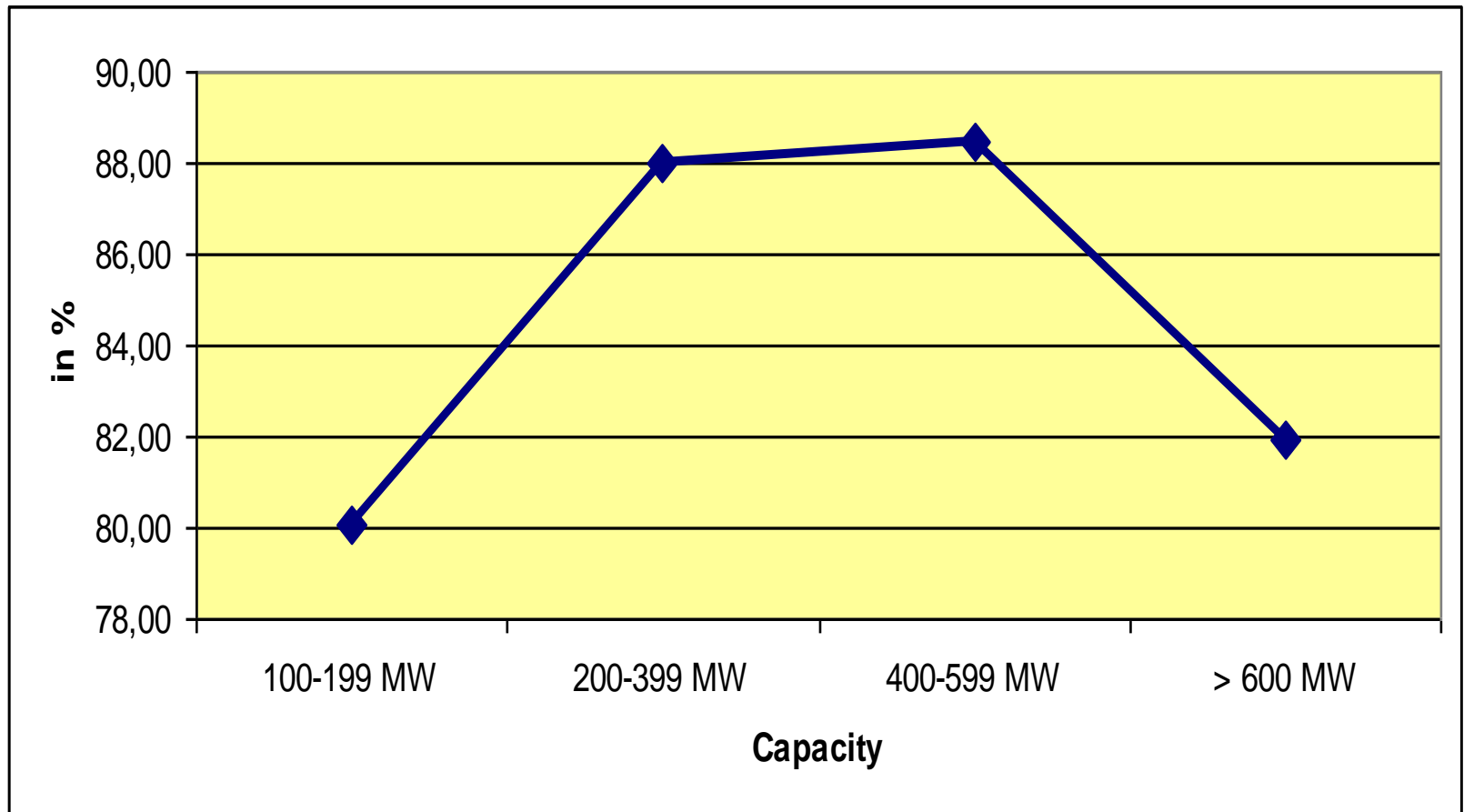
Energy Availability Sub- and Super-Critical fossil fired Plants

Fossil fired Power Plants 1996-2005



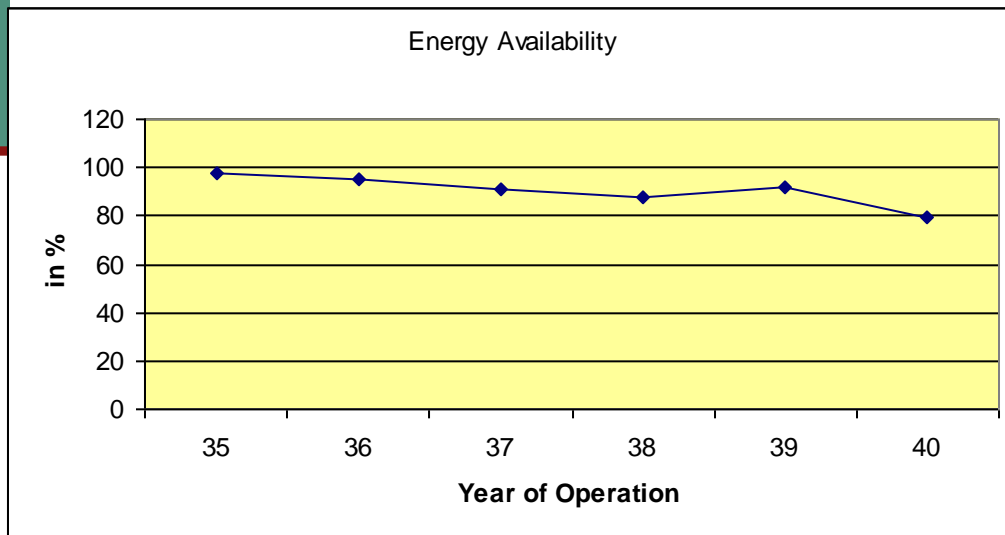
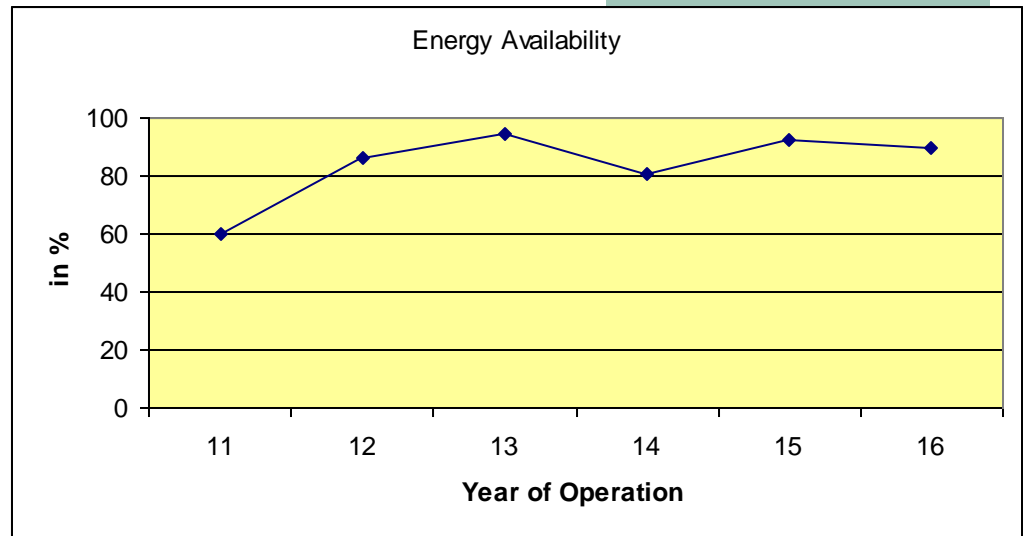
POWER PLANT INFORMATION SYSTEM

Energy Availability versus Capacity Fossil fired Power Plants 1996-2005



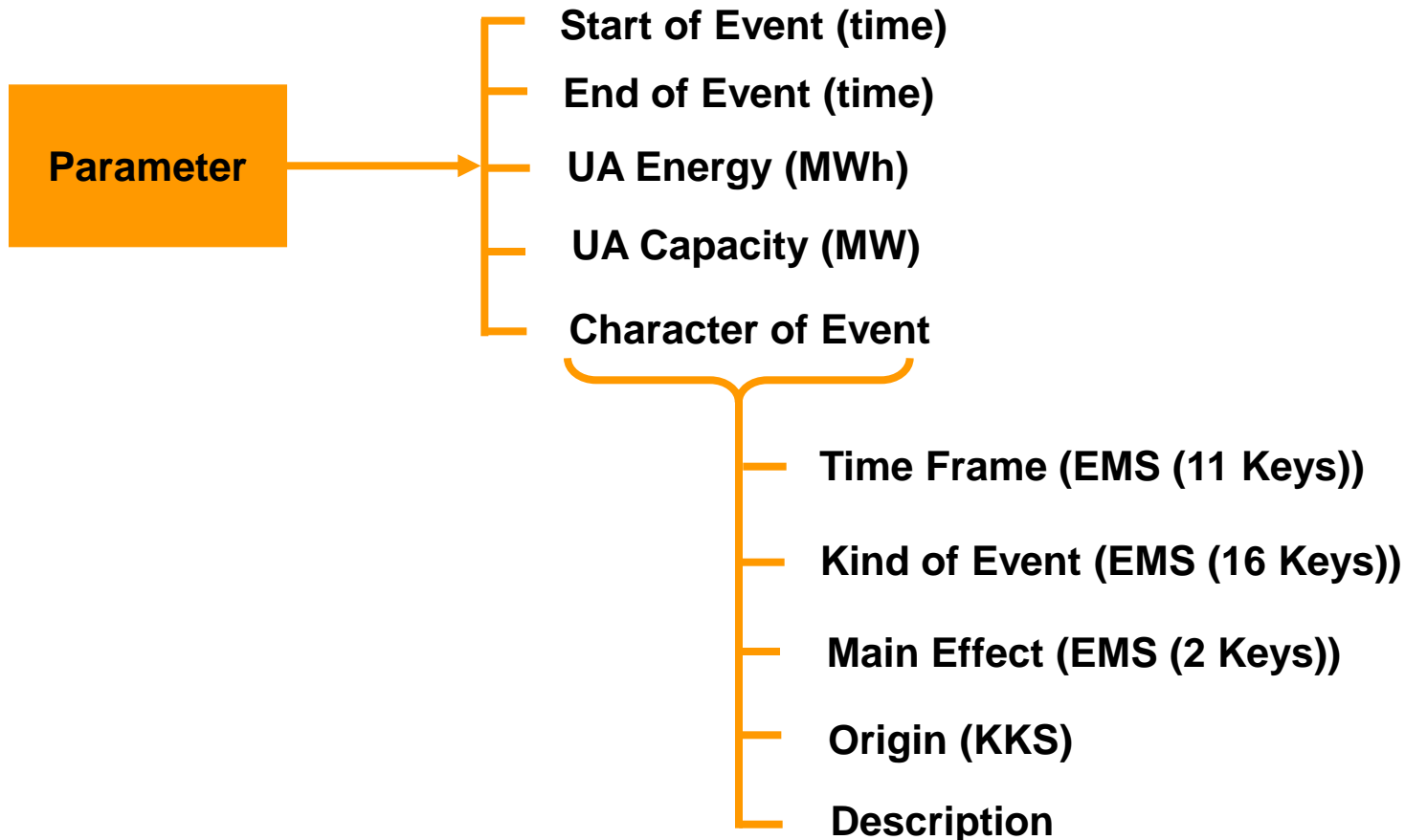
POWER PLANT INFORMATION SYSTEM

Energy Availability versus Age Hard Coal fired Power Plants

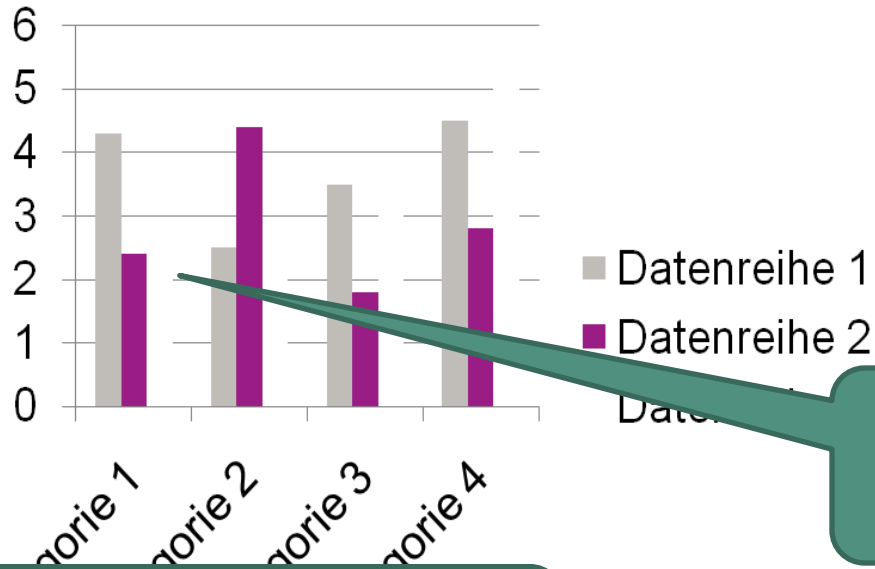


POWER PLANT INFORMATION SYSTEM

Unavailability of Thermal Power Plants Parameter / Characterization



Examples for PPIS Application



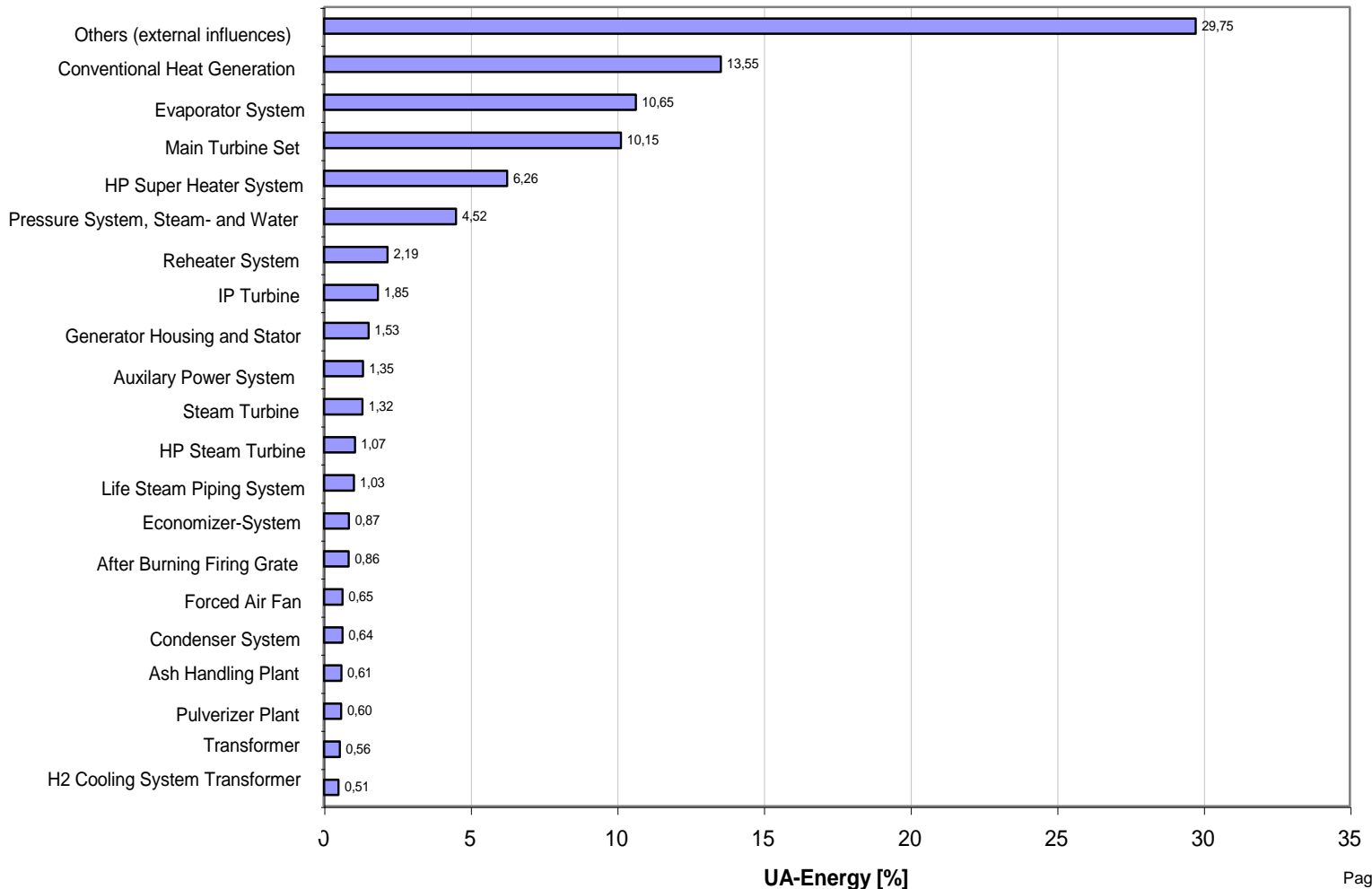
e.g. forced Outage

**Powerful Tool
for strategic Decisions**

POWER PLANT INFORMATION SYSTEM

Typical Outcome of anonymous Evaluation

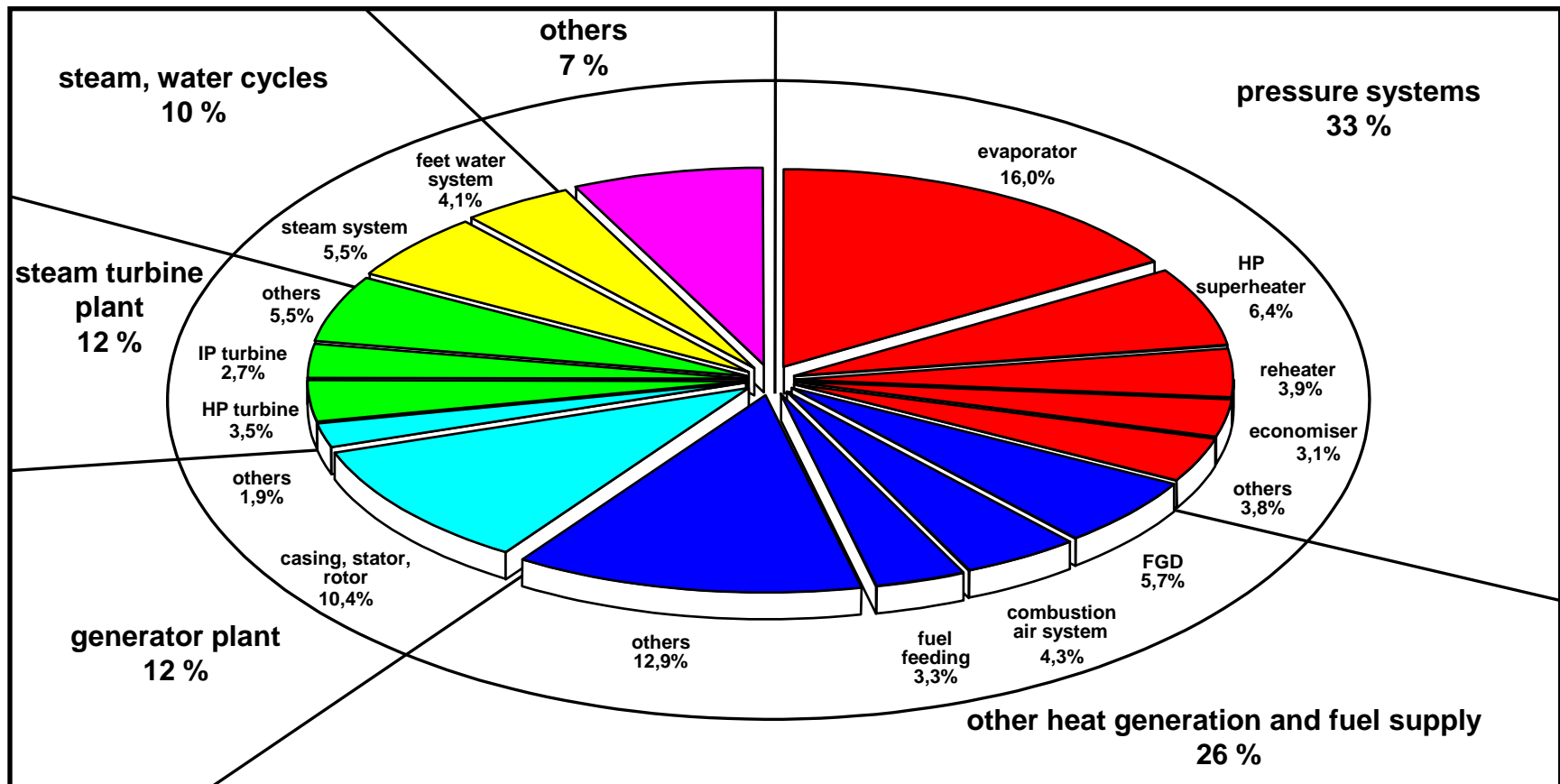
Announced Unplanned Events of Fossil Fired Power Plants > 0,5 % of Total UA-Energy



POWER PLANT INFORMATION SYSTEM

Analysis of Origin

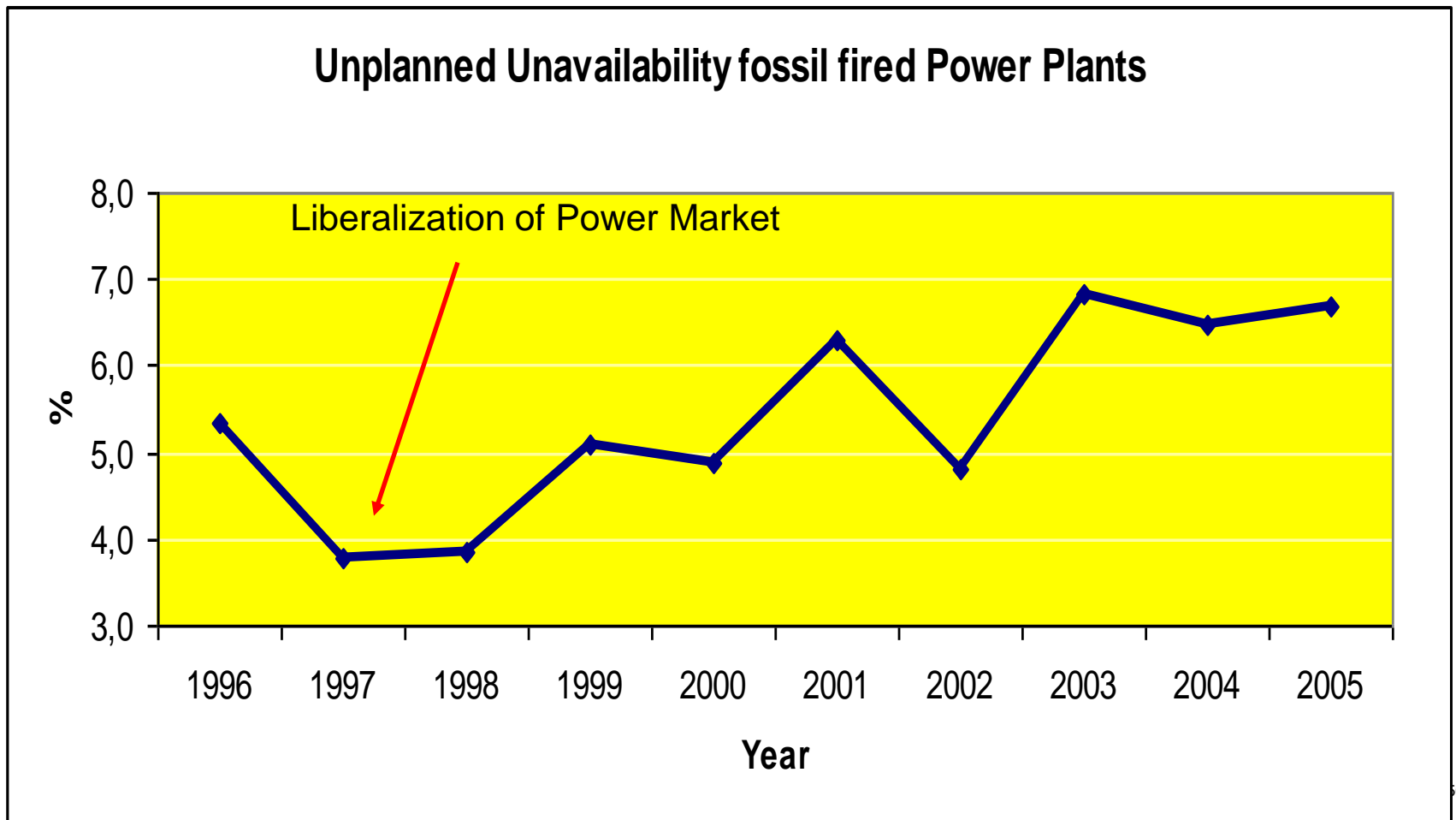
Unavailability of Thermal Power Plants (Example)



POWER PLANT INFORMATION SYSTEM

Typical Outcome of anonymous Evaluation

Fossil fired Units, total 1997-2006

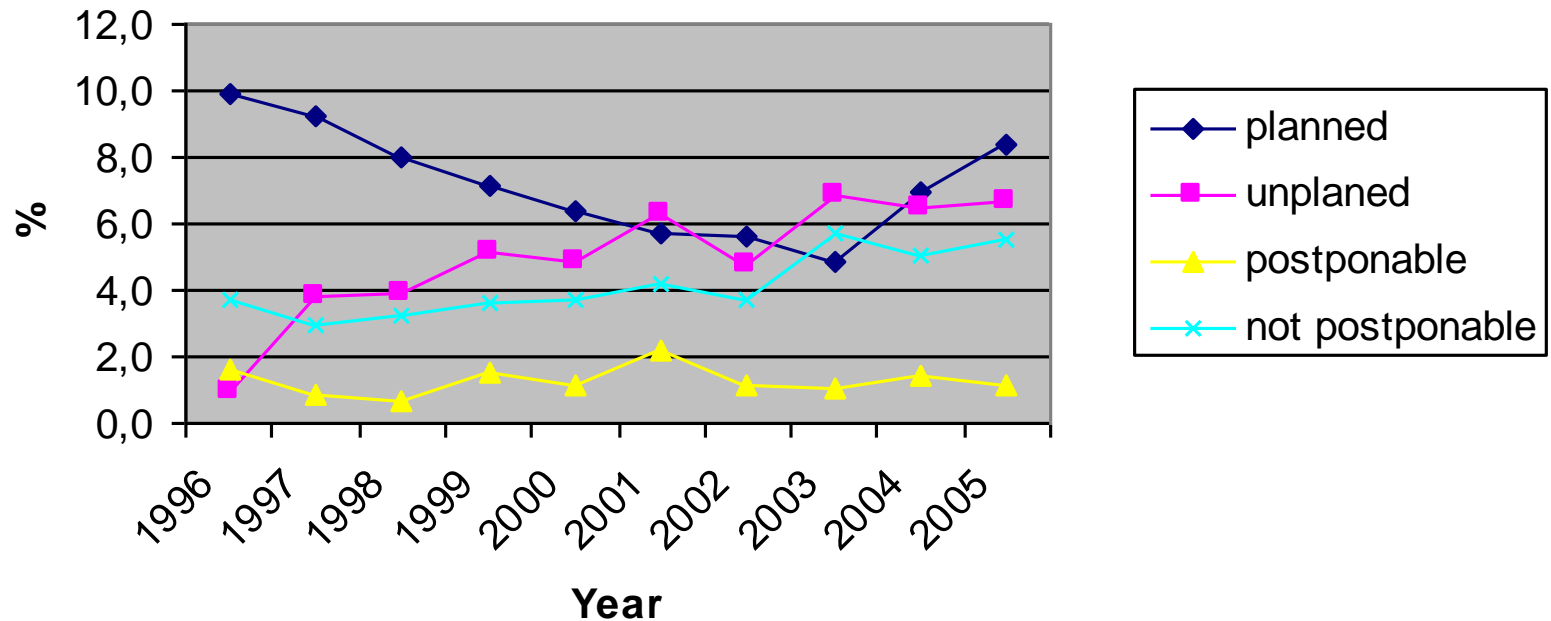


POWER PLANT INFORMATION SYSTEM

Typical Outcome of anonymous Evaluation

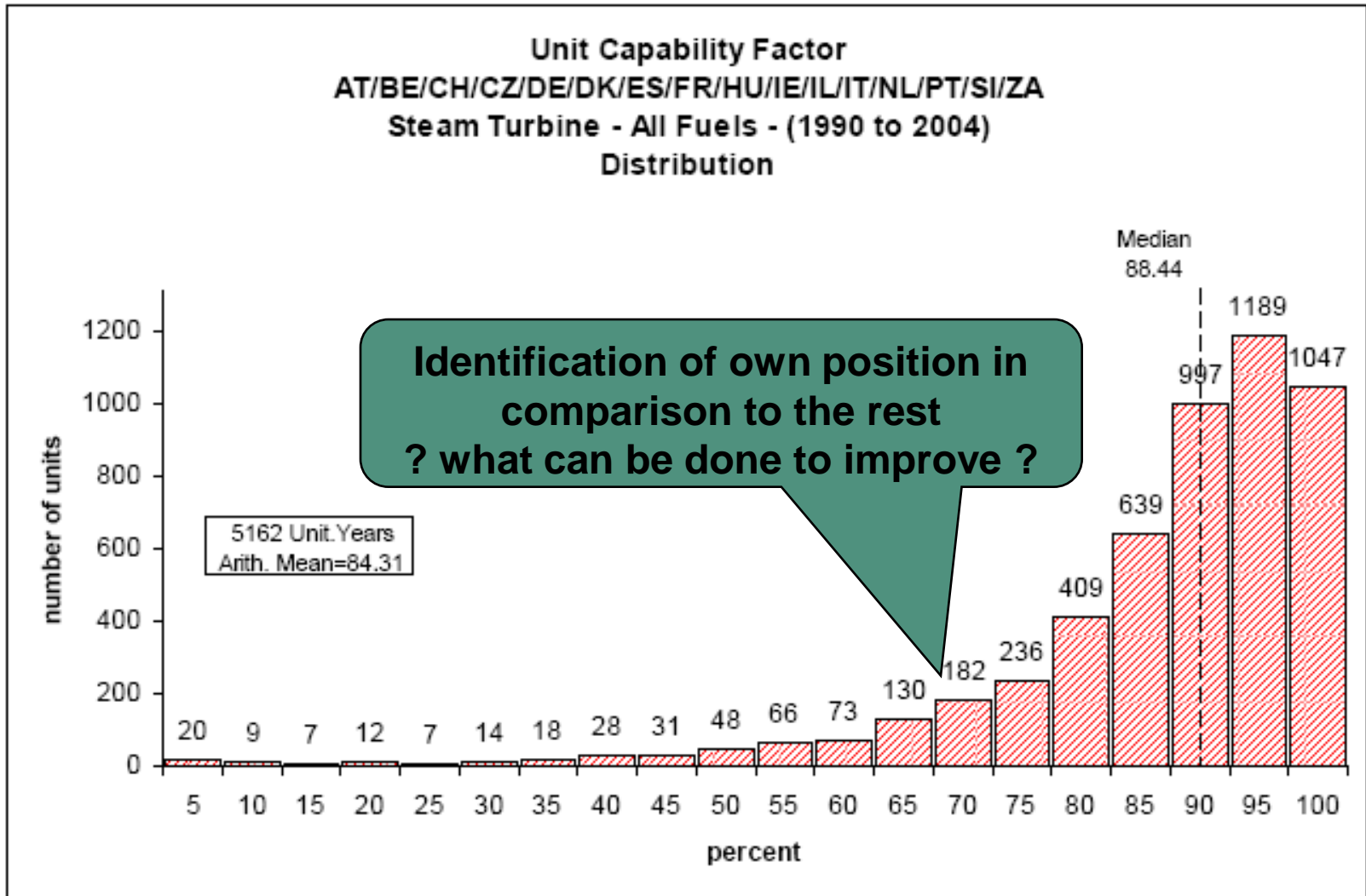
Fossil fired Units, total 1997-2006

Unavailability of fossil fired Power Plants



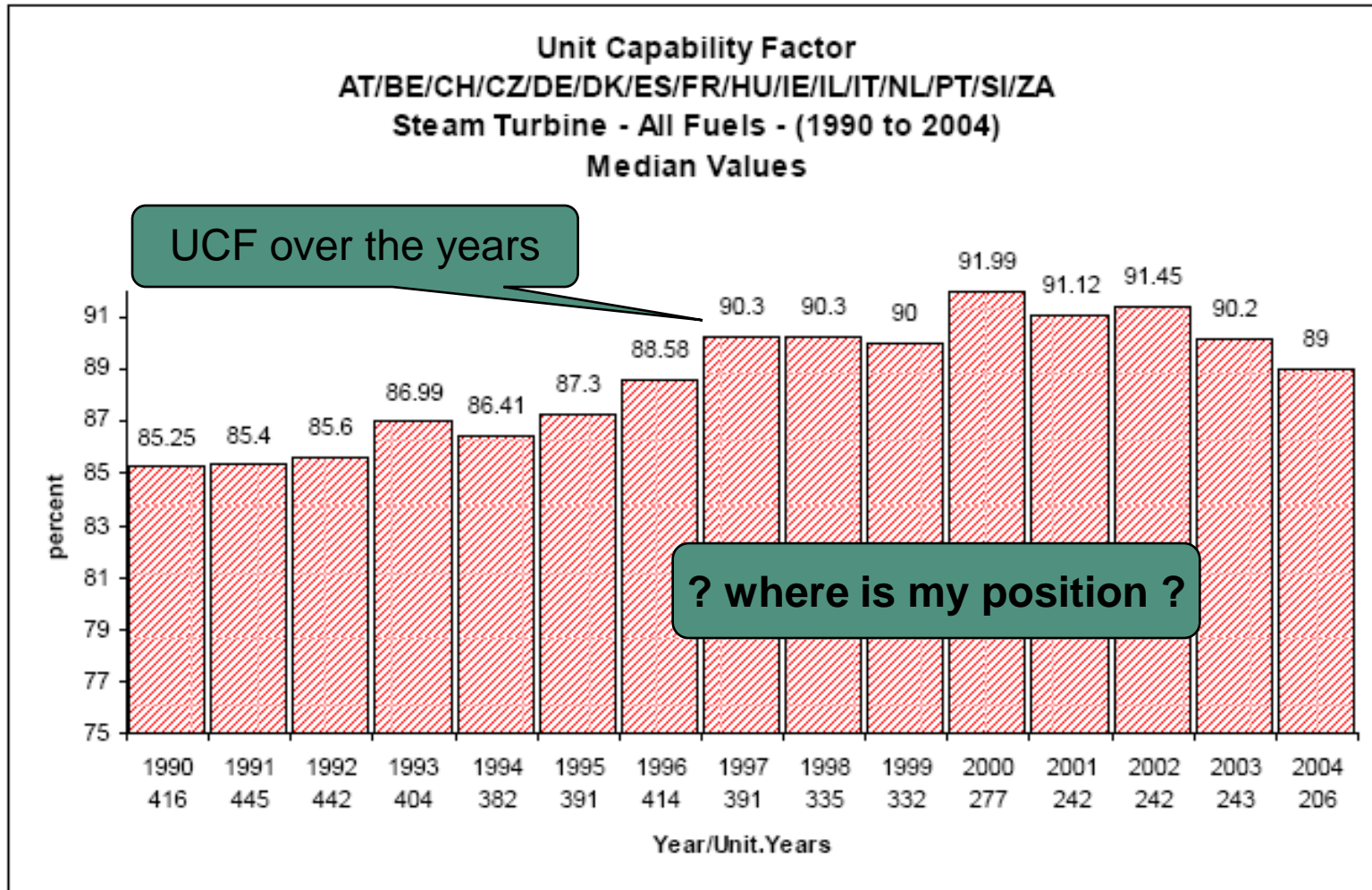
POWER PLANT INFORMATION SYSTEM

Example UCF



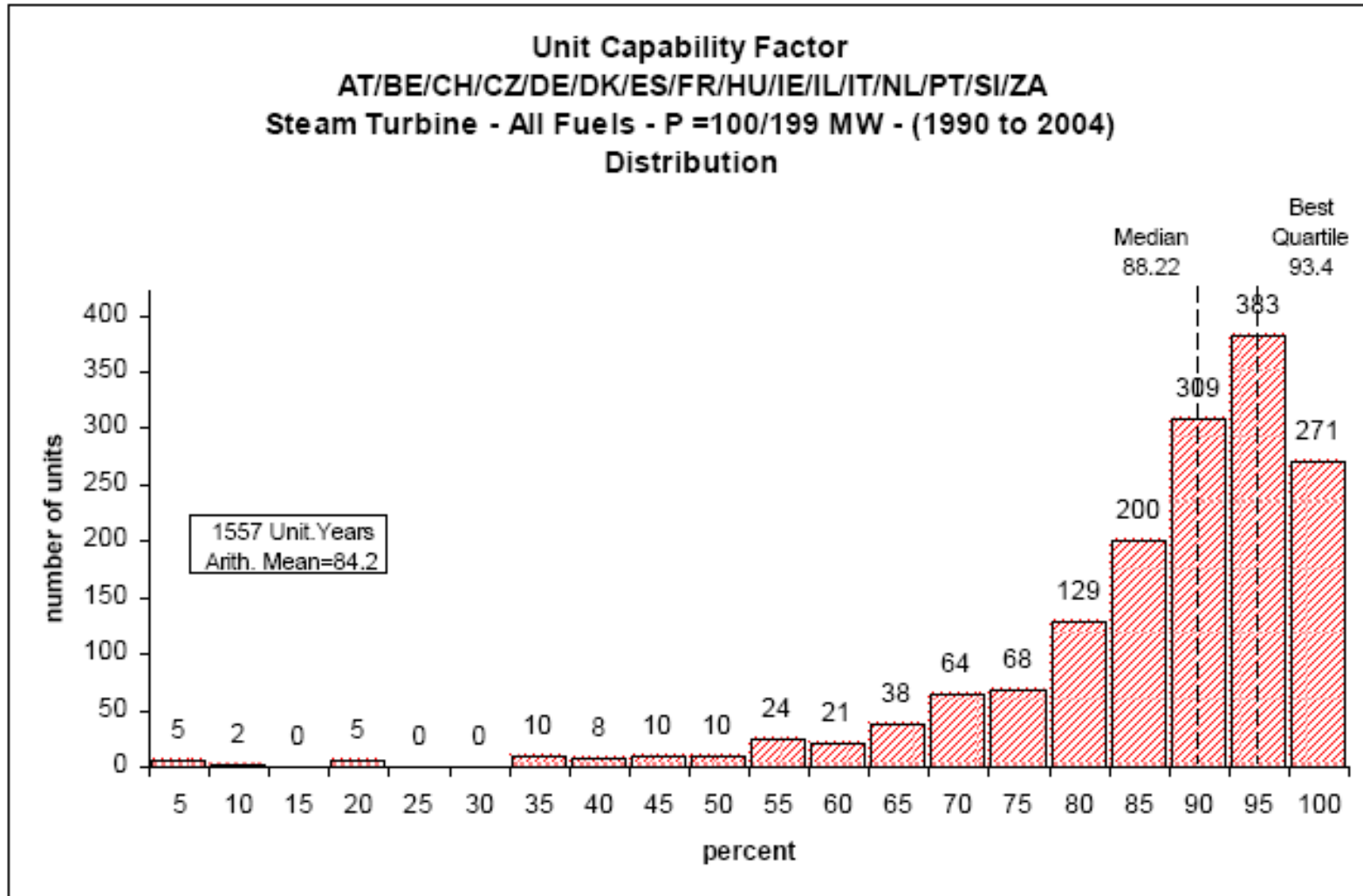
POWER PLANT INFORMATION SYSTEM

Example UCF



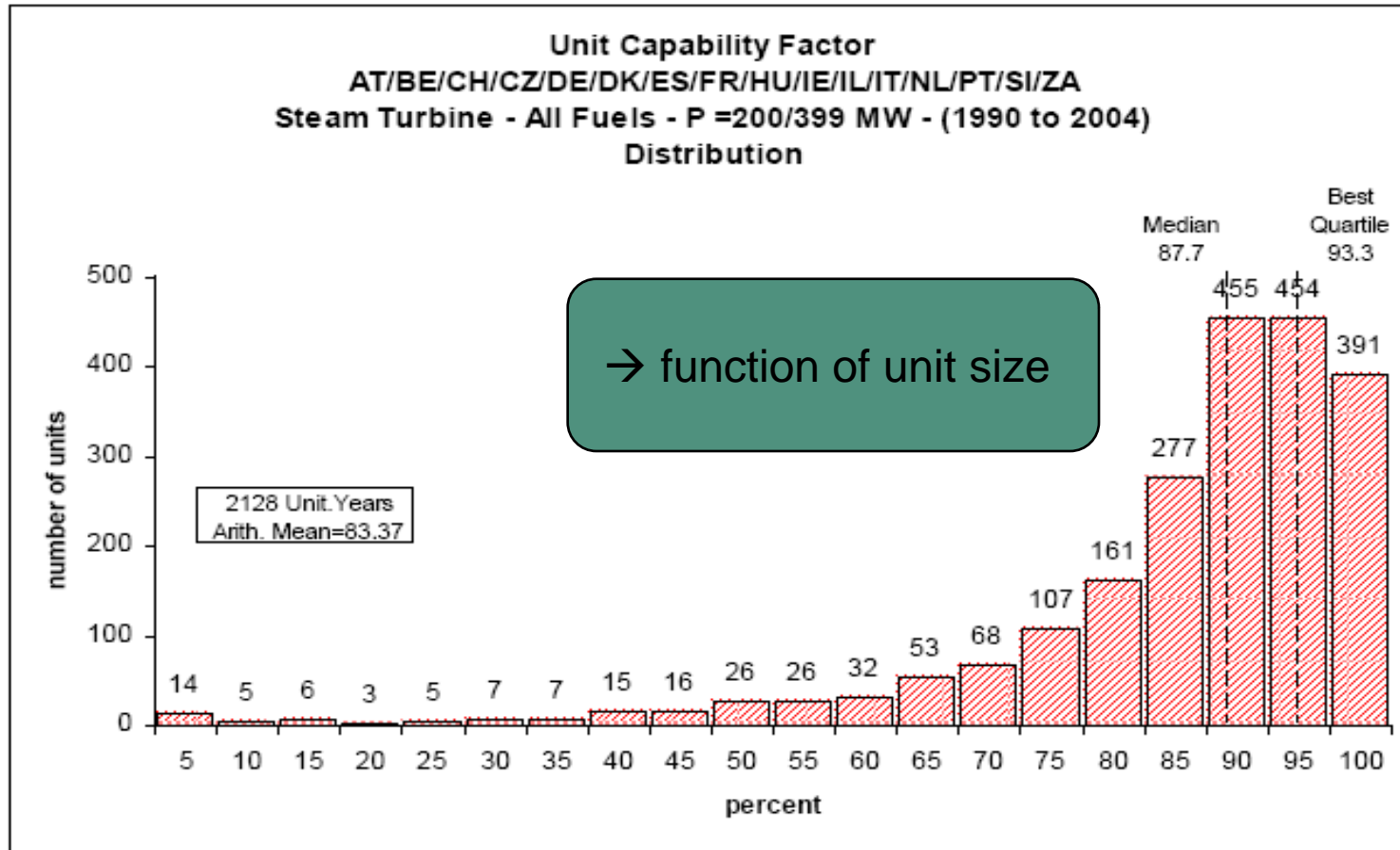
POWER PLANT INFORMATION SYSTEM

Example UCF



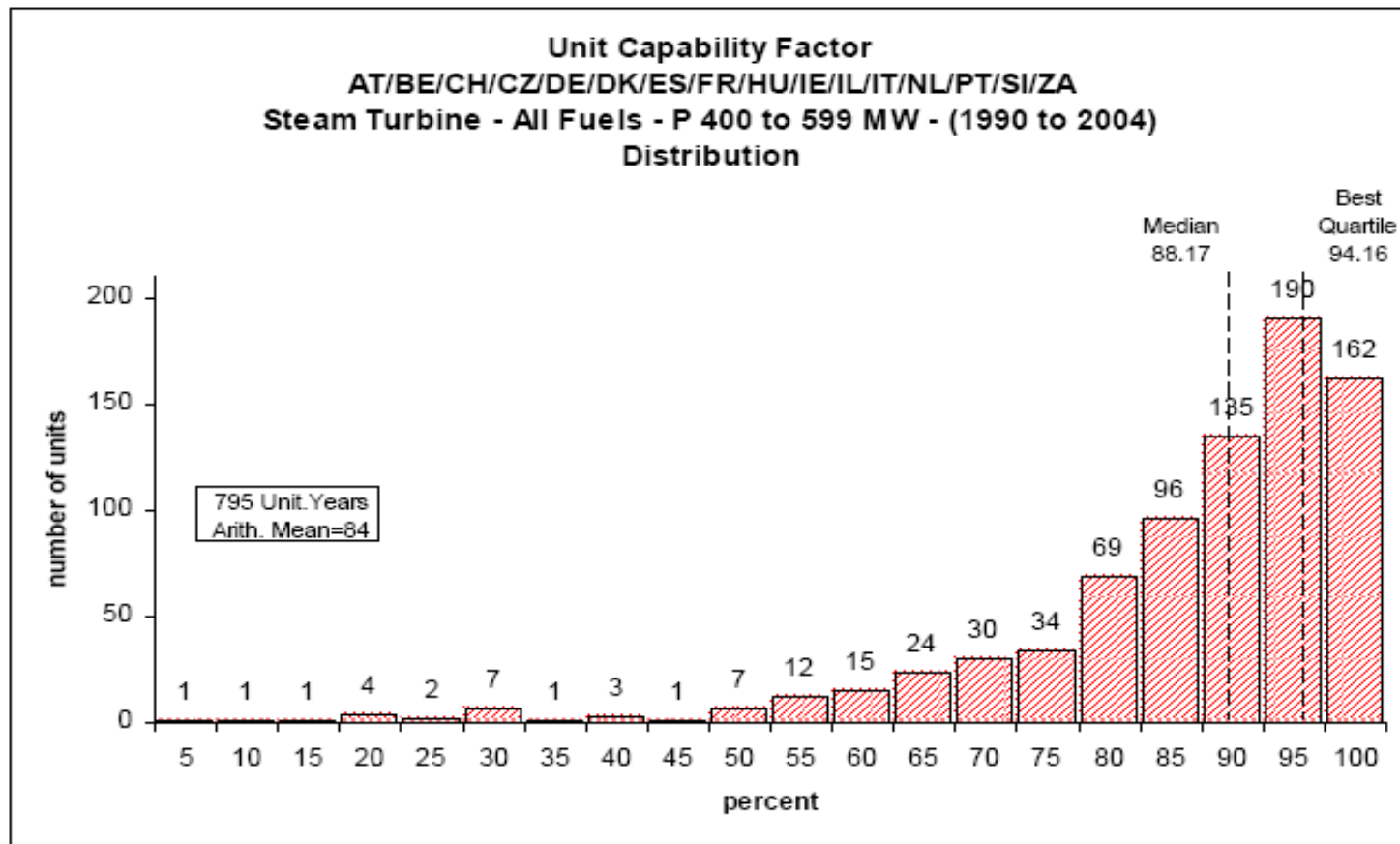
POWER PLANT INFORMATION SYSTEM

Example UCF



POWER PLANT INFORMATION SYSTEM

Example UCF



EXAMPLES FOR APPLICATION

- **Redundancy Feedwater Pump**
- **Damages in Gas /Steam Turbine**
- **Transformer**

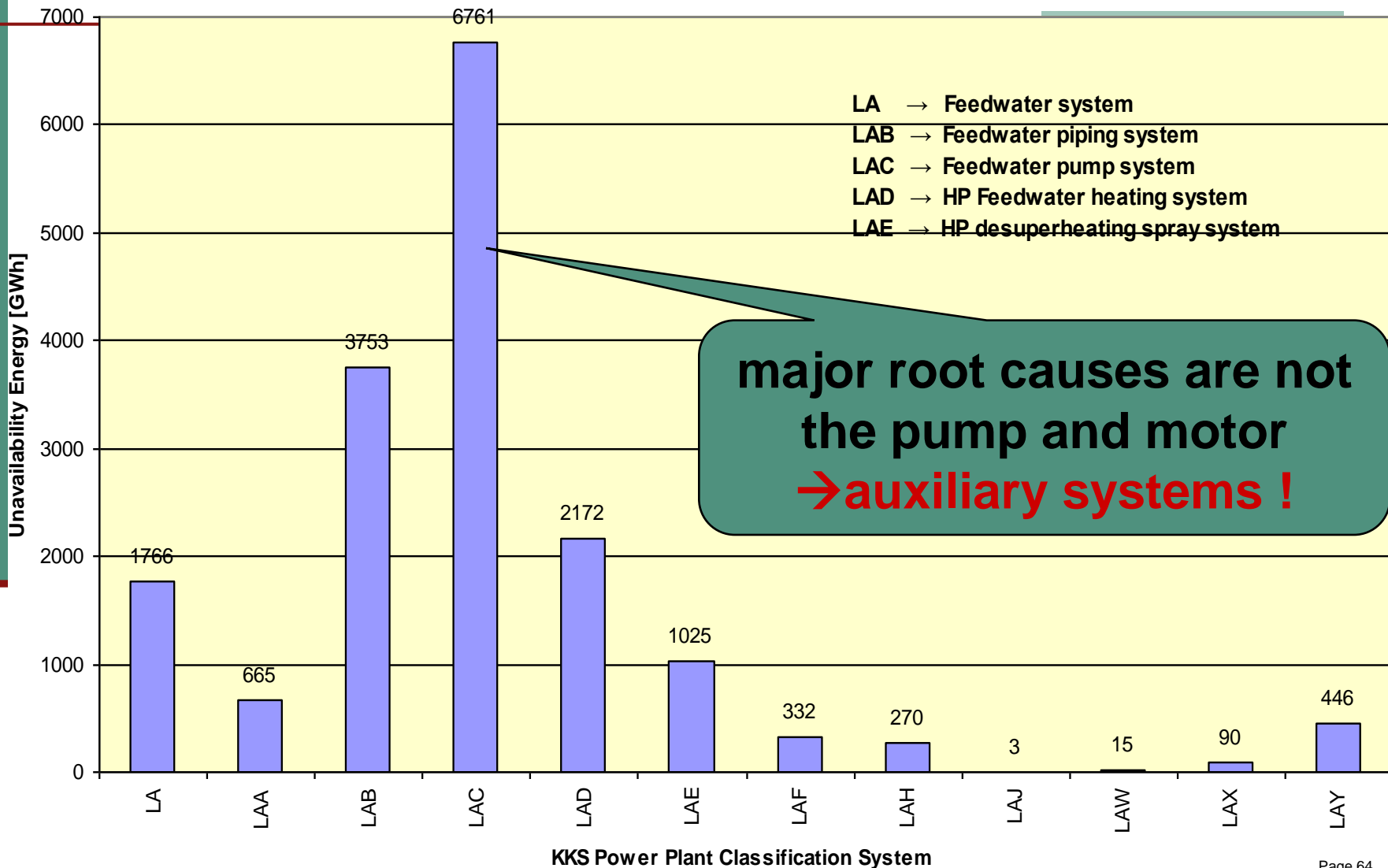
 ***for strategic decisions on***

- **Plant Concept**
- **Maintenance**
- **Spare Part Management**

Evaluation of necessary Redundancies

Evaluation of feed-water pumps

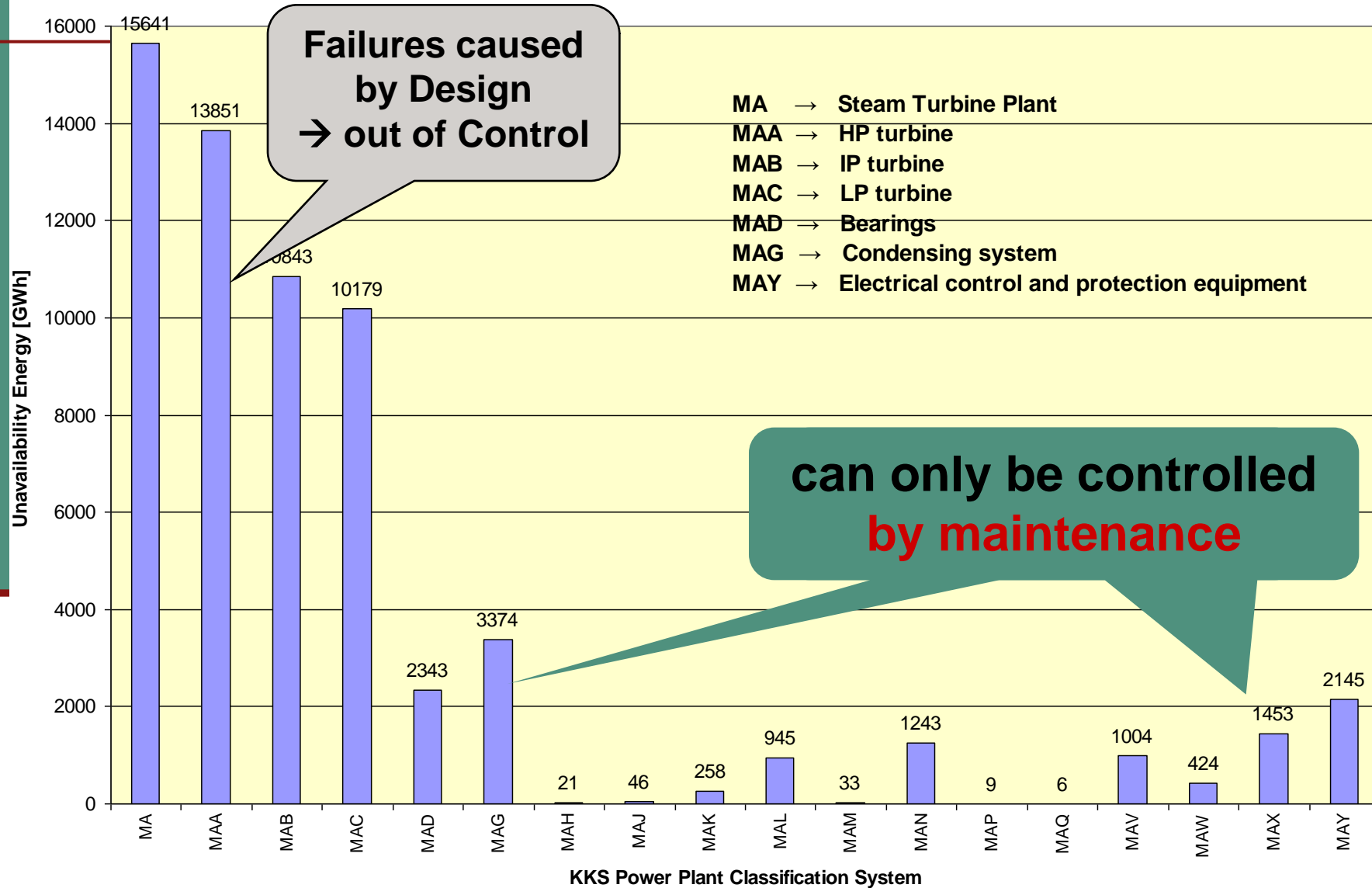
Period 1988 - 2007



Evaluation of Steam Turbine

Evaluation of steam turbines

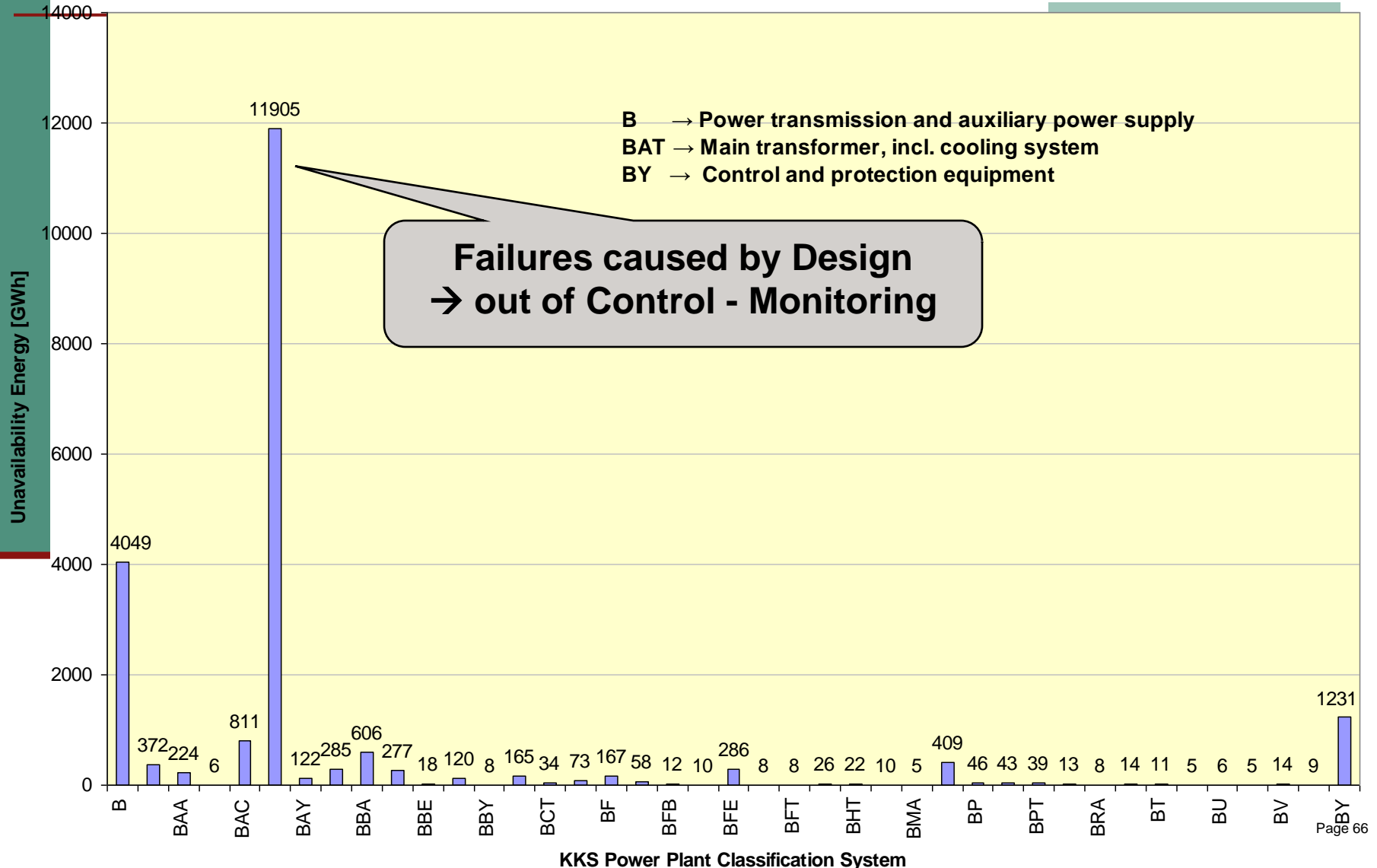
Period 1988 - 2007



Evaluation of Transformer

Evaluation of Transformer

Period: 1988 - 2007



stringent Consequence of Performance Indicator Analysis

System	previous	boiler	turbine	cooling	De-SOx	new
Heat Consumption	8705/8930	-	-360/460	-44	-	8370/8490
Turbine kJ/kWh						
Boiler Efficiency %	84,0/85,0	+4,2/5,8	-	-	-	89,1/90,2
Auxiliary Consumption %	5,2	-	-	-	+2	7,2
Unit Efficiency, net %	31,0/32,0	+1,5/2,2	+1,5/1,9	+0,2	-0,7	35,5/36,1

Efficiency Increase of the B 500 MW_{el} Units
nominal load

Login

Selection

Incidents

Import

Links

Logout

Plant selection

Input new data

Data show

Select Power plant / unit

⊕ monthly av

⊕ unava

⊖ yearly

⊖ VGB

⋮ VGB

⋮ VGB

⋮ VGB-Coal Unit

⋮ VGB-Gas Turbine

System Description

plant side

click the link to open the form

PPIS Online - Data Base

Selection of Power Plant Unit

Login	Selection	Incidents	Import	Links	Logout
	Plant selection	Input new data	Data sheet	Graph	

Select Power plant / unit

- monthly availability data
- unavailability incidents
- yearly availability data

click "+" to open the power plant side

VGB-Side

- [VGB-Lignite](#)
- [VGB-GuD Unit](#)
- [VGB-Coal Unit](#)
- [VGB-Gas Turbine](#)

click the link to open the form

PPIS Online - Data Base

Template Energy Utilization

General		Energy utilization	Time utilization	Operational parameters			
		Formula	Unit		Input	Help	Check
	based on	Field "based on": select "gross" or "net"		Selection mandatory	Please select		
4	nominal energy	$W_N = P_N \times t_N$	GWh	<input checked="" type="checkbox"/>	5,966.00		
5	energy generated	W_B	GWh	<input checked="" type="checkbox"/>	2,725.00		
6	energy utilization	$\eta_W = W_B / W_N$	%		45.68		
unavailable energy							
7	planned unavailable energy - specified	$W_{nv p Soll}$	GWh	<input type="checkbox"/>	1,190.00	?..	
8	planned unavailable energy - effective	$W_{nv p Ist}$	GWh	<input checked="" type="checkbox"/>	1,190.00	?..	
*	unplanned unavailable energy	$W_{nv u} = W_{nv ud} + W_{nv un}$	GWh		automatic value		
9	postponable unplanned unavailable energy	calculated values		<input checked="" type="checkbox"/>	1.00	?..	
10	not postponable unplanned unavailable energy	$W_{nv un}$	GWh	<input checked="" type="checkbox"/>	205.00	?..	
11	unavailable energy	$W_{nv} = W_{nv p Ist} + W_{nv u}$	GWh		1,396.00		
12	unavailable energy - extended	$W_{nv Verl.}$	GWh	<input type="checkbox"/>	0.00	?..	
13	energy availability	$k_W = (W_N - W_{nv}) / W_N$	%		76.60		
14	available unproducibile energy (external influence energy)	W_{ns}	GWh	<input type="checkbox"/>	0.00	?..	

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PPIS Online - Data Base

Template Time Utilization

		General	Energy utilization	Time utilization	Operational parameters				
					Formula	Unit	Input	Help	Check
16	operating time				t_B	h	<input checked="" type="checkbox"/> 4,805.00		
17	time utilization				$n_t = t_B / t_N$	%	54.85		
unavailability time									
18	planned unavailability time				$t_{nv p}$	h	<input checked="" type="checkbox"/> <input type="text"/>	?..//	
19	unplanned unavailability time				$t_{nv u}$	h	<input checked="" type="checkbox"/> <input type="text"/>	?..//	
20	unavailability time				$t_{nv} = t_{nv p} + t_{nv u}$	h	1,784.00		
21	time availability				$k_t = (t_N - t_{nv}) / t_N$	%	79.63		


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Not activated



PPIS Online - Data Base

Template Operational Parameter

General		Energy utilization		Time utilization		Operational parameters			
		Formula	Unit		Input		Help	Check	
22	fuel rate during reference period								
	-- hard coal		%	<input checked="" type="radio"/>	<input type="text" value="99.60"/>			OK geprüft	
	-- lignite		%	<input checked="" type="radio"/>	<input type="text" value="0.00"/>			OK geprüft	
	-- oil		%	<input checked="" type="radio"/>	<input type="text" value="0.40"/>			OK geprüft	
	-- gas		%	<input checked="" type="radio"/>	<input type="text" value="0.00"/>			OK geprüft	
	predominant fuel				Steinkohle				
	start-up reliability								
23	number of successful start-ups	s_e		<input type="checkbox"/>	<input type="text"/>		?...//		
24	number of unsuccessful start-ups	s_n		<input type="checkbox"/>	<input type="text"/>		?...//		
25	start-up reliability	$z = s_e / (s_e + s_n)$	%		automatic value				
26	remarks			<input type="checkbox"/>	<input type="text"/>				

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click "Print"

click "Check input"

click to save the checked data

PPIS Online - Data Base

Menu Item: Data Sheet

[Login](#)
[Selection](#)
[Incidents](#)
[Import](#)
[Links](#)
[Logout](#)

[Plant selection](#)
[Input new data](#)
[Data sheet](#)
[Graph](#)

VGB-Coal Unit - Last update: 7/7/2006 4:18:43 PM

click "Graph"

Vertical view: [Yes](#) [No](#)
 Totals: [Yes](#) [No](#)
 Timeshift: [◀◀](#) [◀](#) [▶](#) [▶▶](#)

Settings

Wrap text: [Yes](#) [No](#)
 Column width: ▼ ▲

Column paging: [All](#) [Paging](#)
 Font size: ▼ ▲

	Attribut	Unit	1995	1996	1997	1998	1999	2000	2001
<input type="checkbox"/>	Number incidents (total)	[1]	0	0	0	0	0	0	0
<input type="checkbox"/>	Nominal capacity (net)	MW	681	681	681	681	681	681	
<input type="checkbox"/>	Nominal capacity (gross)	MW							
<input type="checkbox"/>	Age of the plant during year	a							
<input type="checkbox"/>	Reference period	h	8760	8760	8760	8784	8760	8760	8760
<input type="checkbox"/>	Nominal energy	GWh	5,966.0	5,966.0	5,966.0	5,982.0	5,966.0	5,965.0	5,966.0
<input checked="" type="checkbox"/>	Energy generated	GWh	3764	3110	3927	3323	2725	3520	3520
<input type="checkbox"/>	Gross energy	GWh							
<input checked="" type="checkbox"/>	Energy utilization	[1]	63.09	52.13	65.82	55.55	45.68	59.01	45.68

VGD-Cool Unit - Last update: 7/7/2005 4:10:43 PM

Chart Type: [Bar](#) [StackedBar](#)
[Line](#) [Pie](#)

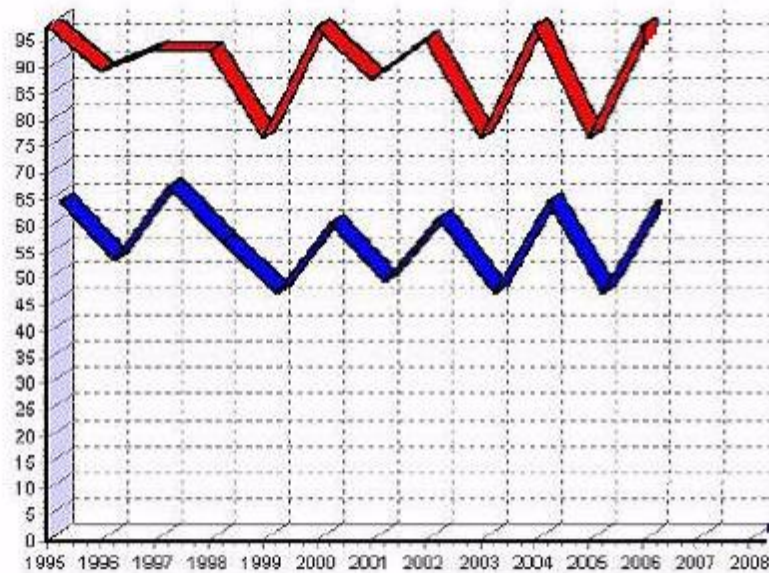
View 3D: [Yes](#) [No](#)
Growth rates: [Yes](#) [No](#)

Settings

[Redraw]

Energy utilization %

Energy availability %



[Redraw]