Minutes of Meeting

VGB-Technical Committee:	**Generation and Technology**
VGB-Working Panel:	**PGMON**
	Power Generation Maintenance Optimisation Network
	29th Meeting on 30.9. / 1.10. 2004 in Arnhem

Agenda

Welcome (Mr. Wels)

Plant ageing and maintenance expenditure

TOP 1: R & D at Dutch Utilities
Dr. Nanno Bolt, KEMA

TOP 2: Life Extension Costs
Henk Wels, NRG

TOP 3: IEC 61508, New standard for safety related Plant Protection System
Paul Thame, EON UK

TOP 4: Designing and Commissioning DCS in Portuguese Power Plants
Antonio Gonçalves, EDP

TOP 5: Cost Saving by Ultrasound Regeneration of Denox Catalysts
Dr. Alexander Schluttig, Envica Kat

Maintenance Quality

TOP 6: RIMAP (Risk Based Inspection and Maintenance Procedures)
Dr. Jörg Bareiss, EnBW

TOP 7: Maintenance Standards
Antoine Despujols, EDF

TOP 8: Kissy, VGB Data Base
Reinold Janßen, VGB

TOP 9: Risk of Gas Explosions in Power Stations
Erwin van Wonderen

Maintenance Organisations

TOP 10: Technical Management Strategy in ESB Power Generation
Richard Sheehan

TOP 11: Modification on EDF Organisation
Claude Degrave, EDF

Miscellaneous

TOP 12.1: Plant List

TOP 12.2 Topics suggested for next meeting

TOP 12.3 Place and date of next venue

TOP 1: R & D at Dutch Utilities
Dr. Nanno Bolt, KEMA

Introduction of KEMA

Our business; Serving the electric power marketplace
- Consulting services
- Inspections, testing & certification

Profile
- Incorporated 1927
- Headquartered in the Netherlands
- Offices in 18 countries
- 1,500 employees worldwide
- NL: 900, USA: 400, Rest if the World: 200
- Turnover 2003: EUR 169 Mio

Changing market conditions
- Liberalization & deregulation – new market conditions for utilities and new roles for parties involved
- Competition – utilities focus on financial and market objectives, less technical
- Mergers & acquisitions – international utilities, less & larger companies

R&D Playing field
- Third party (MC) contract R&D. Short term and practical focus.

Drivers for electricity R&D

Drivers for electricity related R&D are:
- the shape of the future energy systems
- the electricity investment perspectives
- the technology developments including post-Kyoto break through
- the future customer demands

The responsibilities between the key players in the Electricity Supply Industry, the manufacturers, the industry itself and the governments are shifting. And so does the R&D focus. What is the impact of energy policy changes, of environmental challenges, of competitive markets and of new entrants on the R&D needs in the EU-25? And how to respond to unbundling, to the increasing pan-European integration and to the growing importance of customer demands?

The future energy systems.

Important factors in shaping the future energy system are demographics, urbanization, incomes, energy demand and market liberalization. Three factors however will have the potential to introduce fundamental changes in the energy system. The availability of energy resources – the scarcity of oil in the 2025-2050 period followed by gas - will transform the energy system. The second driving force is new technology: solar photovoltaic – offering widely distributed energy - and hydrogen fuel cells – offering high performance and clean energy from a variety of resources – are potentially disruptive energy technologies. The third key driver is social and personal priorities. Will the changes be pushed by governments on behalf of citizens concerned about security of supply and environmental impact? Or will they be pulled by consumer demands for flexible, convenient and clean energy services? Two scenarios arise from those drivers; the Dynamics as Usual scenario and the Spirit of the Coming Age scenario. Looking back from 2050, the energy transition within the Dynamics as Usual scenario is a continuation of past dynamics.

<table>
<tr><td>Demographics
Urbanisation</td><td></td><td></td></tr>
<tr><td rowspan="2">- Resource constraints
- Technology
- Social & Personal Priorities</td><td rowspan="2">Competition and Innovation</td><td>Dynamics as Usual
Energy choices-citizens.
Evolutionary</td></tr>
<tr><td>Spirit of the Coming Age
Energy choices-consumers.
Revolutionary</td></tr>
<tr><td>Incomes & Demand
Liberalisation</td><td></td><td></td></tr>
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Fig. 1. The Dynamics as Usual and the Spirit of the Age scenarios.

The requirements of the future consumer.

The growing importance of the Digital Society will have a major impact on the demand for electrical energy and requires high reliability and power quality from the energy suppliers. Differentiation in reliability between various end users will occur. Premium Power Parks with extreme high reliability and power quality are realistic concepts. In Fig. 8 the reliability demand for various end users is shown, differentiated in numbers of nines (f. i. 4 nines means 99,99 of the time the supply is reliable or the annual outage is 52 minutes).

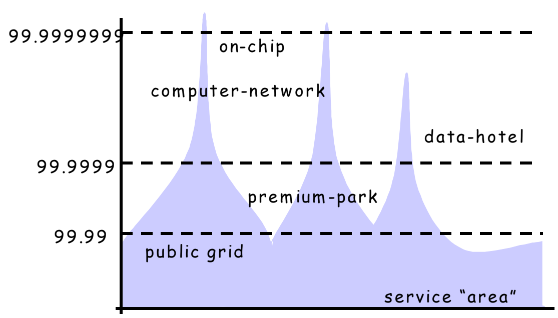


Fig. 2. Reliability differentiation in various service areas.

Present-day consumers however are confronted with power outages having increasingly impact on entire societies. Like the major outages in Italy, US/Canada, UK and Sweden in 2003. These events promote in fact – together with the increased competition between the suppliers – the growth of decentralised power generation.

R&D playing field

The level of market opening and of legal, political and social constraints varies from country to country. At one side the European ESI has to respond to the liberalisation of the market, with unbundling, more competition and new entrants. On the other side the European ESI has to deal with the requirements for Renewable Energy Sources, the requirements for the environment (and Kyoto agreements) and for the security of supply.

R&D Challenges

The objectives of R&D within the ESI are rapidly shifting from "classic" cost reduction projects to development of customer services and business opportunities. Focus is more and more on improving the competitiveness of the enterprise among others by development of asset management tools in the changing market. The position of R&D is shifting as well: for product development the manufacturer is seen as the first responsible. The basic research is performed at universities and research centers. The R&D tasks for f. i. a grid company are restricted to:

- Technology watch,
- Scenario exploring
- Technical and economical evaluation,
- Field tests
- Operation support tools

The contours of the funding for the future electricity R&D are becoming sharper:

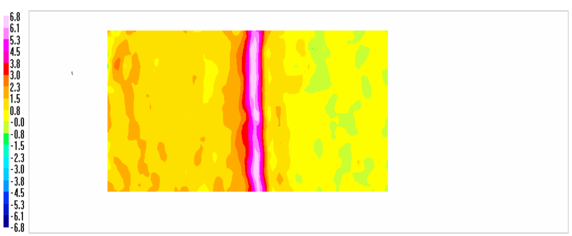
- R&D focussing on the core business of the manufacturer and of the electricity company is funded in house
- R&D securing the electricity supply (the non-profit part) will be payed by the end-consumer. For instance via a levy/kWh as it is practice in Italy
- Long term R&D, supporting the introduction of sustainable energy and of long term security of supply is payed by the tax payer and organised trough (international) public funded programs

KEMA’s multi-client contract research: TSA Power Generation
The Technical Service Agreement Power Generation is:
- based on Trends & Challenges in the liberalised market
- an individual contract with the leverage options of a consortium agreement
- comprises a base fee with access to: the Help Desk Consultancy, finalised former R&D products, and to the Environmental Regulation implementation package

In 2004 the TSA participants are: DELTA, EdeA, Electrabel, EON Benelux, Essent, EPZ, Nuon. The TSA is open for international power generators: EDF participates on product level.

Examples of on-going projects on plant-life
For extension of periods between overhauls, for increased reliability and for addressing questions from the trade departments, inspection tools which can be used during operation raise increasing interest. TSA developments introduced or in development are the following:

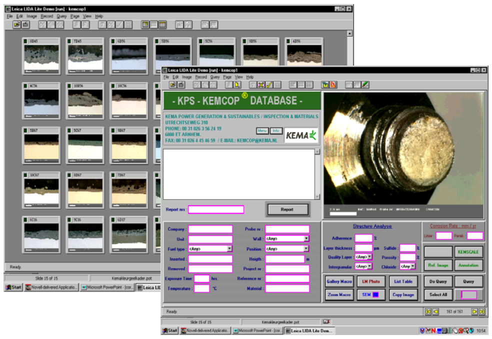
- Stress measurements during operation (SPICA), accepted by Lloyds/Stoomwezen



- Acoustic Emission (hearing the crack growing), exploration phase (together with Lloyds) in the US, and looking at tests in D and DK

- Small Punch Test: participation in the CEN harmonization-Cie, started in the end of 2004

- KEMCOP: Fireside Corrosion Probes, installed in all coal fired power stations in the NL en 1x in Belgium. Provides early warning especially when biomass is co-fired >20% e/e.



- KEMBUS: US waterwallthickness measurements from the outside (without scavenges!). Exploration phase; it works on lab scale; how is the performance in practice?

TOP 2: Life Extension Costs
Henk Wels, NRG

In the Netherlands, a large number of power plants are present that could be candidates for life extension. The situation is similar in other European countries. During the April 2004 PGMON meeting, it was noted that by gathering major cost items, it would be possible to arrive at a yardstick for preliminary cost assessments. Therefore a spreadsheet was designed for input purposes. Power plants were subdivided into systems using KKS-coding. For a limited number of projects within PGMON experience, costs per subsystem were gathered and statistically analyzed. If was found that differences became smaller when results were summarized to boiler, turbine, etc. The remaining spread is explained by problems existing / anticipated in plants, by maintenance budget in the past and by size and fuel characteristics. The data show that improvement of boiler forced outage rate is good value for money, the condition of electrical equipment with regard to remaining life often is not precisely known. Finally, old generators should not be trusted. From the subsequent discussion, it followed that assessing High Impact Low Probability HILP items is important. This might be as important in a Life Extension project, say for the next 15 years, as having the every day boiler problems solved. A new DCS might be an expensive item but worth analyzing. It was concluded that more data were needed to arrive at a yardstick. Since these data are scarce and confidential, an approach using technical life extension data in combination with sound cost engineering later on could be an alternative.

TOP 3: IEC 61508, New standard for safety related Plant Protection System
Paul Thame, EON UK

Standard IEC 61508 (Functional safety of programmable electrical/ electronic/ programmable electronic safety-related systems) is now being adopted in the UK. The UK Health and Safety Executive has endorsed the new standard as best practice for the design and through-life management of active plant safety systems. The objective of the standard is to ensure that the hazards (personal safety risks) of a plant system are known and that safety systems are designed to reduce the risk of each hazard to a defined tolerable level. Details of the standard can be found at www.iec.ch/zone/fsafety/fsafety_entry.htm.

The application of IEC 61508 first involves a hazard identification exercise. At E-ON UK, this has been done using the HAZOP (Hazard and Operability) assessment method. Example assessments made already include the condensate and boiler feedwater system and the fuel and draught system for coal fired power stations. Many hazards have been identified, including obvious examples like explosion of unburnt fuel and the flooding of water into a steam turbine from direct contact low pressure feed heaters. Once all the hazards are identified, a simple risk assessment is made to categorise them by probability of occurrence and the severity of the consequences. The bigger risks, especially all those that could have fatal consequences, are then analysed in more detail to make a good estimate of probability. The probability of a fatal accident must then be assessed against a tolerable risk limit to determine whether it is acceptable.

If the risk is above the tolerable limit, a safety system must be designed that provides sufficient protection to reduce the risk to a tolerable level. The amount of risk reduction required defines a Safety Integrity Level (SIL) for the safety system. Four levels of SIL are defined in the standard, SIL 1 being the minimum level of protection and SIL 4 being the maximum. To illustrate, for a safety system that is not demanded very often, a SIL 1 safety system must protect people with a failure rate in the range 0.01 to 0.1 per occurrence of the hazard. The SIL value then determines the hardware selection, design configuration and software development procedures to ensure a system that achieves adequate risk reduction. For higher SIL systems, redundancy and diversity may be required. Maintenance procedures (e.g. functional test intervals) must then ensure that the system continues to provide the required risk reduction in service. Each safety system must be given a SIL rating according to the risk that it protects against.

The safety systems addressed by IEC 61508 are not just Programmable Logic Controllers (PLCs). The instruments, signals, actuators and control devices, as well as any human interface, must all be included in SIL assessments as part of the active safety system.

TOP 4: Designing and Commissioning DCS in Portuguese Power Plants
Antonio Gonçalves, EDP

New DCS - Distributed Control System - displaying some important features to improve control in Power Plants are available in the market.
Obviously, as new facilities in new DCS increase, the efforts to use them adequately also increase. This effort is substantially reduced because, at the same time, modern DCS are associated with Information Systems, where it is possible to store and manipulate every relevant dynamic data concerning process and controllers. Such data can feed new software to support controllers tuning, thus opening new possibilities to obtain remarkably better performances reducing time and manpower as well.
This paper is an approach to the application of new DCS facilities in Portuguese Power Plants.

The applicability of each new possibility on the control loops of Power Plants is first analysed, its effects on the concerned dynamic behaviour are identified and some experimental results are presented. Then the impact of such behaviour on the reliability and efficiency of Power Plant Units and on the environment is assessed.
Following, some comments about design and commissioning phases are addressed. The urge to a better specialisation and knowledge of control theory by the commissioning teams of new DCS is also referred.
Finally, the consequences of the replacement of the old control systems and control rooms by the new DCS in Power Plants in function for a long time will be discussed. This discussion also analyses the effort that must be made by operating teams to adapt to this new operating philosophy and the subsequent urge to training all the staff dealing with such devices.

TOP 5: Cost Saving by Ultrasound Regeneration of Denox Catalysts
Dr. Alexander Schluttig, Envica Kat

Deactivation of DeNOx – Catalysts
Even tough the catalyst is not consumed during the reaction, it gradually deactivates due do the exposure of so called "catalyst poisons" contained in the flue gas.
Such deactivation of SCR catalyst is caused by arsenic, potassium, phosphorus and other elements contains in the flue gas as well as physical surface layers formed by fly ash and/or reaction products such as gypsum or even eutectics.
Until recently, the deactivation of the catalyst eventually required the very costly replacement of the used catalyst with new catalyst as soon as the overall activity became insufficient. In addition to the high expense associated with replacing the catalyst, this method also led to the disposal of the considerable amount of residual activity remaining in the catalyst.

Catalyst Regeneration instead of replacement
Traditionally, partially deactivated catalyst needed to be replaced with new catalyst. In almost all cases, this costly replacement can be avoided by using our highly efficient catalyst regeneration process. Ultrasound regeneration is based on a combination of washing, ultrasonic cleaning and chemical reactivation of deactivated SCR catalyst.

Ultrasound regeneration: deep cleaning as perfect as possible
Our proprietary patented SCR catalyst regeneration process allows successful regeneration of even the most poisoned catalyst and the removal of even the most persisting blinding surface layers. All these deactivation causes are effectively removed without impacting the catalytically characteristics and structural integrity of the catalyst material.

Fly ash removing
Generally 95 – 100 % of all kinds of fly ash are removed without any influence to the mechanical strength of the catalyst.

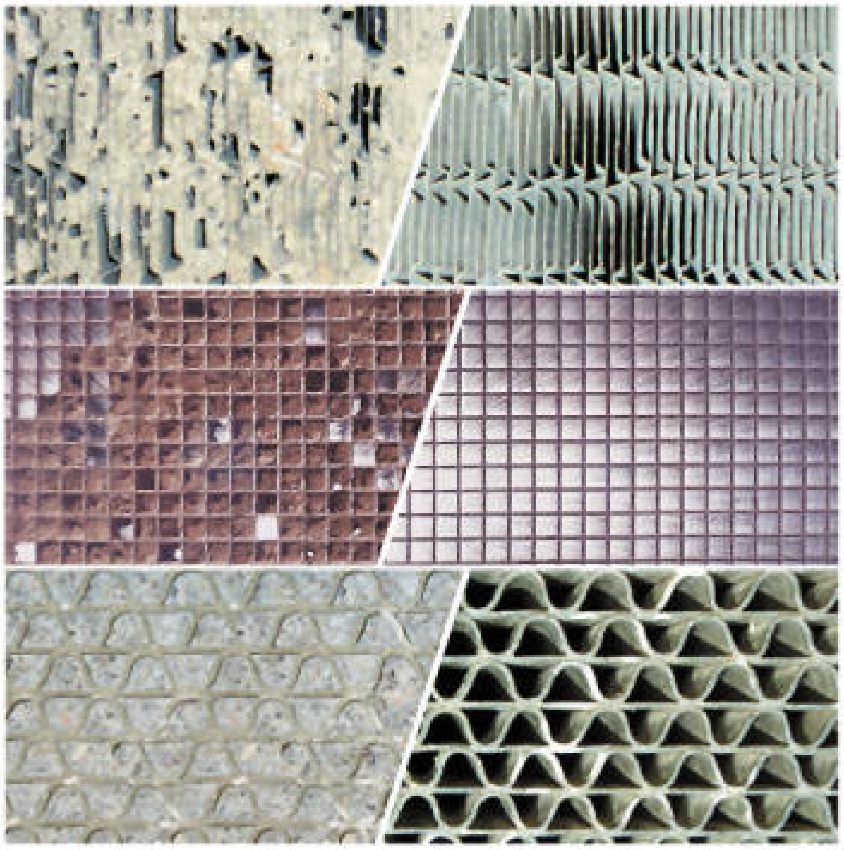


Fig. 1: Catalysts of different types before and after regeneration

We find fly ash blockings in many different forms up to the blockage by a so-called popcorn ash and to concrete-like plug-ins. The ENVICA Kat ultrasound regeneration is able to remove these extreme blockages almost completely without influence in the mechanical strength of the catalyst.

Activity (k)
The activity (k) is the measure for the transferring speed of ammonia and nitric oxides to molecular nitrogen and water at the catalyst. It is indicated in m/h. The higher the activity, the better is (more active) the catalyst.
The activity decreases because catalyst poisons and fly-ash are deposited at the catalyst in the course of the DeNOx - business. As soon as the compliance with the NOx-limits isn't ensured any more, measures must be taken.

By ENVICA Kat regeneration 90 – 100 % of the new catalyst activity is restored.

In some cases an activity (k) above the original one (k0) is possible.

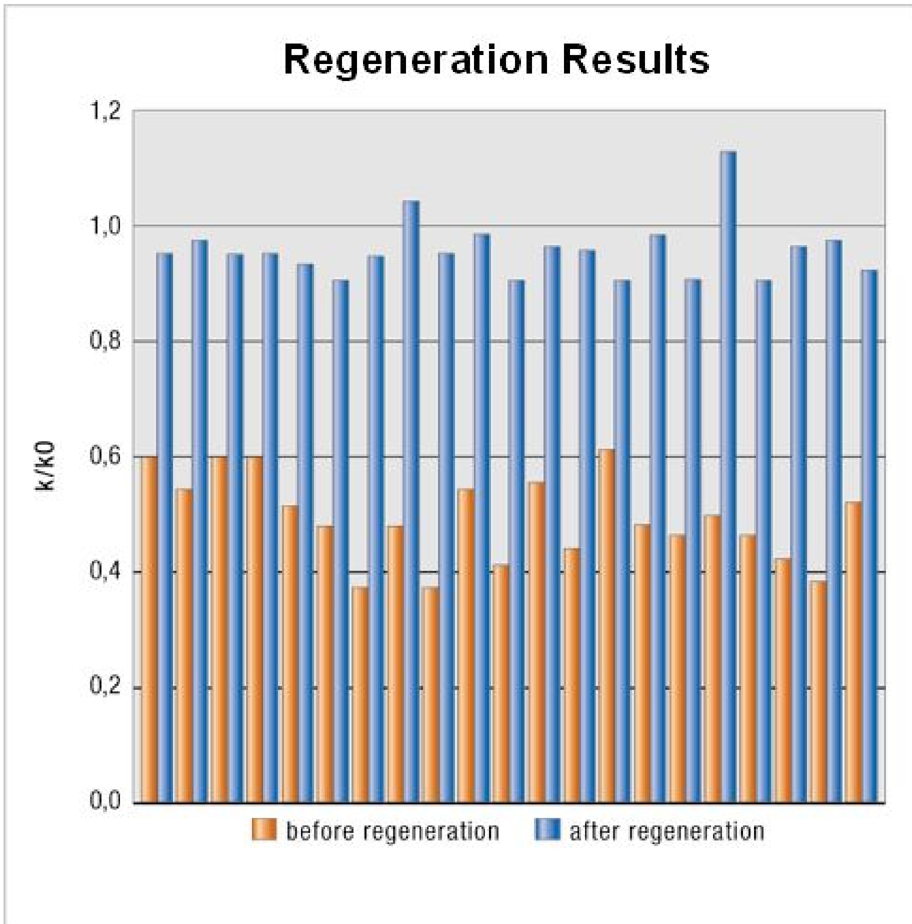


Fig. 2: Activity (k) in comparison to the factory new activity (k0) before and after regeneration (samples)

<u>SO2/SO3 Conversion rate</u>

The oxidation of sulphur dioxide to sulphur trioxide at the catalyst is a mostly unwanted competitive reaction to the activity since sulphur trioxide combines with water to sulphuric acid. The SO2/SO3 conversion rate (measured in %) says how much SO2 is changed to SO3. The lower the conversion rate, the better is the catalyst. Both the production of new catalysts as well as the regeneration always has to find a compromise between an activity as high as possible and an acceptable SO2/SO3 conversion rate.

Besides a decrease of activity the catalyst operation can lead to an increase of the conversion rate. In such cases only the ENVICA Kat process can achieve a reducing of the SO2/SO3 – conversion-rate to the value of the factory new catalyst. Thus without having losses in the activity after the regeneration.

By simple washing with water or deionised water the conversion rate will be increased considerably. By the development of a special method ENVICA Kat has managed to reduce the conversion rate to the level of a factory new catalyst.

Deactivation of regenerated catalysts

The experience of our customers prove the same deactivation rate of ultrasound - regenerated catalysts as new ones under the same firing conditions as before regeneration.

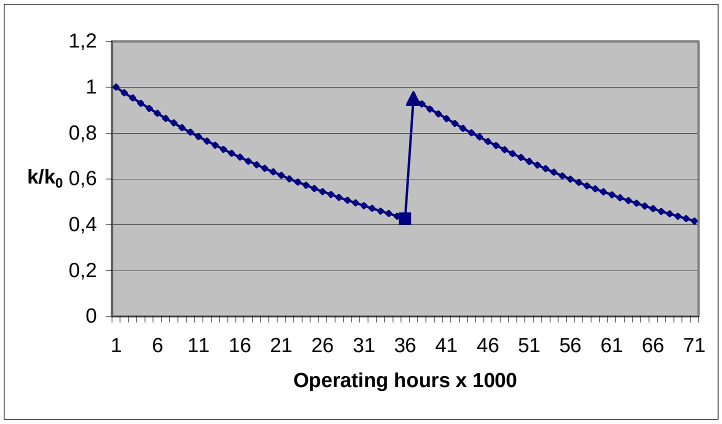


Fig. 3: Disassembly after 35.000 operating hours and further operation with ultrasound regenerated catalysts

An ultrasound – regenerated catalyst is as good as new. The lifetime can be doubled and more. Mostly catalysts are regenerative several times. We have experience with the 3rd regeneration of the same catalyst.

The costs for regeneration are approx. 50% of new material.

TOP 6: RIMAP (Risk Based Inspection and Maintenance Procedures)
Dr. Jörg Bareiss, EnBW

Risk based Inspection and Maintenance Procedures for European industry (RIMAP) is an EU funded initiative (budget: 3.6 mill €; EU: 1.7 mill€; duration march 2001 to march 2005). RIMAP consists of 3 projects: a research and technological development project (RTD), a demonstration project (DEMO) and a Thematic Network (TN). The objective of the RIMAP RTD project is to define a unified approach to making risk based decisions, within the field of inspection and maintenance. Risk is here understood as the combined effect of probability of failure and the consequence of a failure (personnel safety, quality of produce, environmental damage and economic loss). The RIMAP DEMO project consists of four demonstration cases, one for each of the involved industry sectors: petrochemical, power, steel, and chemical industry. The techniques can easily be extended to other industry sectors. The RIMAP TN accompanies the RTD and DEMO projects by disseminating the information, and results of the RTD and DEMO part to a wider community of companies that review results and generate an overall industry acceptance.

Public project results will be disseminated through the RIMAP web site (http://research.dnv.com/rimap) and via the RIMAP Thematic network (see http://www.mpa-lifetech.de/rimap).

The applicability and usefulness of RIMAP methodology were demonstrated on several practical cases on power plants (i.e. boiler parts, turbine components, piping). The application with emphasis on high-temperature systems (main steam/hot reheat line, boiler parts) using ALIAS Software System was shown by Mr. Bareiss, EnBW (see “Rimap BalticaVI Bar040608-2.pdf”). Since creep and fatigue are main damage mechanisms, the PoF determination in this example is based on creep exhaustion and fatigue exhaustion. It is assumed that average creep rupture strength and fatigue strength have a log-normal distribution. The determination of consequences of failures was considered from economical aspects (i.e. repair/replacement costs, lost production time). The risk analysis was performed for different levels, starting with the screening level and generic data and ending for critical components with a detailed analysis (i.e. high-temperature fracture mechanics analysis) with all obtainable data for the component. Based on actions for different risk areas in the user defined risk map, inspection and maintenance (I&M) activities/levels were assigned. The optimization process includes comparison of value at risk before and after applying the I&M actions suggested in the I&M plan. Cost savings are considered by eliminating ineffective inspection, extending inspection intervals and greater plant availability. Additional expected benefits are improvement to the plant safety and reliability.

TOP 7: Maintenance Standards
Antoine Despujols, EDF

Nowadays different organizations for standardisation are providing standards in the maintenance area. Respectively at international and European levels, the Technical Committees TC56 (Dependability) of International Electrotechnical Commission (IEC) and TC319 (Maintenance) of European Committee for Standardisation (CEN) are carrying out documents which are generally included in the set of national standards of each member countries. Some works done by working groups of these Technical Committees deserve to be mentioned:
IEC/TC56/WG1 is working on terminology and is revising the IEV 50(191) which defines dependability terms including a number of maintenance terms.
IEC/TC56/WG3 working on dependability management provided interesting application guides about Maintainability (IEC60300-3-10), Reliability Centred Maintenance (IEC60300-3-11), Integrated Logistic Support (IEC60300-3-12), as well as a general presentation of “Maintenance and maintenance support (IEC60300-3-14)”. Some new work items should be proposed on spare parts management, maintenance support planning, and measurement of maintenance performance.
CEN/TC319/WG3 wrote a “guideline on preparation of maintenance contracts (ENV 13269)”.
CEN/TC319/WG4 wrote in 3 languages (English, French and German) a “Maintenance terminology” standard which contains about 120 basic term definitions.
Other standards can also be mentioned as “a guide to Reliability Centered Maintenance (SAE JA1012)” produced by the Society of Automotive Engineers or
“documents for maintenance (EN13460)” produced by CEN, as well as the present CEN/TC319/WG6 work about “Maintenance Key Performance Indicators”.
These documents, which are the result of large discussions and comments, can be useful for maintenance people.

TOP 8: Kissy, VGB Data Base
Reinold Janßen, VGB

In the liberalised energy market the evaluation of the capacity of an own power plant compared to other power plants (benchmarking) is of great importance.
Strategic tools to optimize the capacity of a power plant in competition are:
- compilation of availability data and evaluation of performance indicators
- comparison of indicators of a single plant with the indicators of several plants of the same type.

The power plant information system KISSY of VGB is the tool, which treats these questions efficiently. It currently contains availability data and performance indicators from over 9,760 plant years of German and foreign power plants.

The elaborated performance indicators are defined and analysed in the VGB Guideline “Availability of thermal power plants – basis and compilation” (VGB RV 808 in German language only).
The new kind of operating power plants caused by the liberalised market requires the consideration of further performance indicators. KISSY enables to extend the field of performance indicators substantially. The intended extension will comprise:

- indicators for commercial availability
- damage- and condition-oriented indicators.

The data base system KISSY enables the online input of data via Internet by authorised persons. Standardised reports about the evaluation of performance indicators and analysis of non-availability of power plant components in ten year periods are available at VGB PowerTech Services.
Special evaluations will be provided on demand at individual costs.

TOP 9: Risk of Gas Explosions in Power Stations
Erwin van Wonderen

In the presentation Quantitative Risk Assessment (QRA) is presented and applied to hazards of gas lines in an urban environment.

In the Netherlands a risk policy was devised starting in the early 70’s mainly to investigate the acceptability of risks posed by the 2 Dutch Nuclear power plants. At the moment that the European guidelines and legislation came into play (European "Seveso-II" guidelines), this was integrated with the risk policy. Part of the regulations is the need of a Safety report. The safety report is obliged if the quantities of flammable, toxic or explosive substances surpass a certain amount, using a selection method. Part of the safety report is the Quantitative Risk Assessment (QRA). In the QRA a systematic probabilistic assessment is made of initiating events (Los of containment events), outflow modelling, possible physical consequences (effects like blasts, jet fire, toxic cloud dispersion) using event trees and meteorology and resulting risk to humans (probability of death as a result of heat radiation, pressure wave effects or intoxication using probit functions). The end result is two graphs, the individual risk and the group risk plot. At present the individual risk should not surpass the level of 10^{-6}/year outside the fence and the group risk should not exceed the limit line $10^{-3}xN^{-2}$/year, where N (number of victims) >10. During the 80-ies a committee was established (backed by various governmental ministries) called “the committee on the prevention of disasters”, in which various scientific organizations were gathered. The committee produced a number of guidelines called “the colored books”*. These books provide detailed practical models and knowledge on all afore mentioned topics.
Power stations are obliged to author the Safety report if for example tanks with ammonia are present (toxic hazard). Interestingly, the risks of natural gas pipe lines present at power stations need normally not to be evaluated. As shown in the presentation, due to the proximity of urban areas to some Dutch power stations, failure of gas pipe work inside the large volumes of the buildings pose an explosion thread, while piping outside the building can lead to explosions and heat radiation (as seen in the accident in Ghislenghien, Belgium). As in some cases the group-risk exceeded the limit, fast shutting gas valves (which will close at a full bore rupture) will be applied, lowering the risk to acceptable levels.

*:
•Guidelines for Quantitative Risk Assessment, CPR 18E (“The Purple Book”)
•Methods for determining and processing probabilities, CPR 12E (“The Red Book”)
•Methods for the calculation of physical effects, CPR 14E (“The Yellow Book”)
•Methods for the determination of possible damage, CPR16E (“The Green Book”)
To be obtained at “Sdu Uitgevers”, The Hague (www.sdu.nl).

TOP 10: Technical Management Strategy in ESB Power Generation
Richard Sheehan

Introduction

A previous PGMON presentation (Paris, meeting no. 27), the technical challenges facing ESB were outlined. This presentation was to give an impression of some of the technical initiatives which have since been undertaken, which are designed to manage the various challenges.

Challenges

Some of the technical challenges facing ESB include:

- Plant age profile
- Staff numbers reduction
- Knowledge Loss
- More plant cycling
- Regulatory pressures
- Recent plant performance
- Lack of systematic approach

Current Strategy

The current strategy is made up of a diverse number of technical initiatives, covering safety, plant and environmental risk areas. However there is not always clear definition as to how these initiatives fit together, or a systematic way to demonstrate that the approach is comprehensive.

Technical Management Framework

A framework was designed to provide a structured and systematic manner for managing technical issues. Such an approach will help ESB to comply with safety and environmental obligations and as well as compliance with corporate governance requirements.

Framework Model

A model was designed which would incorporate existing Standards, Guidelines and Local Procedures that are currently being implemented in ESB. The model required however a high level Technical Strategy and high level Technical Policies to be put in place.

- The technical strategy spells out the technical ‘mission statement’ for ESB
- In order to allow the strategy to be upheld, seven technical policy areas were defined, covering:-
    - Health & Safety
    - Integrity
    - Performance
    - R&D
    - Environment
    - O&M
    - Technical Risk Management

- The policies are in turn implemented via a suite of Standards and Guidelines.

- The Standards & Guidelines are in turn implemented by a suite of local O&M procedures implemented in Stations and in Head Office.

Typical Policy

An example of a typical policy was described (Integrity Policy), which set out high level aspirations in areas such as life assessment, documentation control, technical competencies, condition monitoring etc.

Cross Reference with Standards & Guidelines
An immediate application of the framework was to examine the adequacy of the current body of Standards and Guidelines. An assessment of the current suite of Standards and Guidelines and cross reference with the stated policies allowed a number of areas to be identified where there are gaps or inadequate levels of supporting documentation.

Cross Reference with 7-Year Plans
ESB stations are currently involved in detailing technical initiatives to be undertaken over the course of the next 7 years in order to return the plants to conditions that will allow them to achieve performance targets. The template being used in stations allow them to link all technical initiatives with the technical policy areas within the Technical Management Framework.

Technical Initiatives
A number of technical initiatives have been developed or are on-going, which link to the Technical Management Framework. These include

- Station 7-Year Plans
- Technical Integrity Self-Audit
- Plant Condition Overview
- Management Systems Overview
- Technical Benchmarking
- External Technical Risk Audits
- Guideline on Workscope Identification
- Analysis of Forced Outages
- Assessment of Technical Competencies Requirements
- Technical Training Courses
- Plant Maintenance Optimisation
- Operational Information Systems
- Overhaul Management Steering Group
- Forced Outage Reduction Team
- Cycling Studies

TOP 11: Modification on EDF Organisation
Claude Degrave, EDF

Since the 90's, the EDF Group has made determined and sustained efforts to meet the challenge of rapidly changing and growing competition in the energy field. Deregulation, concentration in the energy sector, and technological evolutions has created new risks and great opportunities. EDF consequently internationalised its activities and expanded into multi-service and multi-energy activities.
As of February 1st, 2002, the Group will be implementing the new management structure. It will be organized around Branches, Divisions and Business Networks. The Branches will be the operational arms of the Group, acting as resource developers and market actors under the overall strategic guidance of the Executive Committee. The Business Networks will ensure that EDF's skills and businesses evolve consistently and in synergy. The Executive Committee will concentrate on strategic planning and investment decisions,