Minutes of Meeting

VGB-Technical Committee:	Generation and Technology
VGB-Technical Group:	PGMON Power Generation Maintenance Optimisation Netzwork **58th Meeting on 23/24 May 2019 in Retford**

Participants:

Andrejkowic	Milan	CEZ
Hoffmann	Martin	CEZ
Krickis	Otto	Latvenergo
Le Bris	Yves	EDF
Martin	Conor	ESB
Panday	August	EDF
Ryan	David	ESB
Wels	Henk	DNV GL

VGB Secretariat:

Göhring	Sven	VGB

Agenda

Welcome (Henk Wels)

TOP 1: a) Steam leakage from Heat Recovery Steam Generator superheater- latest facts about incidents
b) Thermal energy storage – additional flexibility or downgradability?!
Otto Krickis, Latvenergo

TOP 2: Dissolved Gas Analysis & CENTRAM
Henk Wels, DNV GL

TOP 3: a) Short discussion on S 506 condition monitoring of boilers
b) Progress at the VGB Maintenance Group

TOP 4: Operational feedback and problematics from digital maintenance monitoring
Yves Le Bris, EDF

TOP 5: Risk management - Components criticality assessment
Martin Hoffmann, CEZ

TOP 6: Battery Energy storage system – PILOT PROJECT
Milan Andrejkovic, CEZ

TOP 7: a) ESB Generation Portfolio Performance Update
b) Predictive Maintenance and Condition Monitoring Project Update
c) ESB Battery Projects Overview
Conor Martin, ESB

TOP 8: Place and date of next venue

TOP 1: Steam leakage from Heat Recovery Steam Generator superheater
Otto Krickis, Latvenergo

Steam leakage from Heat Recovery Steam Generator

An availability of the combined cycle power plant is directly connected to the health of heat recovery steam generator. Integrity issues of heat recovery steam generator, as well as possible turndowns of the units could be caused by different incidents. The root cause analysis of the incident justify that the main issue is high local temperatures inside of HRSG, as well as manufacturing microdefects, which have a tendency to develop along with the number of the start-ups of the unit. The highest risk of the possible problem with heat recovery steam generator is the upper part of the superheater and economizer, where the vertical tube welded to the main collector. Analysis of the steam leakage inside of HRSG is complicated procedure; as well as damage liquidation procedure should be developed together with the manufacturer of the HRSG. Depending on the type of the issue, can be utilized several defects elimination techniques, cutting the main collector to plug defective vertical tubes and its recovery using the same piece of the collector or using brand new piece of the collector, which easier and more precise in order to recover the collector after plugging the tubes.

Thermal energy storage in order to improve flexibility of the CCGT

Thermal energy storage allows widening the flexibility frames of the CCGT and improving fuel utilization rate during peak electricity price and low thermal energy demand. Such technique allows to operate units more effective, securing cogeneration operation mode, instead of mix mode or condensing mode. Accumulated thermal energy during the day could be utilized in DH network during peak hours, when thermal energy demand is high, as well as ensuring discharging of the storage tank during cycling operation. Estimated effective accumulated thermal energy capacity for the CCGT unit with electrical power 400 MWel is approximately 550 MWh, but charging/discharging power range is 25-150 MWth. Such system integration to the existing CCGT would raise the overall efficiency comparing with the reference operation modes, thus ensuring better competitiveness in the market.

TOP 2: Dissolved Gas Analysis & CENTRAM
Henk Wels, Dekra

The basic principle of DGA is simple: check the amount of key gases and relate these to a degradation mechanism as both the type of gas and amout are dependent on the temperature at these degradation mechanisms. Acceptable values, trends and mechanisms are known from IEC, IEEE, Duval's triangle, etc. DNV-GL gathers DGA data from transformers in their CENTRAM database with user access to values, reports and a yearly Transformer day. The database is being updated for more modern software.

Some raw results for 8648 oil samples, 99 powerplant house load and 75 stepup transformers were analysed in order to find trends, p-F (from degradation to failure) trajectories, etc. For power plant house load transformers several problems were found, mainly thermal faults low temperature. These problems appear to be "family related", if 1 of "family" has a problem, others will have problems also. It was unclear what actions were taken as redundancy at the plant causes a no show at the Dutch centrally gathered plant unavailability records.

Seven cases with stepup transformers were investigated, some of which showed sudden gas increase. As functional failure of a stepup transformer directly effects plant unavailability, the majority could be related to the plant outage data gathered by DNV-GL and its predecessors.

With regard to the p-F trajectory, it appears that low temperature problems in practice are tolerated for years. However high temperature problems may occur suddenly, necessitating more often sampling starting from a half year or yearly interval to almost daily sampling. There is no clear relationship with age, although serious problems occurred at 12, 16, 17 and 25 years of age.

While the CENTRAM database is being updated, new developments are being actively followed by DNV-GL and worked on: CIGRE, IEC, Duval are working on new standards, changing from mineral oil to esters will need new guidelines, methanol may be a marker for paper degradation in addition to 2-FAL. Health indexing is being developed on the basis of utilization and condition function. There are interesting new developments in OLTC (tap changer) diagnostics.

TOP 4: Operational feedback and problematics from digital maintenance monitoring
Yves Le Bris, EDF

The ability for power plants to manage assets can be significantly enhanced through the application of innovative digital solutions. EDF have developed and tested a number such digital tools, which enable optimized decision making in O&M and help improve safety.

During the 57th PGMON meeting in Dublin, EDF presented their experience of digital tools and case studies. Further experience of our digital solutions has been shared during the 58th PGMON meeting which was held at the EDF Energy's West Burton B Power Plant in the UK. The discussion covered the following three areas –

1) Spare strategy for L0 blades and engineering assessment
2) Failure analysis with e-monitoring
3) Reliability data base construction for optispare.

A VME study (application for EDF's own digital tool at WBB) carried-out in early 2018, suggested that spare Last Stage (L0) blades for the steam turbine should be purchased based on mean NPV and probability of regret. Further engineering assessment of these blades has been presented.

Since 2010, E monitoring has been used at EDF plants to save cost through improved performance and early fault detections. A further analysis and evolution to predictive maintenance is discussed.

Furth innovation is being carried out on the 'Optispare' digital tool to build in cost constraint for deciding the best list of spare. EDF is developing its own reliability database utilizing 15 years of plant information and experience from nine 250 MW coal thermal plants. The existing tool and feedback on the database is presented.

TOP 5: Risk management - Components criticality assessment
Martin Hoffmann, CEZ

Presentation was divided into two main parts. In first part of presentation CEZ introduced the position of criticality assessment in the risk and maintenance process. Components criticality assessment represents an essential tool for applying a selective approach in maintenance.

Furthermore, the assessment process was presented in detail. The key step in assessment is categorization process. Within this process, the impacts of probable failure mode are quantified according to defined criteria.

The result of this evaluation is the division of the unit components into three categories according to its criticality.

This assessment is the input step of maintenance setting up. Furthermore, it can be also used in benchmarking of maintenance budgets allocation.

In conclusion, CEZ presented future steps in criticality assessment as standard part of Risk Management process.

TOP 6: Battery Energy storage system – PILOT PROJECT
Milan Andrejkovic, CEZ

CEZ introduced news from its organization. A correlation between the price of electricity and evolution of the price of CO_2 was discussed.
Second part of the presentation was devoted to Battery Energy Storage Systems in Czech Republic. At the beginning, the general situation on the Czech electricity market was presented. The specifics of the regulatory energy market were explained, as well as the CEZ internal situation.
In addition, the existing BESS projects in Czech were briefly introduced, legislative specifics were mentioned.
The final part of the presentation was dedicated to the upcoming project of CEZ Battery Storage System. Project is prepared in coordination with Czech National Grid Operator as a pilot project of primary regulation provided by BESS in Czech. BESS will be installed as part of large lignite unit.
Finally, the future and possibilities of BESS in the Czech were discussed.

TOP 7: Predictive Maintenance and Condition Monitoring Project Update & ESB Battery Projects Overview
Conor Martin, ESB

ESB Generation & Trading presented a performance update from 2018 including an overview of high impact unavailability events in the portfolio. This included details of an extended forced outages at Moneypoint cause by steam turbine rotor cracking and repair requirements experienced across all units which required off-site redesign and repair of key components. The suspected failure mode is stress corrosion cracking caused at the wet-dry transition zone at the L-2 blade section of the LP rotors.
An update on the condition monitoring and predictive analytics project was provided including details of the use cases identified for priority implementation and future planned pilot roll-outs of predictive systems and techniques across the ESB Generation and Trading CCGT fleet. The hydro and wind portfolio has been excluded from the initial phase deployments due to a combination of data quality and instrument availability for hydro and the full service model currently in place in wind with the turbine OEMs. The pilot roll-outs will be delivered by a combination of in-house development and commercial off the shelf products. Benchmarking analysis has shown that power generation businesses have shown quantifiable improvements by deploying predictive maintenance systems and practices.
An overview of current battery storage projects within ESB Generation was provided along with plans for future battery installations. This includes the acquisition of UK battery storage project to build knowledge of the technology and the battery storage market and trading practices. An overview of future planned projects in Ireland was provided which are expected to be delivered in 2022.

TOP 8: Place and date of next venue

The next meeting will be held on 17./18. October 2019 in Karlovy Vary/CZ.