

## Minutes of Meeting

VGB-Technical Committee: Generation and Technology  
VGB-Technical Group: PGMON  
Power Generation Maintenance Optimisation Network  
**57<sup>th</sup> Meeting on 11/12 October 2018 in Dublin**

**Participants:**

Andrejkowic	Milan	CEZ
Galant	Arkadiusz	ESB
Hoffmann	Martin	CEZ
Krickis	Otto	Latvenergo
Le Bris	Yves	EDF
Martin	Conor	ESB
Panday	August	EDF
Wels	Henk	DEKRA

**VGB Secretariat:**

Göhring	Sven	VGB
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## **Agenda**

### **Welcome (Henk Wels)**

- TOP 1: Condition monitoring of equipment and data processing using advanced assessment methods  
Otto Krickis, Latvenergo
- TOP 2: HR3C at modern large coal fired plants: results of all DEKRA measurements up to now  
Henk Wels, Dekra
- TOP 3: Asset Management tools for risk assessment in EDF thermal units  
Yves Le Bris, EDF
- TOP 4: Condition monitoring: real-time gas leakage detection & Unavailability news  
Martin Hoffmann, CEZ
- TOP 5: Introduction of the CEZ Group & IT support for Asset and Risk management processes  
Milan Andrejkovic, CEZ
- TOP 6: ESB G&T Maintenance Optimisation – Condition Monitoring and Predictive Analytics Review  
Arkadiusz Galant, ESB
- TOP 7: Place and date of next venue

**TOP 1: Condition monitoring of equipment and data processing using advanced assessment methods**  
**Otto Krickis, Latvenergo**

Condition monitoring is the process of monitoring a parameter of condition in machinery (i.e. vibration, temperature) in order to identify a significant change which is indicative of a developing fault. In the root of the condition monitoring system lays some statistical approach, which is integrated to some software platform and runs mathematical loop with predefined step. Such assessment method allows searching for the abnormalities or some deviations in measurements, which are witnessing about some defect of the equipment. But any kind of the condition monitoring system receives data from historian databases in online or offline modes. In order to perform some manual analysis of some fault without losing information from raw data set is necessary to perform raw data processing using specially configured software, which is able to read, extract and sort the raw data. In the result the analyst receives evenly distributed measurements, which is possible to proceed in some advanced statistical approach. To improve the accuracy of the developed statistical approach is recommended to implement automated raw data clustering. Combination of the raw data clustering with advanced condition monitoring algorithm leads to the better performance of the whole condition monitoring system.

**TOP 2: HR3C at modern large coal fired plants: results of all DEKRA measurements up to now**  
**Henk Wels, Dekra**

Results of DEKRA measurements up to October 2018.

Many of the new large coal fired plants that have the HR3C show indications and cracks in the heat effected zone of welds. Especially in the piping around reheaters indications and cracks show, originating from the inside (water / steam) and in a circumferential direction. The indication can be on one or both sides of the weld with or without crack development in the zone of the indication.

DEKRA MTI has carried out NDT inspections of several affected reheaters and superheaters to detect any cracks growing close to the welds in HR3C tube, which

subsequently were replaced with new HR3C tube and / or repair welding. Dedicated inspection equipment and procedures were developed for mechanized NDT using so-called creep waves and phased array testing allowing to test LARGE number of pipes in very LIMITED time

Inspection reports have been thoroughly evaluated for boilers A, B, C and D that were inspected in 2015, 2016, 2017. All boilers were recently built by more than one manufacturer. Large differences in number of indications, depth and length of indications are present. The most recent boilers show fewer problems.

The phenomenon involved appears to be IGA = intergranular attack, with the IGA indications increasing over the years. Indications tend to grow in depth and length but with large uncertainty on the amount of increase per year. Short indications can conglomerate to form one longer indication.

Large and, as yet not fully explained differences between plants exist. It is probably related to increased experience and quality improvement at welding. Material and perhaps thickness is an item (HR3C at small thickness appears to have the most problems), however material cannot be separated from thickness as the design is optimized taking thickness, temperature, stress as well as material into consideration.

Several approaches for repair are decided upon by utilities. Some utilities appear to be both replacing by other materials as well as do repair welding. An economical approach for utilities is thought to measure by creep waves on thin pipes or by phased array on thicker pipes (> abt. 5 mm) that already have appreciable indications in length at least every year and find out if the indications have grown. A decision on repair should be made for indications larger than an agreed size, to compare with critical crack size. NDT should be applied to the repair welding with welding under the highest quality conditions possible at the place and geometry applicable.

Care should be taken at HR3C sections not only reheaters at HR3C-HR3C welds, also header connections outside the furnace may show cracking.

**TOP 3: Asset Management tools for risk assessment in EDF thermal units  
Yves Le Bris, EDF**

The ability for power plant to manage assets can be significantly enhanced through innovative digital solutions and software. EDF have developed and tested some digital tools, which enable optimized decision making in O&M and improving safety.

Following the 54th PGMON meeting in Paris, where the e-monitoring center was the focus of the visit, further experience of EDF was presented at the 57th PGMON meeting in Dublin. The discussion covered the following three areas –

1. Benefits of e-monitoring
2. Application of VME tool for making investment decision for strategic spare parts
3. Utilizing Optispare to optimize spare parts storage

EDF shared their experience of utilizing IT applications in risk management and optimizing spares strategy for complex assets.

West Burton ‘B’ CCGT recently used EDF Ingeum (thermal engineering) for the technical and economical assessment of the for steam turbine spare parts (Including Last Stage LP blades, L1 Blades, Valve internals, Bearings, HP/IP nozzles). The VME software tool was deployed to estimate the net present value and to assess the investment case.

Furthermore, Optispare has been applied for the management of safety spare parts in EDF OCGT plants in France. This is a compilation of RFID tag system in the warehouse and a probability database to choose the optimum level of safety spare parts.

EDF is working across its global portfolio of power plants to develop and implement digital tools for better operations and maintenance of assets (both predictive and preventative).

**TOP 4: Condition monitoring: real-time gas leakage detection & Unavailability news  
Martin Hoffmann, CEZ**

Presentation was divided into two main parts. In first part of presentation CEZ introduced the actual development of unplanned and planned unavailability. The general developments correlate with VGB Kissy Report Availability overall data. Significant influence on the overall results has units before shutdown. This is evident from the global overview of unit's group's unavailability report.

Selected failures of conventional units were also presented to share experiences with PGMON group.

The second part of the presentation presented the experience of CEZ with real-time leakage detection. CEZ has a historical experience with using these systems, which are based on the principle of acoustic emission. This principle is used to monitoring the boiler leaks. The deployment of the new system, which is based on Ultrasound principle, is currently being considered.

In conclusion, CEZ discussed possible cost/benefits aspects of this ultrasound system with PGMON group.

**TOP 5: Introduction of the CEZ Group & IT support for Asset and Risk management processes**  
**Milan Andrejkovic, CEZ**

CEZ introduced news from its organization. The correlation between the development of commodity prices, CO<sub>2</sub> and the price of electricity on the energy market in the Czech Republic was discussed.

In the main part of the presentation, main IT tools for Asset Management were presented. The presentation had the character of the user viewpoint.

The presentation of the tools corresponded to the individual phases of Asset Management process:

- Strategy,

- Risk Management,
- Project Management,
- Performance Assessment,
- Operation Support,
- Reporting.

IT tools for AM activities are composed of solutions of proven OEMs in combination with IT tools tailored to the needs of the CEZ. Several applications for performance assessment are created directly by CEZ. For central management is used over 20 applications. Key applications are Plexos, SAP, AS8, Tipom SW.

Over the past few years, the maximum effort is devoted to optimization of used applications into uniform platforms. This remains the main target for a future strategy.

**TOP 6: ESB G&T Maintenance Optimisation – Condition Monitoring and Predictive Analytics Review**  
**Arkadiusz Galant, Conor Martin, ESB**

At last PGMON 57 meeting ESB presented on the progress of conditioning and predictive maintenance review project.

ESB GWM has been carrying out a review of the monitoring systems and technologies implemented in the generation portfolio with a view to maximising the value of data and applications available. This review consisted of completing workshops with key users in the power stations along with central specialists to identify any issues and improvement areas in how we use and exploit technology and data.

Based on the workshops a number of improvement options have been identified with key improvements to be made by progressing three workstreams, Asset Information Management Capability, Exploiting Existing Data and Systems and Exploring New Technology. As part of this review a benefits case was prepared involving a review of forced outage and trip events at an ESB CCGT plant, where data scientists were able to use historian data to identify five potential failures in advance with a high degree of confidence. Preventing these trips and forced outages would lead to a 1.5% availability



improvement at the station and avoid commercial losses associated with unplanned downtime and emergency maintenance.

A benchmarking exercise was also completed and improvements due to exploiting data and carrying out advance defect detection were demonstrable across a number of similar power generation businesses. ESB GWM is proposing to now move forward with the three work-streams in order to realize the value and benefits identified in the benefits case. The optimum set up for this will consider the technology and people requirements to ensure lasting benefits can be achieved from any technology deployed.

**TOP 7: Place and date of next venue**

The next meeting will be held on 22./23. or 23./24. of May 2019 in West Burton/UK.