ENERGY KNOWLEDGE FOR YOU

PROGRESS REPORT 2021

KWS Energy Knowledge eG

Foreword

The Progress Report of KWS Energy Knowledge eG (KWS) at hand informs members about basic and advanced training measures conducted, further activities and projects as well as board and panel work during the report period of January 1st to December 31st, 2021.

In 2021, the impact of the Covid-19 pandemic was once again the dominant topic for KWS. The lockdown, which had begun in December of 2020 and precluded in-classroom instruction, was originally scheduled to last only until January 10th, 2021, but was eventually terminated on July 26th, 2021 for KWS. The pandemic staff convened regularly and determined modifications of various measures (social distancing, hygiene, masks, ventilation, testing). Formats for internet-based instruction that had been successfully introduced in 2020 made sure that all training courses were able to take place as scheduled.

The second most important special topic was the conversion of KWS into a new legal form as an incorporated cooperative. Thanks to thorough planning and substantive assistance by the Board of Directors of the association and the members, all in-house measures had been taken in 2020, and with the formal entry into the Register of Cooperatives on May 6th, 2021, the transformation of KWS was successfully completed.

The restructuring of the power industry continues to progress. According to Germany's law for the discontinuation of coal-based power generation, more hard coal-powered plants have been earmarked for a timely shutdown, and three lignite-fired power plants of the 300 MW class were decommissioned. The politically mandated expansion of renewable energy generation and gas-fired power plants, however, is markedly lagging behind expectations and requirements.

During the report period, enrollment in conventional power plant technology training courses for plant attendant, power plant operator, and power plant shift supervisor was very high. Demand for on-site training courses was low due to the Coronavirus pandemic. Members, both foreign and domestic, used KWS's simulator courses for lignite-, hard coal-fired, and CCGT power plants to ensure practical, high-quality basic and advanced personnel training in 2021.

For power plants designated systemically relevant by the transmission network operator, KWS conducted simulator training on location for the purpose of personnel skill retention, low operating hours of the real-life plants notwithstanding. To that end, simulated control rooms connected online to KWS servers were set up.

Nuclear technology seminars focused on conveying fundamentals, business management, skill retention, and radiation protection.

In the field of renewable energies, training courses for wind power and hydropower plant personnel were conducted. Our new "Empower Refugees" measure saw 12 refugees from Syria and Iran pass the CCI exam for "Wind Power Industrial Electrician" and receive their graduation certificates from Thomas Kufen, mayor of the City of Essen, Germany.

Overall demand in the area of thermal waste treatment was again very high. There is much call for the new training courses specifically adapted to this branch of the power industry. Various members react to market demands by enacting change and optimization measures. KWS accompanies and assists such measures at the operations and shift crew level with best practice workshops in the areas of social, methodical, and personal skills, for example. These workshops focus on workplace behavior, teamwork, communication, decision-making as well as supervision and monitoring.

In international activities, the workload was lower than usual because of the pandemic. Courses were conducted in Saudi Arabia, France, and Iraq.

In conclusion, we would like to express our heartfelt gratitude for your trust vested in us. Today and tomorrow, we continue to be your competent service provider for basic and advanced training of operating personnel, for organizational consulting and human resource development as well as for the construction and development of power plant simulators.

Ernst Michael Züfle
Board of Directors

Monika Bartels
Board of Directors

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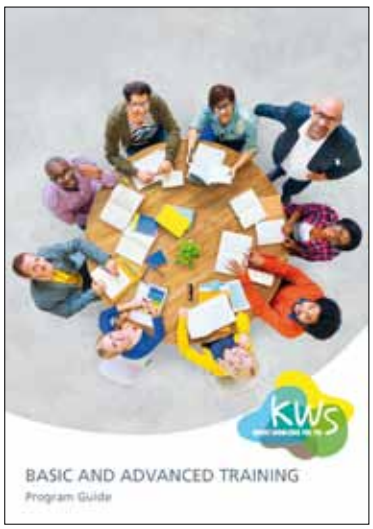


Performance in 2021

Services of KWS PowerTech Training Center: An overview

The range of KWS's services is best described with the terms basic training, continuing education, advanced training, qualification and consulting. KWS's training offerings operate within the legal framework of Germany's Vocational Training Act, the Ordinance on Industrial Safety and Health, and the Atomic Energy and Radiation Protection Law. Plant Attendant, Power Plant Operator and Power Plant Shift Supervisor courses are unequivocally designed to provide the entire power industry with qualified and certified personnel of the highest order. The wide range of KWS's advanced training offerings enables companies to maintain, adapt or enhance the professional skills of its operating personnel. This area of services comprises certified training courses, officially approved courses, but also customized instruction measures. KWS's comprehensive training simulator pool permits offering companies a wide range of in-depth training options for power plant operating pers-onnel. Counseling is the latest addition to KWS's training offerings and concerns itself with the topics of management consultation and human resources development.

NUMBER OF PARTICIPANTS, COURSES CONDUCTED, TRAINING MEASURES AND PARTICIPANT DAYS: ALL DEPARTMENTS

January 01–December 31, 2021	Courses conducted	Number of Participants	Number of Participant Days
Conventional Power Plant Technology	105	1.280	36.532
Nuclear Technology/Radiation Protection	27	260	1.474
Simulator Training	83	293	1.280
Organization Development	8	94	214
Renewable Energies	16	130	1.193
International Activities	9	174	865
Total	**248**	**2.231**	**41.558**

Conventional Power Plant Technology

Basic and advanced theoretical training comprises all instruction measures designed to amplify, expand or renew the professional knowledge and skills of employees who have already completed a first stage of vocational training. Qualification demands on each individual power plant employee increase, with regard to both technical and social skills. The concept of lifelong learning is part of working life, especially in a complex technical environment like a power plant. Very successful in 2020 was the launch of skill enhancement courses in the field of thermal waste treatment (TWT), which were continued in 2021. KWS now offers new, future-oriented specializations of its "KWS-Certified Plant Operator" and "CCI-Certified TWT Power Plant Shift Supervisor" vocational training degrees.

NUMBER OF PARTICIPANTS, COURSES CONDUCTED AND PARTICIPANT DAYS:
POWER PLANT OPERATORS, POWER PLANT SHIFT SUPERVISORS AND CUSTOMER-SPECIFIC ADVANCED TRAINING MEASURES

January 01 – December 31, 2021	Courses conducted	Number of Participants	Number of Participant Days
Power Plant Operators	16	305	14.737
Power Plant Shift Supervisors – Production	12	216	13.587
Power Plant Shift Supervisors – Production Electrical and Control Engineering	5	92	583
Thermal Waste Treatment (TWT)	12	119	4.993
Advanced Training Measures	23	300	2.178
Customer-Specific Advanced Training Measures	37	248	514
Total	**105**	**1.280**	**36.532**

Among others, the following courses were held during the report period:

Plant Attendants
22nd training course (Essen/Germany)
Module Basic with 48 participants
Module Steam Generation with 48 participants
Module Turbines with 42 participants

117th training course (Gernsbach/Germany)
Module Basic with 25 participants
Module Steam Generation with 25 participants
Module Turbines with 24 participants

Plant Operator TWT
05th training course with 19 participants
06th training course with 22 participants

Power Plant Operators
125th training course with 55 participants
126th training course with 30 participants
127th training course with 60 participants

KWS-certified Operator Production for EEW Energy from Waste GmbH
08th training course with 10 participants

Power Plant Shift Supervisors – Production
141st training course with 25 participants
142nd training course with 23 participants

Power Plant Shift Supervisors – Production Electrical and Control Engineering
50nd training course with 11 participants

Nuclear Technology/Radiation Protection

Nuclear Technology training is three-pronged:

1. Nuclear power plant personnel training
2. Nuclear power plant personnel skill retention and instruction, respectively
3. Radiation protection training

The training lineup comprises officially required courses for qualification acquisition of responsible personnel as well as officially approved courses for qualification acquisition and updates in radiation protection. Instruction measures for personnel otherwise employed in nuclear power installations follow the respective guideline of Germany's Federal Environment Ministry. In addition to skill acquisition courses, KWS's training measures also include a wide range of skill retention training options.

NUMBER OF PARTICIPANTS, COURSES CONDUCTED AND PARTICIPANT DAYS:
NUCLEAR TECHNOLOGY / RADIATION PROTECTION

January 01 – December 31, 2021	Courses conducted	Number of Participants	Number of Participant Days
Power Plant Shift Supervisors – Radiation Protection	2	8	180
Nuclear Basics	3	15	610
Skill Retention	10	125	143
Skill Acquisition in Radiation Protection	5	32	225
Special Courses Nuclear Technology/Radiation Protection	7	80	316
Total	**28**	**260**	**1.474**

Simulator Training

The KWS simulators in Essen are utilized to practice efficient power plant operations under normal operating conditions as well as handling malfunctions effectively. In addition to safe plant operations, process engineering technology interaction is immersively trained, if so required. The simulators facilitate quick, easy, and safe familiarization with current process engineering systems. By being able to deal with critical plant scenarios in this risk-free simulator environment, operating personnel is enabled to acquire confidence in managing such situations in the real-life installation.Crews from standby or reserve plants receive little exposure to actual operations due to infrequent operating times of their installations. It is therefore challenging to maintain operational practice, safety and skills of such personnel. KWS assists businesses with customized simulator training in all such cases. Aside from operations training, simulator sessions may be used to practice social skills like teamwork, leadership and communication as well as work out and establish decision-making strategies. KWS rich experience of many years in these areas contributes to an ongoing process of improvement in power plant operations. If so desired, simulator training may be conducted on location – at the power plant or the local training center – all around the world.

NUMBER OF PARTICIPANTS, TRAININGS CONDUCTED AND PARTICIPANT DAYS: SIMULATOR TRAINING

January 01 – December 31, 2021	Trainings conducted	Number of Participants	Number of Participant Days
Lignite 600/1100 MW	28	99	475
Hard Coal 800 MW	27	87	273
Hard Coal 1100 MW	17	66	330
CCGT 750-S/D (SPPA-T2000)	2	7	32
CCGT 750-3 (SPPA-T3000)	9	34	170
Total	83	**293**	**1.280**

Construction Committee "Simulator for Lignite-Fired Power Plants"

The committee was set up for the purpose of realizing the simulator for lignite-fired power plants in order to assist KWS in the implementation of the simulator construction project.
Since the commissioning of the simulator, the committee has been counseling KWS on the evolution of the different simulator variants.
The committee convened once during the report period: October 04th, 2021

The Construction Committee concerned itself with the following topics:

- Upgrade of the simulator to the current power plant control engineering system Siemens SPPA- T3000 V8.2
- Further development of the simulator also with regard to current topics such as cyber security

Organization Development

Member businesses routinely react to market challenges by adjustment measures that often do not result in the desired changes and improvements in ongoing operations. Here, KWS is on hand with a wide range of offerings on personnel selection, team development, organization development, conflict management, and management coaching.
Irrespective of the constraints caused by successive waves of the Coronavirus pandemic, some members were successfully accompanied in their quest for optimizing workplace processes and industrial relations. Since the future is expected to revolutionize the advancement of the energy market, which will bring about great changes in many businesses, our organization development team is working on enhancing its profile in the industry in order to become the go-to contact for assisting organizational change.

NUMBER OF PARTICIPANTS, COURSES CONDUCTED, MEASURES AND PARTICIPANT DAYS: ORGANIZATION DEVELOPMENT (OD)

January 01–December 31, 2021	Courses/Measures conducted	Number of Participants	Number of Participant Days
OD Consulting and Workshops	6	86	198
OD Seminars	2	8	16
Total	**8**	**94**	**214**

Renewable Energies

2021 brought about some changes in the structure of our lineup and the execution of seminars in the field of renewable energies.

Hydropower:

The restrictions caused by the Coronavirus pandemic necessitated splitting up the "Control Room Operator for Hydropower Plants" seminar. The first part took place online in the spring, while the second part was conducted in the classroom in the fall. Members and trainees alike would rather accept this format than cancel the seminar, but would prefer in-classroom instruction in the future.

Wind power:

In the second run of the "Empower Refugees" project, all 12 refugees passed their final exams during the first try. They are now integrated in the German labor market as CCI-certified industrial electricians for wind power operations technology. In addition to workplace safety training measures on KWS's wind power training installation, the first seminars covering electrotechnology qualification took place. Training is characterized by hands-on instruction on the training installation (complete with active control engineering and transformer station) and in the training workshop.

Hydrogen:

Before the backdrop of Germany's scheduled phase-out of coal-based power generation, the dynamic of the topic of hydrogen accelerates for the power industry and therefore for KWS as well.

In this new field, the focus was on building up the network and a first basic seminar has already been developed and established.

NUMBER OF PARTICIPANTS, COURSES CONDUCTED AND PARTICIPANT DAYS:
RENEWABLE ENERGIES

January 01 – December 31, 2021	Courses conducted	Number of Participants	Number of Participant Days
Renewable Energies	16	130	1.193

International Activities

Like in the year before, KWS's international activities in 2021 were characterized by the Coronavirus pandemic. Nevertheless, plant-specific training measures were conducted in the Iraqi power plants of Maisan and Al Rumailah on behalf of Siemens. The training courses in Maisan took place in the spring so that our instructors had to spend 30 days in quarantine in Iraq and Germany in order to conduct 26 days of training.
A training requirement and potential analysis of approx. 100 staffers of the Besmaya power plant in Iraq was performed for Mass Group Holding. This was a entirely virtual event using a digital training platform with supplementary online expert interviews, the first of its kind for KWS.

NUMBER OF PARTICIPANTS, COURSES CONDUCTED, MEASURES AND PARTICIPANT DAYS: INTERNATIONAL ACTIVITIES

January 01–December 31, 2021	Courses conducted	Number of Participants	Number of Participant Days
International Activities	9	174	865

Organization

Board of Supervisors

The Board of Supervisors is tasked with monitoring the Board of Directors' management of KWS. Its job is to examine the annual financial statement, the status report, and the use of the annual net profit and to convey the results of its examination to the General Assembly. The Board of Supervisors directs the General Assembly that approves the annual financial statement and the investment, financial and business plan. Furthermore, the Board of Supervisors appoints and recalls the Board of Directors.

The Board of Supervisors convened twice during the report period:
2nd meeting March 17th, 2021
3rd meeting November 5th, 2021

Altmann, Hubertus, (Chairman)
Member of the Board of Directors
of Lausitz Energie Kraftwerke AG/
of Lausitz Energie Bergbau AG, Cottbus/Germany

Gruber, Karl Heinz, Dipl.-Ing., Dr. (Deputy Chairman)
Member of the Management of VERBUND Hydro Power AG, Vienna/Austria

Bockamp, Stefan, Dr.
Director Operations Steam & Biomass
Uniper Kraftwerke GmbH, Düsseldorf/Germany

Giesen, Ralf
Member of the Board of Directors of RWE Power AG and
Chief Human Resources Officer (CHO),
RWE Power AG, Cologne/Germany
(since January 2021)

Lücker, Guido
Technical Manager
of EEW Energy from Waste Hannover GmbH, Hannover

Razanica, Kemal
Member of the Board of Directors of RWE Power AG
(from June 2021)

Reinhard, Volker
Head of HR Production Department (P-AE),
EnBW Energie Baden-Württemberg AG, Stuttgart/Germany

Board of Directors

Ernst Michael Züfle

Monika Bartels

Financial and Legal Committee

The Financial and Legal Committee of KWS Energy Knowledge eG assists and advises the Board of Supervisors and the Board of Directors in all financial and legal matters.
The committee discussed the audit report which was compiled by BDO AG Wirtschaftsprüfungsgesellschaft, Zweigniederlassung Essen branch office, on the financial statement for 2020, the review of operation including the attachment and recommended that the board approve KWS's financial statement for 2020 as is. Consultation of the economic, investment and financial plans for the business year 2021 was carried out by the Financial and Legal Committee. It recommended to the Board of Supervisors that it submit them in the General Assembly in 2021.
The Financial and Legal Committee also concerned itself with medium-term business planning designed for a five-year period and with the impact of the corona pandemic.

The following activities took place during the report period:
66th meeting April 21st, 2021
67th meeting September 21st, 2021

Eck, Jens, Dr. (Chairman)
Lausitz Energie Kraftwerke AG/
Lausitz Energie Bergbau AG, Cottbus/Germany

Frey, Rainer, Magister
VERBUND-Hydro Power GmbH, Vienna/Austria

Ketterer, Marcel
EnBW Energie Baden-Württemberg AG, Karlsruhe/Germany

Schlingensiepen, Daniel
RWE Nuclear GmbH, Essen/Germany
(since May 2021)

Sennekamp, Peter
Uniper Kraftwerke GmbH, Düsseldorf/Germany

Training Committee

The KWS Training Committee advises and assists the Board of Supervisors and Board of Directors in their task, such as determining admission criteria for training courses, admission to courses (if so determined in the admission criteria), collaboration during examinations conducted by KWS with regard to examination regulations. Other activities of the committee involve filing applications to the incorporated society upon which KWS is legally based for the procurement of instruction materials and equipment as well as managing various other school- and training-related affairs.
In its sessions during the report period, the Training Committee concerned itself with the results of the admission exams for the 143rd and 144th Power Plant Shift Supervisor–Production training course and those of the 3rd Power Plant Shift Supervisor–Thermal waste treatment training course.
Other consultations topics during sessions were

- KWS reports on current training activities and new projects,
- Exchange of basic and advanced training program information and experience,
- Quality control of power plant shift supervisor training .

The Training Committee convened twice during the report period:
135th meeting June 1st, 2021 (online session)
136th meeting December 9th, 2021 (online session)

Bieder, Markus (Chairman)
Stadtwerke Münster GmbH, Münster/Germany

Hark, Guido (Deupty Chairman)
RWE Power AG, Eschweiler/Germany

Ahrens, Carsten
PreussenElektra GmbH, Grohnde Nuclear Power Plant, Emmerthal/Germany
(since November 2021)

Hager, Frank, Deputy Assistant Under-Secretary
Ministry for the Economy, Innovation, Digitilization and Energy of the State of Northrhine-Westphalia, Düsseldorf/Germany

Jedamzik, Bernd
EnBW Energie Baden-Württemberg AG, Karlsruhe/Germany
(since November 2021)

Kirstein, Klaus-Dieter
KDK Consulting, Düsseldorf/Germany

Klein, Käthe
Chamber of Industry and Commerce, Essen/Germany

Kurzmann-Friedl, Christof, DI
VERBUND Thermal Power GmbH & Co KG, Dürnrohr Location, Zwentendorf/Austria

Lang, Martin, Prof. Dr.-Ing.
University Duisburg-Essen/Germany

Paus, Christoph
UNIPER SE, Essen/Germany

Schuknecht, Michael, Dr.-Ing.
TÜV NORD Systems GmbH & Co KG, Essen/Germany

Stenzel, Oliver
Lausitz Energie Kraftwerke AG, Kraftwerk Schwarze Pumpe, Spremberg/Germany

Then, Oliver, Dr.
vgb energy e.V., Essen/Germany

Tschersich, Conrad
AWG Abfallwirtschaftsgesellschaft mbH Wuppertal, Wuppertal/Germany

Volkmann, Peter
Grosskraftwerk Mannheim Aktiengesellschaft, Mannheim/Germany

Von Gehlen, Sebastian, Dr.
PreussenElektra GmbH, Emmerthal/Germany
(from November 2021)

Wagner, Karsten
EnBW Energie Baden-Württemberg AG, Karlsruhe/Germany
(from November 2021)

Wiegel, Michael
RWE Generation SE, Gersteinwerk Power Plant, Werne/Germany

Ernst Michael Züfle
KWS Energy Knowledge eG, Essen/Germany

Consultant:
Nina Woydack
KWS Energy Knowledge eG, Essen/Germany

Facts and Figures

Members

KWS Energy Knowledge eG Membership

KWS Energy Knowledge eG is a partnership of power industry companies. It strives to promote and assist the businesses of its members through basic and advanced training events for expert operations and management personnel of installations dedicated to power and/or heat generation and supply, heat extraction and desalination by maintaining locations for holding such events and conducting examinations as well as offering room and board for trainees. The cooperative assists its members within the framework of said vocational training in the area of environmental protection, in pollution control and water conservation, and also in the field of occupational health and safety and accident prevention. Furthermore, it acts as consultant for personnel and organization development.
In order to ensure that the KWS can continue to serve in the long-term it is necessary that all power plant operators and other interested organizations support them by becoming members.
According to the KWS' statutes it differentiates between ordinary members, affiliated members and sponsoring members.
The KWS would be pleased to assist you in any questions regarding the organization and membership as well as its statutes and subscription fee regulations. Further information can be found on the internet at "www.kws-eg.com" or "international.kws-eg.com".

Ordinary Members

3M Deutschland GmbH, Membranes Business Unit, Wuppertal

Abfallwirtschaftsgesellschaft mbH Wuppertal, Wuppertal
AGR Betriebsführung GmbH, Herten
AHLSTROM-MUNKSJÖ PAPER GMBH, Aalen
Allessa GmbH, Werk Cassella-Offenbach, Frankfurt am Main
AMK Abfallentsorgungsgesellschaft des Märkischen Kreises mbH, Iserlohn
AVEA Entsorgungsbetriebe GmbH & Co. KG, Leverkusen
AVG Abfallentsorgungs- und Verwertungsgesellschaft Köln mbH, Cologne

Basell Polyolefine GmbH, Wesseling Site, Wesseling
BASF SE, Ludwigshafen
Bayer AG, Bergkamen
Bayer AG, Berlin
Berliner Stadtreinigungsbetriebe, Abfallbehandlungswerk Nord, Berlin
Boehringer Ingelheim Pharma GmbH & Co. KG, Ingelheim am Rhein
Bremerhavener Entsorgungsgesellschaft mbH, Bremerhaven
BS|Energy Braunschweiger Versorgungs-AG & Co. KG, Braunschweig

Cerdia Produktions GmbH, Freiburg
CURRENTA GmbH & Co. OHG, Leverkusen

Deutsche Windtechnik X-Service GmbH, Erkelenz
DREWAG Stadtwerke Dresden GmbH, Dresden
DSM Nutritional Products GmbH, Grenzach-Wyhlen
DS Smith Paper Deutschland GmbH, Aschaffenburg
DS Smith Paper Deutschland GmbH, Witzenhausen

EEW Energy from Waste Helmstedt GmbH, Helmstedt
EnBW Energie Baden-Württemberg AG, Stuttgart
EnBW Kernkraft GmbH, Obrigheim
enercity AG, Hanover
Energie AG Oberösterreich Erzeugung GmbH, Linz/Austria
Energie und Wasser Potsdam GmbH, Potsdam
Energie- und Wasserversorgung Bonn/Rhein-Sieg GmbH (SWB), Bonn
Energieversorgung Oberhausen AG, Oberhausen
Energieversorgung Offenbach AG, Offenbach
Engie, Engie Towers Brüssel, Brussel/Belgium
ENTEGA AG, Darmstadt
Erlanger Stadtwerke AG, Erlangen
Essity Operations Mannheim GmbH, Mannheim
EVN AG, Maria Enzersdorf/Austria
Evonik Operations GmbH, Marl

Fernwärme Ulm GmbH, Ulm

Gemeinschafts-Müllverbrennungsanlage Niederrhein GmbH, Oberhausen
GfA Gemeinsames Kommunalunternehmen für Abfallwirtschaft, Olching
GKS-Gemeinschaftskraftwerk Schweinfurt GmbH, Schweinfurt
Grosskraftwerk Mannheim AG, Mannheim

Hamburger Energiewerke GmbH, Hamburg
Hamburger Stadtentwässerung AöR, Hamburg
HEB GmbH, Hagener Entsorgungsbetrieb, Hagen
Heizkraftwerk Würzburg GmbH, Würzburg
Henkel AG & Co. KGaA, Düsseldorf

IHKW Industrieheizkraftwerk Andernach GmbH, Andernach

INEOS N.V., Zwijndrecht/Belgium
InfraServ GmbH & Co. Gendorf KG, Burgkirchen
InfraServ GmbH & Co. Höchst KG, Frankfurt am Main
InfraServ GmbH & Co. Wiesbaden KG, Wiesbaden

K + S Minerals and Agriculture GmbH, Philippsthal
K + S Minerals and Agriculture GmbH,
Neuhof-Ellers Site, Neuhof
Kämmerer Energie GmbH, Osnabrück
Kernkraftwerk Gösgen-Däniken AG, Däniken/Switzerland
Knapsack Power GmbH & Co. KG, Düsseldorf
Kraftwerke Mainz-Wiesbaden AG, Mainz-Wiesbaden
Kraftwerk Mehrum GmbH, Hohenhameln
Kraftwerk Obernburg GmbH, Obernburg
Kraftwerk Schwedt GmbH & Co. KG, Schwedt
Kreis Weseler Abfallgesellschaft mbH & Co. KG, Kamp-Lintfort

Lausitz Energie Kraftwerke AG, Cottbus
Linz Strom Gas Wärme GmbH für Energiedienstleistungen
und Telekommunikation, Linz/Austria

MAINOVA AG, Frankfurt am Main
Mark-E AG, Hagen
Mercedes-Benz AG, Sindelfingen
MHB Hamm Betriebsführungsgesellschaft mbH, Hamm
MHKW Müllheizkraftwerk Frankfurt am Main GmbH, Frankfurt
MIBRAG Mitteldeutsche Braunkohlegesellschaft mbH, Zeitz
Mohn media Mohndruck GmbH, Gütersloh
Moritz J. Weig GmbH & Co. KG, Mayen
Müllheizkraftwerk Rothensee GmbH, Magdeburg
Müllverbrennung Kiel GmbH & Co. KG, Kiel
Münchener Stadtentwässerung, Munich
MVA Weisweiler GmbH & Co. KG, Weisweiler
MVV Umwelt Asset GmbH, Mannheim

N-ERGIE Kraftwerke GmbH, Nuremberg
Nordland Papier GmbH, Dörpen
Norske Skog Bruck GmbH, Bruck an der Mur/Austria

OMV Downstream GmbH, Vienna/Austria
Onyx Kraftwerk Farge GmbH & Co. KGaA, Bremen
A member of the ONYX Power Group
Onyx Kraftwerk Wilhelmshaven Betriebs GmbH & Co. KGaA,
Wilhelmshaven, A member of the ONYX Power Group
Onyx Kraftwerk Zolling GmbH & Co. KGaA, Zolling
A member of the ONYX Power Group
OQ Chemicals Produktion GmbH & Co. KG, Ruhrchemie Site,
Oberhausen

Powerplant Rotterdam B.V.,
A member of the ONYX Power Group,
LB Maasvlakte Rotterdam/Netherlands
PreussenElektra GmbH, Hanover
PreZero Energy GmbH, Bernburg

Raubling Papier GmbH, Raubling
R.D.M. Arnsberg GmbH, Arnsberg
RKB Raffinerie-Kraftwerks-Betriebs GmbH, Essen
RheinEnergie AG, Köln
RWE AG, Essen
Group Membership for
- Gemeinschaftskraftwerk Bergkamen A OHG, Bergkamen
- RWE Generation SE
- RWE Nuclear GmbH
- RWE Generation NL B.V., Netherlands
- RWE Generation UK plc, Didcot B CCGT Power Station,
Oxfordshire/Great Britain

Salzburg AG, Salzburg/Austria
Salzgitter Flachstahl GmbH, Salzgitter
Sappi Austria Produktions-GmbH & Co. KG, Gratkorn/Austria
Sappi Ehingen GmbH, Ehingen
Schluchseewerk AG, Laufenburg
SchwörerHaus KG, Hohenstein
SEO Societe Electrique De l´Our S.A.,
Centrale Vianden, Stolzembourg/Luxembourg
Smurfit Kappa Zülpich Papier GmbH, Zülpich
Solvay Chemicals GmbH, Hanover
Spreerecycling GmbH & Co. KG, Spremberg
SRS Eco Therm GmbH, Salzbergen
Stadtwerke Augsburg,
Elektrizitäts- und Fernwärmeversorgung,
Wärme- und Stromerzeugung, Augsburg
Stadtwerke Bielefeld GmbH, Bielefeld
Group Membership for
VA Bielefeld-Herford GmbH
Enertec Hameln GmbH
Stadtwerke Düsseldorf AG, Düsseldorf
Stadtwerke Flensburg GmbH, Flensburg
Stadtwerke Heidelberg Netze GmbH, Heidelberg
Stadtwerke Karlsruhe GmbH, Karlsruhe
Stadtwerke Leipzig GmbH, Leipzig
Stadtwerke Münster GmbH, Münster
Stadtwerke Rosenheim GmbH & Co. KG, Rosenheim
Stadtwerke Rostock AG, Rostock
Stadtwerke Schwerin GmbH, Schwerin
Städtische Werke Energie + Wärme GmbH, Kassel

STEAG GmbH, Essen
Konzernmitgliedschaft für
RKB Raffinerie-Kraftwerks-Betriebs GmbH, Essen
Stora Enso Maxau GmbH, Karlsruhe
swb Entsorgung GmbH & Co. KG,
Müllheizwerk Bremen, Bremen
swb Erzeugung AG & Co. KG, Bremen
SWM Services GmbH,
Strom- und Wärmeerzeugung, Unterföhring
SWP Stadtwerke Pforzheim GmbH & Co. KG, Pforzheim

TEAG Thüringer Energie AG, Erfurt
Technische Betriebe Solingen (TBS), Solingen
Thermische Verwertungsanlage Schwarza (TVS),
Eigenbetrieb des Zweckverbandes
Abfallwirtschaft Saale-Orla, Pößneck
Thyssen Krupp Steel Europe AG, Duisburg
T-Power Energie Services BV, Tessenderlo/Belgium
TWL Technische Werke Ludwigshafen AG,
Ludwigshafen am Rhein

Uniper Benelux N.V., Rotterdam/Netherlands
Uniper Kraftwerke GmbH, Hanover

Vattenfall Europe Nuclear Energy GmbH, Hamburg
Vattenfall Heizkraftwerk Moorburg GmbH, Hamburg
Vattenfall Wärme Berlin AG, Berlin
Vattenfall Wasserkraft GmbH, Berlin
Venator Germany GmbH, Duisburg
Veolia Industriepark Deutschland GmbH, Heinsberg
VERBUND Hydro Power GmbH, Vienna/Austria
VERBUND Thermal Power GmbH & Co. KG,
Fernitz-Mellach/Austria
voestalpine Stahl GmbH, Linz/Austria
Vulkan Energiewirtschaft Oderbrücke GmbH, Eisenhüttenstadt
VW Kraftwerk GmbH, Wolfsburg

WIEN ENERGIE GmbH, Vienna/Austria
WSW Energie & Wasser AG, Wuppertal

ZAK Energie GmbH -Müllheizkraftwerk-, Kempten
Zweckverband Abfallverwertung Südostbayern, Burgkirchen
Zweckverband für Abfallwirtschaft in Nordwest-Oberfranken,
Dörfles-Esbach
Zweckverband Müllheizkraftwerk Stadt und Landkreis Bamberg,
Bamberg
Zweckverband Müllverwertung Schwandorf, Schwandorf
Zweckverband Müllverwertungsanlage, Ingolstadt
Zweckverband Restmüllheizkraftwerk Böblingen (RBB),
Böblingen

Affiliated Members

FGW e.V. – Fördergesellschaft Windenergie
und andere Erneuerbare Energien, Berlin/Germany
GfS Gesellschaft für Simulatorschulung mbH, Essen/Germany
Kerntechnik Deutschland e.V., Berlin/Germany
Technical University of Munich/Germany,
FRM II: Research Neutron Source Heinz Maier-Leibnitz,
Garching
VAIS Verband für Anlagentechnik und Industrieservice e.V.,
Düsseldorf/Germany
VGB PowerTech e.V., Essen/Germany
VIK Verband der Industriellen Energie- und Kraftwirtschaft e.V.,
Essen/Germany

Sponsoring Members

Carl Duisberg Centren, Cologne
GESTRA AG, Bremen
KONRAD Meß- & Regeltechnik GmbH,
Gundremmingen/Germany
OffTEC Base GmbH & Co. KG, Enge-Sande
SHE Solution Bergmann GmbH & Co. KG, Enger
Siemens Gas and Power GmbH & Co. KG, Erlangen
Siemens Gas and Power GmbH & Co. KG, Essen
S.T.E.P. Consulting GmbH, Aachen/Germany

Membership Development

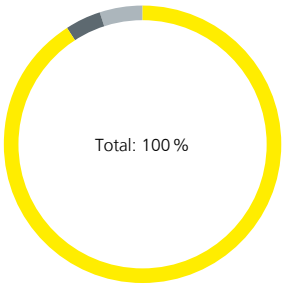
On December 31st, 2021, the KWS Energy Knowledge eG had 165 members, 150 of which were ordinary, seven were affiliated and eight were sponsoring members.
During the report period, two companies joined KWS as an ordinary members. 42 member companies left KWS; seven membership were revoked.
In accordance with the membership contribution ordinance passed on November 11th, 2020, individual membership fees are assessed based on net nominal installed electrical capacity in megawatts as listed by the German Federal Network Agency. The total amount of installed electrical capacity of all ordinary members during the report period stands at 87,738 MW.

18 member companies are based outside of Germany, namely:

- eleven companies in Austria,
- three companies in Belgium,
- one company in Luxembourg,
- two companies in the Netherlands,
- one company in Switzerland.

The net nominal installed electrical capacity of the foreign member companies adds up to 19,487 MW or approximately 22 % of the total amount of all ordinary members.

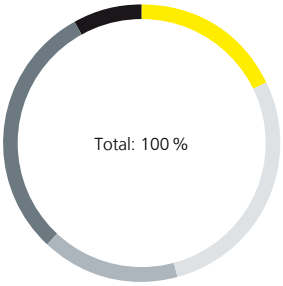
MEMBERS



Ordinary Members:	150	90,91%
Affiliated Members:	7	4,24%
Sponsoring Members:	8	4,85%

Listing of all members (As at December 31st, 2021) Fig. 1

COMPOSITION OF THE GROUP OF ORDINARY MEMBERS



Energy Supply Companies:	18%
Public Utilities:	28%
Thermal Waste Treatmant Companies:	16%
Industrial Companies:	30%
Other:	8%

Listing of all ordinary members (As at December 31st, 2021) Fig. 2

BREAKDOWN OF NET NOMINAL ELECTRICAL CAPACITY OF ALL ORDINARY MEMBERS:

	Ordinary Members		Net nominal electrical capacity	
	Number	Percentage %	MW	Percentage %
up to 250 MW	107	71,33	4.435	5,05
251–500 MW	13	8,67	4.674	5,33
501–1.000 MW	13	8,67	8.766	9,99
1.001–2.500 MW	11	7,32	15.377	17,53
2.501–5.000 MW	1	0,67	2.789	3,18
5.001–8.500 MW	1	0,67	7.921	9,03
above 8.500 MW	4	2,67	43.776	49,89
Total	**150**	**100,00**	**87.738**	**100,00**

KWS in General

Conversion into an incorporated Cooperative successfully concluded

Given the pertinent legal and tax-related provisions for a non-profit association, the transformation from a registered association to an incorporated cooperative is both necessary and expedient in order to maintain services previously provided by the association. This new legal form is best suited to sustain the association's former structure and continue its successful efforts on the one hand while on the other hand creating a legally compliant framework to conduct and develop such efforts in the future. The structure of an incorporated cooperative is very much like that of a registered association, yet lends itself significantly better to the strategic development of the business than a non-profit association.

All existing products and services provided by the association will continue to be available from the cooperative. Article 1 of Germany's Cooperative Societies Act states that an incorporated cooperative is exclusively obligated to further and serve the commercial interests of its members. An incorporated cooperative also enjoys more entrepreneurial freedom. The cooperative is a member of an audit association that reviews the state of the business, management compliance, and the annual financial statement every year in the interest of the cooperative's members. This offers members more control, transparency, and security compared to a registered association.

The structure of an incorporated cooperative with its General Assembly, Board of Supervisors, and Board of Directors gives members an equal measure of leverage as in a registered association.

Based on these benchmark data, the General Assembly voted unanimously on November 5th, 2020, in favor of the transformation into an incorporated cooperative. The vote was duly notarized. On May 6th, 2021, the cooperative was entered in the Register of Cooperatives, which legalized the conversion. Since then, the new name of the organization has been KWS Energy Knowledge eG.

Rebranding

In the course of changing its legal form, the KWS panels concerned themselves in detail with a name change, a new logo, and an updated public profile in general.

In the end, "KWS Energy Knowledge eG" was selected from a multitude of suggestions. "KWS" has been a well-established brand name for decades and possesses a very positive connotation, which is why it is being carried over. "Energy Knowledge" is a descriptor of KWS's core activity, namely conveying knowledge about energy. Also, its English spelling can be employed worldwide.

The new logo is a verbal/visual brand that projects new impulses and incorporates all current types of energy.

Gray represents conventional energies, blue stands for hydropower, yellow for solar energy, and green for wind power. With this, KWS takes on a modern and agile image conveyed by the logo's natural flow.

Impact of the Coronavirus Pandemic

In 2021, the effects of the Covid-19 pandemic once again dominated KWS as well as the rest of society. A pandemic staff was formed that developed a plan of action, among other things. The staff convened regularly in order deliberate over new developments and political directives and to evaluate their impact on KWS.

Comprehensive social distancing, hygiene, masking, ventilation, and testing measures were enacted and refined regularly. A Corona hotline was installed where faculty and staff members, trainees, and instructors could get information on infections, symptoms, or contact with infected persons.

The lockdown that began in December 2020 and prohibited in-classroom instruction was originally scheduled to end on January 10th, 2021, but eventually lasted until July 26th, 2021, for KWS. Many training courses were conducted online. There was also more hard- and software investment for the benefit of correspondence courses. Many crash courses, however, were canceled or postponed as a safety precaution. There was also a negative impact on organization development activities, international activities, and renewable energy training.

Thanks to shop agreements on mobile workplaces, staffers and faculty members were able to work from outside KWS in part.

E-Learning at KWS

E-learning proved its value at KWS Energy Knowledge eG in 2021. In 2020, during the first lockdown, KWS quickly switched to pure online instruction (virtual classroom). Some of the previous in-classroom formats like the prep courses for power plant operators or power plant shift supervisors were converted to online courses and will continue to be conducted exclusively online in the future. The Moodle training platform is consistently employed for long-term courses.

2021 confirmed that such formats work over a certain period of time, although communication between course participants was partly impeded. It turned out that trainees enrolled singly in a course by their employers fared worse than groups of trainees from one employer. Under these circumstances, it was important to take the personality of each individual trainee into account and to cater to it. However, where in-depth laboratory exercises and exam preparation is concerned, almost all participants voiced a preference for in-classroom instruction. In summary, student performance, even under these circumstances, was similar to that of previous years in most cases, which was reflected by the results of the exams conducted by the CCI.

The pandemic forced the flexibilization of instruction. KWS alternated between in-classroom, pure online, and hybrid training whenever necessary and feasible. Customized advanced training prepared instructors for the specific challenges of web-based teaching. Also, the technical groundwork was created for live online training. One example are the visualization tools already installed in classrooms that were employed for the depiction of training contents as well as answering trainee questions on online instruction. The complete equipment was also available to instructors for teaching from home, which facilitated flexible and intense live online training.

Hybrid instruction, that is, transmission of classroom training to trainees participating from their home offices, was made possible by creating the necessary technical conditions, like purchasing mobile videoconferencing cameras and microphones. This enabled participants to follow classroom lessons even though they were unable to attend in person.

All in all, methods and media have evolved. A variety of media are embedded in online teaching, while instruction videos and quizzes diversify training and enhance the range of learning methods.

Training for Nuclear Power Plants during Power Operations and the Post-closure Phase

During the past four decades, KWS has been assisting NPP operators by conducting the "Nuclear Fundamentals for Responsible Shift Crews in Nuclear Power Plants" training course as well as the "Nuclear Power Plant Operator" course for non-responsible shift personnel.

Since making responsible shift personnel out of novices takes a full three years, long-term planning is in order. For that reason, the last time KWS conducted this course was in 2019. Even though mandatory training requirements for non-responsible shift crews are not as strict, no "Nuclear Power Plant Operator" courses were conducted in recent years.

A variety of early retirement regulations as well as personnel fluctuation posed a problem for some installations because it was necessary to train responsible shift crews for the post-closure phase (the period from plant shutdown to complete fuel removal). Governmental regulations mandate an abbreviated training course since many topics are no longer relevant. KWS introduced an accordingly shortened training course "Nuclear Fundamentals for Post-Closure Operations" for nuclear power plant employees without power operations authority as early as 2014. These courses often ran in parallel with the standard courses because enrollment was often low. Two courses took place during the 2021 report period. One of the courses was held for the Gundremmingen nuclear power plant, which was still in power operations mode at the time. However, even after the plant's shutdown on December 31st, 2021, licensed personnel was needed. Two other German nuclear power plants face similar problems, so that one such course was booked in 2022 and another one requested for 2023.

The second training course was held specifically for research reactors in the post-closure phase. Since the Heinz Maier-Leibnitz (FRM II) research neutron source of the Technical University of Munich happened to be in need of training for responsible personnel at the same time, a concept was developed that involved conducting an advanced training module. Topics relevant to reactor operations were covered in this training module.

Another field in which KWS assists nuclear power plant operators is training for personnel otherwise employed in nuclear power plant operations. Here, KWS has been assisting EnKK for years and also conducts such training for the Gösgen nuclear power plant in Switzerland.

Another key KWS activity in nuclear technology is radiation protection, specifically the acquisition and updating of technical qualifications. Differentiating between installations in power operations and post-closure operations mode makes little sense here because legally mandated training regulations do not distinguish between the two modes of operation. The key is complete fuel removal.

Cooperation Agreement with RWE on Hard-Coal Simulator Training for Eemshaven Power Plant Sstaff

On December 1st, 2020, Germany's Federal Network Agency had announced that block unit E of the Westfalen power plant had been awarded a contract in a bid for the shutdown of coal-fired power plants. As a consequence, a marketing ban for this block unit took effect on January 1st, 2021, followed by a power generation ban in July 2021. Thus, further development of the hard coal simulator based on block unit E is no longer possible. The creation of a simulator variant replicating block unit A of the Eemshaven plant had begun as early as 2020, using the block unit's control engineering. In particular, a crusher for the incineration of biomass was incorporated, which may now be used for training following successful acceptance testing in February of 2021. This greatly amplifies the scope of possible applications of the simulator. In order to safeguard further development and readiness for training of the Eemshaven block unit A simulator variant, a new cooperation agreement was negotiated with the Eemshaven power plant's management. This agreement provides for 145 man weeks of training during the years 2022 to 2026. Training measures will take place at KWS in Essen, but may be conducted alternatively at Eemshaven via remote connection. This gives the simulator for hard coal power plants a perspective for the future even after the shutdown of block unit E of the Westfalen power plant.

Certified Plant Attendant for Thermal Sewage Sludge Treatment

KWS cooperates with DWA
(German Association for Water, Wastewater, and Waste)

In 2017, an amended ordinance regulating sewage sludge took effect in Germany, obligating large sewage treatment installations to recover phosphorus contained in municipal sewage and sewage sludge, respectively.
The reason for the amendment is the significance of phosphorus in industrial applications. Phosphorus is an essential raw material of vital importance for plant growth and therefore a crucial component of modern fertilizers. Phosphorus is also a key ingredient of numerous products like animal feed and pharmaceuticals. Europe possesses hardly any domestic phosphorus resources, Germany in particular has none. Due to the large amounts of phosphorus needed in Germany, the country is heavily dependent on imports.
Sewage sludge, an organic residue of sewage treatment, may be used as a source of phosphorus in addition to its employment as an energy source, thereby making a contribution to saving natural resources.
Considerable investment in phosphorus recovery technology and incineration capacity (monocombustion installations) will be necessary in the coming years.
According to current estimates, approx. 2,000 employees in monocombustion installations with phosphorus recycling require qualification training.
KWS and DWA have jointly developed a new qualification measure to meet current and future demand, especially. The pilot course will start in the third quarter of 2022.

Wind Energy

In 2021, the wind power industry had to tolerate considerable uncertainty regarding the projected completion of new installations as well as from a serious labor shortages, particularly in services.
The "Empower Refugees" project saw all 12 participants of the second group pass their graduation exams as "Industrial Electricians Operations Technology (CCI)". Mr. Thomas Kufen, mayor of the city of Essen, Germany, showed his appreciation for this extraordinary achievement by personally handing out the graduation certificates. The partnering wind power industry businesses expressed their desire for a continuation of the program. However, profound changes in the requirements for financial assistance necessitate a new design for the project and subsequent extensive certification procedure.
Media interest in the "Empower Refugees" project and the wind power training installation continued to be high. For example, a very exciting feature story for Germany's ARD public television network and its "Wissen macht Ah!" series was filmed at the training tower.
In order to sharpen KWS's profile in the wind power industry, we made several appearances at trade fairs nationwide like at HUSUM Wind and the Wind Energy Days in Potsdam, Germany, for example.
For the first time, businesses availed themselves of the offer to rent our training tower for conducting advanced training drills with their in-house specialists for the benefit of their staffers

KWS training tower
.

International Activities even during the 2021 Corona Year – a Case Study from Iraq

On behalf of Siemens Energy Global GmbH & Co. KG, KWS Energy Knowledge eG conducted "Basic Operation Trainings" (BOT) und "Basic Power Plant Trainings" (BPT) at the Maisan and Al Rumailah locations.

Training in Maisan began in January 2021, when the international state of affairs with regard to the Coronavirus pandemic changed almost every day.

This meant, for example, that our (freshly PCR-tested, of course) instructor Mr. Peter Just for the first five-day BOT-E I&C (Electrical Instrumentation & Control) training, which began on January 10th, 2021, flew to Basra via Dubai on January 3rd, to be transported to Maisan in a convoy under guard. The power plant construction site was a hermetically sealed camp. Prior to entry into the camp, another PCR test was conducted. The camp was off limits until the result of the test was in (after approx. 18 hours). This meant spending the night in the guesthouse outside the camp and – provided the test result was negative – five more days of quarantine inside the camp.

Our instructor's report on the training measure reflects the problems that subsequently appeared during training pretty well:

"The first training in Maisan, Iraq, for E+I&C took place from the 10th to the 14th of January, 2021 on location at the power plant. The plant is currently under construction and looks more like a building site. No components for hands-on training were available.

All 19 trainees arrived on January 8th and took their Covid-19 test on the 9th. Personal safety equipment was not available for all trainees. Since entering the construction site without personal safety equipment is not permitted, the commencement of the training measure ought to have been postponed for two days. An exception was made in this case, however, so that the trainees were able to get to the classroom without personal safety equipment. The group was pretty young and inexperienced. Of the 19 trainees, only six had ever seen a power plant, with three of them actually having worked in a plant.

For all the others, this was uncharted territory, and they were hardly able to comprehend many topics. Unfortunately, I could not use the power plant components covered in the classroom lessons to answer their questions because these components simply were not there at the time.

Training was definitely too early for most of the trainees and should have been tailored to the status quo of the power plant or rather, the construction site. Even though all parties involved put in a lot of effort, it was not always possible to convey the subject matter in a theoretical manner.

It would be beneficial to the young trainees to repeat this training with more emphasis on the complex interaction in a power plant at a more appropriate time, keyed to the current phase of construction. All trainees gave a very good impression and worked hard to acquire and comprehend the new technology. I think they should get to know the power plant better so they will not be overwhelmed by its size. This is impossible right now because the first PCC (Power Control Center) containers were not installed on their foundations until the time of my departure. Most of the other large components were also still in their transport packages."

The rest of this series of training measures passed in a similar fashion, which meant that our instructors had to spend 30 days in quarantine in Iraq and Germany in order to conduct 26 days of training.

The 16-day Basic Operation Training in Al Rumailah, Iraq (May/June) took place under similar conditions yet was conducted by just one KWS instructor. Thanks to more uniform Coronavirus safety measures, the training days/quarantine days ratio was much better.

KWS used a completely different approach for Mass Group Holding. A training demand and potential analysis was conducted for approx. 100 staffers from the Besmaya, Iraq power plant. For the first time, KWS devised such an event completely digitized using a learning platform with complementary online expert interviews. All tests that were part of the analysis were made available on our learning platform (kws.e-learn) and had to be processed online.

The accompanying online expert interviews took place via videoconference in which one trainee would be interviewed by two KWS instructors in order to get a coherent result. The KWS instructors were located in different places in Germany while some of the staffers from the Besmaya plant took part from their home leave spots in India.

Evaluation of the results was detailed in a final report in which every individual's potential analysis was laid out and complemented by specific training recommendations for that staffer's personal and professional development.

Hydrogen

In early 2021, a working group consisting of members of various KWS teams formed for the purpose of incorporating the pertinent future topic of hydrogen into the KWS training environment in the medium and long term. Apart from approaching the subject with regard to contents, the main goal since has been to network businesses and specialists with KWS. For example, cooperation on the local level with GWI (Gas- und Wärme-Institut Essen e.V.) a Gas and Heating Institute in Essen, Germany, was agreed upon. One initial practical result is a 2.5-day seminar "Basic Skills in Hydrogen Technology" that was already booked to capacity by the end of December and was held in January 2022 for the first time.

Collaboration with Uniper Kraftwerke GmbH comprises two fields of activity: In anticipation of future electrolyzer operations, a six-month qualifying format is being developed to prepare graduates for working on their own responsibility in hydrogen installations, primarily electrolyzers. For this purpose, thorough discussions took place involving the Chamber of Industry and Commerce of the state of Northrhine-Westphalia, the DVGW (Deutscher Verein des Gas- und Wasserfaches e.V. – Technisch-wissenschaftlicher Verein) a German Technical and Scientific Association for Gas and Water, and BG ETEM (Berufsgenossenschaft Energie Textil Elektro Medienerzeugnisse), a German occupation cooperative concerned with energy, among other things. As things progress, more members with similar plans are to be integrated in the project. A pilot course is scheduled to begin in late 2022.

In addition, Uniper is planning to modernize the former hard coal installation in Scholven, Germany, and to turn it into a center for hydrogen technology. Under the name of Hydrogen Industrial Research and Training Center (H_2iRTC), the existing local infrastructure is to be complemented by a large-scale hydrogen pipeline, for example, so that a cluster of research and training facilities may accelerate hydrogen technology development. KWS assists this project and is looking forward to participate in a substantive collaborative effort in Gelsenkirchen.

Since December 2021, there has been further cooperation focusing on hydrogen as the key topic. The companies of Lorenz Kommunikation, vgbe, and WindAdvice will jointly hold "Hydrogen Industry Days" regularly in various regions of Germany. The first such event is scheduled for the spring of 2022 at KWS. This symposium is designed to close the gap between the transfer of expert know-how and business networking, as are other such events to follow.

Acquisition and Retention of Operating Practice in a Grid Reserve Power Plant

The systemically relevant Weiher power plant operated by STEAG has been part of the grid reserve for years. It runs only on demand from the network operator to ensure service security.

With little uptime during the year, breaking in new personnel is difficult and so is retaining the know-how and routine of resident operating crews. The plant stands still most of the time and offers little opportunity for operators to acquire and preserve operational experience. Nevertheless, such installations must be on call to go online quickly and safely at any time.

Therefore, KWS is now in its third year of conducting a hands-on operations training in a power plant simulator. This training takes place on location at the Weiher power plant where KWS has erected a complete simulated control room. There is also an original operator station of the Weiher power plant in the classroom. Here, the actual power plant process can be observed in real time and the power plant history can be evaluated. The local specifics of operations and of the installation's technology are dealt with intensively.

Training contents are tailored to the level of competency of individual groups of trainees. Training prep and implementation are attended by an experienced local operative. Training measures target shift supervisors, control room operators, trainee power plant operators, and rookies. That way, orderly operations of the installation are guaranteed today and in the future.

Simulation Technology: Successful Upgrade of Control Technology of the Simulator for Lignite-fired Power Plants to the current Siemens SPPA-T3000 V8.2 Power Plant Control and Communications System

With the final installations in early November 2021, the upgrade of the control technology of the simulator for lignite-fired power plants to the current Siemens SPPA-T3000 V8.2 power plant control and communications system was successfully concluded.

RWE had assigned KWS to conduct the upgrade of the simulator in 2019. This necessitated the complete exchange of the computer hardware installed in the simulator. KWS placed the order with Siemens AG and took delivery in December 2019. Current control technology configurations for the simulator variants of Niederaußem block unit G (600 MW), Neurath block unit D (600 MW) and Neurath block unit G (BoA3, 1,100 MW) were adopted from the actual power plants. Subsequently, the simulation models were adapted to recent technical modifications in the respective power plants. The Niederaußem block unit G variant was ready for training use in July 2020, followed by the Neurath block unit D variant in October 2020. In June 2021, the Neurath block unit D variant was declared ready for training use.

The successful upgrade to the current Siemens SPPA-T3000 V8.2 control and communications system employed in RWE's lignite-fired power plants makes sure that adaptation of state-of-the-art control technology from the power plants to the simulator may continue in the future. This enables KWS to conduct simulator training for lignite-fired power plant personnel using the latest Siemens control technology so that participants can train on familiar operations and monitoring systems.

Quality Management at KWS

First-class quality all around is what we strive for every day. One important component in that strife is our quality management system in order to meet the requirements of the DIN EN ISO 9001:2015 standard. To make sure that the system does not gather dust on the shelf, but determines and sustainably assists our actual workplace efforts, it was designed by KWS itself and is constantly evolving. While the management provided a general framework and concept, a multitude of staffers worked out concrete processes and procedures. This laid the groundwork for high acceptancy and sustainable application.

The recertification audit of the quality management system, which was conducted from October 27th - 29th, 2021, yielded outstanding verification and effectiveness results and revealed no deviation from the standard or deficits of any kind. Suggestions for improvements will be implemented in 2022.

The supervisory audit of our AZAV license (Accreditation and Licensing Ordinance for the Promotion of Employment) of October 27th, 2021 went fine, proving that we continue to meet the requirements for publicly funded training courses.

Public Appearances

Trade fairs are an important communication platform for exchanging information and one of the most vital marketing tools for a company. For KWS, trade fairs and conventions offer the opportunity to cultivate existing contacts, make new ones and get fresh impulses for ist ongoing evolution.

During the report period, KWS Energy Knowledge eG was present at the following trade fairs and conventions:

- 13th North Rhine-Westphalia Wind Energy Industry Day (Branchentag Windenergie NRW), Gelsenkirchen/Germany
- KONTEC 2021, Dresden/Germany
- VGB Conference "Steam Generators, Industrial and Cogeneration Plants 2021", Papenburg/Germany
- HUSUM Wind 2021, Husum/Germany
- 33rd VDI-/ITAD-Symposium "Thermial Waste Treatment", Würzburg/Germany
- VGB Congress 2021 „100 Years VGB", Essen/Germany
- 53rd Colloquium on Power Plant Technology (Kraftwerkstechnisches Kolloquium), Dresden/Germany
- VGB Conference "Gas Turbines and Operation of Gas Turbines 2021", Potsdam/Germany
- 29th Wind Energy Days, Potsdam/Germany

Apartment Building

Apartment building of the KWS

The apartment building with its 55 modern furnished apartments of approx. 21 square meters each enables residents to live and study in the immediate neighborhood of KWS's training center.
Generously equipped kitchens on each floor, gyms and leisure areas as well as group study chambers complete with audiovisual equipment round out accommodations on the premises.
Spacious outer premises offer plenty of diversion thanks to a variety of leisure time activity options.
Due to the online phases in the courses as a result of the Coronavirus pandemic, an occupancy rate of 60 percent was achieved in the apartment building. However, demand for the years 2022 and 2023 shows that the apartment building continues to be in high demand among participants.
Featuring an innovative energy concept, this architecturally successful object blends in perfectly with its Deilbachtal surroundings and complements the Energy-Campus Deilbachtal.

KWS Conference Center

KWS has been offering all members an option of using the training center facilities as a convention center. Convention and seminar rooms are available for up to 130 participants and equipped with all modern media and optional videoconferencing. Meals may be supplied by the staff restaurant. During the report period, KWS's facilities were booked 28 times by external hosts of seminars or conventions.

Inside view of conference room

KWS
ENERGY KNOWLEDGE FOR YOU

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Our conference center provides you with the perfect all-in service package. Rooms for small and large groups are at your disposal. We will be pleased to support you in the planning and realization of your event. We offer you the following items:

- Modern, light conference rooms for 3 to 130 persons
- Up-to-date technical equipment including WLAN, beamer, whiteboard and smartboard, visualizer
- Videoconference room
- Conference support service
- Further technical equipment on demand

Contact

We are looking forward to be at your disposal for any queries and suggestions.

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