ENERGY KNOWLEDGE FOR YOU

PROGRESS REPORT 2022

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, 2022 to December 31st, 2022.

In 2022, the impact of the Covid-19 pandemic was once again an important topic for KWS. The staff specially created to deal with the pandemic, convened regularly and defined changes in the various protective measures (distancing, hygiene, face masks, ventilation, testing). For the most part, training courses were conducted in hybridized form, meaning in-classroom instruction as well as online instruction was enabled.

The conversion of Germany's power generation structure all the way to decarbonization as the ultimate goal of the German federal government remains unchanged. Russia's war of aggression against Ukraine, however, has forced substantial modification measures, especially due to the reduction and eventual cessation of natural gas deliveries from Russia. Therefore, the final shutdown of Germany's last three nuclear power plants was postponed from the end of 2022 to April 2023 and various hard and soft coal power plants will continue operate longer than heretofore intended as the only way to guarantee security of supply. The politically mandated expansion of renewable energies and gas-fired power plants once again markedly lags behind planning and demand.

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 once again in 2022.

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.

One of the key activities the field of renewable energies lay in the development of training courses for the use of hydrogen in power generation. Since the growth of hydrogen usage is a highly important objective of Germany's energy policy, partnerships were founded to help establish KWS as a training provider in this field.

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 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.

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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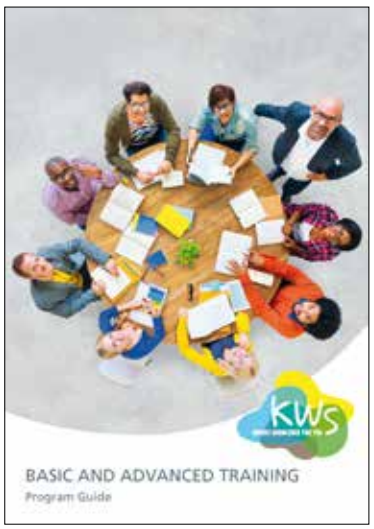


Performance in 2022

Services of KWS Energy Knowledge eG: 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. Organization development 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, 2022	Courses conducted	Number of Participants	Number of Participant Days
Conventional Power Plant Technology	128	1.479	41.473
Nuclear Technology/Radiation Protection	40	299	1.612
Simulator Training	95	341	1.256
Organization Development	9	50	100
Renewable Energies	9	65	405
International Activities	4	38	330
Total	**285**	**2.272**	**45.176**

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 are increasing, as both technical and social skills are cornerstones of the modern requirements profile for employees. The concept of lifelong learning is part of working life, especially in a complex technical environment like a power plant. Many outside forces affect the flexible design of power generation, a fact that is reflected by short- and medium-term personnel demands. KWS conducts professional and practical courses and training for these personnel demands.

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, 2022	Courses conducted	Number of Participants	Number of Participant Days
Power Plant Operators	16	368	14.450
Power Plant Shift Supervisors – Production	13	238	17.355
Power Plant Shift Supervisors – Production Electrical and Control Engineering	5	84	507
Thermal Waste Treatment (TWT)	10	118	5.249
Advanced Training Measures	36	355	2.288
Customer-Specific Advanced Training Measures	48	316	1.624
Total	**128**	**1.479**	**41.473**

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

Plant Attendants
23rd training course (online)
Module Basic with 22 participants
Module Steam Generation with 24 participants
Module Turbines with 18 participants

24th training course (Essen/Germany)
Module Basic with 48 participants
Module Steam Generation with 48 participants
Module Turbines with 48 participants

Plant Operator TWT
07th training course with 20 participants
08th training course with 19 participants

Power Plant Operators
128th training course with 58 participants
129th training course with 30 participants
129.01th training course with 21 participants
130th training course with 60 participants

KWS-certified Operator Production for EEW Energy from Waste GmbH
09th training course with 12 participants

Power Plant Shift Supervisors – Production
143rd training course with 13 participants
144th training course with 39 participants

Power Plant Shift Supervisors – Thermal Waste Treatment
3rd training course with 7 participants

Nuclear Technology/Radiation Protection

Nuclear Technology training is three-pronged:

1. Nuclear power plant personnel training
2. Nuclear facilities 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, 2022	Courses conducted	Number of Participants	Number of Participant Days
Power Plant Shift Supervisors – Radiation Protection	2	9	380
Nuclear Basics	3	9	106
Skill Retention	12	64	364
Skill Acquisition in Radiation Protection	2	17	85
Special Courses Nuclear Technology/Radiation Protection	21	200	677
Total	**40**	**299**	**1.612**

Simulator Training

The KWS simulators 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, 2022	Trainings conducted	Number of Participants	Number of Participant Days
Simulator for Fossile Fired Power Plants	4	14	38
Lignite 600/1100 MW	48	168	612
Hard Coal 800 MW	20	73	247
Hard Coal 1100 MW	8	27	132
CCGT 750-3 (SPPA-T3000)	15	59	227
Total	**95**	**341**	**1.256**

Construction Committee "Simulator for Lignite-Fired Power Plants"

The Construction Committee "Simulator for Lignite-Fired Power Plants" was founded in 2008 for the implementation of the respective simulator. Since then, the committee has been assisting and advising KWS in carrying out and developing the different variants of the lignite simulator.

During the report period, the committee convened for its 35th session on August 30, 2022. After the successful conclusion of the control engineering upgrade in 2021, the focus was now on simulator variant development. One particular installation saw changes in 2022, which are to be integrated into the simulation model. Furthermore, general simulator evolution is to be expedited for the purpose of the "Skill Retention" training goal. It has been suggested to KWS to consider using the simulator for instruction in the field of cybersecurity in power plants. This would add another aspect to simulator usage.

Organization Development

All of KWS's members act within the framework of ongoing political, economic, and social change. Additional challenges arise from interaction between staff, business partners, and clients. Here, KWS is on hand to assist interested parties with issues like personnel selection, team development, organization development, conflict management, and management personnel coaching. The energy market will continue to evolve in the future and trigger major changes in many businesses. Therefore, our organization development team will be the go-to contact for assisting business with organizational changes.

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

January 01–December 31, 2022	Courses/Measures conducted	Number of Participants	Number of Participant Days
OD Consulting and Workshops	5	32	64
OD Seminars	4	18	36
Total	**9**	**50**	**100**

Renewable Energies

The training course situation steadied in the year 2022 following the constraints caused by the pandemic in the previous year.
Hydropower:
Basic and extension courses were in high demand and conducted very successfully thanks to the employment of some new instructors, among other things.
Wind power:
The "Empower Refugees" project had to pause. Its resumption under modified conditions is expected for 2023. Demand for electrotechnology qualifying courses and WindTrainingTower rentals increased.
Hydrogen:
The 1st Hydrogen Industry Day took place at KWS immediately after the start of the year and was received very positively. The newly developed seminar "Basic Hydrogen Technology Skills" was successfully conducted twice. Hydrogen-related topics were also integrated into other seminars like "Power Plant Technology For Engineers", for example.
Other seminars have been worked out and are scheduled to enter their pilot phase in 2023. Joint seminars with the Gas- und Wärmeinstitut Essen e.V (Gas and Heating Institute) are in the planning stage. Taking care of future projects turned out to be particularly labor-intensive. Uniper SE wants to set up the H2iRTC in Gelsenkirchen, Germany, with emphasis on research. KWS is to manage training. In Duisburg/Germany, a prominent "Basic and Advanced Hydrogen Training Center" is being planned by the City of Duisburg, the Port of Duisburg, the Center for Fuel Cell Technology and KWS as part of the 5-location program.

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

January 01 – December 31, 2022	Courses conducted	Number of Participants	Number of Participant Days
Renewable Energies	9	65	405

International Activities

Like in the previous two years, KWS's international activities in 2022 were affected by the Coronavirus pandemic. Nonetheless, a training measure that had begun in 2020 was successfully concluded in the end. Furthermore, a five-day online "Flexibility Training Program" for Indian simulator instructors was conducted in cooperation with vgbe, the GIZ and the Indo-German Energy Forum. For that purpose, the Indian instructors remotely accessed KWS's simulator in Essen, Germany, from India and were coached by the KWS instructor online.

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

January 01 – December 31, 2022	Courses conducted	Number of Participants	Number of Participant Days
International Activities	4	38	330

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 three times during the report period:
4th meeting March 28th, 2022
5th meeting May 16th, 2022
6th meeting November 14th, 2022

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

Giehl, Martin
Member of the Board of Directors of Mainova AG and Frankfurt/Germany
(from June 2022)

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

Razanica, Kemal
Member of the Board of Directors of RWE Power AG,
Essen/Germany
(until August 2022)

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

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 Genossenschaftsverband – Verband der Regionen e.V. on the financial statement for 2021, the review of operation including the attachment and recommended that the board approve KWS's financial statement for 2021 as is.
Consultation of the economic, investment and financial plans for the business year 2023 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 2022.
The Financial and Legal Committee also concerned itself with medium-term business planning designed for a five-year period, as well as the the impact of the corona pandemic and the Urkraine conflict.

The following activities took place during the report period:
68th meeting April 26th, 2022
69th meeting September 29th, 2022

Schlingensiepen, Daniel (Chairman)
RWE Nuclear GmbH, Essen/Germany
(from 09/2022)

Eck, Jens, Dr.
Lausitz Energie Kraftwerke AG/
Lausitz Energie Bergbau AG, Cottbus/Germany
(until 09/2022, Chairman)

Frey, Rainer, Magister
VERBUND-Hydro Power GmbH, Vienna/Austria
(until 09/2022

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

Schönbrunn, Thomas
Lausitz Energie Bergbau AG, Cottbus
(from 11/2022)

Sennekamp, Peter
Uniper Kraftwerke GmbH, Düsseldorf/Germany

Sous, Martin
Mainova AG, Frankfurt
(from 11/2022)

Board of Directors

Ernst Michael Züfle Monika Bartels

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 145th and 146th Power Plant Shift Supervisor–Production training course, for the 51st Power Plant Shift Supervisor–Production Electrotechnology/Control Engineering 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,
- Impact of the energy crisis on continuing and advanced training.

The Training Committee convened twice during the report period:
137th meeting June 23rd, 2022 (online session)
138th meeting December 8th, 2022 (online session)

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

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

Ahmann, Maria
RWE Generation SE, Emsland Power Plant, Lingen/Germany
(from November 2022)

Dünster, Frank
RWE Generation SE, Industrial Power Stations Duisburg-Huckingen/Gersteinwerk Power Plant, Duisburg/Werne/Germany
(from November 2022)

Fielenbach, Christian, Dr.
RWE Power AG, Bergheim/Germany
(from August 2022)

Hager, Frank
Ministry for the Economy, Industry, Climate Protection and Energy of the State of Northrhine-Westphalia, Düsseldorf/Germany
(until May 2022)

Hark, Guido
RWE Power AG, Weisweiler Power Plant, Eschweiler/Germany
(until June 2022, Deputy Chairman)

Iven, Franz-Wilhelm
Ministry for the Economy, Industry, Climate Protection and Energy of the State of Northrhine-Westphalia, Düsseldorf/Germany
(from May 2022)

Kirstein, Klaus-Dieter
KDK Consulting, Düsseldorf/Germany

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

Kunz, Christoph
Siemens Energy Global GmbH & Co. KG, Munich/Germany
(from November 2022)

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.
vgbe 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

Wagner, Karsten
EnBW Energie Baden-Württemberg AG, Karlsruhe/Germany

Wiegel, Michael
RWE Generation SE, Gersteinwerk Power Plant, Werne/Germany
(until December 2022)

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, Berlin (Group Membership)
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 (Group Membership)

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
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
(Group Membership)
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
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

Saale Energie GmbH, Schkopau
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
MVA 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
Stadtwerke Würzburg GmbH, Würzburg
Städtische Werke Energie + Wärme GmbH, Kassel

STEAG GmbH, Essen
Group Membership for
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, Hannover

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
vgbe energy e.V., Essen/Germany
VIK Verband der Industriellen Energie- und Kraftwirtschaft e.V.,
Berlin/Germany

Sponsoring Members

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, Essen
(Group Membership)
S.T.E.P. Consulting GmbH, Aachen/Germany

Membership Development

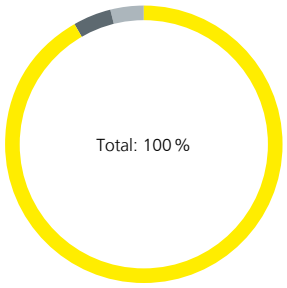
On December 31st, 2022, the KWS Energy Knowledge eG had 161 members, 148 of which were ordinary, seven were affiliated and six were sponsoring members.
During the report period, one company joined KWS as an ordinary member and one sponsoring member left KWS. In addition, eight members (six ordinary, two sponsoring) merged to form four business memberships.
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 77,363 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 18,317 MW or approximately 24 % of the total amount of all ordinary members.

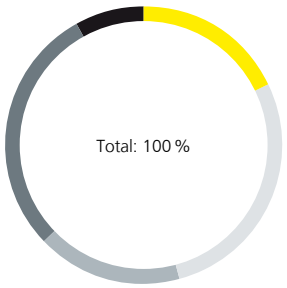
MEMBERS



Ordinary Members:	148	91,92%
Affiliated Members:	7	4,35%
Sponsoring Members:	6	3,73%

Listing of all members (As at December 31st, 2022) Fig. 1

COMPOSITION OF THE GROUP OF ORDINARY MEMBERS



Energy Supply Companies:	18%
Public Utilities:	28%
Thermal Waste Treatmant Companies:	17%
Industrial Companies:	29%
Other:	8%

Listing of all ordinary members (As at December 31st, 2022) 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	103	69,59	4.906	6,34
251–500 MW	14	9,46	4.926	6,37
501–1.000 MW	13	8,71	8.662	11,20
1.001–2.500 MW	12	8,11	16.265	21,02
2.501–5.000 MW	1	0,68	2.781	3,59
5.001–8.500 MW	3	2,03	21.984	28,42
above 8.500 MW	2	1,35	17.839	23,06
Total	**148**	**100,00**	**77.363**	**100,00**

KWS in General

KWS assists RWE Power in Advanced Power Plant Operations Assistant Training

Russia's war of aggression against Ukraine is also substantially impacting Germany, particularly the energy sector. Among other measures, the federal German government has passed the Replacement Power Plant Availability Act in order to save natural gas during the current energy crisis as well as safeguard the security of the country's electricity supply. For that purpose, RWE Power has brought three power plant block units back online from the so-called security reserve. Originally, the 300 MW block units of Niederaußem E and F were scheduled for final shutdown by the end of September 2022 while the 300 MW unit of Neurath C was to follow exactly one year later. In October 2022, the three units returned to the energy market by issue of the federal government. The call-out is tentatively valid through June 30th, 2023 with an extension option until March 31st, 2024. In addition, the two 600 MW block units of Neurath D and E, which had been slated for shutdown by December 31st, 2022, will continue to operate until March 31st, 2024. RWE's personnel planning had been based on the shutdown deadlines determined by the Coal-Based Power Generation Termination Act. Now that the block units mentioned above continue to operate, an additional 120 qualified control room operators are needed on a short-term basis.

View into the second simuator control room

KWS assists RWE Power in its purpose-designed qualification project "Advanced Training Power Plant Operations Assistant". Participants are getting familiarized in theory and practice with the layout, functions, and operations of the respective installations during their ten-month advanced training course. Since September 2022, new groups of approx. 20 participants each have begun their training almost on a monthly basis. KWS initially trains participants in a theoretical instruction segment called "Power Plant Technology Fundamentals". Subsequently, several simulator training segments are phased in over time. These segments permit the rehearsal of a variety of scenarios risk-free and without impacting actual plant operations, from a cold start to load changes with high transients up to load limit events, or a post-blackout startup. In addition to its complete simulater control room installed at the RWE training center in Niederaußem in 2009, KWS has put a second one into service on site. This permits simultaneous theoretical instruction as well as simulator training of three groups by three instructors. The project is expected to run until the end of 2023.

Enhanced CCGT-T3000 Simulator Training Options

Due to the revision of the control engineering technology and the process model, new training scenario options for disturbed plant operations have been created. Training goal is an installation's safe recommissioning back to normal operations after the following events:

- Power drop in one gas turbine down to station supply, second gas turbine and steam turbine remain online,
- Power drop in both gas turbines down to station supply combined with emergency shutdown of steam turbine due to drop in temperature, a scenario that occurs in case of a mains failure,
- Emergency shutdown of the steam turbine, both gas turbines remain online.

Also, post-blackout startup has been developed further. The impact of energy network events on the power plant is destined to affect the continuing evolution of the simulator.

Simulator Training for Operating Skill Acquisition and Retention in the Control Room

After several years in the power grid reserve, STEAG's systemically relevant Weiher power plant has returned to power operations mode. However, actual mains operation occurrences have been rare, which made it harder to break in new staffers. Also, the know-how and practice of legacy operators have been difficult to retain. There were few opportunities for acquiring and maintaining operating skills in a virtually idle power plant.

Therefore, KWS has been conducting simulator training for the fourth year in a row. A complete power plant control room was erected on location. Inside the classroom, a real-life control room operator station of the Weiher power plant was also installed. The actual power plant process could be observed in real time from this control room and the power plant's history evaluated. This setup permitted addressing the specifics of the Weiher power plant's operations and installations in depth.

Training sessions were conducted for power plant shift supervisors, control room operators, power plant operator trainees, and for novice personnel. Training contents were tailored to the skill level of individual groups of participants. A seasoned staffer accompanied preparations and implementation of the training events.

Honorary Certificate Integration Award 2021 "Empower Refugees" Project wins Award

The city of Essen, Germany, issued an invitation to city hall for Monday, April 25th, 2022, on the occasion of the 2021 Integration Award ceremony. There was a multitude of applications and the individuals behind the many projects were treated not only to the remarkable view from city hall's 22nd floor, but also to live music and a little snack rounding out an easygoing and very harmonious event. Addresses by mayor Thomas Kufen, who is also the patron of the Integration Award, as well as by González Kliefken, chairman of the Integration Council, made clear that all projects were worthy of an award and that the jury had had a hard time selecting specific projects. Under the motto "Migrants at work–let's go", a Solomonic solution was found. The "PerMenti" project, which supports educated female refugees, and the extraordinary commitment of the Fank automobile dealership to vocational training for refugees, shared 1st place. As KWS, we are particularly proud to have received the 2021 Honorary Award for our "Empower Refugees" project.

Ehrenurkunde

Integrationspreis 2021 – Zusammenleben in Essen
Beschäftigungschancen für Migrantinnen und Migranten –
Packen wir's an!

KWS Energy Knowledge eG

leistet einen besonderen Beitrag zur Verbesserung der Beschäftigungschancen von Migrantinnen und Migranten.

Dafür danken wir ganz herzlich und wünschen dem Unternehmen alles Gute für sein weiteres Engagement.

Essen, 25. April 2022

Dennis Kufen
Oberbürgermeister der Stadt Essen

Kerstin Groß
Hauptgeschäftsführerin der Industrie- und Handelskammer für Essen, Mülheim an der Ruhr, Oberhausen zu Essen

Dieter Hilebrand
DGB
Regionsgeschäftsführer
Mülheim-Essen-Oberhausen

STADT ESSEN

IHK

DGB

H_2 Educational Center

Germany's national hydrogen strategy defines very ambitious goals for the intersectional use of hydrogen. Only a systematic qualification strategy and the establishment of corresponding instruction capacities will enable existing and future operating personnel to keep pace with ongoing technological developments. The H_2 Educational Center in Duisburg is designed to become a decisive component of effective targeted personnel qualification. Duisburger Hafen AG wants to use local advantageous conditions in Hüttenheim and erect an educational center which provides a laboratory environment with real-life technology laid out for hydrogen applications on top of modern training infrastructure.

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H_2 Educational Center: front view

During the construction period, a consortium comprising KWS Energy Knowledge eG, The Hydrogen and Fuel Cell Center ZBT GmbH, the city of Duisburg, VAIS Verband für Anlagentechnik und Industrieservice e.V. as well as Fraunhofer Institute for Material Flow and Logistics IML, along with associated partners like thyssenkrupp Steel Europe AG, Niederrheinische Industrie- und Handelskammer, Handwerkskammer Düsseldorf and others will develop a qualification matrix.

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H_2 Educational Center: rear view

Loan programs from the federal and state governments will financially assist both the construction of the building as well as the development and validation of the training matrix.
Beginning in 2026, the new training courses and seminars are scheduled to be organized and conducted by KWS in the completed H2 Educational Center. The comprehensively devised program with its customized immersive courses will cover a wide range of training options from entry-level qualification through advanced technical instruction with or without CIC exams all the way to complete training courses. The specific focus on hydrogen technology is designed to create the basis for intensive cooperation with the industry, other instruction providers, and universities and to ensure a continuously high degree of capacity utilization.

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. 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 provides a general framework and concept, a multitude of staffers worked out concrete processes and procedures. This lays the groundwork for high acceptancy and sustainable application.
The first monitoring audits in accordance with DIN EN ISO 9001:2015 standard and AZAV license (Accreditation and Licensing Ordinance for the Promotion of Employment) took place from November 10th – 11th, 2022.
The audit criteria derive from quality management system requirements, the AZAV Accreditation and Licensing Ordinance, the recommendations from the accreditation advisory board on the AZWV of May 23rd, 2011, and the recommendations of the board in accordance with Sec. 182 SGB III in its respective current version. The scope of application encompasses advanced training in the field of power plant technology, simulator training, and organization development.

The audits conducted pursued the following objectives:
- Assessment of conformity of the management system of the client in full or in part with the audit criteria listed above
- Assessment the fitness of the management system, ascertainment of meeting applicable legal, regulatory, and contractual requirements, albeit the audit does not rate compliance with legal provisions
- Evaluation of the effectiveness of the management system with regard to making sure that the client's organization meets its stated goals lastingly and
- Identification of areas for possible improvements in the management system.

Audit result:
- The audit found no deviation from the ordinance- and handbook-compliant implementation status of DIN EN ISO 9001:2015 as well as the AZAV ordinance.
- Three potential points of improvement were identified.
- The QM documentation is well-regulated and available to all parties involved.
- Acceptance of the QM system by all parties involved is a fact.
- The QM system is developed further and consistently applied with regard to its implementation.
- Some 20 individuals were interviewed.
- 112 documents and pertinent processes were reviewed.

Improvements suggested will be implemented in 2023.
The AZAV audit result confirms that KWS consistently continues to meet the requirements for government- sponsored 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:
- 01st Hydrogen Industry Day, Essen/Germany
- IFAT 2022, Munich/Germany
- Enlit Africa 2022, Cape Town/South Africa
- 14th North Rhine-Westphalia Wind Energy Industry Day (Branchentag Windenergie NRW), Gelsenkirchen/Germany
- WindEnergy 2022, Hamburg/Germany
- 54th Colloquium on Power Plant Technology (Kraftwerkstechnisches Kolloquium), Dresden/Germany
- 33rd VDI-/ITAD-Symposium "Thermial Waste Treatment", Würzburg/Germany
- 30th Wind Energy Days, Linstow/Germany

Awarding the Badge of Honour

The KWS Energy Knowledge eG badge of honor is awarded to persons who have contributed in a voluntary capacity to the association or they have given the KWS long-term support through their influence and support in the area of teaching. This extraordinary effort can be honored with the honorary badge in bronze, silver or gold.

In 2022 the general assembly of KWS awarded its **gold** badge of honor to:
Mr. Dr. Jens Eck
- former chairman of the financial and legal committee

In 2022 the general assembly of KWS awarded its **silver** badge of honor to:
Mr. Magister Jens Eck
- former deputy chairman of the financial and legal committee

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.
Featuring an innovative energy concept, this architecturally successful object blends in perfectly with its Deilbachtal surroundings and complements the Energy-Campus Deilbachtal.
As expected, demand for apartments was again very high in 2022 since a large percentage of courses were conducted in the classroom. In spite of training courses continuing to taking place online through March 2022, an occupancy rate of 80.6 percent was achieved. Great demand suggests even higher occupancy for 2023.

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 30 times by external hosts of seminars or conventions.

Inside view of conference room

KWS Energy Knowledge eG

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