

vgbe Technical-Scientific Report

# Analysis of Unavailability of Power Plants 2015 – 2024

VGBE-TW-103Ae (2025)



vgbe  
Technical-Scientific Report  
Analysis of Unavailability of  
Power Plants 2015 – 2024

VGBE-TW-103Ae (2025)  
(formerly VGB-TW 103Ae)

Publisher:  
vgbe energy e.V.  
Publishing house:  
vgbe energy service GmbH  
Verlag technisch-wissenschaftlicher Schriften  
Deilbachtal 173, 45257 Essen, Germany  
Tel.: +49 201 8128-200  
E-mail: [sales-media@vgbe.energy](mailto:sales-media@vgbe.energy)  
ISBN 978-3-96284-410-3 (e-book, English)  
ISBN 978-3-96284-409-7 (e-book, German)

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## **Reference to series**

*Verfügbarkeit von Kraftwerken 2015 – 2024*

*VGBE-TW-103V (2025) German Edition: ISBN 978-3-96284-411-0 (e-book)*

*Analysis of Availability of Power Plants 2015 – 2024*

*VGBE-TW-103Ve (2025) English Edition: ISBN 978-3-96284-412-7 (e-book)*

*Analyse der Nichtverfügbarkeit von Kraftwerken 2015 – 2024*

*VGBE-TW-103A (2025) German Edition: ISBN 978-3-96284-409-7 (e-book)*

*Analysis of Unavailability of Power Plants 2015 – 2024*

*VGBE-TW-103Ae (2025) English Edition: ISBN 978-3-96284-410-3 (e-book)*

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## Note on the evaluation

The following reports could not be published because there are not sufficient data available for this period to form a collective according to the anonymization criteria of the vgbe KISSY database:

- B.2.1.2 Hard coal-fired units with slag tap firing
- B.2.3 Oil/Gas-fired units, total
- B.3.2 All units (without CCGT and gas turbine) < 10 MW

## I. Introductory Remarks

### Introduction

Since 1970, vgbe/VGB<sup>1</sup> has been collecting data on the availability and utilisation of thermal power plants using standardised definitions and calculation methods. The aim is to evaluate, compare, and optimise the operation of power plants and the plants themselves. This technical and economic assessment of power plants has become increasingly important since the liberalisation of the energy markets. Starting in 1988, data on unavailability incidents have also been collected in order to identify and assess direct causes (systems and main components).

Power generation in Europe has changed substantially over the last decade. This includes the development of renewable energies, the reduction in electricity generation by conventional power plants, the different national European energy policies, and the development of the electricity market. Therefore, an efficient tool is needed for assisting in decision-making in order to be able to evaluate the various influences.

According to the suggestions of the vgbe Technical Committee “Performance Indicators” (TCPI) the database system KISSY is modified and updated to enable technical benchmark reports to be displayed on the screen. The European energy suppliers which provide data are able to analyse the data online. Currently, KISSY supports German, English, French, Italian, Dutch, and Portuguese. In addition to the existing parameters, the new online analysis tool will also contain parameters defined by the TCPI in the future. Commercial background information (e.g. price data from the electricity stock exchange) is also to be included in the KISSY system.

In addition to the KISSY update, the associated vgbe/VGB standards are already being published in different languages. The former VGB guidelines “Availability of Thermal Power Plants”, “Unavailability of Thermal Power Plants” and “EMS Event Criterion Key System” were combined into a single vgbe/VGB standard, which has since been revised several times and expanded with new parameters. The English, French, Portuguese and German versions can be downloaded for free from the vgbe Homepage<sup>2</sup>.

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1 vgbe energy e.V. has been the new name of VGB PowerTech since April 2022.

2 [www.vgbe.energy](http://www.vgbe.energy)

## Data collection

In addition to the power plant availability parameters, the performance of key systems and equipment affecting the unavailability of power plants are also important. An unavailability analysis is also done annually in order to identify such systems and equipment and to monitor or retrofit these parts in order to improve power plant performance. The systems and equipment are specified according to the power plant identification system (KKS – Kraftwerk-Kennzeichensystem / Identification System for Power Stations).

Data for unavailability analysis is collected annually from the vgbe member companies similar to the data for the availability analysis. Since not all companies participating in the availability statistics also provide data for unavailability statistics, the analysis is based on different plant categories and the data set is not the same.

The unavailability incidents are coded in accordance to the vgbe event characteristics key (EMS). Approximately 7,200 unavailability incidents were recorded in the year 2024, i.e. during the period under review, 2015 to 2024, a total of about 95,000 unavailability incidents was evaluated.

The EMS – introduced in the year 2003 – replaced all former event-coding key systems. This guarantees unambiguous coding.

The evaluation of unavailability of thermal power plants at hand covers the operating period 2015 to 2024 with operating parameters for a total of 231 units. The evaluation takes into account all data that were entered online by vgbe member companies into the KISSY data base by 31<sup>th</sup> July 2025 for the period under review, i.e. until the end of 2024.

### General remarks concerning the structure of the report

This report was restructured and adapted to the 'Availability of Power Plants' technical-scientific reports and considers only units which entered unavailability incidents into the corresponding module of the power plant information system.

Reserve power plants that do not actively participate in the market but are hold for grid support do not participate in this inter-company benchmark. In the online evaluation module of KISSY, it is possible to carry out separate evaluations for these special power plants independently.

The category 'Results' is separated in four types of units: fossil fired units, CCGT's, gas turbines, and nuclear power plants. The fossil fired units were divided additionally in the categories fuels, technology, and capacity. This section evaluates the incidents of the following causers: all, fuel relevant and non fuel relevant with the correspondent KKS function key. The 'Gas Turbine' sub chapter focuses on the simple gas turbines (without CCGT) divided into the parts open cycle and jet engine units. The nuclear power plants take into account the light water reactors (BWR and PWR) in total. All other types of reactors are not taken into account due to the low number of units and the resulting small statistical expression.

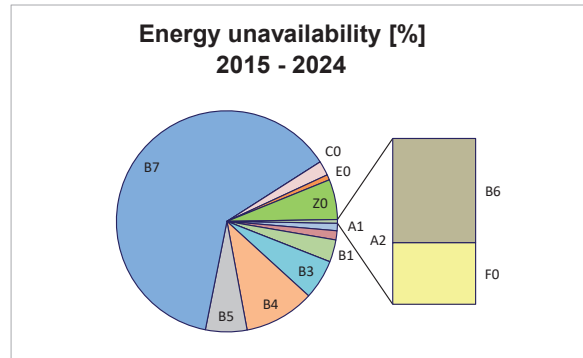
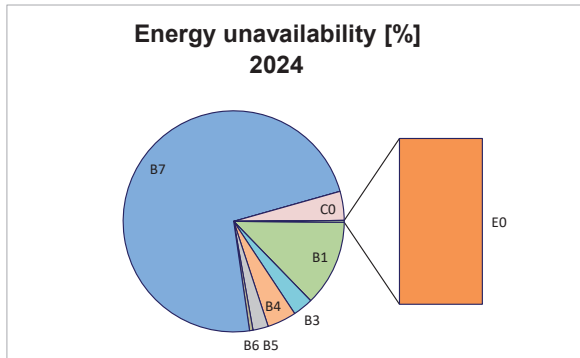
Remark: All values shown in normal font are weighted average values, while quartile values are shown in italics.

Other definitions can be found in the vgbe/VGB-Standards:

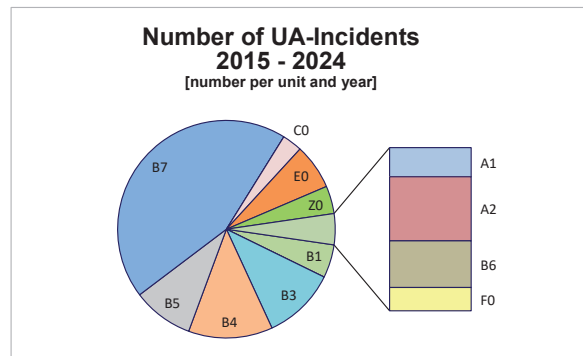
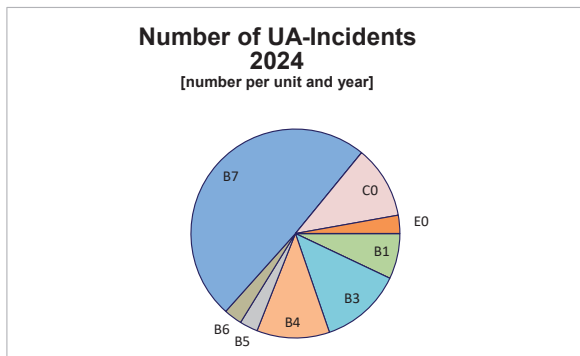
- VGBE-S-002-01      Basic Terms of the Electricity and District Heating Industry
- VGBE-S-002-03      Technical and Commercial Key Indicators for Power Plants, including EMS Event Characteristic Key System
- VGB-S-002-33      Annex to VGB-S-002 Series

**A. Types of incidents of planned unavailability 2015 – 2024**

**A.2 Combined cycle units, total**  
(46 units, AT, BE, DE, ES, FR, LV, PT)



	EMS 1	Units	A1	A2	B1	B2	B3	B4	B5	B6	B7	B8	C0	E0	F0	Z0
Energy unavailability [%]	2024	30	0.00	0.00	1.27	0.00	0.30	0.43	0.23	0.05	7.34	0.00	0.43	0.03	0.00	0.00
	2015 - 2024	46	0.10	0.12	0.28	0.00	0.51	0.90	0.53	0.03	5.49	0.00	0.19	0.07	0.02	0.51
Unavailability incidents per unit and year	2024	30	0.00	0.00	0.17	0.00	0.30	0.27	0.00	0.07	1.17	0.00	0.27	0.07	0.00	0.00
	2015 - 2024	46	0.02	0.04	0.11	0.00	0.25	0.29	0.21	0.03	1.02	0.00	0.07	0.16	0.02	0.10

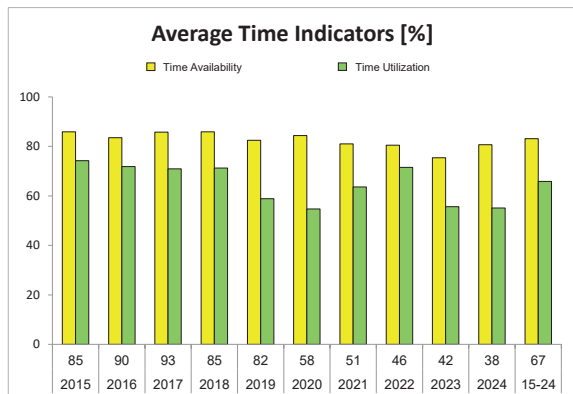
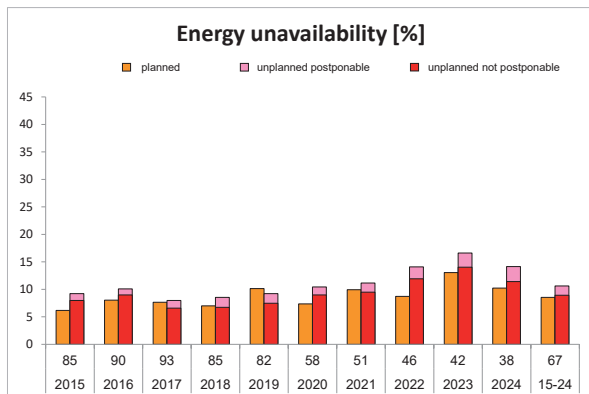
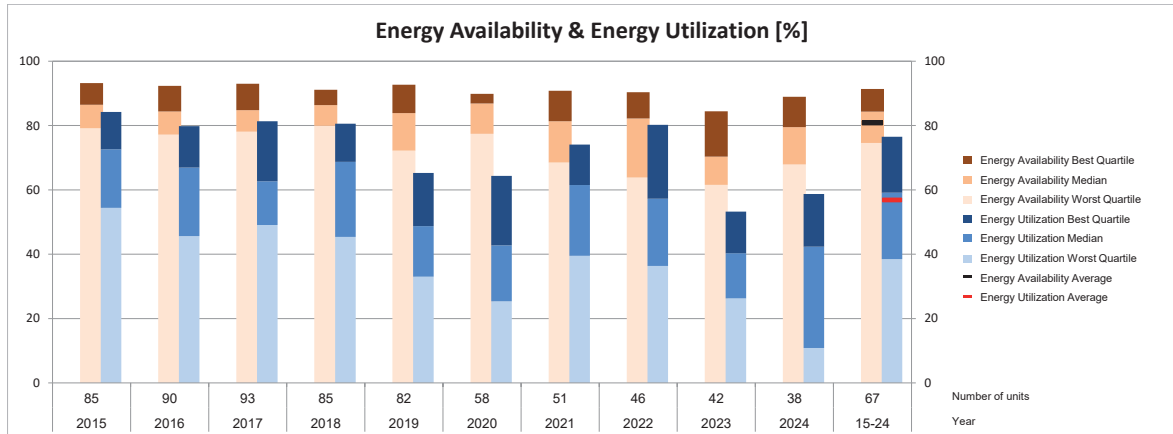


**Types of incidents of planned unavailability (EMS 1)**

- A1 Failure without damage
- A2 Damage
- B1 Check/condition check
- B2 Lubrication
- B3 Maintenance
- B4 Inspection
- B5 Preventive maintenance
- B6 Cleaning
- B7 Revision
- B8 Refuelling
- C0 Reconstruction/refurbishment
- E0 Tests/functional tests/functional check
- F0 Official test/measure
- Z0 Other type of incidents

## B. Analysis of unplanned unavailability 2015 – 2024

### B.1.1 Fossil-fired units, total (106 units, AT, DE, PL, PT)

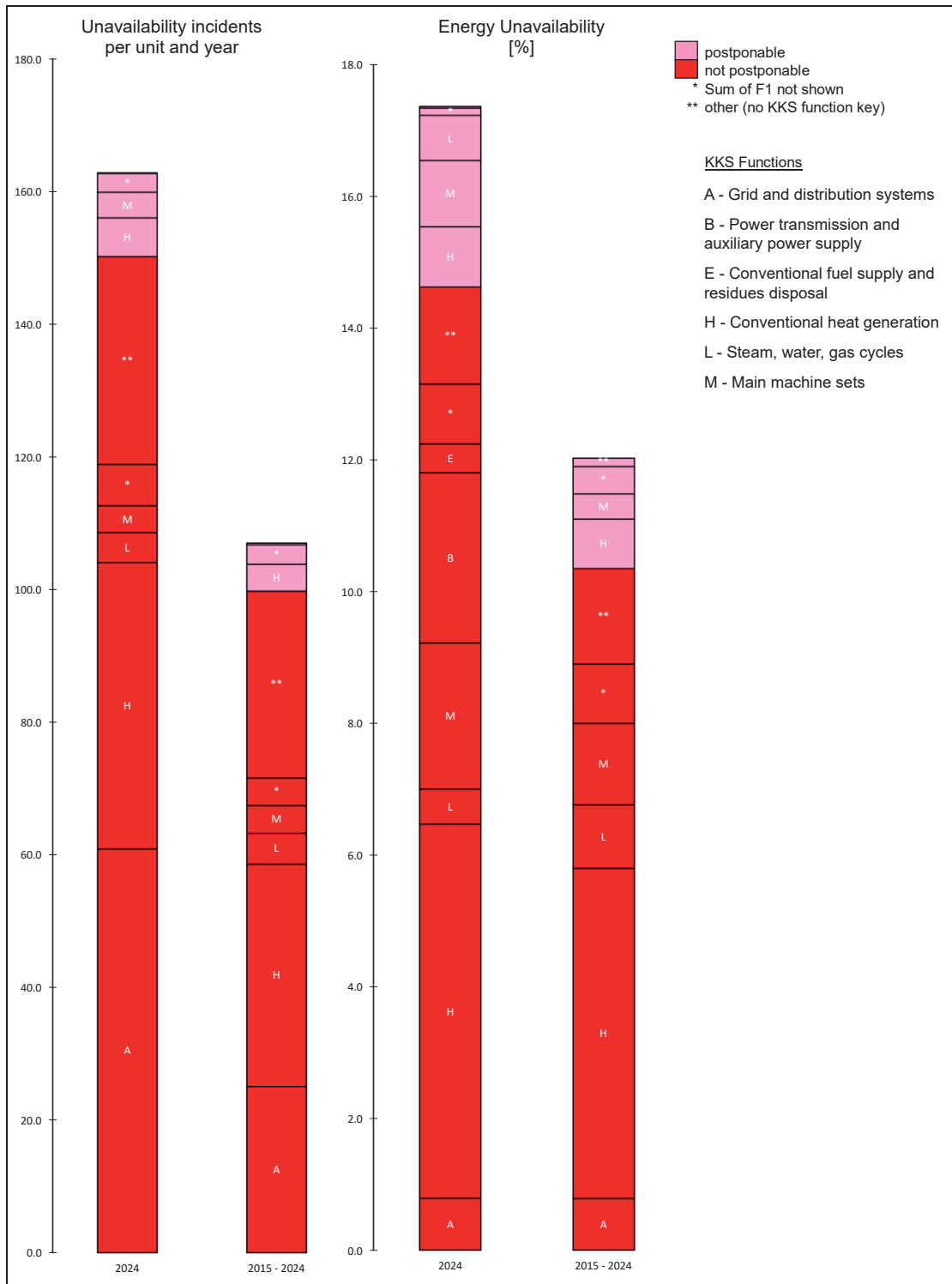


Average values/Quartile values		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	15-24
Number		85	90	93	85	82	58	51	46	42	38	67
Capacity	MW	35,014	36,190	35,590	33,089	31,137	27,049	24,588	22,534	20,362	18,749	28,430
Energy Availability	%	84.6	81.9	84.4	84.5	80.7	82.2	78.9	77.2	70.3	75.6	80.8
worst quartile	%	79.2	77.2	78.1	79.9	72.2	77.4	68.5	63.8	61.6	67.9	74.6
median	%	86.5	84.4	84.8	86.4	83.9	86.9	81.4	82.2	70.3	79.5	84.3
best quartile	%	93.2	92.4	93.0	91.1	92.7	89.8	90.8	90.4	84.4	89.0	91.4
Energy Unavailability	%	15.4	18.1	15.6	15.5	19.3	17.8	21.1	22.8	29.7	24.4	19.2
planned part	%	6.2	8.0	7.7	7.0	10.1	7.4	9.9	8.7	13.1	10.2	8.5
unplanned part	%	9.2	10.1	8.0	8.5	9.2	10.4	11.2	14.1	16.6	14.2	10.6
postponable	%	1.3	1.1	1.4	1.8	1.7	1.4	1.7	2.2	2.6	2.7	1.7
not postponable	%	8.0	9.0	6.6	6.7	7.5	9.0	9.5	11.9	14.0	11.4	8.9
Energy Utilization	%	68.0	63.2	62.7	64.6	50.2	43.1	54.8	61.0	43.1	42.0	56.8
worst quartile	%	54.4	45.7	49.1	45.4	33.0	25.3	39.5	36.3	26.3	10.9	38.5
median	%	72.6	66.9	62.7	68.7	48.7	42.8	61.5	57.3	40.3	42.4	59.1
best quartile	%	84.2	79.8	81.4	80.6	65.3	64.3	74.1	80.2	53.3	58.7	76.5
Time Availability	%	85.9	83.5	85.7	85.9	82.5	84.4	81.0	80.5	75.4	80.7	83.1
worst quartile	%	80.1	78.3	78.5	80.6	73.7	78.6	71.4	67.8	65.9	72.6	76.4
median	%	88.5	85.5	85.8	87.7	84.3	86.9	81.8	84.4	74.3	81.1	85.2
best quartile	%	94.3	93.2	94.2	93.0	93.3	91.7	92.5	91.4	87.6	93.9	92.9
Time Utilization	%	74.2	71.8	70.9	71.2	58.9	54.7	63.6	71.5	55.7	55.1	65.9
worst quartile	%	68.6	61.3	57.8	54.6	41.0	35.0	50.4	46.2	30.6	27.3	50.4
median	%	79.9	79.5	80.0	78.9	62.1	68.2	73.0	74.8	56.9	65.1	73.5
best quartile	%	91.7	88.2	91.8	88.0	78.0	79.9	87.6	88.9	78.5	78.6	86.7

## B. Analysis of unplanned unavailability 2015 – 2024

### B.1 Causers all areas (KKS function keys F1: A to Z)

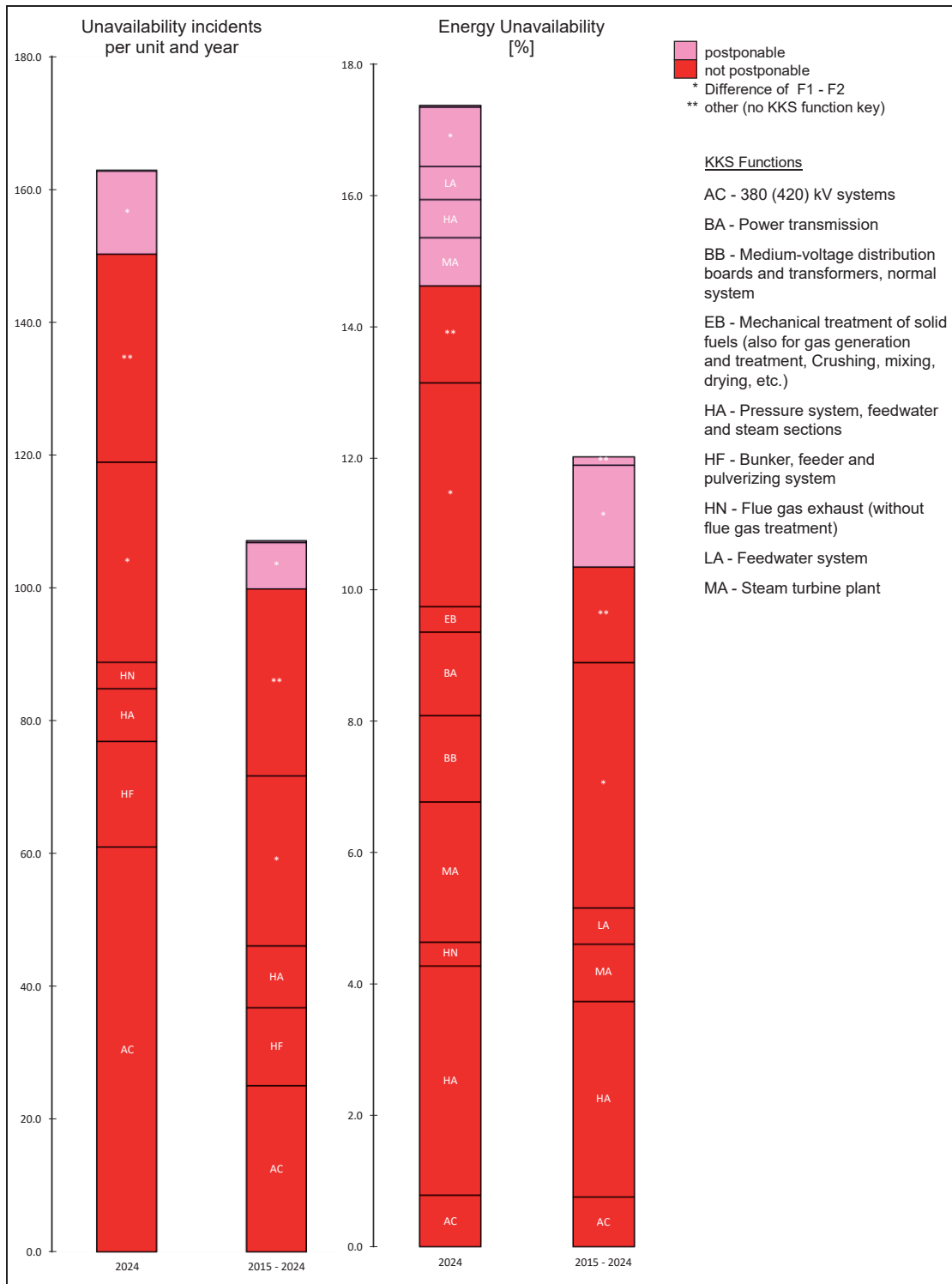
#### B.1.1 Fossil-fired units, total (106 units, AT, DE, PL, PT)



## B. Analysis of unplanned unavailability 2015 – 2024

### B.1 Causers all areas (KKS function keys F1: A to Z)

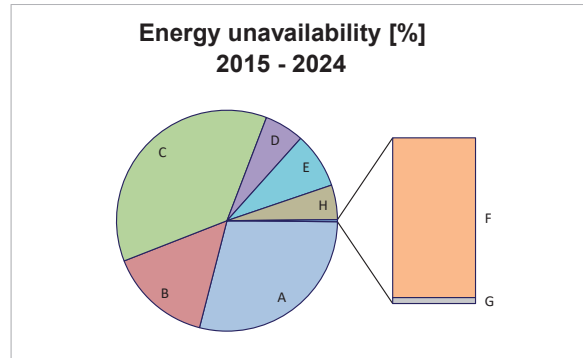
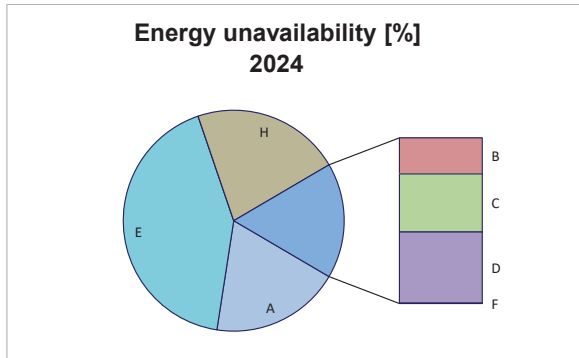
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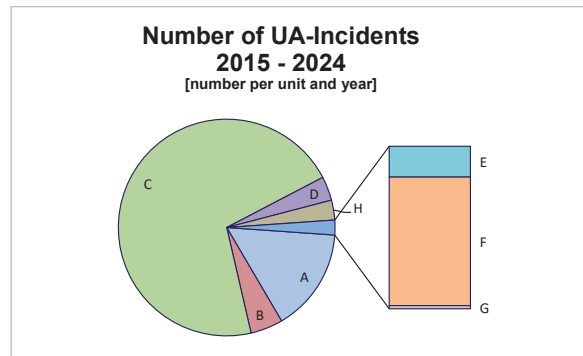
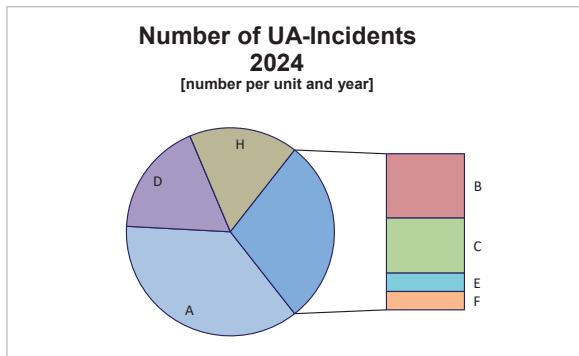
**B. Analysis of unplanned unavailability 2015 – 2024**

**B.4 Time-frame**

**B.4.2 Combined cycle units, total**  
(46 units, AT, BE, DE, ES, FR, LV, PT)



	EMS 4/1	Units	A	B	C	D	E	F	G	H
Energy unavailability [%]	2024	30	0.68	0.13	0.21	0.26	1.52	0.00	0.00	0.78
	2015 - 2024	46	2.63	1.37	3.35	0.53	0.74	0.03	0.00	0.46
Unavailability incidents per unit and year	2024	30	1.43	0.47	0.40	0.70	0.13	0.13	0.00	0.67
	2015 - 2024	46	4.05	1.27	18.63	0.94	0.11	0.46	0.01	0.78



**time-frame of unavailability (EMS 4/1)**

- A Automatic load-rejection/fast shutdown
- B Manual load-rejection/fast shutdown
- C Controlled shutdown within 12 hours
- D Start-up or recommissioning not possible
- E Exceeding planned incident-time
- F Start-up-time extension
- G Start-up prolongation
- H Postponable more than 12 hours

## V. References

- vgbe-Standard Basic Terms of the Electricity and District Heating Industry, VGBE-S-002-01-2024-10-EN, 12<sup>th</sup> Edition 2024, vgbe energy service GmbH, Essen.
- vgbe-Standard Technical and Commercial Key Indicators for Power Plants – incl. EMS Event Characteristic Key System, VGBE-S-002-03-2024-10-EN, 10<sup>th</sup> Edition 2024, vgbe energy service GmbH, Essen..
- VGB Standard Annex to VGB-S-002 Series, VGB-S-002-33-2016-08-EN, 1<sup>st</sup> Edition 2016, VGB PowerTech Service GmbH, Essen.

All listed vgbe/VGB-Standards are also available in German.

### Note:

The following guidelines were revised and taken over in the above vgbe/VGB-Standards:

- VGB-Guideline Availability of Thermal Power Plants – Fundamentals and Determination, VGB-RV 808, 6<sup>th</sup> Edition 1999. This edition was published as part of the series “Begriffe der Versorgungswirtschaft”, Part B, Booklet 3. VGB PowerTech Service GmbH, Essen, und VWEW-Verlag, Frankfurt (Main).
- VGB-Guideline Analysis of the Unavailability of Thermal Power Plants, VGB-R 140e, 2<sup>nd</sup> Edition 1999, VGB PowerTech Service GmbH, Essen.
- VGB-Guideline EMS Event-Criterion-Key-System, VGB-B 109, 1<sup>st</sup> Edition 2003, VGB PowerTech Service GmbH, Essen.

**Editor:**

**vgbe energy e. V.**  
Deilbachtal 173  
45257 Essen  
Germany

**Publishing house:**

**vgbe energy service GmbH**  
Deilbachtal 173  
45257 Essen  
Germany

**t** +49 201 8128-0

**e** sales-media@vgbe.energy

**be informed**

[www.vgbe.energy](http://www.vgbe.energy)  
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ISBN 978-3-96284-377-9 (e-book, English)  
ISBN 978-3-96284-376-2 (e-book, German)