



KTG

29.09.2023 | 16:00-18:00 Uhr



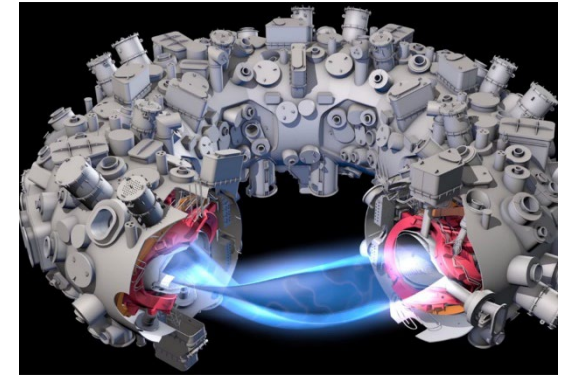
FRANK APEL

Vorstandsvorsitzender KTG

KERNTECHNIK

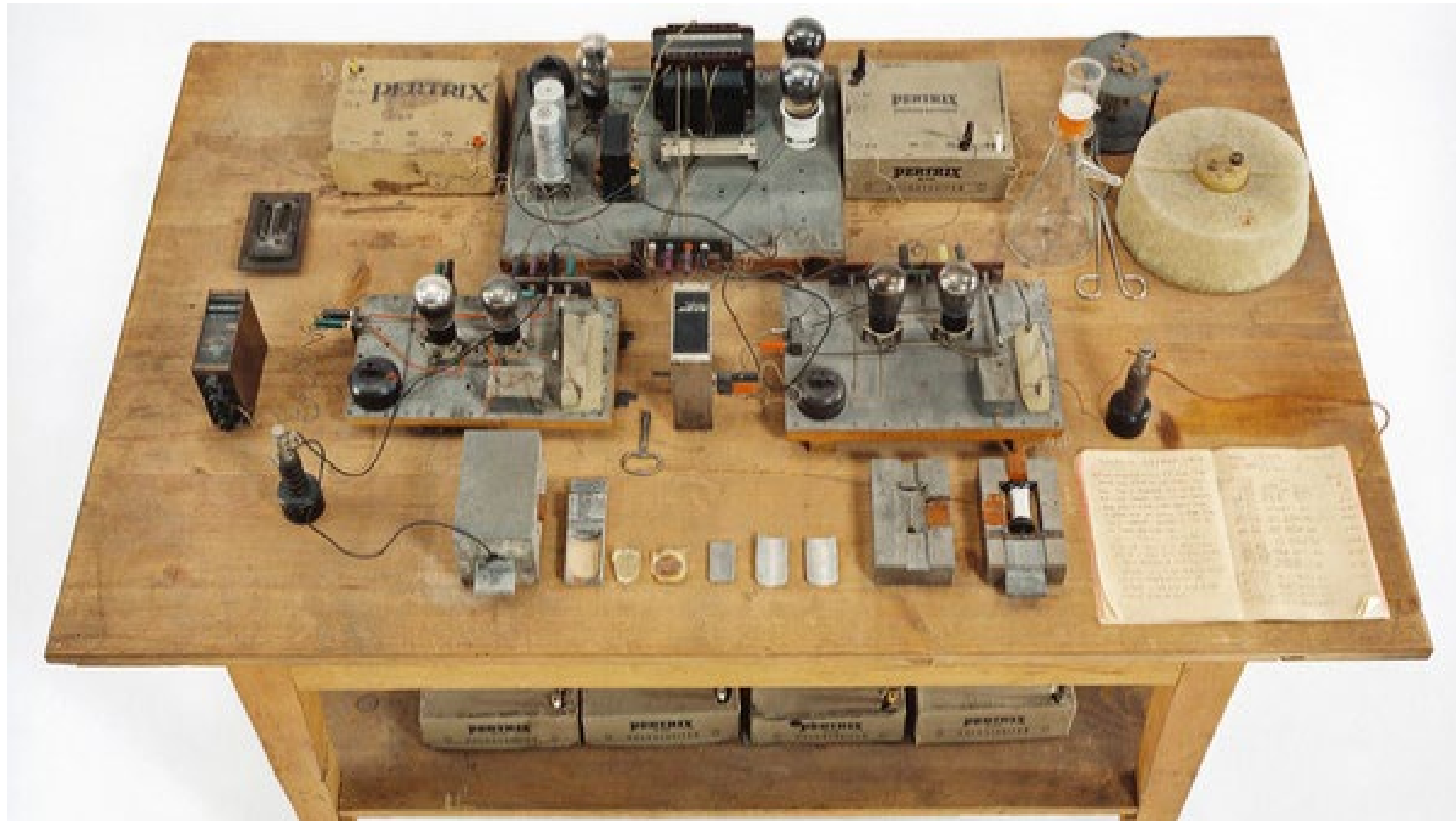
Made in Germany

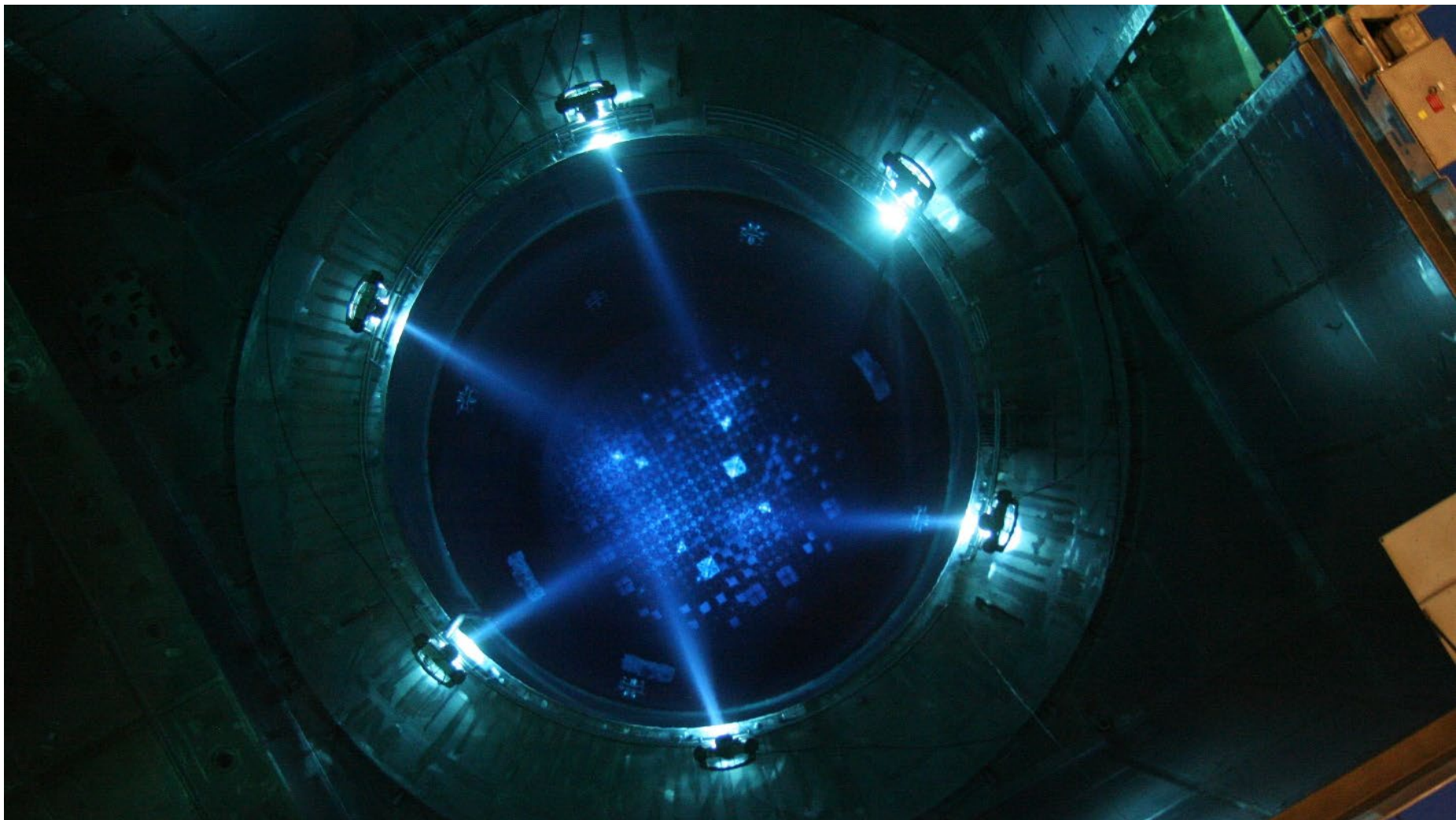
Fascinating Nuclear Technology



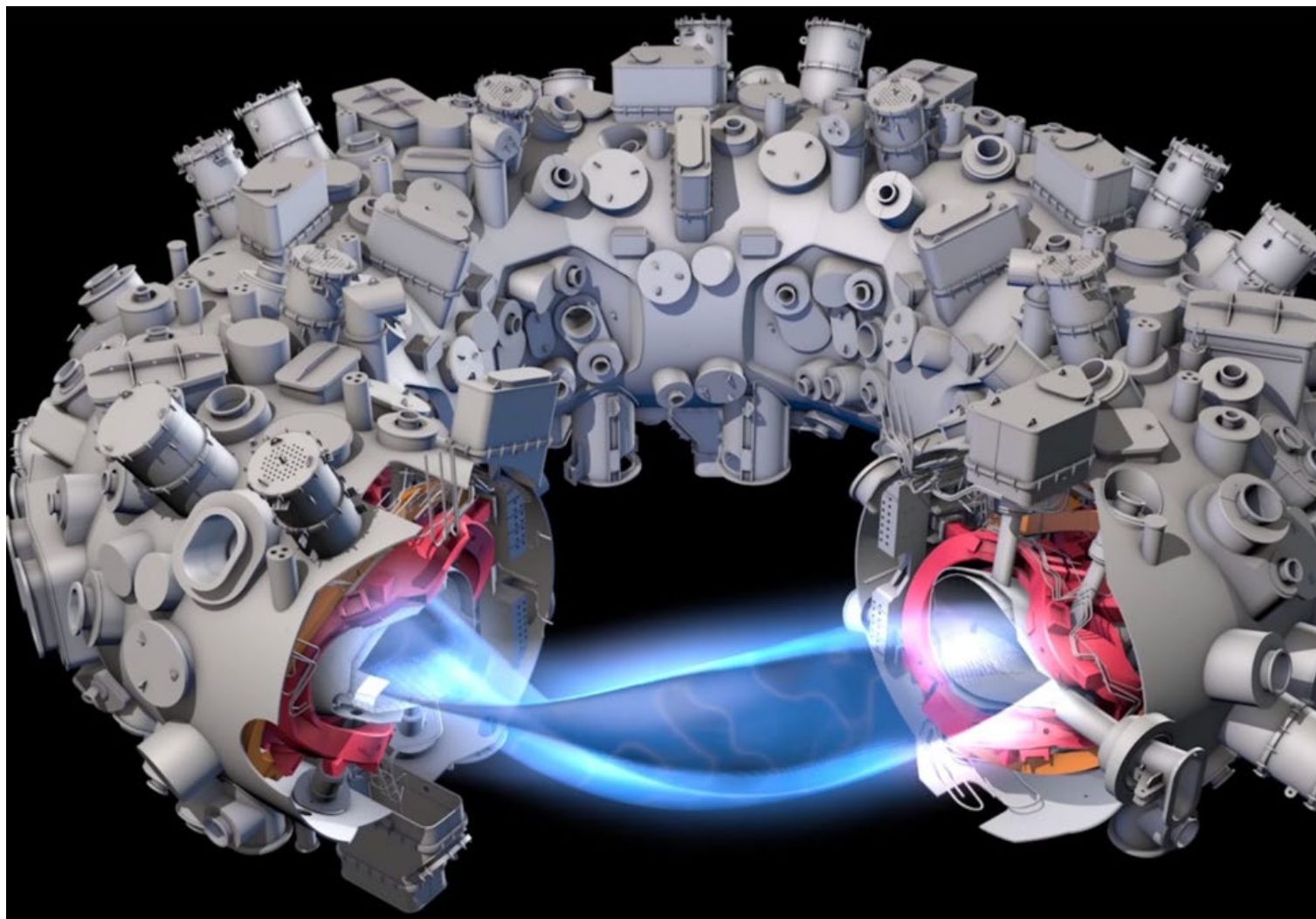
Wenn Du ein Schiff bauen willst, dann trommle nicht Männer zusammen, um Holz zu beschaffen, Aufgaben zu vergeben und die Arbeit einzuteilen, sondern **lehre die Männer die Sehnsucht nach dem weiten, endlosen Meer.**

Antoine de Saint-Exupéry







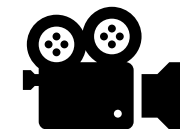


All-Rounder Nuclear Technology

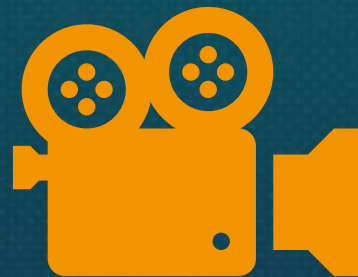


**KERNTECHNIK
IN FORSCHUNG
UND ALLTAG**

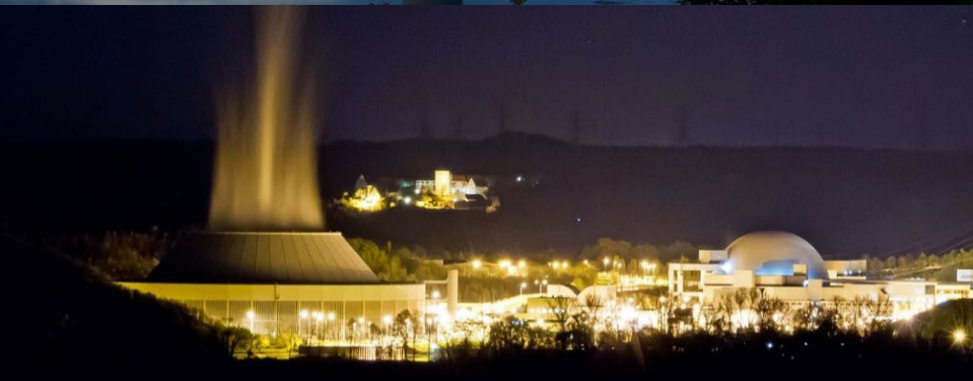
- Nuclear technology in Germany is (was) not limited to energy production.
- Nuclear technology is biology, nuclear technology is environment, nuclear technology is information technology, medicine, art, history, space travel, cars, airplanes, computers, smartphones, spices and even yogurt pots.
- In short: nuclear technology is everywhere and reaches far into our everyday lives.
- The all-rounder (Alleskönner) nuclear technology offers surprising and fascinating aspects...



VIELKÖNNER KERNTECHNIK



Power off (April 15th, 2023)



German NPPs have been World Champions

- Records are nothing new for the Isar 2 nuclear power plant. The nuclear power plant on the Isar River with a capacity of almost 1,500 MW has been in operation since 1988 and has been world champion in annual electricity generation ten times since then, and became vice world champion in 2022. In the night of November 12, 2022, KKI 2 produced more than 400 billion kWh of electricity during its lifetime.
- This makes KKI 2 the second nuclear power plant in the world to have generated such an amount of electricity. Before KKI 2, the eight-time world champion in electricity production and the Grohnde plant in Lower Saxony, also operated by Preussen Elektra, achieved this in the spring of 2021.

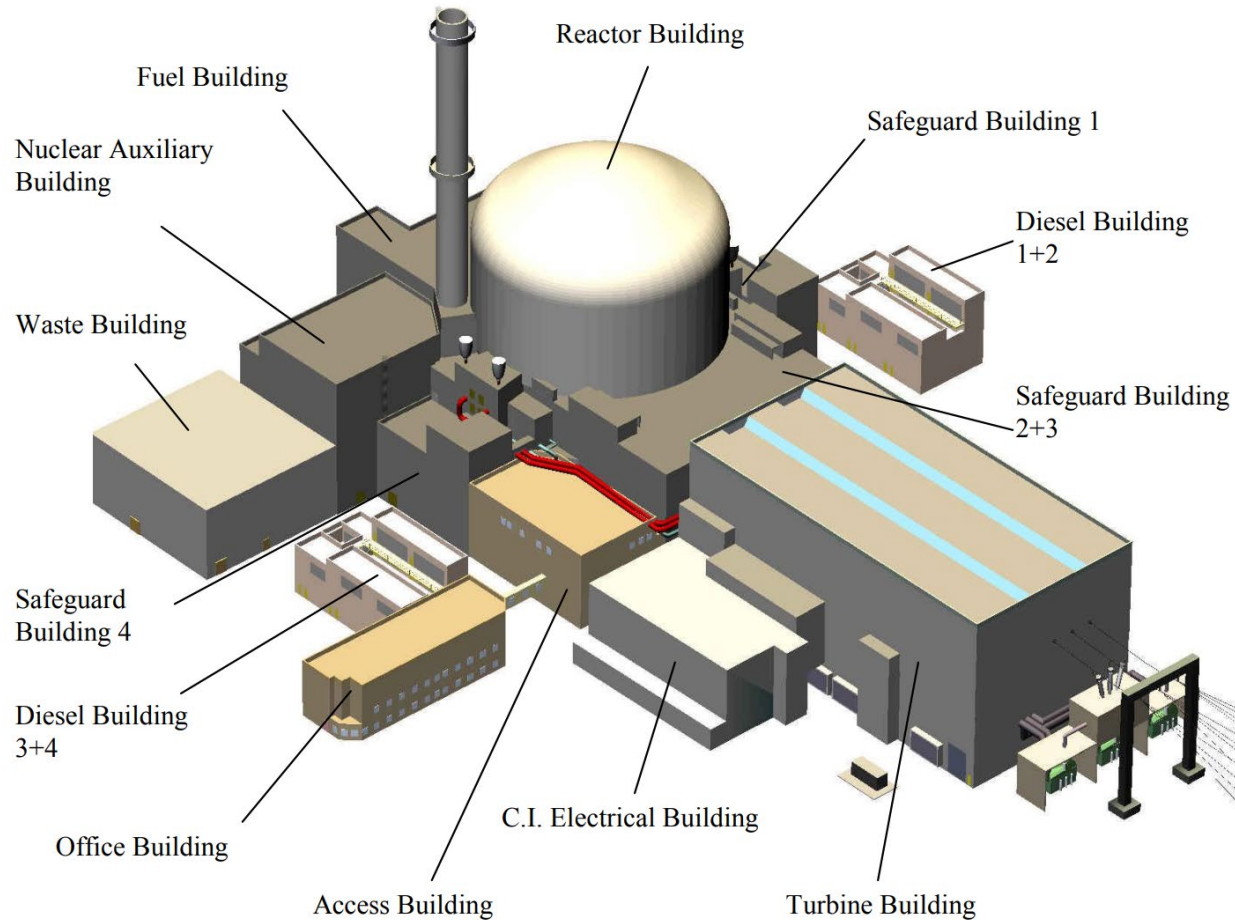
Power on (April 16th, 2023)



Regular electricity production has started at Olkiluoto 3 EPR on April 16th

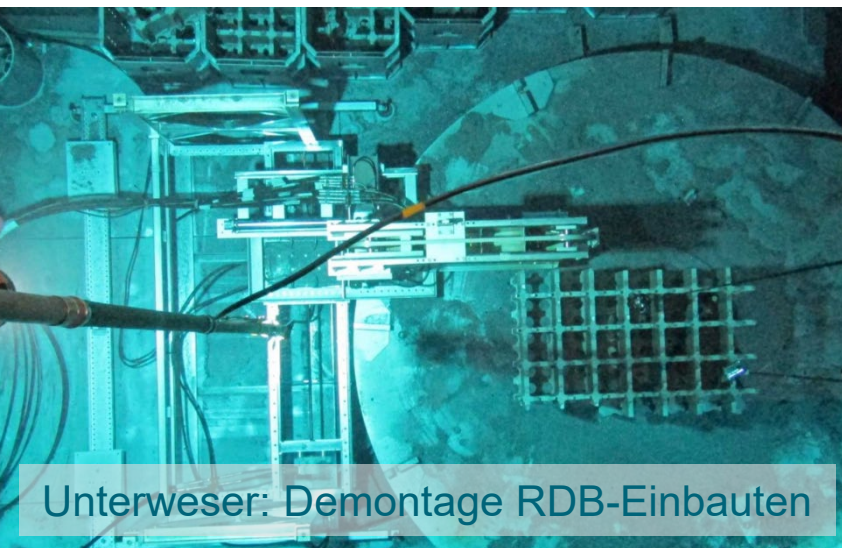
- Test production has been completed; regular electricity production started. From now on, about 30 percent of Finnish electricity is produced in Olkiluoto.
- The electricity production volume of Europe's largest nuclear power plant unit is a significant addition to clean, domestic production. The production of Olkiluoto 3 stabilizes the price of electricity and plays an important role in the Finnish green transition.
- OL3 makes Finland almost self-sufficient. As Finland's greatest climate act, it will also accelerate the move towards a carbon-neutral society.

The EPR



- The design of the 1600 MW EPR is based on experience feedback from several thousand reactors-years of operation worldwide, primarily based on the French N4 and the German KONVOI reactor technologies.
- From the start of the project in 1991, a Franco-German cooperation was set up to develop the EPR: On vendors' side, the two most experienced European nuclear suppliers, Framatome and Siemens acted together. On operators' side, Electricité de France and the major German Utilities formed a strong group.
- The French and German Safety Authorities and safety experts worked closely together in order to ensure that state-of-the-art safety standards will be met on the EPR.
- The structure of the EPR Design Project involving all organizations of the nuc industry from the very beginning ensures a comprehensive industrial approach for the development of the nuclear power plant technology.

Decommissioning & Dismantling (D&D)



Unterwaser: Demontage RDB-Einbauten



Stade: Splitterschutz im Liner entfernt



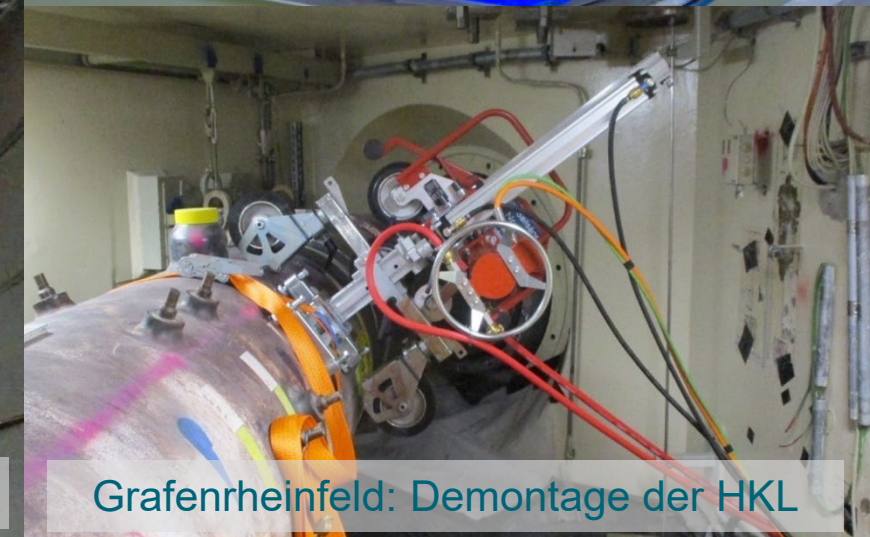
Grohnde: Beprobung der RDB-Einbauten



Unterwaser: RDB-Zerlegung



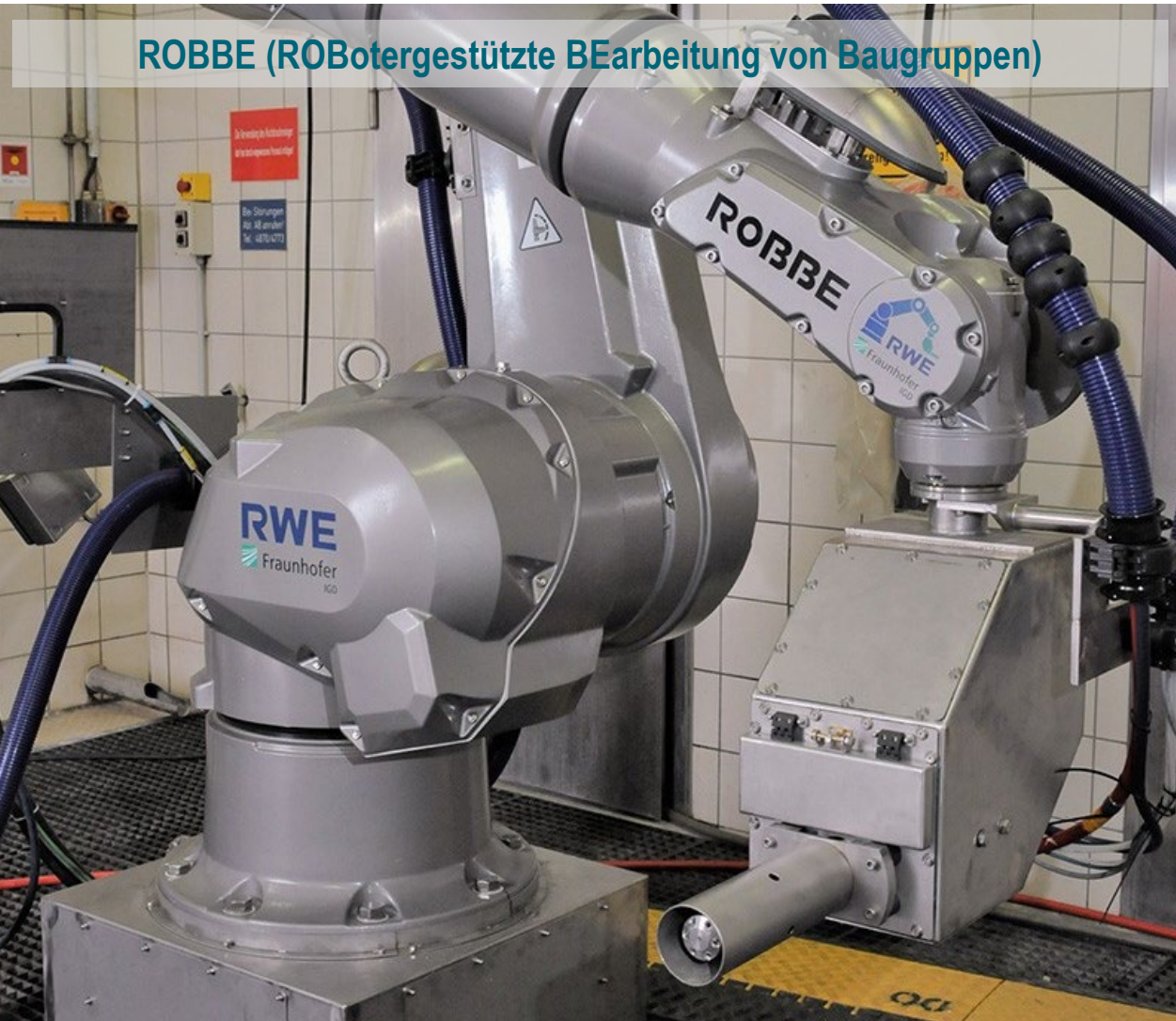
Unterwaser: Wasserfreiheit



Grafenrheinfeld: Demontage der HKL

Hightech in D&D

ROBBE (ROBotergestützte BEarbeitung von Baugruppen)



AZURO (Automatisierte Zerlegung mittels Unterwasser-Robotertechnik)



Nuclear Footprint in Germany (examples)



Regulatory Authorities



Third Parties (TÜV's)



Operators (Utilities)



Federal companies



Nuclear Suppliers



Education and Research



German nuc suppliers go abroad



framatome?

- Support of nuc new build (e.g. EPR-2's in France)
- International Engineering, Fuel and Service Business



- Unique experience from the cask business in Germany led to exports e.g. to Switzerland and Belgium and to new developments e.g. for Taiwan

Westinghouse?

- Support of nuc new build (e.g. AP1000 in Poland)
- International Engineering, Fuel and Service Business



- D&D experience gained in Germany used abroad (e.g. US)
- Supplier for major EPR components (e.g. core catcher)



- D&D experience gained in Germany used abroad (e.g. US)



- Vitrification of HALW in China (after Belgium and Germany)
- International piping and welding projects (resp. nuc new build)

Research on Nuclear Safety



The image shows the cover of a brochure titled "BMWFi-Forschungsförderung zur nuklearen Sicherheit". The cover is primarily dark red with white text. At the top left, there is the logo of the Bundesministerium für Wirtschaft und Energie. The title is prominently displayed in the center. Below the title, there is a subtitle and the years "2021-2025". At the bottom right, there is a yellow circular logo with the text "bmwi.de". The bottom of the cover features a decorative pattern of white dots on a dark red background.

Bundesministerium
für Wirtschaft
und Energie

**BMWFi-Forschungsförderung
zur nuklearen Sicherheit**

*Projektförderprogramm des Bundesministeriums
für Wirtschaft und Energie zur Sicherheitsforschung
für kerntechnische Anlagen*

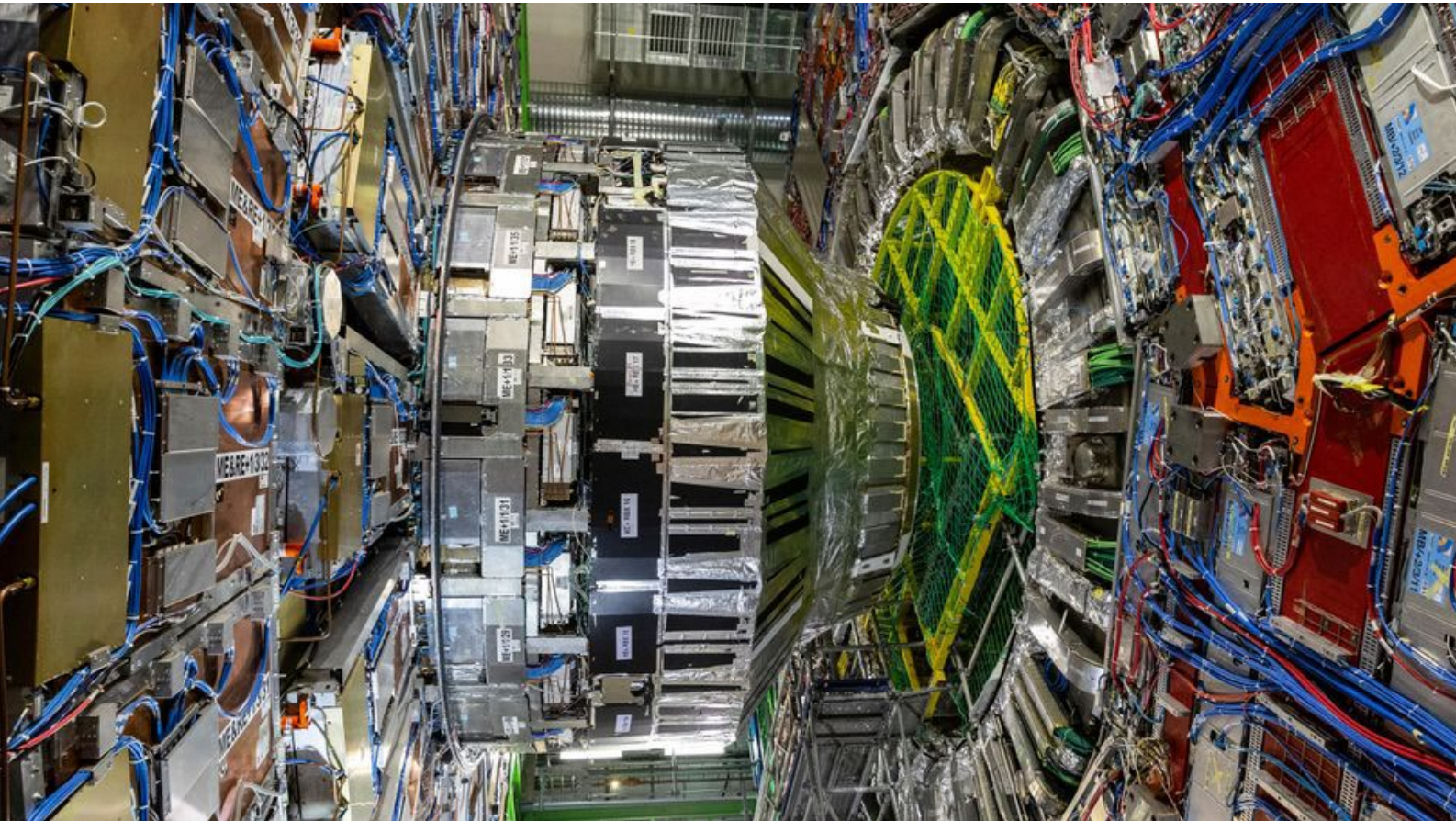
2021-2025

bmwi.de

Research on safety of nuclear facilities

- For the German government, the safe operation of nuclear facilities in Germany, but also in neighboring countries, is a top priority.
- Research projects to assess the safety of the operation of nuclear facilities will be continued.
- Research funding will be used to maintain and expand safety expertise for assessing and further developing the safety of nuclear facilities abroad, including new reactor concepts, even after the end of power operation of nuclear facilities in Germany.
- International developments are accompanied, and the extent to which goals for increasing reactor safety, proliferation resistance (in the case of research reactors) and reduction of radioactive waste and its safe storage can be achieved and, if necessary, made usable for Germany is examined.

Research abroad

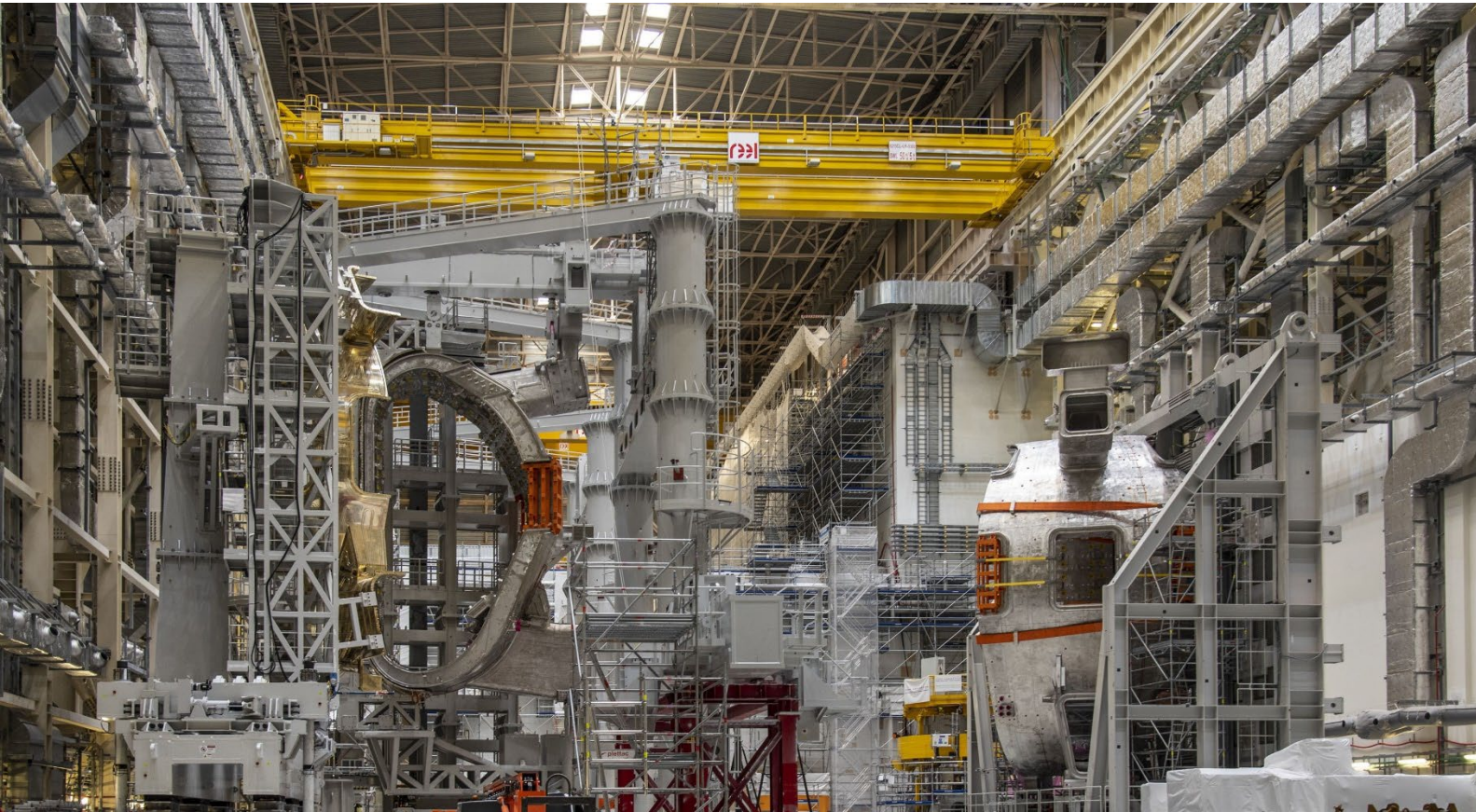


Germany and CERN

- Germany is one of the founding countries of CERN
- with 21% of the yearly budget (2023: ~ 250 million) its largest contributor
- > 300 Germans are employed at CERN, including more than 120 post-docs and students
- CERN experiments involve more than 1100 researchers (students, PhD students, junior group leaders, engineers, professors) working at German universities, research centers of the Helmholtz Association and the Max Planck Society

PS: Kraftanlagen & Assystem have > 25 engineers at CERN

Fusion (ITER)



ITER: one of the most ambitious energy projects in the world today

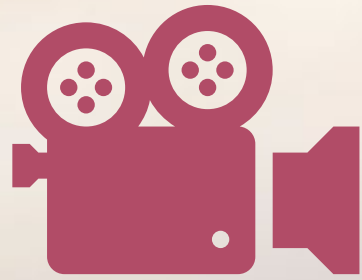
Europe bears the largest portion of construction costs (45.6 %); the remainder is shared equally by China, India, Japan, Korea, Russia and the US (9.1 % each)

ITER is designed to yield in its plasma a ten-fold return on power ($Q=10$), or 500 MW of fusion power from 50 MW of input heating power

Initial costs: 5,5 bn€, estimate by end of 2022: 18 – 22 bn€

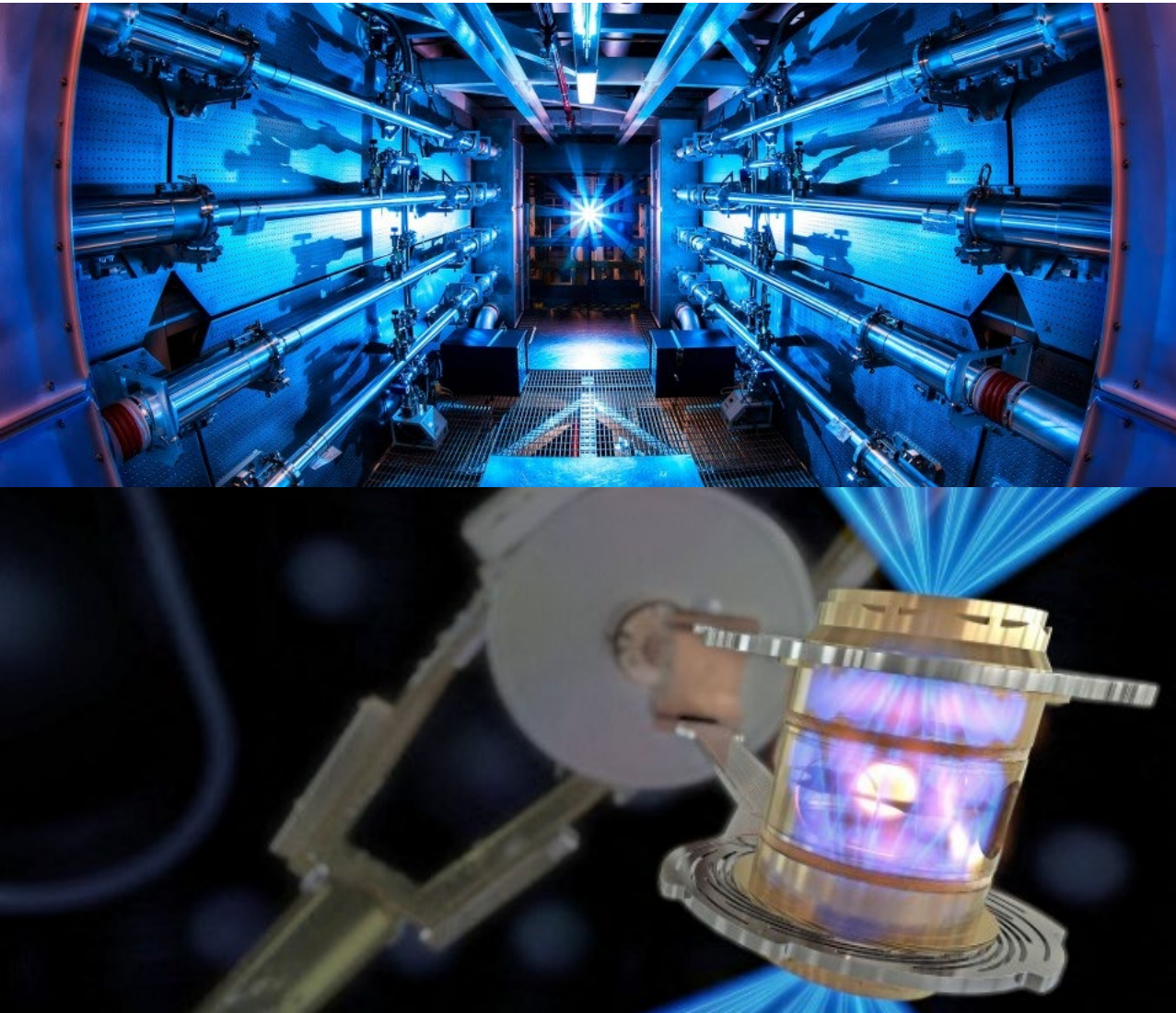
New schedule to be communicated in 2024

THE
B1M



COURTESY OF ITER

Fusion (Breaking News)



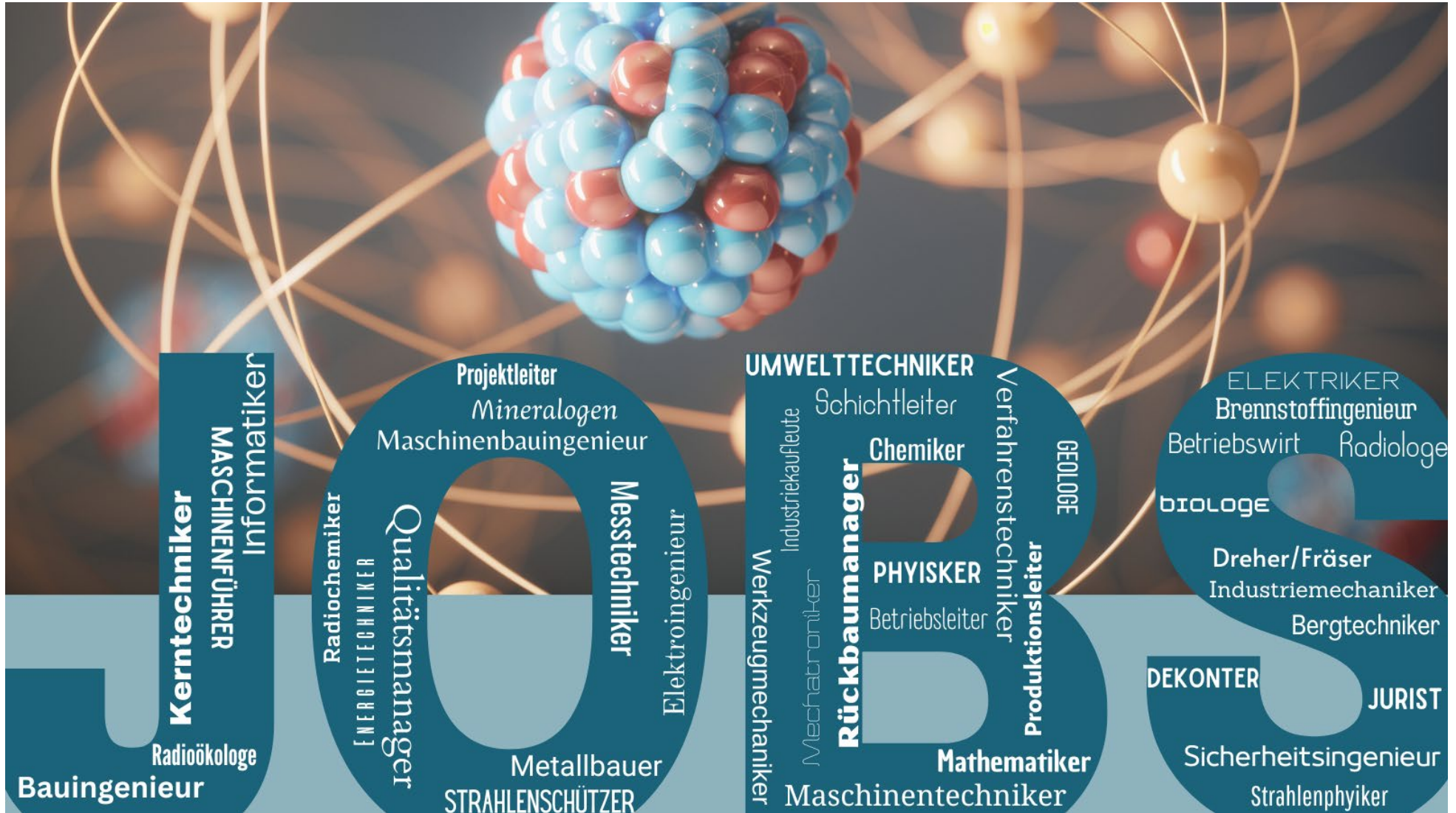
FAZ vom 03.06.2023

Zukunft für Atomkraft in Deutschland: Bundesregierung bereitet Plan vor

- Veranstaltung mit Signalwirkung am 05.06.2023 mit prominenten Teilnehmern: Bundesforschungsministerin Bettina Stark-Watzinger (FDP), Siegfried Russwurm, Präsident des Bundesverbands der Deutschen Industrie (BDI). Peter Leibinger, Technologiechef des schwäbischen Laserherstellers Trumpf, Vinod Philip, Vorstand des Dax-Konzerns Siemens Energy.
- Der Erfolg der US-Forscher lenkte den Blick auf die lasergestützte Fusion. Anders als die Magnetfusion (ITER, Wendelstein 7-X) wird die Laserfusion in Deutschland bisher nicht staatlich gefördert. Genau das aber könnte sich nun ändern.
- FDP-Ministerin Stark-Watzinger: „Die Kernfusion hat das Potential, unsere Energieversorgung zu revolutionieren. Deutschland ist heute in der Fusionstechnik in der Pole Position. Technologisch haben wir die besten Voraussetzungen, um international vorne mitzuspielen. Aber die gute Ausgangslage müssen wir auch in wirtschaftlichen Nutzen ummünzen. Die Kommerzialisierung der Fusionstechnik muss bei uns erfolgen.“

Careers in nuclear technology (examples)

m/w/d



Courses offered by German universities



Saleries



Metall- und Elektroindustrie Baden-Württemberg, ERA - Monatsentgelte (in Euro) gültig ab 01.06.2023 *)

Entgelt- gruppe	Grundentgelt	mit Leistungszulage 15% (average)	mit Leistungszulage Max. (30%)	Jahreseinkommen (average)	Jahreseinkommen (Max)
EG 1	2.522,50 €	2.900,88 €	3.279,25 €	41.192,43 €	45.581,58 €
EG 2	2.591,00 €	2.979,65 €	3.368,30 €	42.311,03 €	46.819,37 €
EG 3	2.727,00 €	3.136,05 €	3.545,10 €	44.531,91 €	49.276,89 €
EG 4	2.863,50 €	3.293,03 €	3.722,55 €	46.760,96 €	51.743,45 €
EG 5	3.034,00 €	3.489,10 €	3.944,20 €	49.545,22 €	54.824,38 €
EG 6	3.204,50 €	3.685,18 €	4.165,85 €	52.329,49 €	57.905,32 €
EG 7	3.409,00 €	3.920,35 €	4.431,70 €	55.668,97 €	61.600,63 €
EG 8	3.647,50 €	4.194,63 €	4.741,75 €	59.563,68 €	65.910,33 €
EG 9	3.886,50 €	4.469,48 €	5.052,45 €	63.466,55 €	70.229,06 €
EG 10	4.142,00 €	4.763,30 €	5.384,60 €	67.638,86 €	74.845,94 €
EG 11	4.414,50 €	5.076,68 €	5.738,85 €	72.088,79 €	79.770,02 €
EG 12	4.721,40 €	5.429,61 €	6.137,82 €	77.100,46 €	85.315,70 €
EG 13	5.028,50 €	5.782,78 €	6.537,05 €	82.115,41 €	90.865,00 €
EG 14	5.335,00 €	6.135,25 €	6.935,50 €	87.120,55 €	96.403,45 €
EG 15	5.642,00 €	6.488,30 €	7.334,60 €	92.133,86 €	101.950,94 €
EG 16	6.017,00 €	6.919,55 €	7.822,10 €	98.257,61 €	108.727,19 €
EG 17	6.358,00 €	7.311,70 €	8.265,40 €	103.826,14 €	114.889,06 €

*) Weitere Erhöhungen zum 01.05.2024 vereinbart

Summary

The complete German phase-out of nuclear energy has remained the great exception internationally.

The German abandonment of electricity generation from nuclear energy is not to be equated with a complete phase-out of the technology:

- ongoing post-operation of the plants
- upcoming tasks in the dismantling of nuclear power plants
- disposal of waste

Germany: a country of cutting-edge research, operating research reactors and participating in international nuclear research programs

Germany has unique scientific and industrial capabilities in nuclear technology, which require a sufficiently large critical mass of German manufacturers, their suppliers and service providers to maintain over the long term

Germany has operated and continues to operate the most reliable nuclear power plants and nuclear facilities, not least because decades of critical discussion about nuclear energy have led to very high safety standards and a highly developed safety culture

On this basis, the German government is committed to a high level of nuclear safety in the EU and worldwide. This interest will exist in the long term, since the majority of other states that use nuclear energy are not seeking to phase it out

However, without its own nuclear industry embedded in a corresponding research landscape, it will not be possible to continue to be a driving force of nuclear safety worldwide



Faszination Kerntechnik

Frank Apel

Vorstandsvorsitzender KTG

frank.apel@kraftanlagen.com



Herzlichen Dank für Ihre Aufmerksamkeit!